A N A L E L E

UNIVERSITĂŢII DIN ORADEA

FASCICULA

EDUCAŢIE FIZICĂ ŞI SPORT

EDITURA UNIVERSITĂŢII DIN ORADEA

2016

Annals of the University of Oradea. Physical Education and Sport Fascicle

Review indexed in Index Copernicus, DRJI – Directory of Research Journals Indexing, InfoBase Index, Worldcat, SCIPIO – Platforma Editorială Română,
The review is issued under the aegis of **The University of Oradea, Department of Physical Education, Sport and Physical Therapy**

Editorial Office Address:
University of Oradea, Department of Physical Education, Sport and Physical Therapy
1 Universității Street, 410087 Oradea, Romania
http://www.fefsoradea.ro/Fascicula_Educatie_Fizica_si_Sport/index.html,
e-mail: journal@fefsoradea.ro

I. S. S. N. 1224 – 5100

CONTENTS

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. no. XXVI /**2016 pp. 3-9**
Article no. 26111 - 831

DEVELOPING STUDENT SOCIALIZATION THROUGH MOTOR ACTIVITIES

Ioan Sabin SOPA*
National UniversIty of Physical Education and Sport, Adress: Str. Constantin Noica, No. 140, Sector 6, Bucharest, C.P. 060057, Romania
Corresponding author: tel: 0742682226, e-mail: sopa_sabin@yahoo.com

Marcel POMOHACI
University "Lucian Blaga", Faculty of Science, Departament of Enviroment Sciences, Physics, Physical Education and Sport, Adress: Str. Ion Raţiu, No. 5-7, Sibiu, C.P. 550012, Romania
marcelpomohaci@yahoo.com

Abstract: Starting from the assumption that motor activities are the perfect environment for socialization, communication and social integration of young people, this study aims to analyze the effectiveness of these activities in improving intergroup relations at the university level. In this research, the samples were composed of two groups, the experimental group (n = 25) with students from the Physical Education specialization and control group B (n = 25), composed of students from the Faculty of Sciences. The sociological survey applied on the two samples aimed to analyze the level of socialization, communication and social integration of students. The findings showed that the experimental group is more united, having a higher level of socialization and communication, compared to the control group B, proving once again the socializing effects of motor activities.
Key words: socialization, motor activities, communication, social integration.

* * * * * *

INTRODUCTION

Sport is by excellence psychosocial, which includes multiple relationships between individuals with feelings, emotions, attitudes, behavior ultimately manifested in specific environment (partners, opponents, supporters, etc.,) and the nonspecific linked to daily life, the game reflects social existence, of acquiring knowledge by motor and mental action, they reproduce social relations through written rules and unwritten, between cooperation and non-cooperation aimed at solving problems and overcoming them through action. Also sports game has connotations psychosocial, with individual behaviors as: motivations, concepts, attitudes, beliefs, opinions, behaviors, attitudes, traditions, moods and feelings, as with structured collectively as: organizing conscious intragroup relationships and tasks, reality and common objectives, management structures.

Related to physical education and its effects on group cohesion experts say the following: physical education can also improve the cohesion of groups, having a good cohesion of the group is considered important and may lead to better performance of the group. The relationship between cohesion and performance has been studied by many researchers, the majority concluded that "the connection between performance and cohesion is mutual" (Sopa & Pomohaci 2014 b). Also,

* Corresponding Author

groups or successful teams are built around strong leaders and the importance of this role is growing in the nowadays sports in all categories (Sopa & Pomohaci, 2015).

Socialization through motor activities aimes a wide range of consequences of practicing physical exercises: from the training of motor skills and social competence, until the acquisition of values and social norms (Sopa & Pomohaci, 2014).

Physical education and sport can be considered factor of socialization and social integration as a result of their characteristics (Stanescu, 2000):

- It takes place mostly in groups, thereby facilitating interaction between individuals (basic condition for the socialization process). The model in which is organized the interaction between individuals within physical education, determine different levels of its manifestation.
- Through its content and forms of organization, it creates an environment that allows psychosocial appearance and manifestation of all interaction types, ranging from cooperative to the adversity. By the specific of the organization of practicing physical exercises, of sports branches, individuals meet cooperative roles simultaneously - with members of their teams, but also of adversity - with other team members.
- Physical education and sports bring the individual into a position to evaluate others and evaluate themselves, which contributes to the formation of self-image. Socialization is favored due to the fact that physical education, but especially sports involve competition between individuals and groups of individuals. Through competition is made the comparison with itself and others, it makes rankings by values.
- Motor behavior in physical education and sport is socializing because favors the emergence of social phenomena like communication, social interaction, cooperation involved in social interaction. From the socialization point of view, schemes and forms of personal interaction are more important than the branches of sport practiced. Some factors are determinant: the degree of cooperation between individuals, quality management, competitive spirit, the importance given to the victory, the share of individual activity and decision-making freedom.

Also, sportive activities develop communication, intergroup relationship, and group cohesion. We can demonstrate that motor activities can develop group cohesion, development of positive intergroup relationships, discover the group leader and most importantly integrate and reintegrate children into the social group. Group cohesion is very important in the evolution of school performance as a group, therefore in collectives where we can find positive relationships as sympathy and friendships work efficiency is greater (Sopa & Pomohaci, 2014 a).

Another important contribution of the motor activities is their socializing role, demonstrated by many researchers from different fields saying that these activities represent the perfect framework in the social development of young people (Sopa & Pomohaci, 2014 e).

Many skills are learned by young people using team sports, one is even the competition. Nowadays we meet competition every day and in every area. As adults we meet competition when looking for a job or trying to find better jobs, school children meet competition for notes. (Sopa & Pomohaci, 2015 b). Socialization through sport means the measure that attitudes, values, skills, traits, transfer rules are learned in sports and other activities and how they manifests itself in social institutions (Epuran, 1998).

Socialization through sport is a process of social integration through communication, understanding, and cooperation, an interactive role for conflict resolution. Therefore, is structured on cognitive, affective, and motivational structures, as well as the performance, conduct, and performance of sports groups (Sopa & Pomohaci, 2014 c). Also, situational factors are important for the cohesion of groups like leaving close to each other, sharing the same hobbies and activities, the same uniforms or clothing, group rituals etc (Sopa & Szabo, 2014).

Extracurricular activities in physical education are precisely those that reveal new facets of the behavior, of the motor act in relation to direct social work; special importance has the value of

these activities, being equally prevention, compensation, and therapy, sports activities stimulates collective integration of the individual, educating cooperative attitude, honesty and fairness (Florea, 1998).

Seen as a social institution, sport has its own base in society, has rules, laws, specific ways of sanctioning, binding friendships (both social and cultural) and communication systems, principles and ideologies (Sopa & Pomohaci, 2014 f).

Individuals learn through sport to work together, to assume certain roles within the group and to define themselves within the group (Sopa, 2014 a).

Socialization through sport is a complex process through which individuals learn skills, attitudes, values and ways of behavior that allows functioning in a particular culture. These modes of behavior are learned in institutions like school or family (Sopa & Pomohaci, 2014 d).

Socialization of sports performance is a complex psychosocial process conditionate by many economic and non-economic factors, socializing is done in the transmission and assimilation of values and behavioral patterns of individual and group sports; the purpose is to adapt, training and social integration of the individual (Ungureanu et. al., 1998).

PURPOSE

The purpose of this research was to discover the effects of motor activities on the level of socialization, communication and social integration of students.

OBJECTIVES

The main objective of the research was to analyze the effect of motor activities regarding the socialization level, communication level, and social integration of students.

HYPOTHESIS

Using a sociological questionnaire can provide the opportunity of analyzing the level of socialization, communication and social integration of students in the group to which they belong.

MATERIALS AND METHODS

Research methods used in this study were: the method of investigation and data collection (documentary theory) statistical methods of processing and interpretation of data, the survey method - sociological survey. The sociological questionnaire applied on the two sample of students had as purpose finding the motivational factors regarding group membership, socialization, and group cohesion, intragroup relations etc. The questionnaire included 12 items, each trying to discover some pieces of the socialization and group cohesion puzzle.

The content of the sociological questionnaire applied to the students

Bibliographical sources used in developing sociological survey were: Eys, M. A. Carron, A. V., Bray, S. R., Beawley, L. R. (2007), Dragnea, A., et al. (2006), Cârstea, G. (2000).We use the following types of scales in the questionnaire:- pre-proportional 5 answers scale - we used this 5 answers scale for the quantitative variables, allowing us most types of operations and a thorough statistical processing.

We used the following scale of five levels:

5 - Totally agree with the statement
4 - Agreement with the statement
3 - Somewhat agree with the statement
2 - Somewhat disagree with the statement
1 - Disagree with the statement

RESEACH SAMPLES

The research sample was composed of two groups of students: A - the experiment group and B - the control group. A group, the experimental group, was composed of 25 students, 15 male, and 10 female, with an age mean of 20 years, all students were in 2-year specialization at Physical Education and Sports. Group B, the control group, was composed of 25 students, 13 male, and 12 female, with an age mean of 20 years, all students in the 2-year at Faculty of Sciences. With the experimental group, group A, we conducted numerous activities like the motor activities in teams, training camps, contests, competitions. With group B, the control group, we worked the normal course comply with the specific curriculum.

RESULTS

Sociological questionnaire addressed to the students from the two samples was provided with 12 items, each with a response scale with 5 levels, aiming to analyze the degree of cohesion of group, communication in the group, the level of acceptability of individuals, the level of cooperation and into help, socialization and social integration of students.

In Table 1 we can see in the first column the 12 items of the sociological survey and in the following columns, we have the student's answers in the experimental group (A) and control group (B) depending on what mark they chose from 1 to 5.

Table 1 – The answeres to the sociological questionnaire

The sociological questionnaire items	5		4		3		2		1	
	A	B	A	B	A	B	A	B	A	B
1. I like to communicate and collaborate with colleagues during work group	10	8	6	5	4	4	1	3	3	5
2. I will miss my group colleagues when the semester will end	12	9	6	7	3	2	1	3	3	4
3. Some of my best friends are part of this group of colleagues	14	11	3	4	3	3	1	3	4	4
4. I like to practice with my classmates during various activities	12	8	7	5	1	3	2	3	3	6
5. Colleges would prefer better to do activities together than either alone	14	8	4	2	2	3	1	4	4	8
6. All colleagues want everyone to participate in all group activities	10	7	2	3	3	3	4	3	6	9
7. Our colleagues meet and practice group activities outside courses	12	8	2	4	5	3	2	4	4	6
8. Our group spends time socializing before the beginning of classes and after finishing them	11	11	5	4	1	2	3	3	5	5
9. Group activities require our cooperation and mutual assistance to fulfill assigned tasks	14	10	4	4	1	3	1	3	5	5
10. If one of the group members would have problems at one of the exercises everybody would like to help him	12	9	5	4	2	2	2	4	4	6
11. I can perform assigned tasks alone, without the help of other colleagues	8	10	2	5	4	2	2	3	9	5
12. Our group colleagues communicate and express themselves freely during classes	12	10	3	2	2	3	2	5	6	5

Table 2 – Statistic interpretation of answers

Item chestionar	Media aritmetică		Mediana		Abaterea standard		Skewness		Kurtosis		Testul-T pe gen	
	A	B	A	B	A	B	A	B	A	B	T	p
Item 1	3.62	3.38	4	4	1.46	1.56	-0.86	-0.46	-0.55	-1.28	**0.845**	0.201
Item 2	3.92	3.58	4	4	1.38	1.53	-1.18	-0.73	0.26	-1.03	0.881	0.191
Item 3	3.88	3.67	5	4	1.54	1.55	-1.06	-0.76	-0.42	-0.97	**0.262**	0.262
Item 4	3.92	3.25	4	4	1.41	1.65	-1.20	-0.31	0.12	-1.62	1.585	0.597
Item 5	3.92	2.92	5	3	1.53	1.74	-1.16	0.14	-0.20	-1.82	**2.185**	0.017
Item 6	3.24	2.88	3	3	1.69	1.73	-0.18	0.10	-1.73	-1.79	0.834	0.204
Item 7	3.64	3.26	4	4	1.55	1.63	-0.65	-0.25	-1.10	-1.64	**1.068**	0.145
Item 8	3.56	3.58	4	4	1.64	1.64	-0.64	-0.68	-1.32	-1.25	0.121	0.501
Item 9	3.84	3.46	5	4	1.62	1.64	-1.05	-0.50	-0.63	-1.47	0.875	0.193
Item 10	3.76	3.35	4	4	1.54	1.67	-0.91	-0.35	-0.71	-1.66	**1.148**	0.128
Item 11	2.92	3.50	3	4	1.73	1.64	0.08	-0.58	-1.77	-1.40	-1.185	0.121
Item 12	3.52	3.29	4	3	1.71	1.68	-0.58	-0.20	-1.47	-1.75	0.505	0.308

In Table 2 we performed statistical calculations for each item of the questionnaire, so in the first column we can find questionnaire items 1 to 12, in the second column we find calculated the arithmetic mean for each group (A - the experimental group, B - the control group) in the third column we find calculated the median, and standard deviation, coefficient Skewness, Kurtosis coefficient, and in the last column we calculated the difference in meaning between the two groups.

DISCUSSIONS

At the first item "I like to communicate and collaborate with colleagues during activities," the average grade for the experimental group was 3.62 compared to the control group B where the average response was 3.38, and the difference between the two groups was **significant** (0.845).

At the second item, "I will miss my colleague group when the semester will end", students experimental group responded with an average of 3.92 compared with those of control group B where the average response was 3.58, and the difference between the two groups was **not significant** (0.881).

Regarding the third item "some of my best friends are part of this group of colleagues", the average grade for the experimental group was 3.88 compared to the control group B where the average response was 3.67, and the difference between the two groups was **significant** (0.262).

At the fourth item, "I like to practice with my classmates during various activities", the average grade answers at the experimental group was 3.92, compared to the control group B that achieved an average rating of 3.25, the difference between the two groups was **not significant** (1.585).

At the fifth item, "colleagues would prefer to do activities together than each other alone," the arithmetic mean of responses in the experimental group was 3.92 compared to the control group B the where the average response was 2.92, the difference between the two groups was **significant** (2.185).

At item no. 6, "all colleagues want everyone to participate in all activities of the group", the average grade for the experimental group was 3.24, and compared to the control group B where we recorded an average of 2.88, the difference between groups was **not significant** (0.834).

Regarding item 7, "colleagues in our group meet and practice various activities outside classes", the average responses to the experimental group was 3.64, compared to the control group where the average was 3.26, the differences being **significant** (1,068).

Item 8, "our group spends time socializing before the beginning of classes and after graduation", we record for experimental group an average rating of 3.56 compared to the control group where the average was 3.58, the differences are **not significant** (0.121).

Regarding item 9, "group activities require our cooperation and mutual assistance to fulfill the assigned tasks", the average responses at the experimental group was 3.84, compared to the control group where the average was 3.46, and the differences are **not significant** (0875).

At item 10, "if one member of the group would have trouble for one of the exercises everybody would like to help", the average grade for the experimental group was 3.76 compared to the control group B where we recorded an average of 3.35 the difference between groups was **significant** (1.148).

Regarding item 11, "I can fulfill assigned tasks alone, without the help of other colleagues", average marks in the experimental group was 2.92 compared to the control group B the average response was 3.50, the difference between the two groups being **not significant** (-1.185).

At item 12, "colleagues in our group communicate and express itself freely during classes" media responses in the experimental group was 3.52 compared to the control group B the average response was 3.29, the difference between the two groups was **not significant** (0.505).

CONCLUSIONS

The conclusions of our reseach showed that children from the experimental group A, which practice more sport activities, have better socialization and communication level that children from group B. Significant results between those two groups were found at the first item regarding the communication and collaboration between colleagues during activities. Also significant differences were found at item three that analysed the relationships between group members, many students from group A said that they have their best friends in this group.

We can observe significant differences between the experimental and control group at item 5 and 7 that analysed the teamwork in those groups, we can see that in group A students prefer to work in team rather than alone and also they meet and practice outside the classes.

Also in the experimental group A we can see that children are willing to help if anyone would need them, and we can observe that the difference was significant at item 10.

So the conclusions showed us that the experimental group have a better cohesion level, with high socialization an communication level, willing to help eachother, to work in teams and practice sport activities in their free time comparing to the control group that prefer to work alone, and be more individualist.

REFERENCES

Cârstea, G. (2000), Theory and methods of physical education and sports, Publishing NA-DA, Bucharest, p. 32-42.

Dragnea, A., Stanescu, M., Teodorescu, S. Bota, A., Şerbănoiu, S., Tudor, V., (2006), Physical education and sport - theory and teaching, Ed Fest, Bucharest, p. 18-29.

Epuran, M. (1998), Aspects of socialization in sport, Sports science, Nr. 13, p. 7.

Eys, M.A., Carron, A.V., Bray, S.R., Brawley, L.R. (2007), Item wording of the measure and Internal Consistency of Cohesion: The Group Environment Questionnaire, In: Journal of Sport & Exercise Psychology, 29, 395.

Florea, A. (1998), Importance of extracurricular physical education in school, ANEFS, sport science, V, Nr. 13, p. 22.

Sopa, I. S., Pomohaci, M., (2014), Motor important sources of socialization activities at primary school level, at International Scientific Conference "Perspectives in Physical Education and Sport" in Constanta.

Sopa, I. S. (2014), The Role of motor socializing activities at primary school level. Published in the Bulletin of the Transylvania University of Brasov, Vol. 7 (56) No. 2-2014.

Sopa I. S., Pomohaci, M. (2014), Developing Cohesion in Sport Group through socializing Means of Motor Activities. Published in: Medimond by Editografica, Bologna, Page 135.

Sopa, I. S., Pomohaci, M. (2014 b), Group Cohesion important factor in sports performance. Published in European Scientific Journal, Volume 10, No 26.

Sopa, I. S., Pomohaci, M. (2014 c), Study regarding the impact of sport competitions on student's socialization. Published in European Scientific Journal, Volume 10, No 26

Sopa, I. S., Pomohaci, M. (2014 d), Socialization through sport, effects of team sports on students at primary school level. Published in: Medimond by Editografica, Bologna, Page 351.

Sopa, I. S., Pomohaci, M. (2014's), Contribution of sport game in children socialization process. The International Scientific Conference "Physical education and sports in the benefit of health" - the 40th Edition, Oradea.

Sopa, I. S., Pomohaci, M. (2014 f), Study regarding Cohesion group of students. The International Scientific Conference "Physical education and sports in the benefit of health", Oradea.

Sopa, I. S., Pomohaci, M. (2015), Finding the volleyball team leader of the socio metric Using the survey method. Published at the International Congress of Physical Education, Sports and Kinetotheraphy 5th Edition "Education and Sports Science in the 21st Century" 10-13 June 2015 UNEFS Bucharest.

Sopa, I. S., Pomohaci, M. (2015 b), Improving socialization through sports games. How does team sports Affect children at primary school level. International Scientific Conference "Sport, Education, Culture - Interdisciplinary Approaches in scientific research," Galati.

Sopa, I. S Szabo, D. A. (2014), regarding the Importance of Developing Study group Cohesion in the volleyball team. Do Social and Behavioral Sciences, Elsevier Publication, Volume 180C, Pages 1343-1350.

Stanescu M., (2000), Physical education and sport - the process of socialization factors, ANEFS, session of scientific papers and 9 to 10 March 2000; p. 301.

Ungureanu, O., Antohi, N., M. Luchian, Clapon, G., Lupu, A., Paveliuc, P. (1998), Study over the social phenomenon in professional juvenile sports ANEFS, Sports science, V 1998 , Nr. 13, p. 48.

Submitted: June 4, 2016

Revised: October 10, 2016

Accepted and published online Octomber 27, 2016

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. No XXVI /**2016** pp. 10 -17
Article no. 26212 - 832

STUDY REGARDING THE IMPACT OF PHYSICAL EDUCATION AND SPORT ON STUDENTS LIFE FROM UNIVERSITY "LUCIAN BLAGA" SIBIU

Ioan Sabin SOPA*
National UniversIty of Physical Education and Sport, Adress: Str. Constantin Noica, No. 140, Sector 6, Bucharest, C.P. 060057, Romania
Corresponding author: tel: 0742682226, e-mail: sopa_sabin@yahoo.com

Marcel POMOHACI
University "Lucian Blaga", Faculty of Science, Departament of Enviroment Sciences, Physics, Physical Education and Sport, Adress: Str. Ion Raţiu, No. 5-7, Sibiu, C.P. 550012, Romania
marcelpomohaci@yahoo.com

Abstract: In this research, we tried to discover the motivations considered by the students decisive for active participation in the motor activities proposed within the hours of physical activity and sport. The study had as main research method the survey of views and research sample included a total of 100 students from the University "Lucian Blaga" from Sibiu. Research findings showed that the main motivation of students to practice motor activities were keeping or maintaining optimal health, the need for relaxation or stress relieving, maintaining a physically, mentally, emotionally and socially balance, the attractiveness of motor activities, promoting values in the sphere of socialization, finding new friends, communication, socialization. Gender differences show that opinions are divided, male students consider physical and social motivations as most important while female students consider as exponential for the motor activities the mental and sanogenic effects.
Key words: motivation for sport, socialization, motor activities.

* * * * * *

INTRODUCTION

During student studies, physical education and sports activities have as a scope to aim to continue training and self-training of future specialists. So, in the lessons of physical education and sport, through practical activities of various sports, students can capitalize and harness the talent and skills also ensures a framework to strengthen the skills of movement, develops motor capabilities at a higher level , improve the body's major functions, develop moral values as respect for self and opponent, fair play, mutual assistance needed, perseverance, attention, memory (Tufan, 2015).

In scientific literature, the notion of sport has a general meaning representing: "all forms of physical exercises and dynamic games with character more or less spontaneously and competitive, with origins in traditional games and major founding myths of modern civilization and diversification of link that conveys values that come from contemporary lifestyles" (Dragnea & Teodorescu-Mate, 2002).

* Corresponding Author

Motor activities represent a component of active life, an "important link of lifestyle, which involves moving under its own choices, several times a week, move that would make pleasure, consuming energy and produce satisfaction (Grigore, 2007).

Physical education can also improve the cohesion of groups having a good cohesion of the group is considered important and may lead to better performance. The relationship between cohesion and performance has been studied by many researchers, most have reached the following conclusion "connection between performance and group cohesion is mutual" (Sopa & Pomohaci, 2014 b). Also, successful groups are built around strong leaders and the importance of this role is growing in nowadays sport in all categories (Sopa & Pomohaci, 2015 a).

Many skills are learned by young people using team sports, one is even the competition. Nowadays we meet competition every day and in every area. As adults we meet competition when looking for a job or trying to find better jobs, school children meet competition for grades. (Sopa & Pomohaci, 2015 b).

The benefits of practicing motor activities on the body have been highlighted in numerous papers, but we want to present the summary of some of its formative practice values of motor activities which aims the sanogenic, attitudinal and behavioral plan (Uţă, 2012):

Tabelul Nr. 1 – Formative valences of motor activities

Formative valences		
On sanogenic level	***On attitudinal level***	***On social level***
- Removing stress; - recovery; - Relaxation; - Relieve stress; - Disease prevention; - Increase working capacity; - Good physical condition; - Maintain a pleasant appearance for as long as possible	- Self respect; - Managing emotions; - Failure and frustration tolerance; - Conflict management and control of violence; - risk management; - Positive mental attitude (eliminating the complex of loser, a better self-knowledge).	- Respect to the community; - Fair play and team spirit; - The ability to integrate through sport into different groups; - The ability to know and recognize our stable values of the society; - Developing communication skills (knowing that physical activities are a stimulant for communication); - Ability to work in teams; - Capacities for cooperation, collaboration etc.

One of the main motivations for sport, analyzed and discovered by specialists, is to create a healthy lifestyle through practicing physical exercises. According to experts, a healthy lifestyle is an active process that takes place during ontogenesis especially during maturity, the genetic inheritance being important and environment norms and values in which individuals live.

Furthermore, sports develops communication, intergroup relationships, and group cohesion. We can demonstrate that motor activities can develop group cohesion, positive intergroup relations development, the discovery of a group leader, and most importantly integrate and reintegrate children into the social group. Group cohesion is very important in the evolution of school performance as a group, therefore in groups where we can find positive relationships as sympathy, friendship, cooperation, work efficiency is greater (Sopa & Pomohaci, 2014 a).

Other important developments of motor activities are their socializing role, demonstrated by many researchers from different fields saying that these activities represent the perfect setting in the social development of young people (Sopa & Pomohaci, 2014 e).

Table Nr. 2 - Factors influencing the development of a healthy lifestyle (after Grigore, 2007):

Factors which influence a healthy lifestyle		
Factors that relay on individuals	Grup belonging to other persons	Institutions, organisations, associations of other structures
Normative factors	Cultural level	Socio-politic factors

Socialization through sport is a process of social integration through communication, understanding, and cooperation, an interactive role for conflict resolution. Therefore is structured on cognitive, affective, and motivational as well as the performance levels, behaviors, and performance of sports groups (Sopa & Pomohaci, 2014 c). Also, situational factors are important for the cohesion like leaving close to one another, sharing the same hobbies and activities, the same uniforms or clothing, group rituals etc. (Sopa & Szabo, 2014).

Seen as a social institution, the sport has a good basis in society, has rules, laws specific ways of sanctioning, binds friendships (both social and cultural) and communication systems, principles and ideologies (Sopa & Pomohaci, 2014 f).

Besides family, the first and most important social group, other groups contribute to the socialization of individuals: schoolmates, friends group and later professional collective. One of the ways that socialization within the group of friends or colleagues is done is sports. Individuals learn through sport to work together, to assume certain roles within the group and to define themselves within the group (Sopa, 2014 a).

Socialization through sport is a complex process by which individuals learn skills, attitudes, values and ways of behavior that allows functioning in a particular culture. These modes of behavior are learned in institutions like school or family (Sopa & Pomohaci, 2014 d).

SCOPE

Through this present research, we wanted to know the opinions of students in higher education at the University "Lucian Blaga" from Sibiu, regarding motivational factors that determine students to participate in motor activities proposed university.

OBJECTIVES

Among the research objectives can include: identification of student opinion about the motivational factors that lead in their participation in motor activities.

HYPOTHESIS

The knowledge of the motivation regarding student active participation at the motor activities proposed can give us, as managers of the lesson, teaching guideline for practical and methodological approaches and teaching students within sports.

MATERIALS AND METHODS

In this research we used the following research methods: the method of investigation and data collection (documentary theory) statistical methods of processing and interpretation of data, the survey method - questionnaire views.

RESULTS

The sample of the questionnaire included 100 students from various specializations within the "Lucian Blaga" University from Sibiu.

The questionnaire had 14 items that analysed the motivational factors regarding practicing physical education and sport. The questionnaire had a scale of 5 levels starting from 1 that was the lowes to 5 the highest level. The motivational factors proposed were: preserving or maintaining optimal health, the desire to constantly practice motor activities, the need for mental relaxation and stress relief, ensuring a physically, mentally and emotionally balance, learning the ability to practice exercises independent, the desire for self-improvement, participation in the motor activities for knowing one's limits, the attractiveness of motor activities carried out, promoting the values from the socialization sphere, mandatory participation in formal classes, the desire for affirmation, participation in the program only for obtaining credits, improving group cohesion, finding new friends, communication, socialization.

Demographics data - we used them to have a clearer picture of the group of subjects, such as age and gender.

Later on, the gender analysis will show whether there are differences between feminine and masculine gender views.

Age - most students interviewed were aged between 19 and 20 years (67.4%), as we can see in Table No. 1 and Table No. 3.

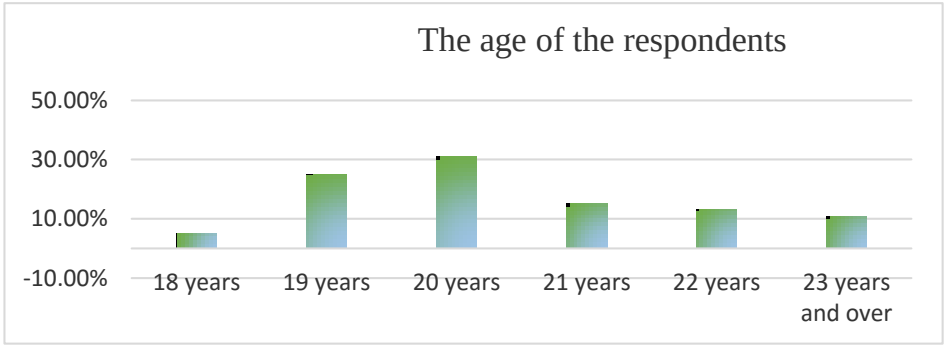


Figure 1 – The age of the questionnaire respondents – graphic representation

Table 3 – The age of the respondents – statistic calculation

The age of the respondents	**Cases**	**% N = 100**
18 years	5	5%
19 years	25	25%
20 years	31	31%
21 years	15	15%
22 years	13	13%
23 years and over	11	11%
Total	**100**	**100%**
Arithmetic mean	20.91	
Median	20	
Standard deviation	2.92	
Skewness	2.72	
Kurtosis	8.20	

The gender distribution of respondents at social questionnaire was the following:

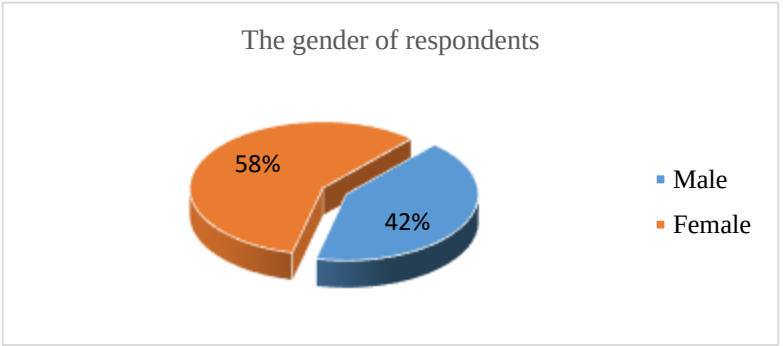


Figure 2 – The gender of respondents to the social questionnaire

Appreciate how the following factors influence your motivation to participate in physical education curricular motor activities. Evaluate each motivational factor.

Table 4 – The students responces to the social questionnaire

Motivational factors, student opinions	***5***	***4***	***3***	***2***	***1***
1. Preserving or maintaining optimal health	60	23	10	2	5
2.The desire to constantly practice motor activities	52	15	18	5	10
3. The need for mental relaxation and stress relief	58	21	11	4	6
4. Ensuring a physically, mentally and emotionally balance	55	25	10	5	5
5. Learning the ability to practice exercises independent	44	20	10	16	10
6. The desire for self-improvement	50	14	16	10	10
7. Participation in the motor activities for knowing one's limits	53	8	14	18	7
8. The attractiveness of motor activities carried out	62	20	11	4	3
9. Promoting the values from the socialization sphere	58	12	10	11	9
10. Mandatory participation in formal classes	30	15	5	10	40
11. The desire for affirmation	52	28	4	6	10
12. Participation in the program only for obtaining credits	33	10	12	5	40
13. Improving group cohesion	55	15	12	8	10
14. Finding new friends, communication, socialization	61	18	5	14	2

Table 5 – The calculation of statistic indicators of questionnaire items

Item questionnaire	Arithmetic mean	Median	Standard deviation	Skewness	Kurtosis	Testul-t on gender
Item 1	4.31	5	1.07	-1.76	2.64	**2.332**
Item 2	3.94	5	1.35	-1.03	-0.17	1.150
Item 3	4.21	5	1.17	-1.51	1.43	**2.120**
Item 4	4.20	5	1.13	-1.48	1.44	**1.740**
Item 5	3.72	4	1.42	-0.69	-0.97	-0.322
Item 6	3.84	4.5	1.40	-0.84	-0.67	**2.136**
Item 7	3.82	5	1.42	-0.67	-1.10	0.220
Item 8	4.34	5	1.03	-1.64	2.12	1.180
Item 9	3.99	5	1.40	-1.05	-0.38	**2.454**
Item 10	2.85	2.5	1.75	0.12	-1.78	**2.224**
Item 11	4.06	5	1.31	-1.38	0.67	1.202
Item 12	2.91	3	1.76	0.06	-1.77	-0.200
Item 13	3.97	5	1.38	-1.07	-0.23	-0.420
Item 14	4.22	5	1.17	-1.29	0.30	**2.450**

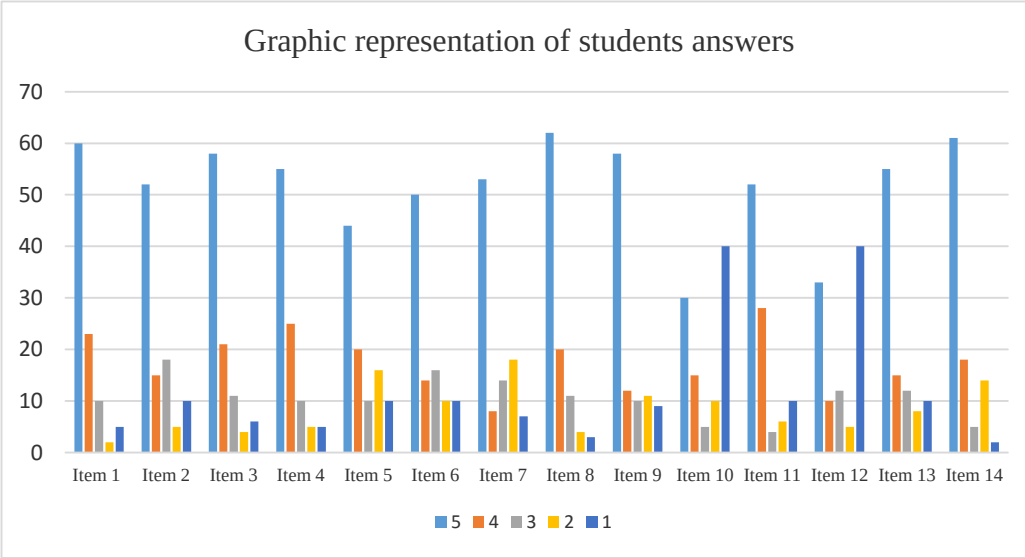


Figure 3 – Graphic representation of students answers to the social questionnaire

DISCUSSIONS

Looking at Figure 1 we can see that many of students are aged between 19 and 20 years (56% of total). And in terms of gender composition we can observe that most students (58% of total) are female and 42% of respondents were male.

Ask to answer which are the motivational factors for practicing motor activities, the students answered:

- At the answer variant 'keeping or maintaining optimal health", the majority of students reply was 5 (60% of total respondents), the average grade being 4.31 and the differences by gender, calculated with the significance t-test (2.332) was significant.

- At the item „the desire to constantly practice motor activities", the most frecvent answer was 5, with 52% from the total, with an average of 3.94 and the gender difference was not significant (1.150);

- At the item "need mental relaxation or stress relief", the most frequent response was 5 (58% of total), the average was 4.21, and we found a significant difference in terms of gender (2,120).

- At the answer variant "ensuring a physically, mentally, emotionally and socially balance", the students replied in 55% with 5, averaging 4.20 and significant gender difference (1,740).

- At the item 5 "ability to practice independent learning exercise", 44% of students responded with 5, the average grade being 3.72 and gender difference being insignificant (-0.322).

- At the item 6 "desire for self-improvement", 50% of students chose with 5, the average grade being 3.84, gender difference is significant (2.136).

- Regarding item 7 "participation in motor activities for knowing own limits", about 53% of students rated 5, the average grade being 3.82, and gender difference was insignificant (0.220).

- At the item 8 concerning "attractiveness of motor activities carried out" about 62% of students chose with 5, the average grade being 4.34, and gender difference was insignificant (1.180).

- At the item 9 "promote the values from the socialization sphere", 58% of respondents rated 5, the average grade being 3.99, and gender difference was significant (2.454).

- Regarding item 10 "mandatory participation in formal classes," 30% of all students have rated 5, the average grade being 2.85, and gender difference was significant (2.224).

- At item 11 "the desire for affirmation", 52% of students have chosen the grade 5, the average grade being 4.06, and gender difference was insignificant (1.202).

- In the case of item 12 "formal participation in the program for obtaining credits only" 33% of students chose grade 5, the average grade being 2.91, gender difference was not significant (-0.200).

- At item 13 "Improving group cohesion", 55% among students ticked grade 5, the average grade being 3.97, the gender difference was not significant (-0.420).

- Regarding item 14 "Discovering new friends, communication, socialization", 61% of respondents chose grade 5, the average grade being 4.22, gender difference was significant (2.450).

CONCLUSIONS

The study conclusions showed that students from „Lucian Blaga" University consider that the main motivation for practicing sport activities are: the attractiveness of motor activities carried out, preserving or maintaining optimal health, finding new friends, communication, socialization, the need for mental relaxation and stress relief, promoting the values from the socialization sphere etc.

The gender differences showed that male students' motivation are different from female motivations. Male students' motivation are: ensuring a physically, mentally and emotionally balance, the desire for self-improvement, finding new friends, communication, socialization. Comparing to the female motivation for sport that are: the need for mental relaxation and stress relief, mandatory participation in formal classes etc.

REFERENCES

Cârstea, G. (2000), *Teoria şi metodica educaţiei fizice şi sportului*, Editura NA-DA, Bucureşti, p. 32-42.

Dragnea, A., Mate-Teodorescu, S., (2002), *Teoria sportului*, Editura Fest, Bucureşti, p. 12.

Grigore, V., (2007), *Exerciţiul fizic. Factor activ pentru prevenirea îmbătrânirii şi instalării bolilor degenerative*, Editura Didactică şi pedagogică, Bucureşti, p. 30.

Sopa, I. S. (2014, a), *The socializing role of motor activities at primary school level*. International Scientific Conference Youth in the perspective of the Olympic Movement, Brasov, Romania 28 February – 01 March 2013. Published in the Bulletin of the Transylvania University of Brasov, Vol. 7 (56) No. 2 – 2014, Series IX – Sciences of Human Kinetics, ISBN 2344-2026 (Print) ISSN-L 2344-2026 (Online), ISSN 2344-2034 (CD-ROM).

Sopa I. S., Pomohaci, M. (2014, a), *Developing Cohesion in Sportive Group through Socializing Means of Motor Activities.* Published in: Medimond Publishing Company ISBN: 978-88-7587-718-7 July 2015 by Editografica, Bologna (Italy), Page 135.

Sopa, I. S., Pomohaci, M. (2014, b), *Group cohesion important factor in sport performance*. Published in European Scientific Journal, Volume 10, No 26 (2014), ISSN: 1857 - 7881 (Print) ISSN: 1857 - 7431 (Online).

Sopa, I. S., Pomohaci, M. (2014, c), *Study regarding the impact of sport competitions on student's socialization.* Published in European Scientific Journal, Volume 10, No 26 (2014), ISSN: 1857 - 7881 (Print) ISSN: 1857 - 7431 (Online).

Sopa, I. S., Pomohaci, M. (2014, d), *Socialization through sport, effects of team sports on students at primary school level.* Published in: Medimond Publishing Company ISBN: 978-88-7587-718-7 July 2015 by Editografica, Bologna (Italy), Page 351.

Sopa, I. S., Pomohaci, M. (2014 e), *Contribution of sportive game in children socialization process.* The International Scientific Conference „Physical education and sports in the benefit of health" – the 40th Edition, Oradea, 18th October. ISSN 2286 – 2870.

Sopa, I. S., Pomohaci, M. (2014 f), *Study regarding group cohesion of students.* The International Scientific Conference „Physical education and sports in the benefit of health" – the 40th Edition, Oradea, 18th October. ISSN 2286 – 2870.

Sopa, I. S., Pomohaci, M. (2015 a), *Finding the leader of a volleyball team using the socio metric survey method.* Published at the International Congress of Physical Education, Sports and Kinetotheraphy 5th Edition „Education and Sports Science in 21st Century", 10-13 June 2015, UNEFS Bucharest.

Sopa, I. S., Pomohaci, M. (2015 b), *Improving socialization through sport games. How does team sport affect children at primary school level*. International Scientific Conference „Sport, Education, Culture – Interdisciplinary approaches in scientific research", Galati 28-30 May 2015, ISSN 2344 – 4584.

Sopa, I. S., Szabo, D. A. (2014), *Study regarding the importance of developing group cohesion in a volleyball team.* Published in: Procedia Social and Behavioral Sciences, Elsevier Publication, ISSN: 1877-0428 Volume 180C, 5 May 2015, Pages 1343-1350.

Stoica A., (2004), *The peculiarities of teaching physical education in higher education not profiled*, Editure Arvin Press, Bucharest, p. 62-63.

Tufan A., (2015), *The impact of motor activities on educating a healthy lifestyle at students*, UNEFS Bucharest.

Uţă F., (2012), *Non-formal motor activities at students – values, perceptions, motivations*, Editure Tiparg, Piteşti, p. 129-134.

Submitted:	Revised:	Accepted and published online
May 04, 2016	October 05 2016	Octomber 27, 2016

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. No XXVI/**2016** pp. 18 - 24
Article no. 26613 - 836

USE OF OPEN-SOURCE TECHNOLOGY TO TEACH BIOMECHANICS

Ana FARO *
Faculty of Sports Science and Physical Education, University of Coimbra, Coimbra, Portugal
anafaro@fcdef.uc.pt

Pedro RUI
Faculty of Sports Science and Physical Education, University of Coimbra, Coimbra, Portugal

Abstract: The purposes of this study was: (1) develop a different methodology based on open-source technologies to promote quantitative movement analysis of sport skills as a regular tool in the biomechanics classroom, (2) analyze the expertise and development students' level during the work labs and finally, (3) access the students' engagement, motivational status and technology expertise performed in sports biomechanics. First we explore movement analysis with Dartfish software. A second software *Kinovea 0.8.15* was used to extract variables for the 2D kinematical analysis and the Excel 2010 was used for data mapping and the statistics treatment ($p \leq 0,05$). For the gait study results presented as an example, the statistically significant differences from the overcharge increase (+ 40% of body weight) were found on step time at 1,80 m/s (p=0,029), on the step leng at 1,25 m/s (p=0,001) and at 1,80 m/s (p=0,003), on the leng gait cycle at 1,25 m/s (p=0,011) and at 1,80 m/s (p=0,002), on the torso angle at 1,80 m/s (p=0,000) and on the hip joint angle motion at 1,25 m/s (p=0,000) and at 1,80 m/s (p=0,012). However, we conclude that overcharge (+ 40% body weight) reduce the step time and step lengthy, shorter gait cycle, increase torso frontal flexion (sagittal plane) and increase the hip joint flexion, mainly in the swing phase.The advantage of this type of classroom lab work with students, besides of having no costs, is an increase of their motivation, pushing the passing rates from 45% to 77% last year. The ability of understanding theory concepts has an exponential raise as every new concept has immediate application on the practical analysis performed with Kinovea At phase 4 we will establish the validity and reliability of all 3 softwares: Dartfish, Kinovea, and Tracker and compare sports and rehabilitation movements at 30 fps versus 60 fps
Key words: gait biomechanics, kinematics analysis, gait patterns, open source software, kinovea

* * * * * *

INTRODUCTION/ BACKGROUND

Computers, internet and new technologies have developed to a point where everybody viewing its use as a vital part of their lives (Alvarez & Olivera-Smith, 2013; Holladay et al., 2011). Indeed, the new technologies take us time and, in some circumstances, ours private lives, but give us new skills, different knowledge, worldwide information and, more important, the chance to share knowledge.

According to Yaman (2009), currently, the technology has turned out to be a need instead of a luxury. Presently, all professions and all professionals face the time were the new generations never understand life without technology (Alvarez & Olivera-Smith, 2013; Faro, 2009). Plenty of

* Corresponding Author

this technology is in the internet in an open-source base, or better, in a free download base. This new technologies are more and more predominant in our society and require new conditions and opportunities for teaching and learning processes (Alvarez and Olivera-Smith, 2013).

Perhaps, this link between this new, attracting and motivational technology and biomechanics could be an important step to take the biomechanics out of the laboratory and create a new free, educational, fascinate and alternative kinematics method for analysis the human movement in sports science, exercise & health and rehabilitation areas. To Becker et al. (2010), complementary innovations had to take place, such as in the area of business models, science research, people relations, society, countries organization and more, world point of view. In several studies developed on the physical education field show that students are highly motivated to perform the physical education class using technology (Ferreira, 2012; Edginton et al., 2011).

To Bartling and Friesik (2014) and Optaros (2007), open-source software is software components and solutions with available source code to be used, changed and distributed to other users following commonly agreed-upon rules. On the basis of open-source projects, new companies have been created and shaped to make money based on the success of open-source technologies. Most of these companies either distribute closed and open versions of specific software, offer support and maintenance services based on open-source software or provide consulting, training and systems integration services around open -source software.

Bartling and Friesik (2014) and Holladay et al. (2011), define three innovative elements of open-source software success: first, low cost distribution of the software through the Internet; second, collaborative development often connected to the development teams and, finally, transparent and free access to the source code and providing the basis for new services offerings such as support and maintenance. Based on these three elements, open-source is changing the way software is developed, acquired and used.

According Salmon and Wright (2014) and de la Vega et al. (2007), the use of the open-source technology to teach and learn biomechanics it is a real way to learn the physical principles applied to biomechanics and human movement studies. With this different lecture approach the students filmed the target movements, analyzed the variables selected, collected the data and they draw the conclusions from their hands-on experience always with the affordable equipment's (cameras, laptops …) and free software (kinovea, tracker …). The significant factor of linkage between students and technology appearance to be motivational, collaborative, highly engaged and behavior conducive, creating a significant improvement of knowledge transference, enthusiastic team-work dynamics, problem solving, critical thinking and improve the technology expertise (Smith, 2014; de la Vega et al., 2007).

OBJECTIVES

The purposes of this study was: (1) develop a different methodology based on open-source technologies to promote quantitative movement analysis of sport skills as a regular tool in the biomechanics classroom, (2) analyze the expertise and development students' level during the work labs and finally, (3) access the students' engagement, motivational status and technology expertise performed in sports biomechanics lecture.

METHODS

The study was conducted in 2 Universities (FCDEF UC and INUAF) in Portugal during 4 years and conducted in 3 phases. A total of 158 movements performed on the sagittal plane were filmed with digital video and analyzed using dartfish, kinovea and tracker software in the context of a classroom lab both at graduate and undergraduate levels to obtain kinematic variables.

1st phase, we analyzed the validity and the reliability of the students' classroom labs.

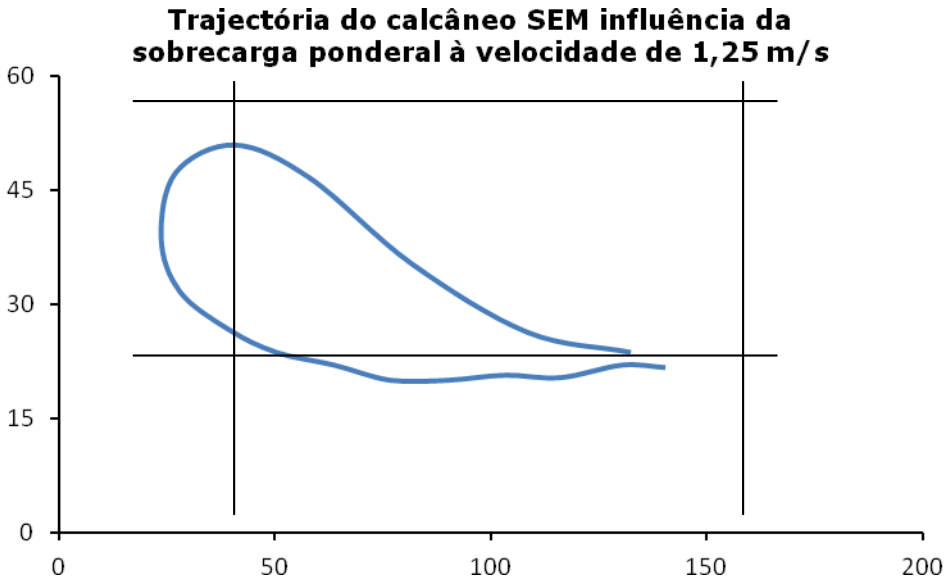
2nd phase, we studied the evolution since the first classroom lab to the Master Thesis using open-source software.

3rd phase, we explored the kinovea and tracker data to develop simulate models using software VIDLE for Python

RESULTS and DISCUSSION

Data will be presented showing the evolution of analyses done from phase one to phase three.

A study developed by Pedro (2013) using the open-source software (kinovea 0.8.15) as instrument have shown the data comparable with others data and reference studies. Figure 1 presents the trajectory of the foot with and without 40% overcharge at a velocity of1,25 m/s. As observed both present a similar path. Significative differences could be found for the x axes trajectory ($p = 0,027; < 0,05$) but not for the y axes ($p = 0,227; > 0,05$).



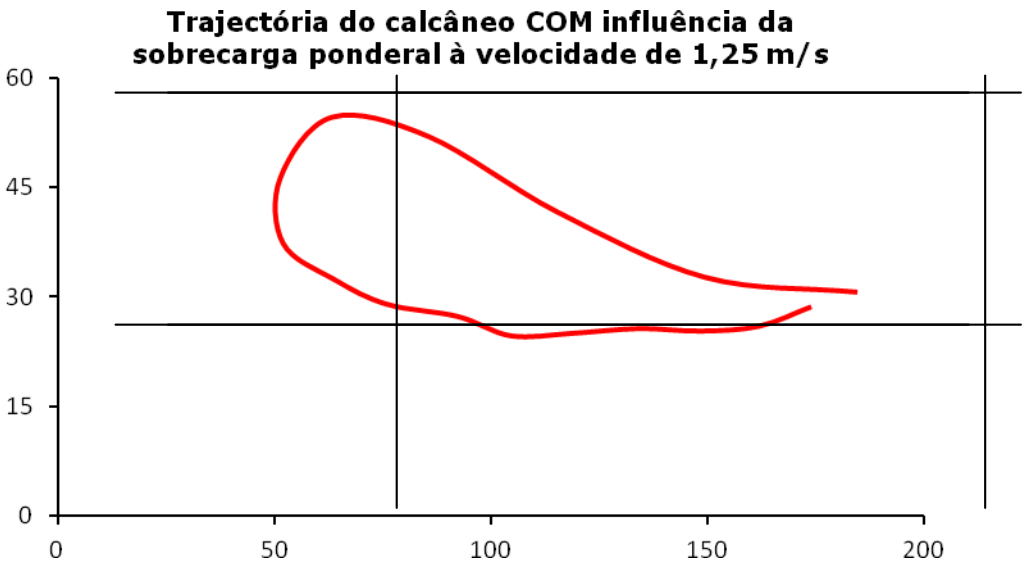


Figure 1: foot trajectory at the velocity 1,25 m/s

The angle values for the trunk at the velocity of 1,25 m/s present $\bar{X}$ = 88,71º ± 3,13 without overcharge of 40% body weight and $\bar{X}$ = 88,16º ± 2,75 With overcharge of 40% body weight (Fig. 2).

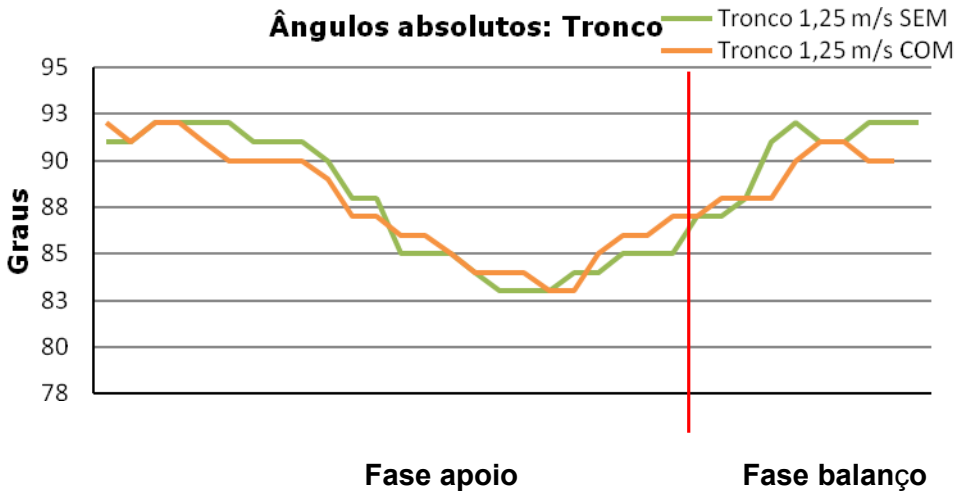


Figure 2: Absolute trunk angle at the velocities of 1,25 m/s overcharge of 40% body weight

Gait cadence are presented at table 1 comparing values obtained with this study and similar studies Ling et al. (2012), Cimolin et al. (2011), Demura and Demura (2010) and Silva (2009).

Table 2: Comparison of cadence data ($\overline{X}$ ± DP)

	Presente Estudo	Ling et al. (2012)	Cimolin et al. (2011)	Demura e Demura (2010)	Silva (2009)
Cadência CM (passos/min)	1,25 SEM=106 1,25 COM=109 1,80 SEM=124 1,80 COM=132	GC=76,7±13,4 GO=68,5±9,4	GC=111,8±4,8 GO=111,2±8,2	0%=116,0±4,7 20%=116,1±5,8 40%=114,4±5,6 60%=111,9±6,2	GC=116,8±5,4 GO=108,6±6,9

Movement times are presented at table 2 comparing values obtained with this study and similar studies Blaszczyk et al. (2011), Cimolin et al. (2011), Demura and Demura (2010) and Cunha (2009)

Table 2: Comparison of time data ($\overline{X}$ ± DP)

	Presente Estudo	Blaszczyk et al. (2011)	Cimolin et al. (2011)	Demura e Demura (2010)	Cunha (2009)
Tempo CM (s)	1,25 SEM=1,13±0,06 1,25 COM=1,10±0,03 1,80 SEM=0,97±0,02 1,80 COM=0,91±0,02	GC=1,16±0,11 GO=1,15±0,10	----------	0%=1,04 20%=1,04 40%=1,06 60%=1,08	GC=1,43±0,29 GO=1,28±0,20
Tempo apoio (s)	1,25 SEM=0,73 1,25 COM=0,72 1,80 SEM=0,61 1,80 COM=0,59	GC=0,77±0,09 GO=0,74±0,08	----------	0%=0,63±0,03 20%=0,64±0,04 40%=0,66±0,04 60%=0,68±0,05	----------
% Tempo apoio	1,25 SEM=64,7% 1,25 COM=65,5% 1,80 SEM=63,4% 1,80 COM=64,2%	GC=63% GO=67%	GC=61% GO=59%	0%=60,5% 20%=61,5% 40%=62,2% 60%=62,9%	GC=63% GO=65%
Tempo balanço (s)	1,25 SEM=0,40 1,25 COM=0,38 1,80 SEM=0,36 1,80 COM=0,32	GC=0,41±0,03 GO=0,38±0,02	----------	0%=0,41±0,01 20%=0,40±0,01 40%=0,40±0,01 60%=0,40±0,02	----------

% Tempo balanço	1,25 SEM=35,3% 1,25 COM=34,5% 1,80 SEM=36,6% 1,80 COM=35,8%	GC=37% GO=33%	GC=39% GO=41%	0%=39,5% 20%=38,5% 40%=37,8% 60%=37,1%	GC=36% GO=34%
Tempo duplo apoio (s)	1,25 SEM=0,27 1,25 COM=0,29 1,80 SEM=0,18 1,80 COM=0,19	GC=0,16±0,03 GO=0,19±0,04	----------	0%=0,11±0,01 20%=0,12±0,01 40%=0,14±0,01 60%=0,15±0,02	----------
% Tempo duplo apoio	1,25 SEM=23,9% 1,25 COM=26,0% 1,80 SEM=18,6% 1,80 COM=20,2%	GC=13% GO=17%	GC=23% GO=25%	----------	GC=11% GO=14%

Movement distances are presented at table 3comparing values obtained with this study and similar studies Silva (2009), Cimolin et al. (2011), Demura and Demura (2010) and Cunha (2009)

Table 2: Comparison of distance data (± DP)

	Presente Estudo	Cimolin et al. (2011)	Demura e Demura (2010)	Cunha (2009)	Silva (2009)
Compriment o passo (m)	1,25 SEM=0,61±0,1 1,25 COM=0,59±0,1 1,80 SEM=0,73±0,2 1,80 COM=0,68±0,2	GC=0,88±0,2 GO=0,38±0,1	0%=0,66±0,1 20%=0,63±0,1 40%=0,62±0,1 60%=0,59±0,1	----------	GC=0,64±0,1 GO=0,59±0,1
Compriment o CM (m)	1,25 SEM=1,22±0,1 1,25 COM=1,17±0,3 1,80 SEM=1,45±0,1 1,80 COM=1,37±0,2	----------	----------	GC=1,14±0,1 GO=1,02±0,2	GC=1,29±0,1 GO=1,18±0,1

CONCLUSIONS

The advantage of this type of classroom lab work with students, besides of having no costs, is an increase of their motivation, pushing the passing rates from 45% to 77% last year. The ability of understanding theory concepts has an exponential raise as every new concept has immediate application on the practical analysis performed with Kinovea. At phase 4 we will establish the validity and reliability of all 3 softwares: Dartfish, Kinovea, and Tracker and compare sports and rehabilitation movements at 30 fps versus 60 fps.

REFERENCES

Becker, S., Crandall, M., Fisher, K., Kinney, B., Landry, C. & Rocha, A. (2010), *Opportunity for All: How the American Public Benefits from Internet. U.S. Libraries.* Institute of Museum and Library Services. Washington, D.C.

Cimolin, V., Vismara, L., Galli, M., Zaina, F., Negrini, S. & Capodaglio, P. (2011), Effects of obesity and chronic low back pain on gait. *Journal of NeuroEngineering and Rehabilitation*, 8 (1), 55-63

Demura, T. & Demura, S. (2010), Relationship among Gait Parameters while Walking with Varying Loads. *Journal of Physiological Anthropology*, 29 (1), 29-34Faro, A & Chin, M (2011).

Edginton, C; Sobral, F.; Faro, A. (2009), Exploring the impacts of a contextually based, total immersion graduate program with a focus on teaching physical education with an emphasis on technology. *International Journal of Physical Education*, 48 (1): 18-26.

Faro, A. (2009), *Using Technology motivation in Physical Education: Is There One Best Way?* Unpublished research paper. University of Northern Iowa. Iowa.

Ferreira, A. (2012), *A Análise Digital de Vídeo e software exploratório no ensino da Física.* Master Thesis. Faculty of Science and Technology of Lisbon University. Lisbon. 153 pp.

Holladay, J., Glusman, A. & Soloway, S. (2011), *Internet Benefits: Consumer Surplus and Net Neutrality.* Institute for Policy Integrity, New York University School of Law. New York.

Yaman, (M. (2009), Perceptions of Students on the Application Distance Education in Physical Education Lessons. *The Turkish Online Journal of Physical Educational Technology*, 8 (1): 122-132.

Morton, F. (2006). *Consumer Benefit from Use of the Internet.* In A. Jaffe, J. Lerner & S. Stern, Innovation Policy and the Economy, Volume 6, Yale School of Management. Yale.

Optaros (2007), *Realize the Benefits of Open-source.* Open-source Catalogue. US Version. New York.

De la Vega, G., Aguilera, J., Puzzella, A. & Mallamaci, C. (2007), An alternative strategy to teach Biomechanics: The long jump. *Journal of Physics: Conference Series*, 90.

Alvarez, I. & Olivera-Smith, M. (2013), Learning in Social Networks: Rationale and Ideas for Its Implementation in Higher Education. *Education Science*, 3: 314-325.

Smith, T. (2014), Elementary Science Instruction: Examining a Virtual Environment for Evidence of Learning, Engagement, and 21st Century Competencies. *Education Science*, 4: 122-138.

Salmon, G. & Wright, P. (2014). Transforming Future Teaching through 'Carpe Diem' Learning Design. *Education Science*, 4: 52-63.

Fecher, B. & Friesike, S. (2014), Open Science: One Term, Five Schools of Thought. In Bartling, Sonke; Friesike, Sascha, editors – *Opening Science: The Evolving Guide on How the Internet is Changing Research, Collaboration and Scholarly Publishing*. Springer Open, London. p. 17-48.

Submitted:	Revised:	Accepted and published online
December 4, 2015	October 23, 2016	Octomber 27, 2016

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. no. XXVI/**2016** pp.25 - 30
Article no. 26414 - 834

THE CONTRIBUTION OF PLAY FIGHTING TO THE EMOTIONAL DEVELOPMENT OF CHILDREN

Ioan TRIFA*
Universitatea din Oradea
Corresponding author: nelu.trifa@gmail.com

Abstract: Play fighting is a form of behavior in which partners compete with each other to gain an advantage. Behavior during play fighting largely resembles the behavior in a real fight, where partners encounter, push and pull down onto the ground, trying to get into a position whereby to control or to dominate the opponent. In the play, unlike the fight, movements are exaggerated and performed at a lower intensity, muscles being somewhat less tensed, and certain actions that can cause injury to the partner are inhibited or modified, while offensive-defensive roles will be reversed quite frequently.
Play fighting can be considered a type of evolutionary adaptation designed to facilitate those experiences that will shape the cognitive and emotional development necessary for living in social communities. Research undertaken on different mammal species shows that play fighting offers many opportunities for expression and decoding emotions, improves emotional regulation and contributes to the development of coping mechanisms.
Key words: play; development; stress; emotional regulation.

* * * * * *

INTRODUCTION

In evolutionary approaches, human or non-human behavior can be fully understood only in relation to the mechanism that explains the means of the ontogenetic development of behavior and the adaptive value of behavior and the contribution of these adaptations to increasing inclusive fitness (Tinbergen, 1963; Burghardt, 2005). The first part provides an explanation of how these traits or behaviors create a certain effect, and the second explains why these behaviors have been favored during the course of evolution (Confer et al., 2010; Scott-Phillips, Dickins, & West, 2011). The adaptive value of behavior or "survival value", as it was called by Tinbergen (1963), concerns the contribution to increasing the chances of survival and reproduction. As shown by the author, some animals have a number of behaviors that are quite hard to understand. Many of the characteristics of these animals are adaptations that help them camouflage in the native environment, and these motions will be adapted to the function of avoiding being caught by predators that must be stimulated by movement in order to detect and track prey (Tinbergen, 1963). The adaptive value of behavior will be derived from the consequences that arise from these manifestations or from the effects produced by the deprivation of experiences that make these changes possible, but it is not always obvious which functions these behaviors serve.

In recent years, there have been many studies on different species of mammals, which have tried to highlight the functions of play fighting and its role in development. One of the most influential theories, formulated by Spinka, Newberry and Bekoff (2001), shows that juvenile play experience is meant to provide "training for the unexpected". Marek Spinka and collaborators believe that play allows each individual to find their own solutions and rehearse behavioral

* Corresponding Author

sequences in which animals lose control over position and locomotion and need to regain these faculties quickly to deal with these unanticipated situations. According to them, play results in an increased versatility of the movements used to recover after a loss of balance after collisions with different obstacles, or after being knocked down or immobilized by an opponent, but also an increase in the individual's ability to recover following the emotional shock caused by this unexpected event. The authors showed that during play fighting every individual actively seeks to create unexpected situations, especially through a self-handicapping behavior. The function of these behaviors during the play would be to create such experiences by allowing them to regain control after a temporary loss and to help animals avoid emotional overreaction during unexpected stressful situations (Spinka et al., 2001; Peter et al. , 2009).

THE IMPORTANCE OF PLAY FIGHTING FOR EMOTIONAL REGULATION

Play fighting represents a form of behavior in which partners compete with each other in order to obtain an advantage. Behavior during play fighting resembles largely the behavior in the real fight. The partners hit, push and knock down each other in an attempt to reach a superior position, and thereby to control or dominate the opponent. Unlike in real fighting, in play the movements are exaggerated and performed at a lower intensity, muscle is somewhat less tense and actions that can cause injury are inhibited or modified and the roles (offensive-defensive) will be quite commonly reversed.

In certain situations, when the partners are competing vigurously, these action patterns may be quite difficult to discriminate, and in order to revent play from escalating to real fighting, many species have evolved signals that function to establish and maintain a play 'mood' (Bekoff & Allen, 1998). In the majority of species in which this type of play is present, the interaction happens as a response to the play-soliciting signals coming from one of the participants. These signals appear to foster some sort of cooperation between players so that each responds to the other in a way consistent with play (Bekoff & Allen, 1998). Thus, play fighting can be seen as a form of behaviour though which the protagonists learn to interact and, especially, to find an equilibrium between competition and cooperation (Palagi, 2006).

The attempts to suppress play fighting or to deprive young mammal specimens of such experiences, demonstrate that these play manifestations have multiple functions, being essential for a normal emotional development during the juvenile period and subsequently, for adult's mental health (Baarendse et al., 2013; Brown, 1998). Play deprivation for a relatively short period of time has led to an increase of such manifestations, both in intensity and duration, when new opportunities for playing arise or are created (Panksepp, 1998; Pellis & Pellis, 2006). However, play deprivation for a longer period of time may cause some abnormal reactions, especially in stressful or conflictual situations (Brown, 1998; Bateson, 2005; LaFreniere, 2011).

Conducting an experiment on two groups of rats reared in isolation, with or without the opportunity to have play experiences, Einon and Potegal (1978) found out that rats reared with no opportunities to play are inevitably attacked when, at the age of one month were placed in a cage together with other rats. These animals remain immovable for a significantly longer period of time compared to their peers that have had play experiences, although defensive behavior does not seem to be affected (Bateson, 2005; Pellis & Pellis, 2006; van Kerkhof, 2012). Also, Hard and Larsson (quoted by Pellis & Pellis, 2006) found out that male rats that were reared in isolation are either incompetent or present abnormalities with regard to mating behavior. However, animals reared in isolation are not only deprived of play-related experiences, but they are also deprived of any kind of social experiences, and the contribution of these experiences to the individual's normal development is difficult to appreciate (van Kerkhof, 2012).

In the late 50's, Harry Harlow (quoted by Shaffer, Kipp, 2010; Vicedo, 2010) separated monkey infants from their mothers, wishing to highlight the role of "biological instincts" and early

experiences in behavior development. In order to determine the importance of nursing in comparison with mother contact comfort, for infant/mother bonding, Harlow replaced natural mother with surrogate mothers represented by two artificial dummies. A dummy was made out of wood wrapped with rubber and covered with cloth, warmed by an electric light placed at its back, and the other dummy was made out of wire mesh and had a different face. Harlow shows that regardless of mothers nursing, the monkey offspring has spent more time with the mother providing warmth and comfort, which reveals the need for affection and physical contact. Later, he tested the strength of attachment in two pre-arranged experiments: the first analyzed the reaction of the monkey offspring in an unusual situation meant to induce emotional stress; in the second the infant was placed in a room filled with objects designed to arouse curiosity. The monkey infant raised with surrogate mothers offering contact comfort have used it as a "security source" because it sat clinging before starting to explore with slow movements, and repeatedly returning for a little comfort before continuing to explore or play with objects. In contrast, the monkeys raised with wire surrogate mothers sat curled up at its feet and did not try to explore the surroundings on their own (Vicedo, 2010).

A few months later, monkeys raised with surrogate mothers started to show signs of depression or develop stereotyped behaviors like balancing, auto-stimulation and contact avoidance with their peers (Mendizza & Pearce, 2003) showing an obvious delay in development of social behavior (LaFreniere, 2011). Attempts of rehabilitation, by putting them together with other peers raised normally, turned out to be ineffective because monkeys raised in isolation respond with fear or aggression when their peers challenge them to play. However, rehabilitation of monkeys raised in isolation can be successful if they are placed together with partners that do not pose a threat, especially with female partners that are still in the attachment phase and ensuring an appropriate level of social stimulation. Even though monkeys raised in isolation will gradually get to develop normal social behaviors, they remain strongly reactive to stress and conflict (LaFreniere, 2011).

Subsequent research undertaken by Harlow and his colleagues (quoted by Vicedo, 2010) focused on comparing monkeys raised with surrogate mothers, but which have had opportunities to play with other peers raised in the same conditions, and the monkeys raised without play partners. In the conditions of raising monkeys with real or surrogate mothers, a prolonged attachment negatively affects the ability to establish social relationships with suitable peers. In order to clarify mother's role in the socialization process, Harlow and his colleagues separated the monkey infants from their mothers to raise them together with their peers. These monkeys raised only with other peers developed bizarre behaviors, clinging to each other like "wagons in a train,"; however, the presence of their peers allowed them to eventually develop skills which helped them establish social relations that are apparently normal.

This research suggested that mothers are not that essential, as it was believed, in the socialization process; however, their presence can facilitate the interaction between a child and other fellows. In the monkey, according to Harry Harlow (quoted by Vicedo, 2010), it would thus appear that "under favorable circumstances, real mothers can be bypassed but early peer experiences cannot" (Vicedo, 2010; p.8).

Stephen Suomi (2005) states that a young monkey bonding with its mother and with its peers complete each other rather than compete against each other in the course of social development. The infant/mother bonding is greatly enhanced long before any interaction with peers, and tends to change over time in terms of both shape and relative reciprocity. In contrast, the frequency and duration of interactions with peers tend to grow steadily during the first year of life and remains at a relatively high level until puberty. Each relationship offers to the young monkey a type of specific stimulation which the other part cannot replace, and the interaction of the young monkey with its mother and peers takes place in physical spaces and in different social

contexts; however, these relationships are not always completely independent from each other, nor are they always beneficial. For example, mothers that have a lower social status are more restrictive with their own offspring, in respect of the exploration conduct or play behavior with its peers. As a result, young monkeys have increasingly few opportunities to find partners of the same age, and when they are finally able to interact with other peers outside their group, their play was often cut short by their mothers' intervention. In this way, playing with their peers tends to become less frequent and shorter in duration and does not extend to create a lasting bond of affection among them, and these young monkeys which have not had the same opportunities to develop social relationships with peers from other families during their first years of life, will are less adept at dealing with peers and come to manifest more and more hostility as they grow. Suomi interpreted these findings as a demonstration of the critical role that playing can have in adjusting emotions (LaFreniere, 2011).

A number of other studies and observations carried out on different species of mammals present similar results; therefore, we can say that the long-term deprivation of this form of social interaction affects the emotional development of the individual. According to Peter LaFreniere (2011), monkeys deprived of playing during their juvenile period cannot cope with emotional excitement generated by dealing with an unusual or unexpected situation and respond via a mixture of feelings that oscillate between fear and threat. These monkeys show a high level of arousal and betray a great deficit in emotional adjustment.

William Mason (quoted by LaFreniere, 2011) suspected that this inability to engage in appropriate social interactions may be exacerbated by shortcomings in non-verbal communication and recognition of emotions. Miller, Caul and Mirsky (quoted by LaFreniere, 2011) compared in a cooperative-conditioning paradigm, the capacity of monkeys raised in isolation and monkeys raised in a social context to encode and decode facial expressions. They found out that monkeys raised in isolation are unable to effectively communicate emotional expressions. In order to assess the role of facial expressions in regulating social interactions of monkeys, Carroll Izard (quoted by LaFreniere, 2011) cut their facial nerves before placing them in shelters together with other monkeys. Monkeys with cut nerves became victims of aggression because of their inability to convey facial expressions. These skills to communicate and interpret emotional signals seem to be dependent on social interaction with parents and with other infants for their full development (LaFreniere, 2011).

In humans, research undertaken shows a number of similarities with some of these discoveries made on animals. Studies conducted in 1992 by Parke, Cassidy, Burks, Carson (quoted by Smith, 2010), and in 1993 by Boyum, Carson, Burks and Parke (quoted by Smith, 2010), confirmed that the length of time spent playing vigorously with his/her parents is associated with the child's ability to understand some emotional expressions, such as happy, sad, angry, scared or neutral (Pellegrini & Smith, 1998; Smith, 2010). At the same time, children who have been victims of aggression or have been deprived of such play episodes, are more inclined to react aggressively to "brutal" movements of a fellow, and tend to interpret them as a threat against him/her (Crick & Dodge, 1994), movements which otherwise represented an invitation to competition and play and which other children are able to interpret as such. In addition, Anthony Pellegrini (quoted by Smith, 2010) discovered that the frequency of interactions among fellows in play tracking and play fighting is correlated with the ability to understand play signals, whereas Smith, Smees and Pellegrini (2004) found that people who participate in play fighting or who have had such experiences are more able to differentiate between real fighting and play fighting, when they are presented such images or witness such events.

Play deprivation in a critical period for development will affect the individual's ability to find appropriate solutions under stress and to modify the behavioral response according to the situational context. Caroline van den Berg and her colleagues (1999), after conducting a series of

tests performed on rats reared in groups or in isolation, have found that this form of social playing can be essential for developing coping mechanisms to deal with stressful situations from the social environment. The two groups of rats, after being subjected to a powerful social stress by placing them in a cage with a dominant male, presented major differences of behavioral response. Rats reared in isolation, when faced with this form of territorial aggression, presented an exploration behavior which made the resident male attack, unlike those of the control group, which reduced their activity or remained immobile. In addition, rats reared in isolation needed a significantly greater period of time to adopt a submissive behavior, which may lead to a higher number of attacks. On the other hand, the confrontation with the resident male resulted in an elevated plasma concentration of corticosteroids (corticoids), adrenaline and noradrenaline, corticosteroid concentration level and adrenaline were significantly higher in the group of rats reared in isolation. By comparing the results concerning behavior and data resulted from hormone analysis showed that play deprivation during the juvenile period does not reduce the impact caused by the presence of the resident male, which produced an inability in choosing appropriate response strategies (van den Berg et al., 1999). Even more, when rats reared in groups are offered a chance to escape from the presence of the dominant male through access to a platform above, they took advantage of the given chance, while rats reared in isolation failed to do so (Pellis & Pellis, 2011). After removing the dominant male, rats reared in group, but not those reared in isolation, restarted their play activity or mutual care, activities that are recognized to be used for reducing the effects of stress. These differences in behavior of the two groups are also highlighted by the hormonal changes that occur. For the rats reared in groups, the corticosteroids level grew rapidly in stressful situations but dissipated fast, compared to rats reared in isolation, this level will remain high for a longer period of time (van den Berg et al., 1999; Pellis & Pellis, 2006).

Play fighting may be extremely strenuous physically, coginitively and emotionally. Play fighting have the capacity of especially generating positive emotional states (Panksepp 1998), that facilitate the interaction between peers and help construct durable social rapport (Scott, Panksepp, 2003). In the context of play fighting, the paticipants learn to cope with powerful positive feelings, such as enthusiasm and restlessness, or with unpleasant feelings, such as fear, wrath, upset, benig somewhat obligated by the reactions the individual seeks to effect in the playing partner to modulate the intensity of their emotional response.

CONCLUSIONS

Play fighting is proves to be among most important manifestations of play in childhood.Attempts to suppress play fighting, or to deprive young specimens of mammals of such experiences, demonstrate that these play manifestations fulfill multiple functions, which are essential for normal development during the juvenile period and later for adult mental health.

People who are deprived of such playing experiences may encounter difficulties in emotion regulation, which may affect the ability to understand the rules of conduct imposed by living in certain social communities and the ability to find workable solutions to the stressful life situations they might experience. Evidence gathered from this research conducted on different species of mammals shows that play fighting offers many opportunities for expression and decoding emotions, improves emotional regulation and facilitates the acquisition of better adapted reactions in unexpected situations or under stress.

Children seek to spend significant time in direct interaction with peers and to engage in play chasing and play fighting. Adults should allow children to engage in play chasing and play fighting and intervene only when obvious signs that these manifestations tend to degenerate into real fights. Adults and educators should provide for sufficient periods of free play, especially during breaks and during activities with an unstructured character, and such periods must be part of any educational program especially during childhood.

CONFLICT OF INTERESTS

Nothing to declare.

REFERENCES

Baarendse P.J.J., Counotte DS, O'Donnell P, Vanderschuren LJMJ. (2013). Early Social Experience Is Critical for the Development of Cognitive Control and Dopamine Modulation of Prefrontal Cortex Function. *Neuropsychopharmacology*; 38(8):1485-1494.

Bateson P. (2005). The role of play in the evolution of great apes and humans. In A. D. Pellegrini & P. K. Smith (Eds.), *The Nature of Play. Great Apes and Humans* (pp. 13-24). New York: Guilford.

Bekoff M., Allen C. (1998). Intentional communication and social play: how and why animals negotiate and agree to play. In M. Bekof & J. A. Byers (Eds.), *Animal play. Evolutionary, comparative and ecological perspectives* (pp. 97-114). Cambridge: Cambridge University Press.

Brown S. (1998). Play as an organizing principle: Clinical evidence and personal observations. In M. Bekof & J. A. Byers (Eds.), *Animal play. Evolutionary, comparative and ecological perspectives* (pp. 243-259). Cambridge: Cambridge University Press.

Burghardt G. M. (2005). *The Genesis of Animal Play. Testing the Limits*. MIT Press, Cambridge: Bradford Books.

Confer J.C., Easton JA, Fleischman DS, Goetz CD, Lewis DMG, Perilloux C, Buss DM. (2010). Evolutionary Psychology: Controversies, Questions, Prospects, and Limitations. *Am Psychol*; 65(2):110-126.

Einon D.F., Morgan MJ, Kibbler CC. (1978). Brief periods of socialization and later behavior in the rat. *Dev Psychobiol*; 11(3):213-225.

LaFreniere P. (2011) Evolutionary Functions of Social Play. Life Histories, Sex Differences, and Emotion Regulation, *American Journal of Play*; 3(4): 464-488.

Mendizza M., Pearce JC. (2003). *Magical Parent-Magical Child: The Optimum Learning Relationship*. Nevada City, CA: In-Joy Publications.

Palagi E. (2006). Social play in bonobos (Pan paniscus) and chimpanzees (Pan troglodytes): Implications for natural social systems and interindividual relationships. *Am J Phys Anthropol*. 129(3):418-426.

Panksepp J. (1998). Affective neuroscience: The foundations of human and animal emotions. New York: Oxford University Press.

Pellegrini A. D., Smith, P. K. (1998). Physical activity play: The nature and function of a neglected aspect of play. *Child Development*; *69*(3): 577-598.

Pellis S. M., Pellis, V. C. (2011). Rough-and-tumble play: Training and using the social brain. In A. D. Pellegrini (Eds.), *The Oxford Handbook of the Development of Play* (pp. 245-259). Oxford: Oxford University Press.

Pellis S. M., Pellis, V. C. (2006). Play and the development of social engagement: A comparative perspective. In P.J. Marshall & N. A. Fox (Eds.), *The Development of Social Engagement: Neurobiological Perspectives* (pp. 247-274). Oxford: Oxford University Press.

Petru M., Spinka M., Charvatova V., Lhota S. (2009). Revisiting Play Elements and Self-Handicapping in Play: A Comparative Ethogram of Five Old World Monkey Species. *Journal of Comparative Psychology*, 123 (3): 250–263.

Shaffer D. R., Kipp, K. (2010). *Developmental Psychology: Childhood and Adolescence* (8th ed.). Belmont: Cengage Learning.

Smith P. K. (2010). *Children and Play: Understanding Children's Worlds*. Oxford: Wiley-Blackwell.

Scott E., Panksepp J. (2003). Rough-and-Tumble Play in Human Children. *Aggressive Behav*; 29(6):539-551.

Scott-Phillips T. C., Dickins T. E., West, S. A. (2011). Evolutionary theory and the ultimate-proximate distinction in the human behavioral sciences. *Perspectives on Psychological Science*; *6*(1): 38-47.

Spinka M., Newberry R. C., Bekoff M. (2001). Mammalian play: Training for the unexpected. *The Quarterly Review of Biology*, *76*(2): 141-168.

Suomi S. J. (2005). Mother-infant attachment, peer relationships, and the development of social networks in rhesus monkeys. *Human Development*; 48: 67-79.

Tinbergen N. (1963). Facsimile of "On aims and methods of Ethology". *Animal Biology*; *55*(4): 297-321.

van den Berg C.L., Hol T, Van Ree JM, Spruijt BM, Everts H, Koolhaas JM. (1999). Play is Indispensable for an Adequate Development of Coping with Social Challenges in the Rat. *Dev Psychobiol*; 34(2):129-138.

van Kerkhof L.W,M. (2012). The brain at play: neural substrates of social play behaviour in adolescent rats. Available online from http://dspace.library.uu.nl/handle/1874/273381.

Vicedo M. (2010). The evolution of Harry Harlow: from the nature to the nurture of love. *History of Psychiatry*; 21: 190-205.

Submitted:	Revised:	Accepted and published online
May 12, 2016	October 23, 2016	November 16, 2016

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. no. XXVI/**2016** pp.31 - 40
Article no. 26815 - 838

STUDY REGARDING THE EFFICIENCY OF A PHYSIOTHERAPY PROGRAM IN PAIN REDUCTION, PHYSICAL FUNCTION AND QUALITY OF LIFE IMPROVEMENT IN PATIENTS WITH HIP OSTHEOARTHRITIS

Doriana Ioana CIOBANU [1,2*]
[1] *Universitatea din Oradea, Facultatea de Geografie, Turism şi Sport, Departamentul de Educaţie Fizică, Sport şi Kinetoterapie*
[2] *University of Oradea, Research Centre on Human Performance, Oradea, Romania*
Corresponding author: tel: 004 0722 187589, e-mail: doriana.ciobanu@yahoo.com

Carmen Ileana ŞERBESCU [1,2]
[1] *Universitatea din Oradea, Facultatea de Geografie, Turism şi Sport, Departamentul de Educaţie Fizică, Sport şi Kinetoterapie*
[2] *University of Oradea, Research Centre on Human Performance, Oradea, Romania*
e-mail: carmen_serbescu@yahoo.com

Abstract: ***Introduction.*** *Hip osteoarthritis is mainly characterized by articular cartilage lesisons (distrophy, erosions), lack of articular surfaces shape and contour due to femoral head distruction.****Aim.*** *This paperwork aims to emphasize the efficiency of a comprehensive rehabilitation program in functional and quality of life improvement and pain reduction, in patients with hip osteoarthritis.****Subjects****. This study was conducted in Clinical Rehabilitation Hospital from Baile Felix, on a group of 10 patiants with hip arthrosis, aged between 50 and 80 years old, 50% man, 50% woman, average weight &2 kg, IMC 25.6, duration of affection average 17 years, 50% retired from activity, 50% workers.****Metods.*** *As assessment tools were used: goniometry, 0-5 scale for muscular force and Womac index for pain and quality of life assessment. The exercise program aimed to increase hip muscle tonus and the increasing of hip jount mobility and stability due to a better crossing of femorla head in the acetabular cavity.****Results.*** *After following rehabilitation program, we found the reduction of pain (11±8.18 baseline versus 9±8.18 final), the improvement of hip joint moiblity (4.60±3.28 pretest versus 3.7±3.27 posttest), of physical functioning (43.20±26.75 pretest versus 40.30±26.42 posttest) and of quality of life (59.8±38.12 pretest versus 53±37.70 posttest).*
Conclusions: A rehabilitation program followed 5 times/ week, for two weeks, can lead to the improvement of hip joint mobility, to an increased muscular force of pelvic girdle and to the impovement of quality of life in patients with hip osteoarthritis.
Key words: osteoarthritis, quality of life, physical function, pain, hip mobility

* * * * * *

INTRODUCTION

Hip arthrosis, known as a degenerative pathology of the hip, has a high prevalence especialy in women. (Alexandros Adrianakos, 2016). This pathology affects hip joint and adjacent muscles, leading to the development of structural and functional deficiencies, to pain, disability and a decreased quality of life. (Bennel, 2013)

* Corresponding Author

Hip joint fulfill complex functions in humans: body weight support, while allowing body displacement. When moving to bipedal position, this joint has readjusted anatomy and physiology of the robustness and mobility. Around the hip joint have been developed the most powerful muscle, in order to ensure perfect stability, content of bone surfaces and maintaining the vertical position of the body.

Hip joint is composed by two hip bone: hip bone (which together with the sacrum form the pelvis) and femur. They form the hip joint. The neck of the femur does not continue towards the femoral shaft. Thus, between the femoral neck and body, forms a normally open angle measured from 127 to 130 degrees. (Kapandji, 1987)

Any change in this angle changes the normal opening between the femoral head and acetabulum of the hip. When femoral angle is greater than 130 degrees, the femoral head will be moved up. This deformity is called coxa valga. When the angle decreases below 127 degrees, deformation is called coxa vara and the femoral head will look inward. Coxa valga and coxa vara are strains that can change radically hip joint mechanics, bringing a large amount of stress on the articular cartilage, favoring the development of osteoarthritis.

Two forces are acting on the hip joint: body weight and muscle strength.

In order to be minimal the stress on the hip joint, the two forces must be equal at this level, and also the weight and counterweight that balances the scales knife. (P. Varady, P. AUGAT, 2015)

Changing the angle of inclination of the femoral produces an imbalance of two forces, which will increase the load of the cartilage. Reorientation of the femoral head caused by the changes in inclination angle, decreases the bearing surface (supporting), substantially increasing the pressure on certain areas of articular cartilage.

Clinical observations and histological examinations have shown that the high and concentrated pressure in an area of the articular surface causes characteristic pathological changes specific to hip arthrosis.

The birth certificate of designation of osteoarthritis was initiated by two English authors, Colles (1839) and Redfern (1849), who described two concurrent processes opposing each other : osteochondral and resorption and bone neoformation. Today, the term osteoarthritis is well defined and published literature for the last 40 years, established precisely characters of this disease, although there are still gray areas, especially in terms of etiopatogenia and comparative value of various treatments applied. (Emil Mares, 2011)

Osteoarthritis is characterized mainly by articular cartilage lesions (dystrophy, erosion), loss of joint shape of the contour surfaces by flattening or smoothing femoral head bone structure, changes at the femoral neck and acetabulum (osteophytosis, osteosclerosis). It is associated with reshuffles bone deposition of abnormal bone at the periphery of the articular surfaces (osteophytes) and fibrosis (thickening) of joint capsule, with the decreasing of synovial fluid (fluid normally present in all synovial joints) which leads to decreased lubrication joint and thus to a higher coefficient of friction. Normally friction coefficient is 0.01 and its growth causes more wear. Side effects of these changes are: alterations in the femoral head and the acetabular cavity, articular cartilage destruction with direct impact on the two main functions of the hip: stability and mobility, accompanied by severe pain. (Hunter and Felson, 2006)

The causes of hip arthrosis varies from patient to patient due to the fact that many of them the etiology is not clear. Age is an important factor because it takes a considerable time for the tissues to weaken or to destroy the articular cartilage. Cartilaginous changes occurred in hip arthrosis are seen in areas of cartilage that supports the most commonly contracts due to their weight load. (Zhang Yuqing, and Joanne M. Jordan, 2016)

SCOPE

This paperwork aims to do a functional analysis of the hip joint in the context of primary hip arthrosis and to highlights the efficiency of a physiotherapy program well established after the assessment, on the improvement of joint function and in stagnation of hip disease, as much as possible.

OBJECTIVES

- An analysis of the functional status of the patient by: assessing hip biomechanics and pelvic girdle muscle strength.
- Pain behavior analysis (timing, intensity, hip function, walking, climbed down the stairs etc, walking distance) in relation to hip function.
- Establish a kinetic program effectiveness in relieving pain and improving hip function.

HYPOTHESIS

A physiotherapy program practiced five times a week for 2 weeks, can improve hip mobility, increases pelvic girdle muscles strength, and improve the quality of life in patients with primary osteoarthritis.

MATERIALS AND METHODS

The study was conducted at the Felix Medical Rehabilitation Hospital and at patient's home, on a total of 10 patients, diagnosed with primary hip osteoarthritis, aged between 50 and 80 years, mean age 64.6 years, 50% male, 50% women, highaverage 1.67 m, 72 kg average weight, average BMI 25.6, the average duration of the disease is 17 years, 50% of the subjects are retirees and 50% of them are workers.

Functional Assessment

An important aspect of the assessment is to identify mechanical adsverse conditions predisposing to the appearance of this pathology, as well as local and global factors causing adverse conditions. The decreasing of hip range of motion in all directions of movement (Arokoski et al 2004) and the decreasing of thigh muscle strength, particularly the quadriceps and hip abductorilor are crucial aspects of function disturbance in patients with hip osteoarthritis.

Hypotonia seems to occur due to reduction in diameter muscle rather than due to inhibition. (Loureiro et al 2013).

For joint mobility assessment (range of motion – ROM), the goniometer was used to determine the degrees of flexion, extension, abduction, adduction, internal rotation and external rotation of the hip.

Manual muscle testing was used for hip muscle strength evaluation. "Manual muscle testing is used to determine the clinical muscle strength on a scale known as the" 0-5 scale "(the National Foundation for Infantile Paralysis in the US). (Elena Sîrbu et al., 2012)

Tabel nr.1 Manual muscle testing

Grade	Apreciation
F0 (absence)	No contraction
F1 (outlined)	Visible contraction, but no articular movement
F2 (mild)	Movement on all range of motion, but with no gravity
F3 (fair)	Movement on all range of motion against gravity
F4 (very good)	Movement on all range of motion with a moderate rezistance
F5 (normal)	Movement on all range of motion with a great resistance

WOMAC index

WOMAC index was conceived in 1982 at the University of Western Ontario and McMaster. The index is available in over 65 languages and has been validated linguistically. WOMAC Index (Western Ontario and McMaster Universities Arthritis Index) is a set of standardized questions, often used by professionals to assess the status of patients with knee and hip pathologies. (Tubach F. et al., 2005)

WOMAC Index incude:

• **Pain assessment** (5 items): while walking, using the stairs at night in bed, sitting or lying down, wearing weights

• **Decreased mobility** (2 items) after the first half walk and later during the day

• **Joint function** (17 items): using ladders, lifting from sitting, standing, anterior trunk flexion, walking, up / down from the car, shopping, putting on/ getting out socks, lifting the bed, lying in bed, in / out of bathtub, sitting, laying, lifting the toilet, mild to difficult domestic occupations.

This score includes 24 parameters, the minimum score is 0 and the maximum score is 96.

Test questions are scored on a scale from 0-4, which correspond as follows: **no / no (0) // slightly (1) // moderate (2) severe // (3) // extreme (4).**

The scores for each subscale are summed, with a possible score between:

- 0 and 20 for pain,
- 0-8 for limiting the mobility
- 0-68 for physical function.

Usually the sum of the scores of three subscales gives a Womac score. The maximum score that can be achieved is 96. A higher score indicates Womac extreme pain, limiting mobility and severe major limitation of physical function. Weigl et al. (2003) conducted a study on the recovery of hip osteoarthritis and index used to assess functional Womac subjects. In this study were introduced a number of 23 parameters considered as the most frequent on the daily lives of assessed subjects.

Physiotherapy management

The intervention program consisted in exercises for strenghtening the hip internal rotators, adductors, hip joint extensor muscles (gluteus maximus posterior fibers of gluteus medius), hamstrings and quadriceps. Each patient was advised to follow the rules of hip arthrosis prevention.

RESULTS

At the end of the rehabilitation program, posttest results showed that there is an improvement in the amplitude of ROM in all directions including the extension, adduction and internal rotation. (Table 2).

Table nr. 2 Evolution of joint mobility (mean ± std.dev /10 subjects)

Nr. crt	*Movement*	*Pretest*	*Posttest*	*Improved ROM*	*Normal values*
1	Flexion, knee flexed	91.2±52.8	95.7 ± 53.4	4.5	125
2	Flexion, knee extended	73±39	77.1±39.7	4.1	90
3	Extension	9.8±6.2	11.8±6.5	2	15
4	Abduction	36.5±24.7	41.9±25.1	4.8	60
5	Adduction	18.2±12.3	21.9±12.7	3.7	30
6	External Rotation	8.9±6.2	11.3±6.4	2.4	15
7	Internal Rotation	18.5±14.3	22±14.4	3.5	35

Table 2 showes that after the rehabilitation program applied during hospitalization at Rehabilitation Hospital of Felix was obtained increasing of joint mobility from 91 to 96 degrees hip flexion with the knee flexed, from 73 to 77 degrees for flexion of the knee extended from 10 to 12 degrees extension, 37 to 42 degrees of abduction, from 18 to 22 degrees for the adduction of 9 to 11 degrees external rotation and to 189-22 degrees internal rotation.

Table nr. 3 WOMAC Scores (10 patients), mean ± std.dev.

Nr. crt.	*WOMAC*	*Pretest*	*Posttest*	*Val. minime*	*Val. maxime*
1	Pain	11±8.18	9±8.18	0	20
2	ROM decreasing	4.60±3.28	3.7±3.27	0	8
3	Physical activities	43.20±26.75	40.30±26.42	0	64
4	WOMAC score	59.8±38.12	53±37.70	0	92

Chart no. 1 shows the comparison of pretest and posttest results for WOMAC subscore of pain. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 11. Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore, from 11 to 7.

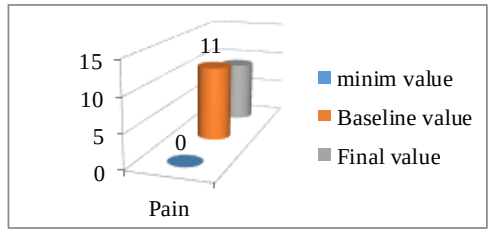


Chart nr. 1 Comparison between baseline and final WOMAC scores for pain

Chart no. 2 shows the comparison of pretest and posttest results for WOMAC subscore for range of motion. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 4.6. Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore 0.9 points, from 4.6 to 3.7.

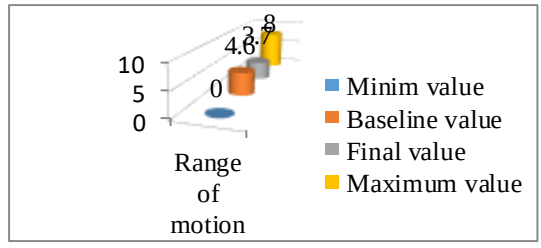


Chart nr.2 Comparison between baseline and final WOMAC subscore for ROM

Chart no. 3 shows the comparison of pretest and posttest results for WOMAC subscore physical activities. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 43.2.

Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore with 2.9 points, from 43.2 to 40.3.

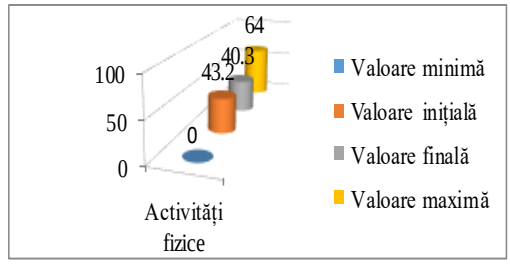


Chart nr.3 Comparison between baseline and final WOMAC subscore for physical activities

Chart no. 4 shows the comparison of pretest and posttest results for total WOMAC score. Comparing the results with the minimum and maximum subscore is observed that as a baseline, patients had a subscore of 59.8. Following the exercise program designed for primary osteoarthritis there was a points decrease in the subscore with 6.8 poins, from 59.8 to 53.

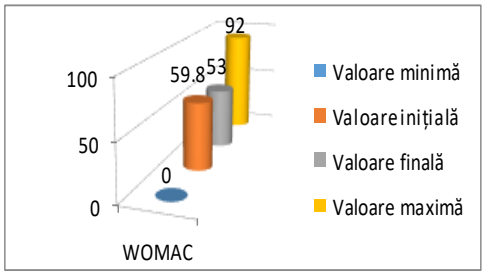


Chart nr.4 Comparison between baseline and final total WOMAC score

DISCUSSIONS

At baseline assessment, before the beginning of rehabilitation program, subjects showed a decreased ROM for: flexion, extenson, abduction, adduction, internal and external rotation and the hip has a posture in flexion, abduction, external rotation.

At baseline assessment, before the beginning of rehabilitation program, subjects showed a decreased muscle strength for flexors, extensors abductors, adductors, internal and external rotators of the hip.

After the rehabilitation program, final assessment showed an improvement of all parameters. Therefore we can say that the rehabiliation program was efficient for the improvement of: flexion with knee extended and also flexion with knee flexed, for extension, abduction, adduction, internal and external hip rotation.

Comparing the results with normal values of hip mobility, in the two situation, can be observed that at baseline, patients had a mean deficit of flexion with knee flexed of 33.8˚ and a great deficit of flexion with knee extended of 17˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 4.5˚ for hip flexion with knee flexed, from 91.2˚ to 95.7˚ and 4.1˚ for hip flexion with knee extended from 73˚ to 77.1˚. This improvement helps to the maintaining of a normal mobility of the hip joint, increase walking perimeter, subject can put his shoes on, can bent, dress and wash himself. We can say that the rehabilitation exercise program was efficient in both situation, for flexion with knee bent and extended and ROM is near to the normal value.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of extension of 5.2˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 2˚ for hip extension from 9.8˚ to 11.8˚.

Because this pathology tend to modify the anatomical position of lower limb in flexion, this improvement with 2˚ of extension helps to a better fixation of femoral head in acetabulum.

We can say that the rehabilitation program was efficient for the improvement of hip extension.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of abduction of 23.5˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 4.8˚ for hip abduction, from 36.5˚ to 41.3˚. This improvement with 4.8˚ of abduction help to the maintaining of normal hip ROM.

We can say that the rehabilitation program was efficient for the improvement of hip abduction.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of adduciton of 11.8˚. After the rehabilitation program for

primary hip arthrosis patients showed an improvement with 3.7˚ for hip adduction from 18.2˚ to 21.9˚. Because this pathology tends to change the anatomical position of lower limb in abduction, this improvement with 3.7˚ of adducție help to a better fixation of femoral head acetabulum, to a better hip ROM and the movements need less effort. We can say that the rehabilitation program was efficient for the improvement of hip adduction.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of internal rotation de 6.1˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 2.4˚ for hip internal rotation, from 8.9˚ to 11.3˚. Because this pathology tend to change the anatomical position of lower limb in abduction, this improvement with 2.4˚ of internal rotation, help to a better fixation of femoral head acetabulum. We can say that the rehabilitation program was efficient for the improvement of hip internal rotation.

Comparing the results with normal values of hip mobility, can be observed that at baseline, patients had a mean deficit of external rotation of 16.5˚. After the rehabilitation program for primary hip arthrosis patients showed an improvement with 3.5˚ for hip external rotation from 18.5˚ to 22˚. This improvement with 3.5˚ help to a better ip ROM, the movement is near to normal amplitude. We can say that the rehabilitation program was efficient for the improvement of hip external rotation. After final assessment, at the end of the rehabilitation program, can be observed an encreasing in muscle strength for all movements, meaning that the rehabiliattion program in efficient for the improvement of hip stability.

If, at the beginnig, 60% of the subjects had F3 muscle strength, 20 % had F4 and 20% had F4+ muscle force, after the rehabilitation program for primary hip arthrosis, flexor muscle srength increased from F3 to F4+ in 60 % of the subjects, from F4- to F4+ in 20 % of the subjects and a stagnation of flexor muscle strenght in 20 % of the subjects. This encreasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint. We can say that the exercise rehabilitation program was efficient for the encreasing in hip flexor muscle strength.

If, at the beginnig, 20% of the subjects had F3 muscle strength, 20 % had F3+ and 60% had F4- muscle force, after the rehabilitation program for primary hip arthrosis, extensor muscle srength increased from F3 to F4+ in 20 % of the subjects, from F3+ to F4+ in 20 % of the subjects and from F4- to F4+ in 60 % from subjects, for flexor muscle. Because in this pathology, extensor muscles are weaker than hip flexor muscle, this increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip extensor muscle strength.

If, at the beginnig 40 % of the subjects had F3 muscle strength and 60 % had F3+, after the rehabilitation program for primary hip arthrosis, abductors muscle strength increased from F3 to F4+ in 40 % of the subjects and from F3+ to F4+ in 60 % of the subjects. Because in this pathology, abductor muscles are weaker than hip abductoare muscle, this increasing of muscle

strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip abductor muscle strength.

If, at the beginnig 60 % of the subjects had F3 muscle strength and 40 % had F3 after the rehabilitation program for primary hip arthrosis, abductors muscle strength increased from F3 to F4+ in 60 % of the subjects and from F3+ to F4+ in 40 % of the subjects. This increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of

hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip adductor muscle strength.

If, at the beginnig 60 % of the subjects had F3 muscle strength and 40 % had F3+, after the rehabilitation program for primary hip arthrosis, internal rotator muscle strength increased from F3 to F4+ in 60 % of the subjects and from F3+ to F4+ in 40 % of the subjects. Because in this pathology, internal rotator muscles are weaker than hip external rotator muscle, this increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip internal rotator muscle strength.

If, at the beginnig 60 % of the subjects had F3 muscle strength and 40 % had F3+, after the rehabilitation program for primary hip arthrosis, external rotator muscle strength increased from F3 to F4+ in 60 % of the subjects and from F3+ to F4+ in 40 % of the subjects. This increasing of muscle strength help the patient to walk for a longer distance, and also provide a better stability of hip joint, replacing and fixing the femoral head in acetabulum. We can say that the exercise rehabilitation program was efficient for the encreasing in hip external rotator muscle strength.

Baseline results of Womac score, showed that the patients complained about pain in hip joint area, a stifness of hip joint as well as dificulties in doing daily activities. Comparing the results from pain assessment with minimal and maximat subscale scores, at the baseline, patients had a mean subscore of 11, meaning a significant pain, leaidng to the limitation of daily activities.

After rehabilitation program baseline pain subscale score decreased from 11 to 6, meaning a moderate pain. We can say that the exercise rehabilitation program was efficient for the decreasing of pain in hip joint area.

Gabriela Hernández-Molina and colab (2008), conducted a metaanalisys regarding the efficiency of different modalities of terapeutical intervention in patients with hip join arthrosis.

The results of this study emphasized that therapeutic exercises are more efficient than medication therapy, but these studies presented a moderate to great heterogenosity. Even more, after the exclusion of the studies who were the source of this heterogenosity, results became even more favourable for exercise rehabilitation programes.

Comparing the baseline and final results of WOMAC subscore for the decreasing of ROM, at the beginning patients had a mean subscore of 4.6. After the rehabilitation program for primary hip arthrosis, subscore decreased with 0.9 points, from 4.6 to 3.7. This means that hip joint stiffness decreased and there was an improvement of hip joint mobility. We can say that the exercise rehabilitation program was efficient for the increasing in hip join range of motion.

Comparing the baseline and final results of WOMAC subscore for physical activities, at the beginning patients had a mean subscore of 43.2, meaning that the subjects presented some dificulties in doing activities like going up and down stairs, rising from a chair, prolonged standing, anterior trunk bending, walking, getting in and out of the car, going for shoping, puting in/ taking off socks, getting out of the bed, bathtub, getting out from the toilet, different home chores. After rehabilitation program for hip arthrosys, meas score of this subscale decreased with 2.9 points, from 43.2 to 40.3. This means that the patients does not have great dificulties in doing activities of daily living. We can say that the exercise rehabilitation program was efficient for the improvement of physical activities area.

Comparing the baseline and final results of total WOMAC score, at the baseline patients presented a total mean score of 59.8 points. After rehabilitation program for hip arthrosys, meas score decreased with 6.8 points, from 59.8 to 53 point. This decreasing means that the subject's pain decreases, is a mild pain, hip joint improved mobility, there is no rigidity and subjects can do their activities of daily living more easily. We can say that the exercise rehabilitation program was efficient for the improvement of subject's quality of life.

Weigl and colab. (2003), conducted a study on 128 subjects, regarding the hip joint rehabilitation and they used WOMAC Index for functional assessment of the subjects. They assessed the evolution of pain, physical function, other aspects of healt, after following a rehabilitation program. The conclusion of this study was that following a comprehensive rehabilitation program for hip joint arthrosis can lead to a reduction in pain intensity and to an improvement of hip function on long term.

CONCLUSIONS

After rehabilitation program, all ROM parameters assessed had improved; we can say that the rehabilitation program was efficient for the improvement of: hip flexion with straight knee and hip flexion with knee bend, extension, abduction, adduction, internal and external rotation.

After rehabilitation program Womac subscores and total scores improved; we can say that the rehabilitation program was efficient for the reduction of pain, hip range of motion, for the improvement of activities of daily living and also for the increasing of patients quality of life.

An exercise rehabilitation program followed 5 times/ week, for two weeks, improve hip joint mobility, pelvic girlde muscle strength and the quality of life in patients with hip arthrosis.

LIMITATIONS OF STUDY

None.

CONFLICT OF INTERESTS

None.

ACKNOLWDGEMENTS

None.

REFERENCES

Alexandros A Andrianakos, Leonidas K Kontelis, Dimitrios G Karamitsos, Spyros I Aslanidis, Athanasios I Georgountzos, George O Kaziolas, Kyriaki V Pantelidou, Elizabeth V Vafiadou, Petros C Dantis (2016) Prevalence of symptomatic knee, hand, and hip osteoarthritis in Greece. The ESORDIG study, *The Journal of Rheumatology*, http://www.jrheum.org/content/33/12/2507.short

Loureiro, P.M. Mills, R.S. Barrett (2013), Muscle weakness in hip osteoarthritis: A systematic review, *Arthritis Care & Research*, 65 (2013), pp. 340–352

Cordun Mariana, (1999), *Kinetologie Medicală*, Editura AXA, Bucureşti, Pagina 93.

David Hunter, David T. Felson (2006), Osteoarthritis, *BMJ*. Mar 18; 332(7542): 639–642.
DOI: 10.1136/bmj.332.7542.639

Gabriela Hernández-Molina, Stephan Reichenbach, Bin Zhang, Michael LaValley, David T. Felson, (2008), Effect of Therapeutic Exercise for Hip Osteoarthritis Pain: Results of a Meta-Analysis, *Arthritis Rheum.* Sep 15; 59(9): 1221–1228., DOI: 10.1002/art.24010

Yuqing Zhang, și Joanne M. Jordan (2010), Epidemiology of Osteoarthritis, *Clin Geriatr Med*., Aug; 26(3): 355–369., doi: 10.1016/j.cger.2010.03.001

Kapandji (1987), *The physiology of the joints, volume two/ lower limbs*, Fifth Edition, Churchill Livingstone, pag 16-18

Kim Bennel (2013), Physiotherapy management of hip osteoarthritis, *Journal of Physiotherapy*, Volume 59, Issue 3, September, Pages 145–157

Mareş Emil (2011) Teză de doctorat, *Artroplastia Totală De Şold În Sechelele Displaziei Coxofemurale, Posibilităti Tehnice De Ameliorare*, Facultatea de Medicină Generală, Craiova, pagina 9.

Moraru Gheorghe, Vasile Pâncotan (2008), *Evaluare şi recuperare kinetică în reumatologie*, Editura Universităţii din Oradea, Oradea, Pagina 201.

M.H. Arokoski, M. Haara, H.J. Helminen, J.P. Arokoski (2004), Physical function in men with and without hip osteoarthritis, *Archives of Physical Medicine & Rehabilitation*, 85 (2004), pp. 574–581

Papilian Victor (2006), Anatomia Omului, Aparatul Locomotor, Volumul 1, Ediţie revizuită integral de Prof. Univ. Dr. Ion Albu, Ediţia XII-a, Editura BIC ALL, Pagina 127.

Paşcalău Nicoleta Dr., Dr. Cioară Felicia (2011), *Actualităţi în Managementul Coxartrozei*, Editura Universităţii din Oradea, Oradea, Pagina 40

Sîrbu Elena, Mircea Chiriac, Dorina Ianc (2012), *Fundamentele kinetoterapiei - Noţiuni şi Tehnici* -, Editura Universitaţii din Oradea, Pagina 85.

Tubach F, Baron G, Falissard B, et al. (2005), Using patients' and rheumatologists' opinions to specify a short form of the WOMAC function subscale. *Ann Rheum Dis*.; 64:75-79. http://www.rheumatology.org/I-Am-A/Rheumatologist/Research/Clinician-Researchers/Western-Ontario-McMaster-Universities-Osteoarthritis-Index-WOMAC#sthash.unsGzVvO.dpuf

Varady P., Augat P, (2015), Biomechanics of hip osteoarthritis: overview of new research findings from simulation studies, *ASU International*, Mai, pag 7-8, DOI: 10.17147/ASUI.2015-05-05-01

Weighl M., Angst F, Stucki G, Lehmann S, Aeschlimann A (2004), Inpatient rehabilitation for hip or knee osteoarthritis: 2 year follow up study, *Ann Rheum Dis*. 2004 Apr; 63(4): 360–368. DOI: 10.1136/ard.2003.011601

Submitted:	Revised:	Accepted and published online
June 16 , 2016	November 08, 2016	December 22, 2016

I. S. S. N. 1224 - 5100