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PRODUCING ACUTE PAIN BY MEANS OF A STRIKE AS A RELEVANT PREREQUISITE FOR A SUCCESSFUL REALIZATION OF THE LEVER TECHNIQUE IN REAL AIKIDO

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Abstract: Research was carried out on a sample of real aikido male practitioners aged 35 (±5 years), who were training three times a week. The criteria for choosing the respondents, along with the age structure and gender, was knowledge of real aikido techniques as well. In that sense, it was decided that the respondents would be the practitioners who had trained real aikido for at least 3, and at most 4 years. The aim of the research was to determine the significance of carrying out the strike directly prior to the lever technique, as a relevant prerequisite for using this technique against the attacker. The subject of research are real aikido skills, which consist of a combining of particular techniques. In pairs, the respondents carried out the lever technique upon the shoulder and hand joints by arranged sparring, as a response to a knife attack. After this, the respondents, prior to the realization of the mentioned lever techniques, inflicted a strike to the attacker which had the aim of temporarily “focusing the attention” of the attacker on the exact body part where the strike was inflicted, which resulted in a weaker resistance of the muscles which carry out a movement in the joint on which the lever technique was carried out. The obtained results justified the presumption that lever techniques will be more successfully carried out if the attacker is inflicted a strike directly prior to their realization.

Key words: lever, strike, real aikido, acute pain.

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INTRODUCTION

Basically, the postulates of certain martial arts seem constant, although the techniques as well as the way of their realizing have evolved with the passage of time in almost all martial arts, producing new styles.

The history of aikido and real aikido

It is considered that original (traditional) aikido was founded in 1925. Morihei Ueshiba (1883-1969) carried out a systematization of the partial modification of various Eastern martial arts techniques.

The roots of the earliest aikido martial art can be traced back to aiki-jiu-jitsu, which was founded in the 9th century in Japan. At that time, the mentioned skill was just one of many martial arts which was practiced. It was created by Prince Teijun, the 6th son of the Emperor Seiwa (859-880). The skills consisted of hand strikes which were carried out as sword blows in the gaps of samurai shields. The skill developed slowly until General Saburo Yoshimitsu, the progenitor of a Japanese martial art and an avid devotee of the medical sciences, modified aiki-jiu-jitsu, creating a system called Daitoryu-aiki-jiu-jitsu. As an 18-year-old, Morihei Ueshiba studied jiu-jitsu in the Kito School in Tokyo. He also studied aiki-jiu-jitsu in the Daito School from 1911 to 1916. Also, he practiced Kenjutsu (Japanese swordsmanship) in the Yagyu School. After the Daito School, he studied jiu-jitsu in the Ashinkage School in 1922, and in 1924 he studied jarijitsu (spear fighting). Even though he knew many martial arts, he was dissatisfied with all of them due to the excessive violence associated with them. He came to the idea to create a style of fighting which could defeat the opponent but not harm him. In other words, he wanted to prove to the opponent that the use of physical force is senseless. In accordance with this idea, in 1925 he created his very own martial art - aikido.

Until the year 1948, aikido was an art which was practiced by a relatively small number of people, as Ueshiba did not wish a large number of people to master an art which can be abused. Only after 1948 did aikido spread around the world. At the very end of Uieshiba’s life, several styles of this art was formed, even though there is very little difference between them. The aikido which was founded by Uieshiba was mostly continued by the following martial artists: Hiroshi Tada, Tadashi Abe, Morihiro Saito, Moriteru Ueshiba, Yoshimitsu Yamada, and his son Kisshomaru Uieshiba who is the figurehead of the Aikikai Federation.

Ueshiba’s student Gozo Shioda (1915-1994) founded the Yoshinkan Institute for Aikido, today called the IYAF (International Yoshinkan Aikido Federation) which is the most prestigious school of aikido. This school produced the famous martial artists Tsutomu Chida, Kancho Inoue, Takashi
Kushida and Sieshi Tekada. One of the students of Morihei Ueshiba in 1930 was also the martial artist Kenji Tomiki who made an attempt to connect aikido and judo, and thus he is considered to be the founder of the modern style of self-defense in judo.

The other famous styles are the following: Daito-ryu (Nakamura), Yoseikan (Mochizuki), Harai style, Takeda-ryu-takeda and Tendoryu (Kenji Shimizu). Real aikido is a relatively young martial art founded by soke (soke: headmaster in Japanese) Ljubomir Vračarević. This is an authentic martial art which ensued from traditional aikido (Milosavljević, Matavulj and Trunić, 2013). Ljubomir Vračarević studied with the greatest masters of the age, some of which are the following: Kishomoru Ueshiba, Gozo Shioda, Tsutomu Chida, Kenji Shimitsu, and Hiroshi Tada. He arrived at the idea of founding his own aikido style by desiring to remove all religious elements and elements of mystification from aikido, especially insisting on style efficiency. This is an authentic Serbian martial art (Milosavljević & Vračarević, 2011), and the main features and attributes of this art in regards to aikido is the existing of strikes which in the majority of cases are inflicted upon the attacker in vital areas prior to realizing the lever technique. The system of training real aikido, as the name itself implies, puts an emphasis on a real attack by the opponent. The founder of real aikido created training sessions which aimed to master the defense techniques which would be applied in real life situations (Vračarević, 2007). Real aikido is used in the training processes of army, police and bodyguard special forces as well. Soke Ljubomir Vračarević trained special forces members and bodyguards in the countries of Zimbabwe, Libya, Macedonia, Republika Srpska, Kazakhstan and Slovenia. Real aikido courses were held for members of special units all over the world, and especially mentioned should be working with the Russian Alpha unit, for which master Ljubomir Vračarević received a high military decoration from General Fetisov.

The following also passed through the real aikido training programs: the special units MČS, MVD, Wolf commando units and the special units for presidential security. Along with applying this martial art for the training of special units, the same was also applied in training bodyguards and protective security services according to IBSSA standards, and licensed martial artists are at the moment securing around 80 heads of states all over the world. One of the most important activities of real aikido is working with children, which is carried out via a special program called “Playing toward Mastery”. The program has been adapted to the psychological and physical attributes of children between the ages 5 and 12 and has produced excellent results. Today, real aikido martial artists train the very young as well as the elderly, so the number of practitioners is assessed to be around 15,000 in some 200 clubs all over the world.

The subject of research of this paper is the skill of real aikido, which consists of a combination of particular techniques.
The aim of research is determining the significance of the strike technique carried out directly prior to the lever technique, as a relevant prerequisite for a successful realization of carrying out the lever technique against the attacker.

METHOD

In this research, the experimental factors were the techniques of strikes which were during “arranged sparring” realized after the blocking techniques, directly prior to carrying out the lever technique, as a defense response to the attack. The strike movement structures can be realized with the hands and feet along with using other parts of the body, and have the aim to destroy the opponent or create a tactical strategy in whose realization various abilities participate (Milošević, Zulić and Božić, 1989).

The efficiency of strike techniques is in a direct correlation with time management and the speed of realization (Blagojević, Vučković and Dopsaj, 2012).

Respondent sample

The respondent sample in this research was taken from the practitioners of real aikido and made up of males aged 35 (±5 years), who train 3 times a week. Along with this, the respondents belonged to no single club but were from various clubs, and thus also various cities. The criterion during the choice of respondents, along with the age structure and gender, was also the degree of knowledge of the techniques of real aikido. In that sense, it was decided that the respondents would be practitioners who have been training real aikido for at least 3, and at most 4 years. The mentioned training period secures a quality realization of individual techniques, as well as a combination of individual techniques which were realized within this research. Thus, this is a planned and chosen sample. “We form a chosen sample from the units of the cluster which we choose according to personal conviction as typical or representative for a basic given cluster” (Žižić et al., 1993, 142). In total, at the beginning, some 42 male respondents (11 pairs) were observed, and the plan for the final observation and while assessing the efficiency of carrying out the lever was to monitor no less than 38 respondents (19 pairs), due to fluctuation. All the respondents were of good health and without any injuries during observation, regular when it came to training, and consented with their own free will to be assessed in carrying out the lever technique through arranged sparring.
The observed variable

The observed variable was the lever technique. During the realization of this technique, there was an intense and quick stretching of tissue in the joint area (Mudrić, 2005). These involve techniques which can control the opponent by creating the sensation of pain.

The procedure of determining the success of realizing the lever technique with and without inflicting a strike

Through arranged sparring, in pairs, the respondents carried out all the planned attacks one by one. First a partner tried to defend himself from an attacker with a knife from top to bottom, after this attacking directly, during which in one variant the defender could not use a strike before the lever, while in the other variant a strike before realizing a lever was mandatory. Only after that was the defender’s role taken over by the opponent, that is, the roles changes. It is important to stress that during the arranged sparring, a rubber knife was used.

Attack no. 1. a) The variant without a strike: One practitioner carried out an attack with a knife top to bottom trying to strike the opponent with a knife in the area of the head. The one defending himself first carried out a block with an extended hand upwards, and then attempted to carry out a lever on the shoulder joint by excess twisting – an overhand grip.

Attack no. 1. b) The variant with a strike: One practitioner carried out an attack with a knife top to bottom trying to strike the opponent with a knife in the area of the head. The defender first carried out a block with an extended hand upwards, while with the opposite hand he inflicted a controlled strike with the fist directly into the body of the attacker, and only after that he tried to carry out the lever on the shoulder joint by excess twisting – an overhand grip.

Attack no. 2. a) The variant without a strike: One practitioner carried out a knife attack trying to inflict a knife blow into the stomach of the opponent. The defender first carried out movement by sliding forward, carrying out a blocking by crossed forearms facing downwards, and then attempted to carry out a lever on the hand joint by excess twisting.

Attack no. 2. b) The variant with a strike: One practitioner carried out an attack with a knife straight ahead trying to inflict a knife in the stomach of the defender. The defender first carried out the movement by sliding backwards, then a blocking with crossed with both forearms facing downwards, and with an extended hand inflicted a controlled strike straight ahead with the upper side of the first into the defender’s body, and only after that he tried to carry out a lever on the hand joint by excess twisting. Acute pain in the attacker, which he indicated by “tapping” the hand or the foot was an indicator
that the defender had carried out a lever to the attacker. By definition, pain is
an unpleasant sensory or emotional experience which is caused by a possible
or already existing tissue damage or which is described by the words which
would fit the mentioned damage (Arlov, 2007).

Statistical analysis

Considering that the variables have been analyzed according to the
principles success/no success (allotted were values 1 for a successful tech-
nique – 2 for unsuccessful) of the carried out task, to determine the statisti-
cally significant differences used was a Wilcoxon test for dependent samples
while in both cases compared were the variables BUNAPI (without strike at-
tack 1) SUNAPI (with strike attack 1) and in the other case BUNAP2 (without
strike attack 2) SUNAP2 (with strike attack 2). The observed level of statisti-
cal significance was p=0.05.

RESULTS

The results of the statistical analysis are given in tables 1 and 2 (for
attack 1 and attack 2 respectively).

Table 1. The results of statistical analysis for variable attack 1.

| Wilcoxon Matched Pairs Test Marked tests are significant at p <.05000 |
|--------------------------|-----------|----|----|-------|
|                         | Valid - N | T  | Z  | p-level |
| BUNAPI & SUNAPI         | 38        | 14.00000 | 4.204375 | 0.000026 |

As can be seen from the table, the results for variable BUNAPI are
statistically different (p=0.000026) and on the level p=0.001 from variable
SUNAPI. Considering that in the case of SUNAPI, the number of success-
fully realized techniques are far greater than BUNAPI, we have concluded
that the realized technique which is preceded by the strike is a far more ef-
ficient method of defense and as such, it is recommendable in training the
mentioned techniques.

Table 2. The results of statistical analysis for variable attack 2.

| Wilcoxon Matched Pairs Test Marked tests are significant at p <.05000 |
|--------------------------|-----------|----|----|-------|
|                         | Valid - N | T  | Z  | p-level |
| BUNAPI & SUNAPI         | 38        | 7.00000 | 2.690598 | 0.007133 |

As can be seen from the table, the results for variable BUNAP2 are
statistically significantly different (p=0.007) on the level of p=0.05 from the
SUNAP2 variable. Considering that in the case of SUNAP2, the number of
successfully realized techniques is far greater than BUNAP2, we can conclude in this case as well that the realized technique which precedes the strike is a far more efficient method of defense and as such recommendable in the training of the mentioned techniques.

**DISCUSSION**

Where real aikido is involved, this topic has hitherto not been researched. Looking at the obtained results, the significance of the experimental factor of the strike as a technique which will contribute to a larger number of successfully realized lever techniques is clear, under the condition that the strike is carried out directly before the lever technique. In the case of real aikido, a strike is a means for inflicting acute pain immediately before the realizing the lever technique. Practice has shown that it is not easy to carry out a lever in real aikido, especially on the joints in which movements are carried out by engaging larger and stronger muscle groups. Thus, the results are not surprising, as they are in favor of the theory that without a strike the lever technique on the hand joint in which the engaging of smaller and weaker muscle groups will be realized with success in comparison with the shoulder joint in which movements of larger and stronger muscle groups.

When the strikes were inflicted on the attacker directly before the lever, the number of successfully carried out levers increased in the hand joint in which the movements are carried out by engaging smaller and weaker muscle groups, and thus also on the shoulder joint in which the movements are carried out by engaging larger and stronger muscle groups. The strike inflicted on the attacker invoked acute pain, which obviously temporarily “focused the attention” of the attacker on the body part on which the strike was inflicted, which resulted in a weaker resistance of muscles which carry out a movement in the joint on which the lever is realized. It is also interesting that regardless of the fact that carrying out the strike increased the number of successfully carried out levers, even with a strike inflicted directly prior to carrying out the lever technique a larger number of successfully carried out levers were realized on the hand joint in which movements are carried out by engaging smaller and weaker muscle groups than on the shoulder joint in which movements are carried out by engaging larger and stronger muscle groups.

**CONCLUSION**

The subject of research of this paper is the martial art of real aikido which consists of a combination of particular techniques. This research had
the aim to determine the significance of the strike technique which was carried out directly before the realizing of the lever technique, as a relevant prerequisite for a successful carrying out of the technique. The obtained results speak in favor of the fact that without a strike a larger number of successfully carried out levers were realized on the hand joint in which movements are carried out by engaging smaller and weaker muscle groups than on the shoulder joint in which movements are carried out by engaging larger and stronger muscle groups.

When the strike was inflicted directly before carrying out the lever technique, the number of successfully carried out lever techniques increased in both the hand as well as the shoulder joint. The strike inflicted on the attacker caused acute pain, which evidently temporarily “focused the attention” of the attacker on the body part which was struck, which in turn results in a weaker resistance of the muscles which carry out the movement in the joint upon which the lever is carried out. Thus, in real aikido, if within a certain problematic situation there is a possibility to choose, the option of carrying out the strike directly prior to carrying out the lever technique should be chosen, which is also valid for carrying out the lever on the joint which engages smaller and weaker muscle groups, and not on the joint which engages larger and stronger muscle groups.

Future research of this area should move towards determining the increase of the number of successfully realized lever techniques with the prior use of some other particular technique (pressure, pinching, etc.). Such research would without doubt contribute to a positive evolution of real aikido which like every other martial art would come “alive” and be prone to positive changes and directed towards a more efficient solving of certain difficult situations.
REFERENCES

Abstract: Children at early school age spend multiple hours a day seated, and they need to be engaged physically. Even though almost everyone is familiar with the risks brought by lack of movement, the source of physical inactivity lies in the absence of habit to exercise regularly. Precisely these habits are acquired at the earliest age, childhood. And for physical activity to make a positive impact, familiarity with the developmental characteristics of the children engaged in the activity represents a significant element in the planning, programming and realization of recreational activities of early school age children. A major part of today’s population of early school age children is not physically active, so it is essential to come up with recreational activities that children have not been engaged in before in order to trigger their interest. It has been long known that play leads to the intellectual, moral and physical development of a child. An important characteristic of play is that it is its own purpose. A child socializes through play, learns to respect others and follow rules. Play enables a child to become more constructive, active, liberated from fear of consequences, increasingly engaged and involved. Some of the potential recreational activities that can be implemented in work with early school age children through play include modified games taken over from real aikido: Kneeling Aikidokas, Semicircular Grab, Pushing, and Rolling Race. Their introduction into the recreational activities of early school age children enlarges the range of activities they can realize.

Keywords: recreation, children, real aikido, early school age.
INTRODUCTION

Early school age is a very significant period in the development of children and there is social responsibility to dedicate major attention to this age group. Hypokinesia, obesity, hypertension, postural defects and other types of defects are increasingly found among early school age children. Human life in contemporary, urban conditions is static and remote from nature.

Children at this age also participate in such lifestyle, and they particularly feel the consequences of insufficient movement and increasingly exercised physical activities. Every child feels the need to move and they should be enabled to satisfy the need through various physical activities. Early school age children spend multiple hours a day seated at classroom desks, and they should be engaged physically, while paying attention to the anatomical-physiological aspects of their development, as well as the psychological characteristics of that age.

These days, children spend more and more time in front of computer, they move less and less, which primarily leads to spinal deformity (Ivanović, 2013). It has been noticed long ago that physical activity impacts individual’s health, that certain physical exercise has beneficial effect on the quality of life. Present day’s lifestyle can be described as sedentary, because a majority of population is physically inactive. Insufficient level of active movement is labelled as hypokinesia, which is the main cause of what is known as hypokinetic diseases. It is precisely the physical inactivity that, combined with other unfavorable factors of modern life (such as stress, malnutrition, etc.), may lead to many ailments. A physically active person has longer average life span and lower disease rate than a physically inactive (sedentary) person, as well as lower risk from sudden death (Ostojić, 2006).

In order to prevent hypokinetic diseases, one should find an adequate physical activity for themselves. Heavy and overly exhausting activities are increasingly avoided, as well as those not adjusted to an individual and their personal needs, and whose exercise does not help them feel good. Therefore, people who exercise should aim for the activity which will help them improve the quality of daily activities, contribute to the realization of their individual physical potentials and what is particularly important in the period of early school age, is that the child enjoys it.

Even though almost everyone is familiar with the risks brought about by lack of movement, the source of physical inactivity lies in the absence of habit to exercise regularly. Precisely these habits are acquired at the earliest age, childhood. Sport and physical activity develop self-consciousness and decrease anxiety and stress. A child learns how to win, but also to accept defeat, adopt fair play in the game as well as in life, make friends… From educational aspect, it is essential to constantly direct children toward reali-
zing their moral development at all times, not only during play or exercise. (Ivanović, 2014).

A program implemented through sport also develops various skills in children. The habits acquired from an early age are maintained for life, and are hard to change. Pleasant fatigue after a physical activity enables a child to fall asleep quickly and easily, which further leads not only to better blood circulation in brain and increased oxygen inflow, but also to better and longer concentration, easier handling of given tasks, faster thinking and combining process, as well as easier acceptance of any kind of challenge. All this results in a positive attitude toward potential problems and life in general. Educational institutions’ function and role makes them responsible for the provision of the best conditions for psychophysical development of children. Apart from children’s daily activities, set by educational institutions’ plan and program, which also include physical education activities, the program of physical education classes could also include specific games that are already used in martial arts sports clubs precisely at early school age. Specific real aikido games could find their place in these particular institutions, as well as in all others where this type of activity can be realized smoothly, systematically, and where it can be organized so as to satisfy the essential staff and spatial-technical conditions.

CHARACTERISTICS OF EARLY SCHOOL AGE CHILDREN AND IMPORTANCE OF PLAY AT THAT AGE

Familiarity with the developmental characteristics of the children engaged in the activity represents a significant element in the planning, programming and realization of recreational activities of early school age children, in order to allow the physical activity to have a positive impact on organ systems and organism as a whole. A particular attention should be dedicated to the fact that the developmental characteristics of certain systems should be known and respected, since individual potentials of every child are separately defined by their genetic code, so an activity can be performed solely within that scope.

At early school age, children shape their relation toward life and work activities, establish critical and objective relation toward oneself, others and the environment, and almost conclude the development of certain abilities, characteristics, bodily systems and organs.

When it comes to physical development, children at this age grow a few centimeters and gain a few kilos. Up until puberty, boys’ height and weight exceed those of girls. In this period children become physically sturdier, their spine gets stronger, bones bigger, chest more developed, but the skeletal system
is still undergoing formation and it is very elastic. Their nervous system is less developed that in adults, but their brain weighs almost equally to adults’. At the age of 8 cerebrum’s growth is concluded and it reaches its final size but its functions are still being developed. The total relative skin surface is greater than in adults, which implies additional heat, so it is extremely important for them to wear “lighter” clothes during physical activities and to exercise in a space with adequate temperature.

In terms of motor development, this age leads to noticeable motor development – the speed of reaction and movement, coordination, balance, the ability to throw, catch, jump and move in general. The moves are faster, more accurate, precise, confident and stronger. This period should be used to practice activities that will stimulate the development of the aforementioned abilities.

The intellectual development of children at early school age is characterized by progressive increase of their intellectual abilities: memory, thinking, logical reasoning, the ability to learn, etc. Exteroceptive and proprioceptive senses are developed which makes children readier to accept sports training and successfully develop sports motor skills.

In case of children at early school age it is important to underline the changes caused by emotional and social development. Children’s emotional life becomes richer, their emotional states less changeable than at pre-school age. New emotional experiences emerge, related to school, their peers, and sports activity.

In this period children are rather cheerful, lighthearted, self-confident, optimistic, and they are particularly sensitive to their failures, injustice, humiliation and mockery. This is the time of intense social development, adaptation to peers and enlargement of the circle of friends. Learning, playing and sport become basic activities for a child. Interest in sport is increased, which leads to a mass inclusion of children into school and extracurricular sports activities. The basic reasons for children to get engaged in sport at this age are their needs to socialize, have fun, enjoy play, excitement, achievement, increase self-esteem, compete and compare to others. In this period, children enter the stage of intense social comparison, when they are directly focused on the comparison between their performance and ability and those of other children, and even adults, unlike preschool children who are solely focused on autonomous success standards, mastering environment and testing their own abilities regardless of others. Many children start doing sport precisely because they believe that sport will make them stronger, faster, sturdier, more skilful and courageous. It is very important for a child to get accepted, appreciated and loved by other children in the play. Children at this age love to explore their movement potentials, so they aspire toward new, non-stereotyped movements and motions.
It has been long known that play leads to the intellectual, moral and physical development of a child (Ivanović, 2014). An important characteristic of play is that it is its own purpose. Games have common characteristics: freedom (player cannot be forced), separation (limited by time and space constraints), suspense (one cannot predict their course and outcome), material unproductivity (they do not contribute to material prosperity), regulations (there are provisions which temporarily cancel standard rules and introduce new ones), fiction (accompanied by specific awareness of some other reality or total unreality in relation to current life). By playing games, children get to know themselves, and who they are in their surroundings. This directs them toward new activities which help them develop abilities, creativity, work habits, moral and aesthetic norms, express emotions. It needs to be underlined that one of the most prominent needs of early school age children is – the need to play.

Playing games speeds up children’s decision-making, which then contributes to the development of thinking and the speed of motor reaction to visual and auditory stimuli (Ivanović, 2014).

A child socializes through play, learns to respect others and follow rules. Acceptance of rules also helps overcome egocentrism, because rules apply to everyone, including the individual. It is also appealing to play games because children can experiment in a way that is not possible in everyday life. Play enables a child to become more constructive, active, liberated from fear of consequences, increasingly engaged and involved.

REAL AIKIDO AND SPECIFIC GAMES IN REAL AIKIDO

Real aikido is an authentic Serbian martial art derived from traditional aikido (Milosavljević, Matavulj and Trunić, 2013). The basic setup of real aikido is to efficiently overpower an attacker without causing them any physical injury. It is a defensive, extraordinarily flexible defense technique system, whose basic characteristics include: integration into opponent’s attack, continuous performance of technique and full final control over the attacker (Milosavljević & Vračarević, 2011).

The founder of real aikido wanted to master defense techniques with such training, and see them applied in real life situations. Real aikido has found its place in the training processes within military, police and bodyguard special training. One of the most significant directions of real aikido's actions is work with the youngest generations, conducted through a special program titled „Gain Mastership Skills through Play“ . The program is adapted to psychophysical abilities of children aged 5 to 12 (Vračarević, 2007).

In real aikido, or to be precise, in the aforementioned program „Gain Mastership Skills through Play“, games are an extremely important part of
the process of training. Above all, they develop basic motor and functional abilities crucial for real aikido, but they also fortify social relations between group members.

This paper aims at describing modified real aikido games, which could be used in the recreation of early school age children who do not train real aikido. These games affect not only specific motor and basic abilities, but also stimulate children’s feistiness, self-confidence, resourcefulness, and enable them to get used to winning and losing. It should be underlined that these games make children cheerful, which is regularly noticed during training sessions. This paper presents certain games used in real aikido, i.e. their modified variations intended for the recreation of early school age children.

**Knelling aikidokasis** a game which is always preformed on mats whose size depends on the number of participants and can be changed. One exerciser kneels in the center of a circle which can have different diameters. Other exercisers are distributed at the edge of the circle and their task is to move on their knees from their position toward the center of the circle without stopping. The one in the center of the circle disposes with very small space of around 1 m² to throw off balance and force one of the exercisers approaching him/her to touch the mat with a body part other than their knee, lower leg and foot. Only after that is done, the exerciser thrown off balance and the one in the center of the circle change places. It is important to underline that destabilization can be performed only by means of shoulder grab, whereby the person grabbed must not use their arms to defend themselves, but rather move on their knees away from the exerciser trying to throw them off balance. The winner is the person who was thrown off balance the least number of times during a previously set duration of the game. What this game primarily achieves is the improvement of balance, but it also teaches exercisers to move on their knees. Trunk muscles are particularly engaged, especially in the situation when an exerciser is trying to maintain balance while another exerciser is grabbing their shoulders in an attempt to throw them off balance.

**Semicircular grabis** a game whose rules make it resemble children's game “tag”. One exerciser is tasked with chasing other exercisers, and the one who gets caught takes over the role of chaser and needs to tag one of the other exercisers. What is particularly characteristic for this game is not straight-line but semicircular movement, described in real aikido as “step, turn, small turn”. Such movement from left posture is performed in the following way: the exerciser makes a semicircular move forward by 180 degrees with their right leg, setting it in front of their left leg, which represents the “step”. Then, they make a semicircular move with their left leg by drawing the leg toward their back by 180 degrees, which corresponds to the part of the move called “turn”. In the end, they rotate around their axis by 180 degrees, whereby the rotation axis is on the exerciser's heel, which corresponds to the part of the
move called “small turn”. From right posture, the moves are opposite. Both chaser and the exercisers who run away from him/her can only move like this. This game develops the ability to implement atypical semicircular movements of lower extremities, characteristic for real aikido. It also enhances agility as motor ability.

*Pushing* is a game in which two exercisers stand opposite each other in left posture at a distance sufficient to reach each other's extended arm elbow. Both exercisers keep their right hand on their right hip, while their left arm is in front of their trunk, slightly bent in elbow and turned to their partner with the edge of the palm (not fingers). During this game, exercisers must not move, but rather stay in place, trying to destabilize their partner with their left arm, without changing the angle in the elbow or grabbing the partner, but only pushing them with the left arm. The exercise is the same from right posture, whereby right arm is used to destabilize partner. This game strengthens shoulder and arm muscles, but also stimulates the development of balance.

*Rolling Race* is a game in which exercisers follow their own line on mats and try to reach the finish line as fast as possible, moving only by rolling forward. Exercisers are at a safe distance from each other, and roll forward toward the finish line after a sound signal is given. The one who reaches the finish line first wins the race. At first, the length of the section they need to cross should be shorter, and it can be increased later on. In order to reduce risk of injury to a minimum, this game must be preceded by well-rehearsed roll forward by all participants. And as several rolls forward in a row lead to temporary dizziness, it is essential for exercisers to remain seated for a while after reaching the finish line. This game strengthens arm and neck muscles.

**CONCLUSION**

Due to sedentary way of life, early school age children are increasingly exposed to modern day diseases. Therefore, it is crucial to come up with such recreational activities that will suit this age group in terms of need as well as the complexity of movement structures. When planning, programming and realizing programs of recreational activities for early school age children, it is essential to take into account the anatomical-physiological aspects of their development, as well as the psychological characteristics of that age. It has been noticed long ago that physical activity impacts individual’s health. Even though one part of the population at this age trains some of the preferred sports regularly, a great deal of them is not physically active, so it is essential to come up with recreational activities that children have not been engaged in before in order to trigger their interest. A child socializes through play, learns to respect others and follow rules. Acceptance of rules also helps overcome egocentrism,
because rules apply to everyone, including the individual. It is also appealing to play games because children can experiment in a way that is not possible in everyday life. Play enables a child to become more constructive, active, liberated from fear of consequences, increasingly engaged and involved. Some of the potential recreational activities that can be implemented in work with early school age children include modified games taken over from real aikido. The description of modified real aikido games - Kneeling Aikidokas, Semicircular Grab, Pushing, and Rolling Raceenlarges the range of activities that can be realized with early school age children.
REFERENCES


Review article

KINESIOLOGICAL ANALYSIS OF EXERCISES FOR THE PREVENTION AND CORRECTION OF LORDOSIS

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Abstract: The paper deals with a high-quality kinesiological analysis which can serve as a base for therapists and persons involved with the prevention and correction of body deformities to make a choice and administer exercises which are the most efficient for preventing and correcting the existing body deformity, in this case, lordosis. The paper describes the basic starting positions in which the exercises are carried out, as well as the contents and analysis of the presented exercises and their aim. Stated for every administered exercise are the muscles and muscle groups which carry out a movement, the types of muscle contractions and the way of their engaging in the existing movement (exercises).

Key words: Lordosis, kinesiology, starting position, exercise, muscles, analysis.

INTRODUCTION

Kinesiology is a science which studies the movements of the human movement apparatus of both healthy and ailing persons, that is, persons with damage locomotion.

In order to understand it, it is necessary to also understand functional anatomy, physiology, biomechanics, motor education, re-education, etc.

It is necessary to knowing and master the high-quality kinesiological analyses of exercise which a therapist determines for the purpose of physical and functional enabling of patients, as only a well chosen and adequately applied

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exercise can lead to positive transformational effects, and thereby also to a total healing after illness or injury. Such an approach is especially necessary in the area of prevention and correction (healing) of postural disruptions and body deformities.

By using high-quality kinesiological analysis, there is feedback on how to carry out the most comprehensive, that is, the most efficient movement (exercise) on the treated segment or the organism on the whole.

For the kinesiological analysis to be as complete as possible, the exercise which is analyzed should be carried out from a certain starting position, in order to view the muscles and muscle groups which take part in carrying out the movement, the type of muscle contractions, the way of engaging muscles in the movement and other.

**LORDOSIS**

One of the most frequent postural disorders in pre-school and younger school children is lordosis. It is the inward curvature of the lumbar region of the spine, but with a forward pelvic tilt, when the pelvis tips forward from 15 to 30 degrees when resting on top of the thighs, measured according to the Cobb angle measuring method. An increase of over 30 degrees of the curvature indicates the existing of lordosis.

The status of a lumbar curvature can also be determined with the help of a plumb line and a ruler (Figure 1). The increase of a lumbar curvature over 5 cm, measured from the base of the curvature to the plumb line along the spine indicates the presence of lordosis.

![Figure 1](image)

The basic cause for the occurring of lordosis is the disruption of the balance between the flexors and the extensors of the hip joint, as well as an insufficiency of the stomach muscles.
KINESIOLOGICAL ANALYSIS OF EXERCISES

Lying starting position

This position (Figure 2) is very stable as the brunt of the body is over the ground with an exceptionally large support area. It can be said that the lying position is very economical from the standpoint of energy expenditure. It can be applied in the elderly as well as very young children as a starting position for carrying out exercises due to its efficient nature and stability. It can also be applied as a lying position on the back (supine), while lying on the stomach (prone) and lying on the side (lateral position). All the mentioned positions are applied often in the preventive and correctional work as numerous exercises can be carried out with a greater or lesser torque.

Figure 2.

Starting position: Lying on the back (supine). The legs are flexed in the joint of the hip and knee, and the hands are next to the body.

Contents and analysis of exercises: The patient should flex his head to the moment of contact of the chin with the *fosom jugulum*. The movement is carried out in the atlanto-occipital joint and the neck part of the spinal column and the flexors of the head and neck (*m. sternocleido mastoideus, m. rectuscapitis anterior, m. longus capitis, m. longuscoli, mm. scaleni, mm. suprahyoidei et mm. infrahyoidei*). The mentioned movement is carried out by a concentric contraction. The isometric contraction of the stomach muscles fixates the sternum, and the fixing of the sternum and clavicle is also helped by *m. pectoralis mayor (pars clavicuralis)* and *m. subclavius*. In this movement, both the neck and upper body spine extensors participate as the stabilizers, via an isometric muscle contraction. They fixate a part of the spine in order for the prevertebral and scalene muscles to have the necessary support for carrying out a movement.

Returning the head to its starting position is carried out under the influence of gravity, and the mentioned muscles are directed by an eccentric muscle contraction, or in other words, they control the movement.

The aim of the exercise: The exercise is chosen in the aim of strengthening the flexors of the head and neck, and it very efficiently engages the stomach muscles. The very starting position is optimal as it is very stable.
and does not exert a large expenditure of energy. The flexed legs direct a retroversion of the pelvis and the strengthening of the lumbar curve. The exercise is appropriate for the young as well as barely mobile patients. It is recommended in the prevention and correction of lordosis.

**Figure 3.**

**Starting position:** Lying on the back with flexed knees and the arms next to the body (Figure 3).

**Contents and exercise analysis:** The patient raised the upper body (cranial) together with the hands extended in front of the body. Elevating the body from the ground is carried out to the moment of separating the shoulder blades from the floor, at most 45 degrees from the floor. The movement is started by the flexors of the head and neck, and then the flexors of the torso by concentric muscle contractions. Thus, the torso flexors (*m. rectus abdominis*, *m. obliquis externus et internus abdominis*, *m. psoas mayor*) carry out the movement up to 45 degrees when the torso tilts the mentioned angle with the base.

The flexors of the thigh with an isometric contraction “act” as the fixators of the pelvis, securing its stability. The position of the arms additionally increases the torque which makes the exercise even more efficient.

Returning to the starting position is carried out by the muscle flexors of the torso by an eccentric contraction, and in the final part of the movement also by the flexors of the head and neck via an eccentric muscle contraction.

The aim of the exercise: Strengthening primarily the muscle of the abdominal wall, which is carried out by correcting the increased lumbar curve.

**Figure 4.**

**Starting position:** The lying position on the back with legs stretched out, with fingers interlaced at the back of the head (Figure 4).


Contents and exercise analysis: A simultaneous elevating of the lower (caudal) and the upper part of the body are to be carried out from the mentioned position. The position of the arms increases the torque so that the torso flexors, that is, the front even kinetic muscle chain will be exceptionally engaged by concentric contractions. Thus, along with the abdominal flexors, also participating in the movement are the flexors of the thigh (m. iliopsoas, m. tensor fasciae latae, m. sartorius, m. pectineus, m. rectus femoris, m. adductor brevis et longus, m. gracilis, m. obturatorius externus), as well as m. quadriceps femoris which by an isometric contraction maintains an extended calf.

Considering there is a simultaneous elevating of the upper and lower parts of the body, the mentioned musculature is engaged in total, and the position and the movement additionally impact the correcting of the lumbar curve.

The return to the starting position is carried out under the influence of gravity, and the same muscles are directed and controlled by an eccentric contraction.

The aim of the exercise: Strengthening the stomach muscles, which impacts the prevention and correction of lordosis.

Figure 5.

Starting position: Lying on the back with extended legs, with the arms next to the body (Figure 5).

Contents and analysis of exercises: The patient elevates the upper part of the body together with outstretched arms, and then he carried out a torso rotation to one side and returns to the starting position. The movement is repeated with the rotation to the other side and alternatively. The torso rotation is carried out to the moment of separating one shoulder blade from the floor. At the same time with elevating the upper body from the floor the movement of torso rotation is also carried out, and the extended hand follows the mentioned movement, in such a way that the hand of one touches the upper arm of the other hand.

The movement starts with a concentric contraction of the flexor muscles of the head and neck. In that part of the movement, the stomach muscles fix the sternum with an isometric contraction, and then the muscles
of the abdominal wall contract. The stomach muscles carry out an elevating
of the torso from the floor by a concentric contraction. In the first part of the
movement, the most active is the even stomach muscle, and then the traverse
inner one on that side and the traverse external muscle from the other side,
carrying out a movement of torso rotation to one side. Also participating in
this movement are the muscles of the dorsal spine (m. transversospinalis, mm.
levatorescostarum, m. iliocostalis). Along with the mentioned, also engaged
are the muscles of the thigh flexors which by an isometric muscle contraction
carry out a pelvis stabilization.

The aim of the exercise: Strengthening the muscles of the longitudinal
front even and the transverse kinetic muscle chain.

Figure 6.

Starting position: Lying on the back with the arms elevated –
outstretched (Figure 6).

Contents and analysis of exercise: From the mentioned starting
position, carry out the raising of the upper (cranial) and lower (caudal) body
part to the sitting position. In the finishing part of the movement, the hands
are along the pelvis, leaning on the floor. The elevated hands increase the
torque in relation with the previously described exercise. The exercise is
carried out by a simultaneous action of the torso and thigh flexor muscles.
Along with the mentioned muscles in the first part of the movement, also
active are the muscles of the shoulder area, that is, the anteflexors of the hands
(m. deltoideus, m. clavicularis, m. pectoralis mayor, m. corac brachialis) as
well as the flexors of the head and neck. The outstretched calves are upheld
by m. quadriceps femoris by an isometric muscle contraction. Returning to
the starting position is carried out under the influence of gravity, and the
movement is directed and controlled by the same muscles, but by an eccentric
contraction.

The aim of the exercise: The strengthening of the complete stomach
wall in an open kinetic chain. In the finishing stage of the exercise, a sitting
position with outstretched legs carries out an optimal effect on the lumbar
curve in the sense of its retracting.
Starting position: Lying on the back with legs held by the therapist and with the fingers interlaced at the lack of the head (Figure 7).

Contents and analysis of exercise: The patient carries out the elevating of the upper body up to 45 degrees. The closed kinetic muscle chain downwards will cause a strong effect of the complete front longitudinal chain. The hands behind the head and the elbows extended along the shoulder axis will increase the torque, which makes the exercise more efficient. The movement is carried out by even and traverse stomach muscles by a concentric contraction. The hip flexors, in the very beginning of the movement, and the lower parts of the stomach wall by an isometric contraction appear as pelvis fixators. Already after the separating of the shoulder blades from the floor, the entire stomach musculature and *m. psoas mayor* as a synergy movement are engaged. The mentioned muscles carry out a 45 degree movement. If the movement should go over 45 degrees, the same would occur within the hip joint. In that case, the stomach musculature transforms into a static contraction and behaves as a stabilizer of the pelvis, while the flexors in the joint would by a concentric contraction continue to carry out the movement. Returning to the starting position is carried out under the influence of gravity, and the movement is directed at the beginning by an eccentric contraction of the flexors in the hip joint, and then the muscles of the abdominal wall, to the starting position.

The aim of the exercise: Strengthening the stomach muscles. The exercise is very efficient and used in the final stage of the treatment of lordosis. If it were applied in the beginning stage with an insufficient stomach musculature, it would even be counter-indicated. An insufficient stomach musculature in a closed kinetic muscle chain downwards could not carry out the elevating of the cranial part of the body from the floor. In that case, there would occur a hypertension of the lumbar spine. Such a hyper lordosis-affected spine would be fixed by the stomach muscles via an isometric muscle contraction, and the flexors in the hip joint would carry out the movement, which would totally minimize the effect of the exercise and render it harmful.

Many therapists err when they opt for this and similar exercises in the early stage of the treatment with a still insufficient stomach musculature. Thus they can cause more damage than benefit.
The sitting starting position

The sitting position can be very good for carrying out exercises to strengthen the stomach muscles (Figure 8). The brunt of the body is retained in the borders of the support polygon. The level of energy expenditure depends on whether the position of the legs crossed or a basic sitting position is used.

The exercises for strengthening the stomach muscles are mostly carried out from the starting position with bent and outstretched legs. The sitting position with legs crossed is most often used for stretching the lumbar extensors and for achieving a retraction of lumbar curve.

The starting position is relatively stable, and at the same time demanding as well, especially if the legs are outstretched, and the spinal column is strengthened and elongated. For maintaining such a position, it is necessary to increase the activity of the torso extensors (m. erector spinae, m. iliocostalis, m. transverso spinalis, m. spinalis, mm. levatore scostarum, mm. intertransversarii, mm. interspinales, m. quadratus lumborum) and the activity of the thigh flexors (m. quadriceps femoris), which should maintain a passive insufficiency of the muscles of the back side of the buttocks.

During carrying out the exercises in this starting position, the stomach muscles are mainly engaged via a static muscle contraction.

Figure 8.

Starting position: Sitting with outstretched legs and hands on the floor.

Contents and analysis of exercise: At the same time, carry out the flexing of the outstretched legs in the hip joint and an anteflex of the outstretched arms towards the feet dorsum. The movement in an open kinetic chain is carried out by a concentric muscle contraction of the thigh flexors, while the stomach muscles via an isometric contraction stabilize the pelvis. The stomach muscles as stabilizers are especially active in the first part of the movement. If the movement continues to the total separating from the back of the thigh from the floor, that is, to the collapsing of the pelvis upwards, the stomach muscles would additionally be engaged even via a concentric contraction.

An anteflexing of the outstretched hands, along with the anteflexors in the first part of the movement, engages the upper parts of the stomach muscles.
via a concentric contraction. Thus, this exercise engages the entire front part of the real kinetic muscle chain. At the same time, through all the stages of the movement, from the start to the final one and returning to the starting position, the lumbar spine constantly retains a good, i.e. improved position.

It is carried out by the same muscles only via an eccentric muscle contraction.

**The aim of the exercise:** Strengthening primarily the muscles of the abdominal wall which impacts the decreasing of the lumbar curvature.

**Starting position:** Sitting with outstretched legs and the hands on the floor (Figure 9).

**Contents and analysis of the exercise:** Unlike the previous exercise, this one is far more complex in a motor as well as kinesiological sense. The exercise is started by the muscles flexors of the thigh via a concentric contraction along with a simultaneous concentric contraction of the arm elevators. Throughout this, the stomach and muscles of the extensors of the lumbar spine fix the pelvis via an isometric muscle contraction. Raising the outstretched leg and turning them to one side, and the arms and torso to the other side, demands a complex engaging of the muscles from the front, side and back side of the torso. The turning of the legs to one side is followed by moving the pelvis to that side. Along with carrying out of this movement and with the thigh flexors, the muscles of the abductors of the thigh from the same side also take part (mm. gluteus medius minimus et maximus, m. tensor fasciae latae, m. sartorius, m. rectus femoris, m. piriformis, m. obturatorius internus) and the muscles of the abductors of the thighs from the opposite side (m. iliopsoas, m. adductor longus et brevis, m. gracilis, m. glutaeus maximus, m. obturatorius externus, m. quadriceps femoris, m. pectineus, m. biceps femoris, m. semitendinosus et semimembranosus). The torso rotation is carried out in the same direction by the m. iliocostalis and m. obliquus internus abdominis, and in the opposite direction by m. obliquus externus abdominis, m. trasverso spinalis et mm. levatores scostarum.

The harmful movements which follow torso rotation exceptionally engage the upper parts of the even and transverse stomach muscles. Their
engaging, depending on the movement stage, goes from isometric, concentric to eccentric muscle contractions.

The aim of the exercise: Primarily strengthening the complete stomach wall, as well as the influence of all the mentioned muscles which are engaged in the mentioned exercise.

**Starting hanging position**

This position represents a stable type of balance, and it can be applied as an active and passive hanging. In our case, it is an active hanging (Figure 10).

It is desirable to be carried out on a climbing frame with the back facing the apparatus. The starting position does not allow for the moving of the pelvis, that is, the entire dorsal side backwards. With an active hanging, along with isometric muscle contractions of the flexor muscles in the finger joints, it is necessary to increase the isometric engaging of the muscles which should maintain a good position of the shoulder area and the area of the lumbar spine.

The shoulder muscles (m. levator scapulae, m. trapezius, m. serratus anterior, m. pectoralis mayor et minor, m. lattisimus dorsi) prevent via an isometric contraction the failure of the head-torso-pelvis-legs system through the shoulder area. Also, the isometric contraction of the stomach muscle wall prevents the turning of the pelvis around the transversal axis straight and downwards, which reduces the lumbar curvature. The starting position is quite demanding and strenuous and should be applied only in the later stage of the correctional treatment of lordosis.

![Figure 10.](image)

**Starting position:** Hanging position.

**Contents and analysis of exercise:** From this position, carry out a simultaneous flexing of the legs in the knee joint as well as their elevating
towards the torso. The movement is carried out by a concentric contraction of the flexors in the hip joint in the first stage of the movement of the stomach muscles engaged by an isometric contraction as pelvis stabilizers. When the knees of the flexed legs are in a right angle which inclines the thigh and torso, and when there is a separating of the pelvis, that is, the gluteus region, the stomach muscles changes from an isometric to a concentric contraction bending the pelvis towards the torso. In the finishing part of the movement, along with an exceptional engaging of the muscles of the stomach wall, there is a retracting of the lumbar curve. Returning to the starting position is carried out under the influence of gravity, and in the very start the stomach muscles, and then the hip flexors and the thigh extensors via an eccentric contraction take the lower extremities to the starting position.

**Contents and exercise analysis:** Primarily strengthening the stomach muscles via a static, concentric and eccentric muscle contraction. Along with this, the very starting position leads to an axial extension of the spinal column.

**CONCLUSION**

The paper shows a high-quality kinesiological analysis of exercises for the prevention and correction of lordosis. A limited space dictated the choice and number of exercises. The description of the mentioned starting positions from which the exercises are carried out and the kinesiological analysis of the exercises shown should show the specialized community how to approach the creating of certain exercises. This implies that therapists, P.E. teachers and coaches should in such a way view and carry out a choice of complex exercises. While creating exercises, attention should be paid to the choice of the starting position, as well as the type of muscles and muscle groups included in the exercises as well as the way of their inclusion. There should also be a clear aim what needs to be attained by applying the chosen exercises.
REFERENCES

Abstract: Due to its complex and fine structure, the knee joint is less resistant to the influence of external factors, which is why knee injuries often occur in sports. Knee joint injuries lead to mechanical and functional instability. Lately there have been significant innovative advancements in diagnostics, inoperative and surgical treatment of knee injuries and diseases. Technological progress has enabled objective assessment by means of computerized techniques, namely kinesiometric platforms. The possibilities of using such systems in sports are of high importance, especially in assessments of injuries, in evaluation and comparison of treatments, but also in forecasting lower limb injuries and the potential risk of falling down.

The aim of this paper is to conduct a review of the research based on the insight in the available literature, where NeuroCom Balance Master kinesiometric platform was used as the research instrument, and to determine the possibility of its clinical application on knee joint injury.

The available literature was reviewed by insight into electronic databases (EBSCO Medline, EBSCO host, ScienceDirekt, ProQuest), which are
INTRODUCTION

The function of the lower limbs is to carry and support the weight of the body while standing, walking, running and carrying weight in daily, professional and sports activities. In fact, lower limbs are more exposed to injuries than the upper limbs. In sports, knee and ankle joint are most exposed to injuries. Due to its complexity and fine structure, the knee joint is unprotected and poorly resistant to exogenous factors. To the present day, anatomical shape and structure of knee joints remains the subject of the most intensive morphological research and biomechanical studies.

Knee joint injuries are common in young persons and they lead to mechanical and functional instability. Anterior cruciate ligament (ACL) injury is the most common one and makes 50% of all knee injuries. It occurs in healthy and physically active persons, especially in sportsmen. Apart from the acute symptoms, pain and swelling, this is an injury which leads to a rotational instability of the knee and which hinders lower limb function (Nakamuta et al., 2011). ACL injury incidence among the population is 32 to 70 in 100,000 people annually, while in sportsmen, especially soccer players, this number ranges from 500 to 8500 (Walden et al., 2011). Apart from the anterior cruciate ligament injury, injuries of other ligaments and soft structures also occur often, as well as meniscus injuries, knee subluxation and dislocation and patellar fractures.

Technological progress has enabled objective assessment by means of computerized techniques, namely kinesiometric platforms. The possibilities of using such systems in sports are of a high importance, especially in assessments on injuries, in the evaluation and comparison of treatments, but also in forecasting lower limb injuries and the potential risk of falling down.

After knee joint injury, the main goal of rehabilitation is the improvement of dynamic stability and function recovery. Lately there have been significant innovative advancements in diagnostics, inoperative and surgical treatment of knee injuries and diseases. At the same time, the methodology of functional diagnostics, physical therapy, kinesiotherapy and rehabilitation has been developed. Rehabilitation implies a quick and precise knee functionality assessment and application of an appropriate treatment.
Knee injury clinical evaluation includes injury history data and physical examination, which reveals a functional integrity of the injured structures. The physical examination of the knee begins with observation and analysis of static and dynamic posture and recognizing gait abnormalities and asymmetry. Subjective and objective assessments can be used to assess postural stability (balance) on knee injury. Subjective postural stability assessment implies static and dynamic balance testing by using standardized tests such as the single-leg balance test (Ross et al., 2008), the Star Excursion Balance Test (Riemann & Schmitz, 2012), and the Multiple Single-Leg Hope Stabilization Test (Riemann et al., 1999), etc.

Technological progress has enabled an objective assessment of balance by means of computerized techniques, namely kinesiometric platforms. These systems provide an easy and practical method for a quantitative assessment of balance through postural sway analysis (Guskiewicz & Perrin 1996). The possibilities of using such systems in sports are of a high importance, especially in the assessments on injuries, in evaluation and comparison of treatments, but also in forecasting lower limb injuries and the potential risk of falling down. The following systems are often used for the purpose of objective static stability assessment: Chattecx Balance System, Force Plate, Pro Balance Master, and Smart Balance Master. For dynamic stability testing, Biodex Stability System, Chattecx Balance System, Kinesthetic Ability Trainer and Neurocom Balance Master are being used.

Neurocom Balance Master kinesiometric platform has developed sophisticated systems with expanded diagnostics and options for postural stability improvement training. It enables an objective registration of data on the existence of sensory and motor dysfunctions, monitoring parameters and constantly showing the body balance point projection by means of cursors, on the screen. The kinesiometric platform consists of the following elements: a software system, sensory platform, auxiliary wooden and sponge elements and protective railing. Sensors installed in the platform register and measure the intensity of vertical forces, transmitted through feet. The platform provides particularly precise results in the subjects whose mass is between 18 and 136 kg. A computerized analysis of the functional balance control of the subject is based on the application of a wide range of tests, in standing and sitting positions. Upon testing, the results are shown graphically and numerically. The platform also provides sensory and voluntary motor control of stability, including visual feedback. The basic set of tests includes: Modified Clinical Test of Sensory Interaction on Balance (mCTSIB); Unilateral Stance (US); Limits of stability (LOS); Rhythmic Weight Shift (RWS); Step Quick Turn (SQT); Tandem Walk (TW) as well as the Walk Across (WA) test (NeuroCom International Inc).
RESEARCH OVERVIEW

In the post knee injury rehabilitation of sportsmen, especially of the anterior cruciate ligament, apart from the assessment of the ankle strength and mobility, attention is increasingly paid to proprioception (Lephard et al., 1997). Changes in proprioception may occur due to ACL injury and mechanoreceptor damage within the ligaments, and as a consequence, the function of an afferent impulse transmitting function can be reduced or lost. In addition, receptors within muscles can cause changes in proprioception after injuries (Kennedy et al., 1992). Thus, in knee joint functionality assessment, it is important to assess the postural stability in addition to muscle strength and mobility. The Neurocom Balance Master kinesiometric platform can be used for such purpose.

For example, in their research, Chmielewski and associates (2002) used the platform in a clinical assessment of individuals aged 25 in average, upon surgical treatment of an ACL injury. The subjects were divided into three groups. The first control group, consisted of 85 subjects (44 men and 41 women) who had no injuries or diseases of the lower back or lower limbs in their anamnesis. The other, experimental group consisted of 10 subjects (7 men and 3 women) with a complete single-sided rupture (confirmed by magnetic resonance imaging) of the anterior cruciate ligament (ACLD group), classified as a group of subjects with unstable knees. The third group (ACLR) consisted of 10 subjects (2 men and 8 women), who underwent a surgical ligament reconstruction, and all subjects had physical therapy upon reconstruction. The testing was conducted upon first, sixth and twelfth weeks postoperatively.

In order to assess postural stability (the balance), the authors used four tests of the Neurocom Balance Master platform. The first test used was Weight Bearing Squat (WBS). The subjects were asked to equally distribute their weight to both legs, while standing upright in several different knee positions. Leg stress assessment (expressed in percentages) was measured with the knees in the default position 0° (straight knees), then in the position with the knees bent at 30°, 60° and 90° angles. After each attempt, the subjects had a 10-second break. In the upright standing position, knees and hips were relatively unstressed. By increasing the squat depth, the stress on the knees and hips increased, making these positions much more sensitive for discovery of support abnormalities in musculoskeletal changes of lower limbs. The percentage of weight supported by the leg in use was expressed numerically, and the measured parameters were given for each leg and each position separately.

The other test which was used in this research was Unilateral Stance (US), which supports the velocity of a postural sway when a subject stands on
the right or the left foot, with his/her eyes open. The subjects were instructed to bend the tested leg in the knee by 20°, and then to attempt at the request of the researcher to transfer their weight to it and maintain their balance without holding on to something. The duration of each attempt amounted to 10 seconds, and the subjects repeated the test three times for each leg, making a 10-second pause between the attempts. The observed parameter in this test was the Mean COG Sway Velocity which shows the stability of the balance point while the subjects stands independently on each leg with his/her eyes open, expressed in degrees per second (deg/sec).

The position change test Sit to Stand test (STS) was used by the authors to assess balance point movement control during the change from a sitting to a standing position. The subjects were instructed to stand up from the sitting position and to maintain a standing position (10 seconds in the control group and 30 seconds in the experimental group). The subjects sat on a wooden bench with felt pads, from 100° in the knees and 90° in the hip, with the weight equally distributed to both legs. The observed parameters in this test were the Rising Index (RI) measured as percentage, which represents the force exerted by the legs at the standing-up stage and Cog Sway Velocity (CSV) – control of the balance point above the support base during the transfer, as well as 10 and 30 afterwards, expressed in degrees per second (deg/sec). The subjects repeated the test three times.

The fourth test the authors performed was the Step Up/Over (SUO) test. This test determines the characteristics of motor control when stepping on the obstacle with a single foot, followed by the raising of the body, assuming and maintaining the upright posture on the obstacle, putting the other leg over the obstacle and finally lowering the body by supporting the other foot against the surface. For the purpose of this test, the authors used a 30 cm high wooden bench and remaining in the position after a leap of 5 seconds. The subjects repeated the test three times, with a 10 second break between each attempt. The two parameters were assessed in this test, namely the Movement Time (the time necessary for performing the manoeuvre measured in seconds, starting from the initial raising of the posterior leg from the surface and ending with the contact made by that same foot with the surface in front of the obstacle) and Impact Index (the maximum vertical impact on the contact of the free leg with the surface, expressed as a percentage of body weight).

In addition to assessing postural stability, the study also included the test of maximum voluntary isometric contractions (MVIC test) for the assessment of muscle strength (of quadriceps femoris) and two scales for the self-assessment of functionality during the performance of daily activities (The Activities of Daily Living Scale (ADLS) and the Global Rating scale).

The main hypothesis of this research refers to the changes in the assessed parameters of postural stability in relation to the muscle strength
of the *quadriceps femoris* muscle and the applied scales for functionality self-assessment. The *WBS* test showed a statistically significant correlation between muscle strength and the load on the injured leg (at 90° knee flexion) in the first week following surgery in the third group of subjects. However, in the sixth week following surgery, the weight was symmetrically distributed to both legs in this group, hence the findings lost their clinical significance in this test. The *ULS* test determined significant changes in the postural sway in the group with unstable knees, while the third group was not significantly different from the healthy subjects. In the third group, using the *SUO* test, the authors determined a significant correlation between the declined strength of the four-headed thigh muscle and the time necessary to perform a leap in the first week of testing, while the speed of the leap significantly improved in the second series of tests (6 weeks later) with the improved muscle strength.

In conclusion, the authors emphasised the statistically significant correlation between muscle strength and some of the assessed variables of postural stability. The differences between the second and the third group were identified in the weight-bearing squat test 6 weeks following the reconstruction, but no correlation was found with the functionality scales, whereas the *Step Up/Over test* proved clinically useful as it established a correlation with the assessed scales.

The stability of the knee joint depends on the interaction between bone structures, soft tissue, body weight and muscle strength. While the bone structure and the characteristics of the meniscus do not provide a high degree of stability, the soft knee structures (ligaments, capsule) contribute to maintaining balance. When high-intensity physical activity is practiced, muscle strength stabilizing the knee joint and preventing ligament overload are essential to postural stability (Williams et al., 2001). Therefore, in 2009 Moussa et al. undertook to assess postural stability in persons two years following the reconstruction of the anterior cruciate ligament. The research involved 26 football players (the first group) at the average age of 22 who had undergone unilateral ligament reconstruction. The control group was comprised of 20 healthy individuals of similar age. All subjects in the first group had undergone the same reconstruction and had returned to their activities afterwards. On average, all subjects were tested 2 years following the reconstruction.

The criteria for participating in the study were the following: a single surgical procedure without any damage to collateral ligaments, no previous injury to the ankle joint or the hip, a full return to one's activities and no reports of instability. Postural stability was assessed using the *Neurocom Balance Master* platform and a single-leg hop test was used. The *US* single leg support was applied. This test quantifies the velocity of postural sway during unilateral stance. A relative absence of a sway in a still position
indicates better stability. Standing on a single leg was assessed in both legs under two conditions: with a fully extended knee and with the knee bent at 20°. The subjects repeated the test three times with a one minute break apart. The postural sway (deg/sec) was shown for each leg individually. A statistically significant difference was established between the first and the second group (p<0.05) in circumstances when the knee was fully extended on the side where the reconstruction was performed. The authors’ main conclusion was that two years following reconstruction of the anterior cruciate ligament the subjects experienced a change in postural stability. The analysis of the single-leg hop test failed to show any differences between the groups. Two years following reconstruction, the subjects’ postural stability was significantly worse in the operated limb when the Neurocom Balance Master platform was used for stability assessment. There was a significant asymmetry between the dominant and the non-dominant leg, with postural sway assessment using the platform proving to be an efficient method for measuring postural control in individuals after the reconstruction of the anterior cruciate ligament (ACL).

The application of autologous chondrocytes implantation (ACI) in the therapy of damage to the knee joint cartilage proved an effective procedure compared to traditional chondroplasty. Howard et al. (2014) tried to document the recovery of the function in individuals after the application of ACI. The research included 48 subjects with the average age of 35. All subjects had undergone implantation, and followed the standard recovery protocol during the rehabilitation period. In the first two weeks following the intervention, the subjects were not allowed any support, during which period the leg was immobilized in a fully extended position. After two weeks, support was gradually introduced to the subjects and mobility of the joint was allowed, while all of them were advised to refrain from high-intensity physical activity in the first 12 months following the procedure. For the purpose of functional assessment, the authors used scales for self-assessment of the function (SF-36 PCS, Western Ontario and McMaster Osteoarthritis Index, the International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form and the Lysholm scale). Postural stability was assessed using the Neurocom Balance Master platform. For balance assessment, the authors used the WBS test, Walk Across test, STS test, SUO test and the Forward lunge (FL) test. The subjects were tested before surgery, and then 3, 6 and 12 months following the procedure. The assessment was performed by the same examiner, and the healthy leg was always tested first.

For the weight bearing squat (WBS) test, different knee positions were assumed (0°, 30°, 60° and 90°). In the WA test, the subjects were instructed to walk along the entire length of the platform, following their own rhythm and pace. This test assesses the characteristics of a walk by moving across
the sensory platform. The parameters to be determined are the average width and length of a step, and the speed of momentum measured by the speed of establishing the touching point with the surface. For the STS test the subjects sat on a 50 cm high wooden bench and were instructed to stand up as soon as possible and remain 10 seconds in the standing-up position. For assessing the characteristics of motor control during the SUO test, a wooden bench 30 cm high was used. The assessment of body movement while lunging on one leg was measured by the FL test.

The change was recorded in all subjects over time. The WBS test returned not so significant, but nevertheless, lower values of shifting the weight onto the operated leg at given knee flexion angles over the period of one year. Statistically significant difference was determined on the WA test, where the length of the step increased, comparing the situation before and after the procedure in the first year. The STS test showed the earliest positive effects of the procedure in terms of a shorter time of shifting the centre of gravity in the first three months. The time continued to decrease gradually even after 6 and 12 months following the procedure. Analysing the SUO test results and the parameters of the Lift–Up Index which determines the maximum force of lifting the leading leg and is expressed in the percentage of the individual’s total body weight, a significant index increase was identified in the first year. Finally, the FL test established the increase of the Impact index (maximum vertical contraction exercised by the leg stepping forward on the basis of the support, expressed in the percentage of body weight) which gradually increased over time.

The main aim of this study was to predict the recovery time after the implantation of autologous chondrocytes in the damaged cartilage of the knee joint, so as to obtain data which could be significant for both doctors and patients. Based on the results, the authors concluded that in the first few months, the symptoms such as pain had decreased although the functional recovery of the knee and the possibility to improve postural stability takes 12 months or possibly longer. The authors reached this conclusion through precise measurements using computerized equipment – the kinesiometric platform Neurocom Balance Master.

**CONCLUSION**

Neurocom Balance Master platform has eleven tests for assessing static and dynamic postural stability, the most commonly used tests for balance assessment after knee joint injury being the unilateral stance (US) test, the weight bearing squat (WBS) test, the Step up/Over (SUO) test and the Forward Lunge (FL) test.
Neurocom Balance Master allows the objective assessment of sensory and voluntary motor control of balance with the presence of visual feedback. The platform has a possibility for assessing and treating all elements of postural stability. In sport, it is a screening method for monitoring athletes after injuries or surgery. It is useful for determining the progression of treatment and assessing the athletes for returning to their physical activities.
REFERENCES


Professional paper

APPLICATION OF ELEMENTARY MOTORIC GAMES IN THE INTRODUCTORY PHASE OF A CLASS AS A FORM OF EMOTIONAL RELEASE OF STUDENTS, AND THEIR USE IN CONTEMPORARY LIFE

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Abstract: The topic of the paper is the basics of elementary games, as specific forms of the movements of students which are normally recommended in textbooks teaching physical education methods, as one of the aspects of the means of performing tasks in the opening phase of a class, and their reflecting importance in contemporary life. The decision on writing this paper was influenced, inter alia, by the importance of physical movement, in spite of a lack of appropriate literature in this field, as well as the obsolescence of existing texts. A possible approach to teaching is presented, intended mainly for primary school students who wish to have a well-shaped body, improve individual physical abilities, develop positive personality traits and maintain health. A comprehensive analysis of the intensity and shape of such movements, among other things, analyzes the justification of game application, mostly of a moderate and medium level of physiological loading suitable in the introductory phase of the class (with the comment that there is no strict regularity in loading by physical effort, but rather, it is variable and depends on the development of the game). The aim of the paper is primarily to refer young people to the realization of a more efficient motoric communication and create a habit for daily physical exercising in the purpose of exerting positive transformational effects of functional systems and morphological characteristics. The means used to achieve the goals in the opening phase of the P.E. class, and the natural forms of movement which are applied in a dynamic and synthetic form, are presented as

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crawling, walking, running, jumping, throwing, climbing, etc. In other words, movements arising in elementary games with the tasks of catching, overtaking, hiding, climbing or descending, with an adjusted competitive motive.

**Key words:** elementary education, physical education, introductory phase of class, the intensity of elementary games, neuro-muscular system, cardiovascular system, respiratory system, modern era, evaluation.

## INTRODUCTION

Considering the effects of the application of elementary games, primarily in primary education institutions and in physical education (hereinafter: P.E.) classes, there must be “a development of various human capabilities - intellectual, sensory, practical, expressive and natural”.

The main goal and tasks of the introductory phase of a P.E. class, which represents a single unit and has its flow and phases which are of equal importance, are adequate answers to the questions: why (goal, outcomes), what (content), how (methods, procedures), and by which means (resources, media). In order to have adequate answers, one must become familiar with the content of the profession, for the subject precisely is derived from the already noted goals and the goals are derived from the working methods and evaluation methods.

A class is usually divided into four parts: the introductory, preparative, main and final parts, with separate units and characteristic contents, tasks and duration. In the introductory part of the class, the general objective is to set up, warm up and prepare the body, especially the cardio-vascular and respiratory system, for heavier loads in the imminent parts, and therefore, the overall effect of warming up is accelerated blood circulation. This section is 5 minutes long, with the most common application being frontal.

By the variability of dynamic movements, i.e. the elementary games, all parts of the body are put in motion and the organism is prepared for increased efforts during the class, primarily cardiovascular, respiratory, nervous system activity and the mobility of the muscles and joints, presented as the basis of physiological targets.

Educational goals are expressed by creating a pleasant and positive mood in class, stimulating interest in exercise and developing discipline, attention and the ability to react quickly. Using a variety of means, there is an improvement of motor skills, with the introduction and mastering of different games and with an overall increase of motor awareness.

There are only a few books, papers, or articles on the mentioned subject matter, mostly older, representing a commitment of the author
to a detailed discussion of the problem. D. Tomic (1991) in his edition of “Education through playing”, has written about some elementary games for P.E. teachers. In a book by Lj. Sikimić (2003), shown is the ability to integrate knowledge from different scientific fields and their operationalization in the games that are applied without risk in different places and different situations, something which is presented in this paper by various elementary games.

THEORETICAL FRAMEWORK

A review of elementary games through a positive prism, and their shortcomings in the introductory phase of a P.E. class.

With the presented items in the paper and with broad explanations, the students are given a basis for developing interest for mastering elementary motoric games which have very significant positive biological effects on their body, especially in the contemporary living conditions.

With their simplicity and developed contents, the games are customized to both students of outstanding physical abilities and those with less developed skills, i.e. those who show less interest in sports and the need for manipulating the body and an increased dynamics of movement.

Elementary games positively affect the development of a creative, open-minded and culturally emancipated personality, eliminating national, racial and linguistic discrimination. Viewed more broadly, the essence of the paper is that motor movements should, along with their usefulness, encourage and develop a permanent need and habit of the students and in different forms and work modes, develop an instinct for physical movements and exercise, thus enabling them to resolve the necessary physical tasks in modern living conditions, applicable in future professional careers.

Elementary games can fully meet the organizational tasks of the introductory phase of the class, and in this case, the beginning of the class is simple and quick, regardless of whether the students are waiting in line or not. The class can start in any part of the playground with a simple and short speech of the teacher explaining the game and initiating the class.

The author of this paper has come up with all the above mentioned variants of elementary games that are organized: individually (birdie in a nest, catch the ball, Speedy Gonzales, etc.), in pairs (finally free, hunters and a deer, a sumo duel, cat and mouse, 4 x 2, etc.), in threes (passing beneath the rope in three, holding by the shoulder), quads (frogs croaking and catching storks, caterpillar leap, the sponge rush), quintuplets (soldier on a mission), sextets (musical chairs), eights (on your marker, the famous gooks), and a
frontal game form (the leader of the tribe strikes, follow the sound, paper on the back, between four fires, etc.).

The following elementary games are organized in lines (relocation, hot gloves, fast carts, ‘comedians’), in columns (pass the ball fast, somersault forward convulsed, somersault backwards convulsed, ‘spatial weights’), in a circle (pass the ball around, take the ball away, guess who?, goalkeeper), and the like.

THE SUBJECT OF THE PAPER

Such mentioned divisions facilitate the organizational and methodical forms of work in the later phases of the class. Empirical results show that children imitate familiar phenomena in their environment and everyday life, especially in the lower grades, while more complex forms of games are increasingly used in higher grades.

A variety of games as well as an organized and methodical system can lead to an unobtrusive socialization of children, mitigating self-absorption. Elementary games do not meet only the preliminary tasks of the class, but also a large part of the overall objectives of physical education.

According to Fetz (1978), a physiological load is viewed from the aspect of the burden on the cardiorespiratory system and muscle strain, but also from the point of view of complexity of movement-strain in the development of coordinative abilities. The solid line indicates the stress of internal organs, the dotted line representing the muscles straining and the dashed lines the coordination of abilities and strain.

Table 1. Physiological curve by Fetz

With a proper theoretical and methodological application in physical education, there is practically no lack of basic games. The negative side of
games appears mainly in those P.E. teachers who are not sufficiently trained for their jobs.

The main issue in a P.E. class, in addition to objective indicators of loads, must be a subjective measure of the load, meaning the student’s awareness, during exercise, of fatigue and task difficulty. The best way of applying elementary games in the introductory phase of the class is based on a gradual, slow and systematic introducing in order to adapt all systems of the body to a progressive increase of physiological load in the following phases. If the opposite occurs, it may lead to errors.

Errors are reflected in various forms of muscular, ligament, joint, and bone structure injuries, especially at a lower temperature. Although the introduction indicated that elementary games often have a competitive motive, this aim should be kept to a minimum during warm-ups, with expressed aspects of satisfaction, happiness, and enjoyment of the game, rather than competition.

Only the best methodologists and P.E. teachers can use games with an appropriate sense for applying focused principles of an educational and health orientation within a P.E. curriculum and the introductory phase of the class, being also aware of the age features of the pupils.

Skilled teachers will sense when the intensity of the given elementary game should be slightly increased and when it should be reduced, either by changing the given game or by giving new instructions during the same. For example, for some pupils even a load at the level of 145-150 beats per minute is the maximum value they can handle, while on the other hand we have pupils for whom a load at the level of 190-200 beats per minute presents no problem.

The heart rate is proportional to the intensity of work or the consumption of O₂ during exertion. In the range of intensity from light to moderately heavy (submaximal), the frequency increases linearly with load increasing. Thus, the higher the turnover of energy, the more O₂ should be delivered to active muscles. CO increases linearly in the metabolism, and a greater amount of blood can deliver more O₂ to the muscles, which is how we linearly increase linearly HR by effort. CO (cardiac output) depends on the HR (heart rate) and SV (stroke volume).

Students should reach the maximum heart rate in the main part of the class, and not in the introductory, which would be a great error. Based on the monitoring, work intensity and HRmax (HRmax = 220 - age (+ - 10)), a judgment is made on the workload of students in different class phases, as well as in its entirety. Occasionally, during work the teacher uses a pulsometer for checking the parameters, and the topic which deals with a comprehensive research of modern means (i.e. a pulsometer) for assessing the load of students in the introductory part of the class will be discussed in the next paper. (All the above standards should be followed by P.E. teachers in order to have a beneficial effect on a child’s body).
Table 2. *The correlation between the load, metabolism and HR*

<table>
<thead>
<tr>
<th>Consumption of O₂ (L/min)</th>
<th>HR</th>
<th>Load (W)</th>
<th>Energy turnover (kJ/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>85</td>
<td>50</td>
<td>21.0</td>
</tr>
<tr>
<td>1.5</td>
<td>110</td>
<td>100</td>
<td>33.6</td>
</tr>
<tr>
<td>2.1</td>
<td>125</td>
<td>150</td>
<td>46.2</td>
</tr>
<tr>
<td>2.8</td>
<td>160</td>
<td>200</td>
<td>58.5</td>
</tr>
<tr>
<td>3.5</td>
<td>180</td>
<td>250</td>
<td>71.4</td>
</tr>
<tr>
<td>4.2</td>
<td>190</td>
<td>300</td>
<td>84.0</td>
</tr>
</tbody>
</table>

The definition of the stated issue is that inadequate elementary games in the opening phase of a class can give unwanted consequences in the form of unrealized tasks, gradual physiological workloads of students, excessive involvement of the locomotor apparatus, as well as a disruption of the concept of teaching intensity.

**THE METHOD OF SELECTING ELEMENTARY GAMES IN THE ORDER OF THE MATURING PROCESS, AND THE AGE FEATURES OF STUDENTS**

Table 3. *The order of the maturing process and the age characteristics of students from early school age to middle and senior school age, features which we included in order for the table to be complete. (Review made with extra instructions from the book by Dr. Milutin Stojanovic, 1979.)*

<table>
<thead>
<tr>
<th>AGE</th>
<th>GIRLS</th>
<th>BOYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Expansion of the pelvis, hips rounding; annual growth in height is even, with no decrease compared to the previous period; muscle weight is about 27.2% of the entire body weight; muscle fiber diameter 38 microns; low tolerance to CO₂ and H⁺La; by maturing higher segments of the central nervous system, especially the cerebral cortex new and more complex motor reflexes are established, the finest coordination with the development of the true sense and expediency is established; brain weight about 1381 grams (according to Mateev);</td>
<td>Annual growth in height is even, with no decrease compared to the previous period; relatively low tolerance to CO₂ and H⁺La; by maturing higher segments of the central nervous system, especially the cerebral cortex, new complex motor reflexes are established, the finest coordination is established, with a meaningful development of the true sense and expediency; brain weight about 1210 grams (according to Mateev);</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Increased secretion of the sebaceous glands; the establishment of normal physiological distortion of the spinal column, with the characteristics of its plasticity and susceptibility to deformities; rich developing of movements, especially of precise motion of handling or manipulation;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Establishment of normal physiological distortion of the spinal column, with the characteristics of plasticity and susceptibility to deformities; muscle fibers diameter 39 microns; rich developing of movements, especially of precise motion of handling or manipulation;</td>
<td></td>
</tr>
<tr>
<td>10-11</td>
<td>Beginning of developing of breasts; in the development of the chest, ribs are becoming more aslope, and the angle rib arches sharper, so that the front and rear diameter represents approximately 75% of the cross; little ability to work under anaerobic conditions and lower working capacity; a relatively short period of recovery of the appropriate intensity;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Start of growth of the penis and testicles; muscle weight approximately 30.8% of the entire weight of the body; decreased ability to work under anaerobic conditions and lower working capacity;</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Outbreak of pubic hair, genitals increase; increased growth of body height, about 8 cm, and body weight over two years for around 20 kg (between 7 and 30 kg); muscle fiber diameter 44 microns; brain weight about 1370 grams (according to Mateev);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The growth of the larynx; in the development of the chest, ribs become more aslope, angle of rib arches sharper, and front and rear diameter represents about 75% of the cross; fast recovery period, after increased intensity; brain weight around 1405 grams (Mateev);</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Change of vaginal secretion from alkaline into a strongly acidic reaction;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Growth of testicles and penile growth, pubes; muscle fiber diameter of 50 microns;</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Menarche (the beginning of menses often irregular and without ovulation), the outbreak of hair under the armpit;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mutation (change of voice), swelling of the mammary glands; increase in the annual growth in height, about 10 cm per year, as well as body weight over two years for around 20 kg (between 7 and 30 kg);</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>More pronounced changes in the pelvis; significant change in the volume of thoracic cavity, the chest expands in all directions, while the sternum does not change its expiratory position, and therefore costal breathing prevails;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pigmenting of scrotum, growth of hair in axilla, beginning of emergence of mustache, ending of growth of the testicles, the first ejaculation;</td>
<td></td>
</tr>
</tbody>
</table>
### RESULTS

**The appropriateness of focused movements in the introductory part of the P.E. class**

The said issue involves the younger period (from 7-8 to 10-11 years of age) and middle school age (from 11 to 14-15 years of age), but not older schoolchildren. The introductory part of the P.E. class, with a time period of 5 minutes, and all the aforementioned age features will show their proper purpose, if a variety of movements dominate, with the full involvement of the locomotor apparatus and large muscle groups.

The movements that dominate in the first or introductory phase must be in complete synergy with the critical periods of physical abilities abilities, and with the necessary emphasis that the mentioned part of the class cannot

<table>
<thead>
<tr>
<th>Age</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-17</td>
<td>Menstruation becomes regular, occurrence of acne; cessation of skeletal growth, with a tendency for 1-2 yr., completion of ossification; at higher exposures to loads, mixed type prevails or cost-diaphragmatic type of breathing; musculature weight is about 32.6% of the entire weight of the body; muscle fiber diameter 92 microns; optimal ability to work under anaerobic conditions and greater working capacity; brain weight about 1450 grams (according to Mateev);</td>
<td>Increased volume of chest and developed musculature with the predominance of abdominal or diaphragmatic type of breathing; optimal ability to work under anaerobic conditions and high working capacity; brain weight about 1480 grams (according to Mateev);</td>
</tr>
<tr>
<td>21</td>
<td>Optimally firm connection of muscles with bones; higher tolerance to CO2 and H + La; period of adulthood, with full mental and physical development and ability for the greatest achievements;</td>
<td>Termination of skeletal growth, and the beginning of adulthood, with a tendency over the next 1-2 years of completion of ossification; optimally firm connection of muscles with bones; musculature weight more than 40% of the entire weight of the body; muscle fiber diameter of 120 microns; high tolerance to CO2 and H+La; adolescence, characterized by full physical and mental development and ability of max. achievements of all function systems;</td>
</tr>
</tbody>
</table>
serve a significant but rather a progressive treatment of the physical features of children. Uneven parameters of the biological and chronological age of a child, as well as some other body systems, testify that some elementary games and certain movements are undesirable in this part of the P.E. class. Thus, accepted and familiar motor habits should be performed by students without any major problems. The most desirable movements and elementary games are the ones where speed, as well as general endurance and flexibility or mobility prevails. The application of elementary games endorsing absolute power and endurance in a static force will be performed to a much lesser extent. The best result in a broader sense is achieved by elementary games in a situation of applying games and P.E. and physical culture in general with people who apply them in adulthood, i.e. those where teaching left a need for continuous exercising in contemporary life. Thus, the P.E. teacher is of a great importance, as in this situation he is the “major link”.

Some elementary games in which speed prevails and which will be applied in junior grades (sorted by weight) are the following:

1. **A net for teachers** – the space is empty and rectangular in shape. The teacher runs back or backwards, facing the players, changing the direction of movement in order to allow after a short while for players to catch him ‘in the net’, clapping his hands.

2. **Joining parts of the body** – players randomly run within a limited space, and when the teacher calls out the name of some body parts, such as hand-heels, head-knee-nose, etc., the players touch their parts of the body as soon as possible, according to the said call. At a specific sign they start to run again.

3. **Locate your marker** – the players are divided into two groups. The teacher holds two markers of different colours, and determines which group belongs to which colour. After that, the players run within a limited space, with the teacher holding one marker in one hand and a second marker in the other. At the ‘Locate your marker!’ call, the teacher stands in one place, and the players run forward and line up on the side where their colour is. The teacher also can move markers from one hand to the other.

4. **Birdies in the nest** – in all four corners of the limited space, smaller rectangles are drawn. Players run free, imitating bird calls. The teacher calls out ‘birdies in the nest’, and counting to three, the players try to get within the nearest rectangular. Anyone outside the rectangle is out of the game.

5. **Changing places** – two groups of players of the same number face each other in lines at a distance of about 10-15 meters from each
other. When the sign is given, the players run to the opposite side, changing places, i.e. making a rotation around the longitudinal axis by 360 degrees and arranging themselves behind the line. The starting positions are different - from the standing position, a resistance kneeling on the hands, a resistance squatting, a resistance sitting, face, or back facing as well as from the front resistance lying.

6. **Finally free** - in pairs of two, and in an upright stance, the players are tied up with rope or tape for the upper ankles. On the teacher’s signal, they take their partner by the arm around his/her waist, and they both start the race in a marked space, with movements back and forth or in either direction.

Some elementary games involving catching (classified by weight) are the following:

1. **Typical catching** – one player catches the other within a limited space. When a player touches the hand of one of their friends, they change roles. It is desirable that the player who is catching holds in his hand a marker for identification. (The game of catching can be modified by specifying two or three catchers, or even more.)

2. **The hunters and the deer** – the size of the restricted area is in close dependence on the quantity of students. Two players are ‘hunters’ and the others are ‘deer’. ‘Hunters’ hold hands and catch the ‘deer’ in a certain area, The ‘deer’ is caught as soon as one of the ‘hunters’ touches it and it immediately becomes a ‘hunter’ (grasping hands with hunters). The game is played until two players remain, considered winners in this game, and are rewarded with applause, and if the game is repeated, then they become the ‘hunters’.

Some elementary games for developing skills in primary school age (sorted by weight) are the following:

1. **Passing the ball into the circle** – standing in an upright position in a circle, rolling up the hull around its axis of rotation, adding the partner the ball at hip height laterally, and in a clockwise direction. When all the players pass the ball once, the game continues in the opposite direction. If we want to accelerate a given game, we can use another ball.

2. **Sumo duel** – standing in pairs opposite each other in circles, the players try ‘taking the bull by the horns’ using their muscles by pulling or pushing to move for a moment and take the partner out of the circle. The time of the sumo duel is relatively short, with a respect for the opponent.

3. **Catching balls** – players run around the playground, tossing small balls filled with sand. A few players drop the balls in their hands and
try to catch those which have fallen to the ground. Then the players who lost their balls try to steal them from someone else, and so on.

4. **Frogs croaking and catching storks** – in several ‘ponds’ at a small distance, there are ‘frogs’. Between the ‘ponds’ there are two or more ‘storks’ walking. The ‘frogs’ jump over on all fours from ‘pond to pond,’ in which up to four frogs can enter, while in the meantime, ‘storks’ leap, trying to catch a ‘frog’. A trapped ‘frog’ has the task to ‘croak’ 3 to 4 seconds, then becoming a ‘stork’ and vice versa.

5. **Taking away the ball** – players create a square or a circle, depending on their number, with an optimum of 6-7 in each so that one of them is in the middle of the said geometric figure. Each described figure is as a game in itself. The students are added by hand (usually leaping), or foot, as determined by the teacher, or by agreement, guided by a democratic way of governance while the middle player tries to take away the ball. If he succeeds, he exchanges roles with the student who had the ball last.

6. **The leader of the tribe guessing** – players choose the ‘leader of the tribe.’ The chosen player turns to face the wall or some other object, and the other players, away from him, agree what they will do in front of him, which he must guess. An example is imitating or emulating hunting in the woods. Approaching ‘the leader of the tribe,’ they say: ‘Good afternoon, leader of our tribe!’ He replies, ‘Hello, children.’ ‘Where have you been?’ ‘In the woods.’ ‘What were you doing there?’ Now children show what they were doing, and the leader tries to guess. The children scatter and he catches them so that they can ‘approach the throne.’ The one caught becomes the leader, and so on. If the leader fails to guess what the children were doing, the game starts again, with the same tribal leader.

Some elementary games for developing spatial intelligence, reflexes and sensation in the junior grades (sorted by weight) are the following:

1. **Following the sound** – all the players close their eyes, while one player takes a whistle and moves around the playground, whistling first quietly then loudly, so that the players can follow the sound.

2. **Passing under the rope in triplets** – two players in an upright position spin a rope, while three players hold hands and with eyes closed, try to snake below the rope in the opposite spinning direction.

3. **Hot gloves** – players are divided into two lines, facing each other at a distance of about half a meter. Both lines stretch out their hands, with one line turning their palms up and the other palms down. A player who has turned his palms up tickles the others’ palms and attempts
to mislead him and hit him on the palms from above. The opponent tries to avoid palms and if there is a miss, roles are exchanged.

4. **The ball as a chair** – players are in a circle facing the center. In the middle of the circle there is a ball. The teacher approaches one player, turns him back towards the ball and makes a small rotation around its axis by 360 degrees, and after that blindfolds him. The task is that the player goes backwards and when he reaches the ball, he sits on it. The game is repeated.

5. **Guess who?** – players hold hands in a circle facing the center and they all move to the right or left side. One player in the middle of the circle is blindfolded and issued the command: ‘Stop!’ The players stop at the sign, and the player in the middle touches another player, asking: ‘Who are you?’ In an altered voice, the chosen says the name of another player. If the player from the middle guesses the right name, the roles reverse.

6. **Cat and mouse** – players make a circle, holding hands, and they are either standing or resistance squatting. In this circle, there are two blindfolded players, with one mimicking a cat, and another a mouse, moving on all fours. The task is for the cat to catch the mouse. In order for a cat to guess where the mouse is, it must meow 2-3 times, and the mouse responds with an arbitrary sound. The cat looks for him from the direction of the voice and the mouse runs away. When the cat catches the mouse, the teacher picks another two students, and so on.

The elementary games described and classified in the junior grades can be used from the first to last grades in the secondary school age. In addition, elementary games used to develop speed, agility and games like catching, are included in this chapter. We divided them from the easiest to the hardest in the secondary school age:

1. **Pass the ball quickly** – students make two or three rows, depending on their number. Standing astride, a player at the rear of the column holds the ball at hip level. On a given signal the players, with balls slightly bent, pass from behind the ball to the next player in the height of the forehead as quickly as possible, and so on. After that the first player bends deep forward and rolls the ball back on the ground with the legs apart to the next player, and so on until the end. The team that finishes the described circle with the ball first is considered the victor (the game can be improved with two or three circles).

2. **A soldier on a mission** – the teacher gives the players 4-5 hoops from rhythmic gymnastics, so that one hoop is in the hand of one of the players. Players are free to move and at the sign of the teacher a player rolls the ball, and the one closest to him stands sideways or
frontally mimicking ‘a soldier on a mission’, and bending quickly, runs through a hoop striving not to touch it. In the next round, the game is the same only with a change of the player holding the hoop, but now the ball is thrown through it.

3. **Skipping caterpillars** – two players run in one direction on the sides towards rows of 4-5 players, holding the ends of a taut rope or string. Other players, at the signal of the teacher, mimic the movement of a ‘caterpillar’, one after the other in the front (in the second variant, laterally from one or the other side), skipping from the ground and trying not to touch the rope with their feet. When both players arrive at the end of the row, the roles change. Optionally, at the teacher’s or players’ will, the following two take the rope.

4. **Speedy Gonzales** – the players are in a confined space, and one player ‘hits’ another one on the arm, although not too hard, and at the same time takes care not to get hit. The game ends with applause on the part of all the players.

5. **Paper on the back** – the game takes place in a confined space and the players are divided into two groups. The first group has attached sticky pieces of paper on their backs, while another group of players needs to take the papers. One player may take several pieces of paper at once. When all the papers are taken, the roles change.

6. **Holding shoulders** – three players in a limited space are holding each other’s shoulders; for example, the left hand grabs the right shoulder and the right arm is pulled through the upper left arm. With his right hand free, a player touches and catches the others while they are fleeing. The caught players join those who are catching, so that the last player remaining is rewarded by applause.

7. **4x2** – in a limited space, four pairs of players catch the others. The caught player enters the circle, and the one that caught him is released. At a signal from the teacher who is clapping his hands, four pairs of players endeavour to catch the others.

8. **Quick trolley** – players are divided into two groups, namely, those who first ‘force a quick trolley’ and those who represent the ‘trolley’. The game takes place in a limited space and is arranged so that players in the standing position and at hip level cover the back of the partners who are in a lying resistance on the hands. The players’ task is to move in a ‘trolley’ position, at the given sound signal by dynamic muscle contractions back and forth, and to as soon as possible cross the given distance. When the first section is crossed, the players change roles. Those walking on their hands must signal their partner when to push forward or pull back. The game ends with applause by all players.
9. **Take care of the ball (the balls)** – players are divided into two or three teams, depending on their number, and in such a way that they are in a line behind the starting line. At a distance of some 15 meters of each starting line, a dumbbell is set as the landmark around which players must pass. The first team holds the ball (two balls, in a more difficult version) under the arm/s at hip level. At the sign of clapping, the players try to go around the dumbbell as quickly as possible, and then return to their original position, so that the ball/s can be given to the next player, and so on. This interesting game may end up with one, two or three bypassing of all teams.

10. **A somersault forward squatted, backward squatted** – two rows of players in a limited space 15 meters long (marked start and finish lines) and a set mat in both columns in the middle of the sections, are trying to run as fast as they can an ordinary relay race and the somersault forward squatted and touch the stretched arm of their team player. The next player continues the same task, and so on until the last round is over. The one who arrives first to the target wins, and is awarded applause. The game can be played in two or three rounds.

11. **Successful goalkeeper** – players are divided into several groups and each group forms a circle and plays in the following way: make a small goal of two cones in the middle of the circle, which is guarded by the ‘keeper’. On the periphery of the circle, players kick and in the best moment try to score a goal, while the goalkeeper in the circle follows the movement of the ball, mainly with short hop steps and by bouncing the ball with the feet. The player who scores a goal becomes the goalkeeper. If the goalkeeper defending his goal inadvertently scores a goal, he is replaced by the player who had the ball in his possession last.

12. **Go between the mats** – in a limited space, a few mats are littered in an arbitrary manner. Two players, holding hands, are chasing the others, but may not run across the mats, just in between. Those players who are fleeing can pass over them. Two players who are caught replace the previous ones.

13. **The sponge rushes** – four players carry a rectangular sponge of the appropriate dimensions and appropriate weight, so that each of them holds one corner of the sponge. Thus, they attempt to catch other players, who scamper around the limited space. The player who touches the hand of the fleeing player is fleeing is released and then they switch roles.

14. **Taking things** – on two opposite sides, at a distance of about 10 m, circles are drawn in which we put the same number of small objects
The teacher divides the players into two groups of equal strength and size, so that each of them is standing in front of a particular circle. At a signal from the teacher, players take only one object and carry it into the opposite circle, where they leave it. Then they take a new item that the opponents left and carry it again in the opposite direction, and so until the end of the game, which takes a maximum of 2 minutes because of its slightly larger intensity. When you count the objects in circles, the winners are the players with a smaller number of objects.

Some elementary game for the development of spatial intelligence, reflexes and sensation in the secondary school age (sorted by weight) are the following:

1. **Children's joke** – one player in a small confined space is blindfolded and is ‘in the dark.’ Other players around tease and tickle him, and he must catches them but without moving from his place. The player in the dark can also bend or crouch in order to attempt to catch the players that way as well. The caught player replaces the one blindfolded.

2. **‘Famous gooks’** – divide the players into several groups so that there are up to 7-8 of them, every group playing for itself. One player puts his right hand under the left shoulder with the palm facing to the side and with his left hand he covers his eyes. Other players are behind him and hit him with the index finger into the palm, shouting: z-z-z-z. After that, the player turns towards the others and if he guesses who had hit him, they change roles. The teacher controls the game while respecting the principles of generosity and honesty.

3. **‘Comedians’** – the entire class is deployed into two lines so that the players are facing each other. A player passes between the two lines, and his task is not to smile, despite his friends making various facial expressions and grimaces, trying in every way to make him laugh. If he succeeds, he chooses himself a replacement, and if he laughs he must once again go through the trial with the arms bent at the elbow joints.

4. **‘Musical chairs’** – for this very famous game, we need one chair less than the total number of participants in the game, which can be arranged in several groups of 6-7. Players listen to music, playing and cheering to the rhythm of the song in the space around the set chairs and after the song is stopped they must quickly sit on a chair. One chair is taken out of the game until there is a winner. After that,
the winners of all the groups enter the finale and compete among themselves for the final triumph.

5. **Balls in the space** – the players sitting on the periphery of the circle face the center or each other. One player is in the circle center with two smaller handball balls in one hand. A player throws with a greater intensity both balls in the air and at the same time speaks out the names of two players from one and the other part of the circle. The called players quickly rise and run to catch their balls before they fall to the ground. If they perform or do not perform the task, they return to their space, only now they move to the periphery of the circle by one space clockwise, while a player at the center moves in the opposite direction. After a while, the player in the center of the circle is replaced.

6. **‘Squeeze the ball’** – in a limited space and at a distance of 8-10 meters from the start line, place two or three weights as a landmark around which the players turn and come back. The task of the two or three rows of players is that the leader in each column and puts a ball between his knees and squeezes firmly, and holds the other by gripping with both hands. At a signal from the teacher, they move by foot jumps to the weights and come back, where they give both the balls to the next player in the line and to the end of the row, when the winner is declared.

7. **‘Environment dumbbells’** – the first task is to form two or three rows of players, depending on their number. At a distance of 10 meters, draw smaller squares. In each of these squares, set 4-5 dumbbells. The teacher gives the signal to start the game, an acoustic signal, and the task is for the first player from each group to run, and at a half distance to the dumbbells to make a rotation around its axis 360 degrees and continue to the drawn square. When the player reaches the target, he tears down all the dumbbells and goes back up, where the next player is waiting for him at the start, whose task now is that in addition to the rotation about the longitudinal axis, he is to hold up all the destroyed dumbbells in a given square. The following player tears down the structure again, until the last one in the row. After that the winner is declared by the applause of the players. Players can form two or more circles in the row.

8. **Between four fires** – in a limited space, the game is completely the same as ‘between two fires,’ only now the ‘caught’ players stand on all three sides of the field. The affected players are arranged evenly on all sides. Every team in this case is between ‘four fires’, as the opponent can strike from all four sides.
DISCUSSION

The basic method and the most appropriate means of physical education in the lower and higher grades of primary school are games. From a diverse selection of games, of which there are over 40 and which are the result of many years of teaching and sports practice by the author, the intention of all the above is to create final positive biological effects on the body of pupils in creative P.E. teaching methods. The best results were achieved when the elementary games were set up so that each student or each team had a chance for comprehensive successful development.

Games are seen as a powerful component in the educating and character-forming of a child, as they help children to develop thinking, attention, imagination, patience, initiative, determination, and self-confidence. With the help of games, a child is preparing to become a useful member of the community, learning discipline, as well as acquiring listening skills and developing integrity.

CONCLUSION

An important pedagogical and methodological requirement in physical education teaching is introducing cheeriness and optimism. In games, there is nothing ceremonial, rather everything is connected with the circle of life and the interests of students. This is why the following requirement was set – ‘There is no P.E. class without games’. Games are necessary, just as physically effective activities, but also as aides to help in relaxing mental and nervous tension, which is nowhere as evident as in games.

Only carefully selected, adapted and dosed elementary games, sorted by age, gender, weather conditions in the given area, or air temperature, can serve as a tool for achieving all the tasks of the introductory phase of the P.E. class.

The variety of shapes and forms of movement of different intensity, the need for play and the possibility of using devices and equipment with unlimited natural resources in an outdoor class enable different types of games to become a powerful tool in achieving the objectives of all the parts of a P.E. class.
REFERENCES

Book review

GENERAL KINESITHERAPY – THERAPEUTIC EXERCISE

Publisher: College of Sports and Health, Belgrade, Serbia; p. 181

A publication by Snežana Milićev, PhD, a specialist of physical medicine and rehabilitation, issued under the title “General Kinesitherapy – Therapeutic Exercise” represents a comprehensive overview of the significance of kinesitherapy in medical rehabilitation. The author describes the contemporary approach to patient in a relatively ample manner, without neglecting the common doctrine at any point. She particularly underlines the need to permanently observe patient as a whole, unique psycho-physical personality, and to apply certain kinesitherapeutic procedures so as to improve patient’s life quality and comfort to the maximum.

Apart from describing kinesitherapeutic procedures, the author also promotes the importance of knowledge in kinesiology as a basis for the selection, understanding and application of therapeutic movement (exercise) for prevention-prophylactic and curative purposes. In this publication, reader soon realizes that kinesitherapy is actually applied kinesiology. Such notion can be accepted as these two corresponding, i.e. compatible disciplines provide the necessary knowledge required to establish physical and functional status, based on which a plan of therapeutic movement (exercise) implementation is created.

The publication by Snežana Milićev, PhD, a lecturer of the College of Sports and Health, study program Vocational Physiotherapist, features 181 pages, with illustrations of 53 therapeutic exercises. In addition, it includes three appendices and 2 forms created by the author herself. The publication also contains 50 bibliographic units by both domestic and foreign authors relevant to the field in question.

The publication contains several methodical units. In the first part, the author presents basic anatomic structures important for good locomotion, which is followed by a description of biological-medical effects, as well as the physiological response of human organism to therapeutic exercise. In that context, the field of adaptation to physical activity and the domain of training and overtraining have been covered in a relatively comprehensive manner.
Apart from physiotherapists, who are the target audience for this publication, this segment may also be used in the education of sports coaches, sports medicine doctors, physical medicine and rehabilitation doctors, physical education professors, etc.

A number of persons often appear in the media, trying to point to the need for physical exercise. However, almost none of them stress the harmful effects of inactivity and its influence to organism. This is precisely what Snežana Milićev, PhD does in her publication, covering this field along with the essential measures for overcoming and removing harmful consequences of inactivity. These procedures involve the application of a kinesitherapeutic program. Each kinesitherapeutic treatment initially implies the determination of functional status, i.e. functional estimation (finding), based on which functional evaluation is performed.

This part of the publication provides a detailed description of anthropometric measuring, manual estimation of muscle strength, clinical estimation of body status, the description of starting positions in kinesitherapy, etc.

Particular attention should be paid to the part of the publication referring to kinesitherapeutic equipment. This part contains very professionally and concisely described analytical (simple) and complex (compound) therapeutic movement, as well as the categorization of exercise according to the basic goals of kinesitherapeutic treatment.

The final part of the publication deals with all types and forms of therapeutic movement. A major part of the text refers to patient’s early verticalization, transfer exercise, training of walking with orthopedic aids, canes, crutches, walkers, balance exercise, etc.

Since proprioceptive exercise occupies a significant place in prevention as well as rehabilitation from sports injuries, the author dedicated some attention to this area, as well. Readers should take note of the field of proprioceptive training, stabilizer musculature training, sensomotoric training and the principles of proprioceptive training.

In addition to all this, Snežana Milićev, PhD, dedicates a fair amount of the text to the illustration of stretching exercise, which improves mobility, breathing, strengthening, coordination, etc.

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Book review


SPORTS MANAGEMENT


A book by Prof. Jovan Šurbatović, Ph.D, titled “Sports Management” has been widely anticipated not only by numerous students, but also by sports professionals and everyone interested in this increasingly popular topic in the field of sport. This monographic study published by Public Enterprise Institute for Textbook Publishing and Teaching Aids together with College of Sports and Health from Belgrade, and comprising 344 pages, 52 images, 39 tables, 8 charts and 14 case studies, holds priceless value for the scientific field of sports management, which is still insufficiently researched. Even though very few authors in this region engage in the research of the process of sports management and sports organization management, based on theoretical foundations and rules from the field of scientific management, this book greatly improves the understanding of more efficient functioning of modern sports organization, as well as the interpretation of numerous questions and issues it permanently faces in today’s dynamic environment.

It is generally known that contemporary sport, whether observed as professional, amateur, recreational or school sport, and sport among children and youth, demands high level of knowledge, competence and professionalism from sports professionals who work with these categories. However, the role and significance of sports professionals and management-administrative part of every sports organization should not be minimized. Successful management of sports organization has become a demand and need for its development and growth, and a major role in that domain is played by highly educated and qualified sports managers. Namely, as sports industry grew and gained momentum, the need for successful management practice based on professionals specialized in sports management increased. That is why today, sports managers with their knowledge, skills, potential and abilities represent a crucial factor in the success of efficient and effective sports organization.

The author structured the book “Sports Management” into 10 chapters, which gradually guide reader into the topic. The final part of the book clearly
and concisely presents an overview of: case studies, tables and charts, Index, and References in this field.

The first chapter is dedicated to the basic characteristics of the theoretical concept of scientific management, its origins and development, and it also presents an overview of basic theories, defines the term management, management levels and basic measures of success of every organization (efficiency and effectiveness), referring to the contemporary aspect of management.

The second chapter is an in-depth presentation of the five basic management process stages – anticipation, planning, organization, management and control.

In the third chapter, the author defines sport as a multidimensional and specific global phenomenon. He underlines the significance and role of sports activity in the modern way of life, and questions the need for strategic and system approach, the role and relationship of the state toward sport, and the degree of its influence on sport’s development and functioning in general, at the same time pointing out that sport should boost its connections to economy through sponsor agreements, advertising and donation contracts, or presents. This chapter also defines the term sports management as a multidisciplinary scientific field, whose origin is found in the management and sports sciences, and at the same time the author stresses the role and significance of managers in contemporary sport for the development of sports organization.

Chapter four elaborates how five basic functions of management process – anticipation, planning, organization, management and control – are applied to sport. What makes this chapter particularly valuable are case studies, which the author used to illustrate most management functions (anticipation in sport – case study of BC “FMP” from Belgrade and the anticipation of the number of medals won at the Olympics; planning in sport – FC “Red Star” and BC “Partizan”; organization in sport – the scheme of organization structure of FC “Red Star”; control in sport - the example of UEFA which conducts financial control of European football clubs through mandatory licensing and regular audits).

Chapters five and six are dedicated to professional and recreational sport, respectively. In the chapter that addresses professional sport, the author shows extensive knowledge of the matter by systematically providing data about the globalization of modern sport (pgs. 116-119). In favour of this, he offers statistical data from the European Commission’s White Papers on Sport, 2006: around 60% of EU citizens (271 million people) do sports or some form of exercise in sports; around 70 million sportspeople compete in 700,000 European sports clubs, which engage around 10 million volunteers. This chapter also includes a presentation of the regional investment into sport in the period from 2008 to 2012, as well as the share of certain sports in the total
value, and an interesting spreadsheet of the US companies which closed deals for naming rights of sports facilities along with the values of those deals, a list of best paid sportspeople (football and basketball players in 2013), a list of the most prominent football brands (football clubs) in the world in 2013. A special contribution of this chapter is embodied in the analysis of financing model in professional sport worldwide (the models included the US, British, Western European – German and Spanish, and French ones), and its management strategy. The author points out two strategies present in the European professional sport: profit maximization and sports performance maximization. At the end of this chapter he provides two interesting case studies involving a partnership between the Coca-Cola Company and the Olympic Movement, as well as a good example of implementation of strategic concept of successful management by Joan Laporta and his team in FC Barcelona.

The chapter covering the topic of recreational sports underlines that the comprehension of its significance is of crucial importance, along with the need to regularly practice a form of physical activity, and define the state’s role in enhanced affirmation and promotion of recreational sport in order to improve its citizens’ health and general psychophysical status.

Chapters seven and eight Management of Sports Facilities and Management of Sports Events, respectively, concisely introduce reader to the basic terms related to sports facilities, types, their classification and typology, also referring to the contemporary trends that accompany the construction of such facilities worldwide. At the end of chapter seven, the author presents a case study of the first multifunctional stadium in Europe – “Amsterdam Arena”. The term, characteristics, planning, organization and funding of sports events and a case study related to the London Olympics in 2012 are all covered in the eighth chapter.

Chapter nine encompassed a popular topic – Marketing in Sports Management, and the author puts a particular stress on the importance of sponsorships (case study – a sponsorship deal between the MasterCard company and the UEFA Champions League), branding (case study – British consultancy Brand Finance Plc’s reports on the most valuable brands – European football clubs).

In chapter ten, the author puts an accent on the significance of the connection of public relations and media with sports, in order to realize more efficient communication with sports and general public and create the best possible image, standing and reputation on sports market. The development of modern internet technology, which is also a novelty in the contemporary literature on marketing in sports management, brought about increasingly frequent use of social networks (Facebook, Twitter, LinkedIn and My Space) in the promotion of sports organizations (case study – implementation of new media in promotion – Twitter and Champions League finals in 2012).
Apart from being a major sports fan and connoisseur, the author of "Sports Management", Prof. Jovan Šurbatović, Ph.D, is also an affirmed sports professional who has been successfully performing the role of Secretary General of the Football Association of Belgrade for several years now, and teaching at College of Sports and Health. The author gives a good example to his students, as well as wider sports public, that theory and practice represent unbreakable wholes in sport, and play a significant role in the solution of numerous problems and difficulties faced by our sport on a daily basis. This book features a simple style, high degree of pragmatism and instructiveness, so it is warmly recommended to all college and university students whose study programs include Sports Management, but also to wider sports public which would like to acquire more knowledge in this field and directly or indirectly support the development of the Serbian sport.

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INSTRUCTIONS FOR THE AUTHORS

The scientific journal SPORTS – SCIENCE AND PRACTICE is an official publication of the College of Sports and Health from Belgrade. It publishes original scientific, specialized and review papers, as well as patents from areas analogous with sports and health.

All the papers are submitted to a twofold proofreading and editing (the identity of the editor and author are unknown until the publishing of the papers). Papers submitted to the editor cannot be published in any other journal.

The manuscripts must be previously unpublished (the exceptions are abstracts from scientific conferences, lectures and academic theses), and not undergoing editing in another journal. When the manuscript is accepted for publication, it must not be published in another journal in Serbian, English or any other language.

A cover letter is sent with the manuscript, its aim being to present the authors and point to the essence, significance and original scientific and professional contribution of the paper. The letter is to include the first and last names of the authors, date of birth, the affiliation, academic title and position, email and postal addresses.

The manuscripts are submitted to the editor in electronic form. After reading the manuscript, the editor makes a decision regarding further proceedings. The manuscript is sent to the reviewers or back to the author with appropriate comments, or rejected. A paper is not accepted for publication if it does not comply with the standards of the journal, if the topic of the paper is not relevant, or if a paper with a similar topic has already been published in the journal.

All manuscripts undergo editing. The identity of the reviewer and author is anonymous (double-blind review). There are two reviewers for each manuscript, from the relevant scientific area. After the review, the manuscripts are accepted for publication or refused, or returned to the authors for changes according to reviewers’ suggestions.

The papers are sent in MS Word, using the Times New Roman 12pt font. The papers are written in Serbian and English and should not exceed 15 pages, including all tables, diagrams, charts, graphs and references. The texts are usually monospaced, and all four margins (upper, lower, left and right) are 3 cm.
THE STYLE AND STRUCTURE OF THE TEXTS

The following format is used for writing original scientific papers: INTRODUCTION, METHOD, RESULTS, DISCUSSION, CONCLUSIONS, REFERENCES.

The bibliographical-speculative method is used and deviations from the suggested structure for original research papers are allowed, while the author will adapt the structure to the contents of the prepared material, taking into account the proper marking of chapters and subsections. The numbering is the same as with the original papers (1. XXXX, 2. YYYY, 2.1. Yyyy, 3.2. Yyy, etc.). Every claim, new classification or synthesis of previous findings should be based on the results of the research. It is also necessary to found every claim, new classification, or synthesis of knowledge on the results of the hitherto research.

THE TITLE OF THE PAPER

The title should contain the following information:
~ a precise and informative title which does not contain abbreviations
~ in the case of empirical scientific papers, it is necessary to specify the variables and the nature of their links with the title
~ the first and last names of all authors, without their titles
~ the institution where the author works, as well as the city and state, should be noted underneath the name of every author
~ a footnote notes the email address of the author for possible correspondence

ABSTRACT AND KEY WORDS

The summary should include a general review of the topic. It must contain a defined aim and objective of the paper, a short description of the applied research proceedings and the most relevant results. The summary should be from 150-200 words.

Up to 5 key words are given below the summary.

INTRODUCTION

The introduction should contain a short review of the relevant research. All the used bibliographical sources are to be mentioned in the references at the end of the article, as well as in the text, noting the last names of the author and the year of publishing in parentheses. For example: (Lazarević and
Havelka, 1981). Bibliographical sources SHOULD NOT be mentioned in the text in a footnote.

The topic and aim of research should be precisely defined, as well as the scientific validity and professional relevance of the researched topic.

In order for the paper to be more understandable to less informed readers, the editorial staff recommends that a short explanation of the basic concepts is given in this segment of the paper.

**METHOD**

This part should give a detailed description of the methodological procedure which would enable other researchers to repeat the testing.

It should contain the following subtitles: samples, variable, techniques for data collecting, testing procedures, statistical analysis.

Every instrument used (survey, interview, scale, test et al.) must be shown in its integral form or illustrated in a shortened version.

**RESULTS**

In this part, it is necessary to concisely show the most important results, with short and clear instructions. It is possible to separate several parts, depending on the nature and complexity of the data. If shorter parts are used, it is necessary to label them precisely.

The results need to be presented and statistically processed (avoiding raw data). In the aim of a better assessment of results, it is optimal to use tables, graphs and images, and not repeat the data analyzed in the text. Each table, graph or image must be clearly numbered and mentioned in the text. For example Image 1, Graph 1, Table 1, Table 2, etc.

Tables, diagrams and images are always numbered precisely and consistently. They are an integral part of the text, and not an addendum. The numbering and labeling of the tables, diagrams and images (the name explains the contents), are given above the diagrams.

**DISCUSSION**

The discussion should comment on the results of the research in regards to the initial expectations and hypotheses set in the paper. It should also be professional and based on data obtained in the research.
CONCLUSION

The conclusion contains a short description of the research, and a concise revealing of the main results, as well as the possible further line of research and the potential of a practical application of the obtained results.

REFERENCES

A reference list of the used bibliographical units is given at the end of the text according to the APA referencing model (http://www.apa.org/journals/webref.html).

- The bibliographical sources are quoted according to alphabetical order, using the last name of the author.
- Every bibliographical source is numbered.

Examples of papers in periodical publications (journals, bulletins, etc.)


Examples of non-periodical publications (textbooks, monographs, scripts, books, etc.)


Examples of chapters in non-periodical publications (textbooks, monographs, etc.)


Examples of references published in journals, from congresses and symposia

Author, A.A., Author, B.B. & Author, C.C. (year). Title of chapter. U: A. Editor, B. Editor, C. Editor (Eds.), Name of conference, congress or symposium (pp. xxx-yyy). Published by: Editor


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Designing and marking tables

- The tables must be simple and easy to understand.
- The data analyzed in the text should not be repeated in the tables.
- Refer the data mentioned in the tables to the text in the paper.
- Number the tables (for example: Table 1, Table 2).
- While marking the tables, after their numbering, make a mention of the data in the tables.
- The number and title of table are written above it.
- The tables are always marked and numbered in the same way.
- The tables are an integral part of the text.

Designing and marking diagrams

- It is desirable to include diagrams, charts, graphs, et al. in the paper.
- The data analyzed in the text should not be repeated in the diagrams.
- Refer the data in the diagrams to the text in the paper.
- Diagrams are to be listed by number (e.g.: Diagram 1, Graph 1).
- After their listing, mention the data they contain.
- The numbering and titles are noted under the diagram, chart, graph, et al.
- Diagrams are always numbered and marked in the same way.
- Diagrams are an integral part of the text.
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The journal can also publish a review of the relevant professional literature from the area corresponding to sports and health recently published. The review in a clear and fundamental way points to the significance and current validity of the book, as well as a review of the most important parts and contents. The title of the review must contain information references according to APA standards, these being the last name and initials of the author, the year of publication, the title (italics), the publisher, place of issue. Also included are the page number, the ISBN and COBISS number. The author of the book review signs it, along with a mandatory mentioning of the affiliation.

Example of the title of a book review:

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