



## PERSONALITY TRAITS: AN ANALYTICAL STUDY BETWEEN SEDENTARY MALES AND SPORTS MALES

ABDUSSALAM KANNIYAN<sup>1</sup>, ABRAHAM GEORGE<sup>2</sup>, SHAFEEQ VALIYAKATH<sup>3</sup>

### Abstract

**Objective.** It is believed that human being is a summation of body and mind and hence the activities of body and its responses will inevitably be associated with the mind and vice versa. There are number of studies which had attempted to seek the relationship between personality characteristics and athletic activities with different conclusions.

**Methods.** Here, the very purpose of the study was to assess the personality traits of sports men from different games and sports with non-sports men. A total of 32 sports persons from different sports and 12 non-sports men were selected as the subjects.

**Results.** Self-reporting questionnaire was the major tool for collecting the required data. In order to gather the personality traits of the subjects, the 16 PF (personality factor) questionnaire was used. One way analysis of variance (one way ANOVA) was used to test for significant differences ( $p < 0.05$ ) among the personality traits of sports men and non-sports men. Whenever F-ratio was found significant, Newman-Keuls post hoc method was used to determine which group differed significantly from each other ( $p < 0.05$ ) in regard to the personality traits. Significant differences were noted on different personality traits including aggressiveness, realism, apprehension, radicalism, and control. In most of the personality traits, sports persons showed moderately high scores compared to that of non-sports persons.

**Conclusions.** When considering the personality trait O (apprehension), findings indicate that the athletes were more self-assured than the non-athletes. The high level of self-assurance generally reported for sports category could be related to their various achievement behaviors and consequently influence their motivation to succeed in sports competition.

**Key words:** sports psychology, personality traits, self-esteem, aggressiveness, self-concept

### Introduction

Personality is a summation of many attributes combining of physical and psychological characteristics. Since personality is the product of heredity and environment, the people from same environment will have some common characteristics which will reflect in their personality to a great extent.

From this point of view, it can be observed that regular participation in competitive sports will be associated with certain personal and behavioral characteristics which can be categorized as the personality traits of sports men.

The question whether personality and competitive sports are related was a topic with heated discussion on many tables. The sports psychologists and counsellors of different teams participating in higher level tournaments play a very significant role by providing mental support to their athletes and players. Earlier, Morgan (1988) had concluded that success in sports performance is dependent in partly on selected psychological states and traits.

Different studies have shown different and diverse findings on the psychological characteristics of sports men and non-sportsmen

over the last many years.

Many researchers (Kane, 1990; Vanek, 2000; Cratty et al, 2000) have proved that certain personality traits are dominant and are special characteristics of certain specific sports activities.

Swimming, long distance running including marathon or activities like triathlon, cycling and top class professional sports life demands higher level of determination, persistence, introversion emotional stability and self-control. Here, the very purpose of the study was to ascertain the psychological classification of sports men compared to that of non-sports men specifically to the University students concerned.

### Methods

A total of 32 sports persons from four disciplines (swimming, volleyball, soccer and Kabaddi) were selected as sports category group. These players were very active in their corresponding games and activities during the data collection.

Besides this sports men's group, there were another group with twelve ( $n = 12$ ) students who do not have any sports back ground who were selected as non-sports category.

<sup>1</sup> King Fahd University of Petroleum and Minerals, Dhahran, SAUDI ARABIA

<sup>2</sup> Annamalai University, INDIA

<sup>3</sup> Government College, Pullut, Kerala, INDIA.

E-mail address: salammanu@kfupm.edu.sa

Received 14.10.2014 / Accepted 27.11.2014



The sports persons were having more than four years of experience in participating both in inter collegiate competitions as well as inter university competitions.

Some of them were also part of State teams of their concerned disciplines. The non sports men group were basically sedentary in nature and not used to have any activities in their daily routine. Twenty three out of forty four students were under graduate students and ten students were graduate students. Eleven students were Masters level students who were about to complete their student life.

Prior to the administration of the research program, subjects were given a detailed instruction concerning the procedure of the study and assurance had given regarding the confidentiality of the data collected which contain the personal particulars including behavioral patterns of the individuals. Standardized equipments were used to gather data pertaining to physical characteristics including height and weight.

The major instrument used for collection of data in this study was self –reporting questionnaire. They were asked to give their free responses without any pre planned or prejudiced answers.

The investigator convinced them that the study wont be affecting in any manner and insisted them to get the apt and straight answers and responses to be elicited.

The first questionnaire administered to the subjects sought to obtain information on their medical history of psychological mal adjustment, smoking, alcohol and drug taking habits.

This preliminary survey was necessary since alcoholism (Eshbaugh et al., 1988) smoking (Spielberger and Jacobs, 1992) and drug abuse (Holm et al., 2002) have been associated with altered personality characteristics. Generally, it was ascertained that the subjects were nonsmokers, alcohol and drugs users and did not previously experience health problems of psychological adjustment.

Data concerning the personality traits of the subjects were collected through the 16 Personality Factor (PF) questionnaire which was the second instrument used.

The 16 PF questionnaires were administered to all subjects in a single session.

Before the collection of the necessary data, the subjects were given clear explanation on the pattern and structure of the questionnaire.

Eventhough the questionnaire comparatively simple, some of questions from the participants were cleared well with examples so that the respondents had no ambiguity when they filled the questionnaire.

Each 16 PF questionnaire tries to assess the sixteen traits namely Warmth (A) Reasoning

(B) Emotional Stability (C) Dominance (E) Liveliness (F) Rule-consciousness (G) Social Boldness (H) Sensitivity (I) Vigilance (L) Abstractedness (M) Privatness (N) Apprehension/Apprehensiveness (O) Openness to change (Q1) Self-reliance (Q2) Perfectionism (Q3) Tension (Q4).

The Cattell 16 PF instrument is recognized to be a valid psychometric measure of the major dimensions of variation within the sphere of normal personality functioning (Bolton 2008).

The test is an objective measure of personality covering 16 functionality independent and psychologically meaningful dimensions viz, (A) reserved vs outgoing ; (B) less intelligent vs more intelligent (C) low ego strength vs high ego strength (E) humble vs assertive (F) sober vs happy go-go lucky (G) expedient vs conscientious (H) shy vs venturesome (I) tough minded vs tender minded (L) trusting vs suspicious (M) practical vs imaginative (N) forthright vs shrewd (O) self-assured vs apprehensive (Q1) conservative vs experimenting (Q2) group dependent vs self-sufficient (Q3) un disciplined self-conflict vs controlled (Q4) relaxed vs tensed.

Though most of the terms are self explanatory, some of them may need slighter clarifications to participants which has to be done at the time of giving the response sheet to elicit the response from the participants.

Results obtained from the 16 PF test are presented as 'standard ten' (STEN) scores so that a mean STEN reading of 5.5 and a standard deviation of 2 is anticipated for each of the variables in healthy normal individuals.

Statistical analysis:- One way analysis of variance ( one-way ANOVA) was used to test for significant differences ( $P < 0.05$ ) among the personality traits of the athletes and non-athletes. Newman-Keuls post hoc method (Hinkle et al., 1979) was used where F-ratio was statistically significant to determine which group differed significantly from each other ( $p < .05$ ) in regard to the personality traits.

## Results

The physical characteristics of subjects are presented in Table 1.

Although a significant difference among the subjects was noted for stature, the subjects were of comparable age and weight.

Table 2 shows the results of the one –way ANOVA and Newman-Keuls post hoc comparison of the 16 PF tests.

When the groups were compared it was found that very little or no significant differences existed for the personality traits of sociability (A) which is considered to be important in one's personality traits.

That means in contrary to the assumptions there is no such significant differences between sports persons and non sports persons in sociability nature and also there was no significant difference among sports people with different team games.

Regarding intelligence (B) which is also as a noted variable, there was no significant differences with sports persons and non persons and among different teams players within sports person group. On the variable, ego-strength (C) which is a factor considered to be more for aggressive games, there was no significant difference between sports man

and non sports man group and also among the different team games.

With regard to surgency(F), conscientiousness(G) it could see that there was no such noted difference between sports man group and non sports man group and among members of different team members. On the variable, adventurousness (H), pretension(L), bohemianism (M), shrewdness (N), self-sufficiency(Q2), and tenseness (Q4) also, there was no such significant difference could note with that of sports man group and non sports man group.

**Table 1 . Physical characteristics of subjects ( Mean ±SD)**

Variable	Volleyball players (n=8)	Soccer players(n=8)	Kabaddi Players(n=8)	Swimmers (n=8)	Non-athletes (n=12)	F ratio
Age (yrs)	18±7	19±5.1	19±4.3	20±3.9	18±6.8	
Height(cm)	178±1.2	171±2.5	169±3.8	175±4.4	172±3.3	
Weight (kg)	68±4.9	66±3.6	67±4.7	65±3.2	73±5.2	
	*p<0.05					

**Table -2 – Personality traits of athletes and non-athletes (Mean± SD)**

Profile	Group 1	2	3	4	5		
component	Volleyball players (n=8)	Soccer Players (n=8)	Kabaddi Players (n=8)	Swimmers (n=8)	Non-athletes (n=12)	F- ratio	Significant Post hoc comparisons
A	6.3±2	8.2±1.4	6±1.8	6.8±1.6	6 ±1.5	.89	
B	5.8±2	7±1.2	5.6±1.5	4.9±1.9	5.8±1.2]	.92	
C	5.7±2	7±2.1	5.8±1.8	6.8±2.4	6.3±1.9	1.91	
E	7.7±1	7.2±1.1	5.9±1.7	5.5±1.9	3.6±1.3	4.12*	1-3-1-5 3-6
F	6.1±2.4	6.9±2.1	5.8±2.7	6.6±2	6.3±1.8	1.92	
G	6.2±2.3	7.1±3	6±2.6	7.6±2.2	5.4±1.7	2.34	
H	5.4±1.8	6.5±1.9	6.8±2.1	7.5±3.1	6 ±2.5	1.04	
I	5.4±1.6	5.9±1.8	3.4±1.1	7±2.8	6.8±2.7	5.23*	1-4 1-6 -4 -4
L	5.7±2.3	4.8±1.7	4.7±1.5	5.3±1.2	6.1±2	.92	



M	5.5±2.8	5.7±1.5	5±1.3	5.6±1.9	6.3±2.3	.73	
N	6.1±3.1	7±3	6.5±2.4	6.7±2.2	5.8±1.7	1.09	
O	4.5±1.9	4.6±1.8	5±1.7	5.1±1.6	7.2±2.6	3.34	
Q1	4.4±1.8	5.8±1.4	6.5±2.1	5.7±1.2	5.5±1.6	4.12	
Q2	5.3±2.04	5.8±1.7	6.3±1.9	7±2.3	6.7±2.8	1.87	
Q3	5.9±1.7	6.5±1.9	6.2±2.7	5.4±2.4	4.3±1.2	3.87*	1-4 2-4 3-5
Q4	6.3±2.1	5.8±1.5	6.4±2.3	6.7±3.7	5.8±2.4	.97	

P<0.05

### Discussion

The very purpose of the study was find out the psychological characteristics of sports men in selected games to that non sports men for the choosen variables which contained in the PF 16 questionnaire.

When analyzed the results of the one – way ANOVA and Newman-Keuls post hoc comparison of the 16 PF tests, it found that significant personality differences (p<0.05) were observed among the groups on the factors of aggressiveness(E), realism (I), apprehension(O), radicalism(Q1), and control(Q3).

In general, athletes were found to be more aggressive (E) than their untrained counterpart. This study substantiates the findings of Salokum S & Toriola L (1985).

This substantiates the contention that sports participation requires competitive aggressiveness (Brunner 1999, Singer, 1999, Samuel, Salokun and Toriola 1985 and Schurr 1990).

Of the various categories of subjects, the Kabaddi players were most significantly (0.05) realistic (I).

The markedly high level of tough-mindedness in the kabaddi group which may be culturally and environmentally determined (Catell 2000) is probably as a result of the psychological demands associated with participation in the sport. It has to be noted that Kabaddi is a tough contact game where aggression and quick intervention with direct contact is a vital part of the game.

### References

Brunner BC, 1999, Personality and motivating factors influencing adult participation in vigorous physical activity. *AJSP*, 40; 124-129  
 Catell RB, Eber HW, 2000, Handbook for the 16 PF campaign, Institute for personality testing

### Conclusions

When considering the personality trait O (apprehension), findings indicate that the athletes were more self-assured than the non-athletes.

The high level of self-assurance generally reported for sports category could be related to their various achievement behaviors and consequently influence their motivation to succeed in sports competition.

Factor Q1 (radicalism) also differentiated the groups. The kabaddi players were significantly more experimenting than volleyball players. In contrast to non-athletes, swimmers have been found to be conservative and conventional in their responses to social situations and are comparable in regard to radicalism (Q1).

An examination on factor Q3 revealed that the kabaddi and soccer players scored higher on this trait than the control subjects. As has been suggested by Joseph (2009), research in sports personality is affected by methodological, conceptual and interpretative problems.

Similarly, the factors responsible for the lack of congruency in the findings of studies seeking to describe athletes' personality traits have earlier been given.

In addition to solving the methodological problems of sport personology research, similar studies in future should examine the issue of whether the duration and level of athletes' competitive sports career could differentiate their personality characteristics.

Eshbough DM, Tosi DJ, 1998, Some personality patterns and dimensions of male alcoholics- a multi variate description. *J Pearson Access*; 42:409-17  
 Joseph PT, 2009, The paradigmatic crises in Indian sport personology. "Voice of Sports"; 5:11-16



Jacob Hartong, Farge EJ, 1997, Personality and physiological traits in middle aged runners and joggers. J Gerontol.; 32:541-548

Holm L, Bergman H, Personality characteristics of patients with exclusive abuse of sedative-hypnotic drugs . Psycho logical reports 51: 899-901

Kane JE, 1990, Personality and Physical abilities contemporary psychology of sport, Chicago.

Samuel O, Salokun, Abel L Toriola, 1985, Personality Characteristics of Sprinters, Basketball, Soccer and Field hockey

Players The Journal of Sports Medicine and Physical Fitness, Minerva Medica, 4: 222-225

Schurr KT, Ashley MA, 1997, A multi variate analysis of male athlete characteristics ,sport type and success, Multi variate Experimental Clinical Research, 3:53-68

Singer RN, 1996, Personality differences between and within baseball and tennis players, Research Quarterly, 40:582-8

Vanek M, Cratty B, 2000, Psychology and the superior athlete, Journal of Psychology 4: 56-59



Science, Movement and Health, Vol. XV, ISSUE 1, 2015  
January 2015, 15 (1): 10-16  
*Original article*

## A STUDY ON THE FINANCIAL COSTS OF THE U.E. POPULATION ACCORDING TO THE "COST PER MINUTE" RATIO OF A MASSAGE SESSION

ALEXE DAN IULIAN<sup>1</sup>, DELEU CRISTINA<sup>2</sup>, NIȘU SILVIU<sup>3</sup>

### Abstract

*Objective.* The cost/total duration ratio of a massage session could be a reference in classifying the most expensive types of massage in the countries of the European Union

*Methods.* The Comparative Analysis has been based on studying 405 web addresses (27 member countries x 15 web addresses) of some companies which have as their object of activity both recovery and rehabilitation therapies by means of massage. Among these, we finally selected 162 companies (27 member countries x 6 companies for each member of the European Union). Our research focused on the analysis of 20 types of massage retrieved from all the offers carefully viewed and observed from 2012 to 2013. We analysed 540 average values (in euro) of the price of massage in the countries under investigation (27 European countries x 1 average value x 20 types of massage).

*Results.* The data highlighted by the statistical analysis reveal different ratios regarding the charts for the most expensive massage sessions within EU. What at first sight may seem a high cost for a certain type of massage; in the end it would seem possible for EU citizens to pay less, as compared with a different type of massage which, at first sight, would seem cheaper.

*Conclusions* Reporting the costs corresponding to massage services according to the cost/total duration per session criterion could be one of the necessary references for classifying the most expensive types of massages which citizens of the European Union would have access to.

*Key words:* massage, European Union, cost/minute session ratio

### Introduction

Our personal experience as well as the observations carried out in time have allowed us to notice the importance of the existence of an optimal ratio between the quality services offered by a kinesiologist and their price so that both people could have access more often to the positive effects of the kinesiologic techniques and procedures, and the specialist who provides them could be considered for effort, his/her activity being recognized and respected.

Massage has been and will always be, in our opinion, a maintenance service or for recovering the health status, to which the population would not give up, taking into account its multiple positive effects.

Access of the UE population to the services of a masseur, as well as the ability to access a masseur for different categories of the population (potential customers, patients or employers) is a topic more than present and of interest, especially for the specialists in the newly-entered member countries (Romania and Bulgaria) within this geopolitical and economic structure.

We support this by the simple fact that the access to a much larger and diversified market, but at the same time, to a greater competition, can only be helpful and useful for those specialists who wish to consolidate and further develop their profession continuously.

The norms of the European Union (European Commission Directive 2005/36/EC), as geo-political and administrative structure which we referred to, are

clear both regarding the mobility on the job market for masseur or kinesiologist, and the criteria for its recognition on the labour market.

According to Leeuwen, (1995), national regulations in the field of the occupational competences and those regarding the access and performance of the professional activities have a highly varied application domain. In most member countries, the activities in the specific field are practised, de jure or de facto, by people who have got either only the official qualification title, or this title accompanied by another name, without benefiting from control on exercising these activities, except the cases in which there are legal provisions otherwise specified.

Although, the founding members of the European Union are those which have delimited a large part of the European legislation regarding the job qualification, they are not necessarily those which have established clear rules regarding the masseur profession, compared with other member countries or in the process of accession.

The data highlighted by Wiesener, S. &all. (2012) in the case of massage, as the subject and object of this research, indicated more than visibly that the EU founding countries have not got any specific rules for the masseur profession yet. The analysis carried out on each country by the above-mentioned specialist shows us a smaller percentage of the member states which have got regulations and recognize the masseur job as a stand-alone profession (16 European countries) compared with those member states which have not got

<sup>1</sup> Department of Kinesiotherapy and Occupational Therapy, "Vasile Alecsandri" University of Bacău, 157 Calea Mărășești, Bacău, ROMANIA

<sup>2</sup> Kinesiologist, Hotel Nordic, ANDORRA.

<sup>3</sup> Teacher Training Department, West University of Timisoara, ROMANIA

E-mail address: alexedaniulian@gmail.com

Received 08.11.2014 / Accepted 02.12.2014

any specific rules for the profession subject to discussion (19 countries);

Knowledge of the costs for massage services, of the national economic characteristic, of the principles governing the recovery - rehabilitation - relaxation activities in every EU country can reveal real and positive evidences for the professional career orientation, but also regarding the massage service appreciation within such a large market, as the European Union's (Alexe, Deleu, 2013).

### Research hypothesis

Could the reporting the costs of the massage services to the cost/total duration per session criterion be a reference for classifying the most expensive types of massage in the countries of the European Union?

### Methods

The comparative analysis has been based on studying 405 web addresses (27 member countries x 15 web addresses) of some companies which have as their object of activity both recovery and rehabilitation therapies by means of massage. Among these, we finally selected 162 companies (27 member countries x 6 companies for each member of the European Union). We have collected from these 162 companies the data regarding the price for the types of massage covered by our research (data collection has been carried out mainly through the online access on the World Wide

Web, but also through our direct access to the premises of companies from Romania, Germany, France, Spain, Austria and Hungary).

We can mention that, reported to the 27 countries of the European Union, the types of massage we have determined have been much more. Due to the fact that some types of massage, practised in some countries and highlighted in the offer in question, have not been found on the offer list of the companies in other European countries, we have focused attention on those types of massage found in all the European countries and to which we have had access for determining their prices (price necessary to our comparative analysis).

Therefore, our research focused on the analysis of 20 *types of massage* (table no.1) found in all the visited and carefully observed offers. For a more strict analysis, we especially chose an average length, due to the fact that the same type of massage was found even for 8-10 different length values of the corresponding session, from 20 minutes to 120 minutes and even 150 minutes).

We analysed 540 average values (in Euros) for the massage prices in the investigated countries (27 European countries X 1 average value X 20 types of massage).

**Table no.1 - Investigated types of massage**

Crt. No.	Type of massage investigated	Crt. No.	Type of massage investigated
1	Classical general relaxation massage 120 min	11	Anti-cellulite massage 60 min
2	Classical general relaxation massage 90 min	12	Therapeutic massage 60 min
3	Classical general relaxation massage 60 min	13	Reflexology massage en 50 min
4	Classical general relaxation massage 30 min	14	Oriental Thai massage 60 min
5	Facial massage 30 min	15	Oriental Shiatsu massage 60 min
6	Californian massage 60 min	16	Abhyanga Ayurveda massage 60 min
7	Tandem massage (4 hands) 60 min	17	Volcanic rock massage 60 min
8	Honey massage 60 min	18	Lymphatic drainage massage 60 min
9	Special oil massage 60 min	19	Anti-stress massage 30 min
10	Special butter massage (Shea, 60min)	20	Anti-stress massage 60 min

In order to perform the comparative analysis, we focused especially on the locations intended for massage services provided to the population for relaxation, anti-stress, tension release, recovery and energising effects. In addition to these, we included also the types of massage with reflexology, therapeutic and anti-cellulite effects (found in all the offers from the specific locations of the 27 European countries).

The prices for the 20 types of massage investigated varied very much within the same country. In order to follow a certain calculation pattern and have a general picture, as objective as possible, we analysed 15 offers from every country. For statistics, we chose the smallest 6 offers and calculated the mean.

To facilitate data interpretation and visualise the aspects for this comparison, we divided the 27 European countries into 4 groups:

- *Northern European area* (including 6 countries with the average values processed: Sweden, Finland, Denmark, Estonia, Latvia, Lithuania);

- *Central European area* (including 7 countries with the average values processed: Germany, Poland, Czech Republic, Slovakia, Slovenia, Austria and Hungary);

- *Western European area* (including 8 countries with the average values processed: United Kingdom, France, Spain, Ireland, Portugal, Netherlands, Belgium and Luxemburg);

- *Southern and Sothern-Eastern area* (including 6 countries with the average values processed: Romania, Greece, Cyprus, Italy, Bulgaria, Malta);

## Results

The processing of the data for the 4 areas subject to our analysis has highlighted the following:

- for the **northern European area**, the cost of the massage services range from 27.78 € (the smallest average value, corresponding to the 30-minute classical relaxation massage) to 72.54 € (the highest average value, corresponding to the 120-minute classical relaxation massage). The massage services with the highest price are the following: the 120-minute classical relaxation, the tandem massage (4 hands) and the 60-minute Abhyanga Ayurveda massage, and, the lowest price are for the following: the 30-minute anti-stress massage, the 30-minute classical relaxation massage and the 30-minute facial massage. The analysis of the standard deviation and the coefficient of variability show us, with a few exceptions, an increased value of heterogeneity (a low uniformity of the average values). The most homogeneous values, by translation, the most constant – in terms of price, the massage services in the 6 countries related to the northern European area, are determined for the 60-minute Oriental shiatsu massage, and the most heterogeneous average values are shown in table no. 3 for the 60-minute volcanic rock massage. This aspect shows us that the prices for the Oriental shiatsu massage are similar in value in the 6 countries in the region, and for the volcanic rock massage, the costs incurred fluctuating more, from one country to another;

- for the Central European area, the cost of massage services range from 26.09€ (the smallest average value, corresponding to the 30-minute facial massage) to 77.29 € (the highest average value, corresponding to the 120-minute classical relaxation massage). The massage services with the highest price are, as in the case of the northern European area, the following: the 120-minute classical relaxation massage, the tandem massage (4 hands, 60min) and the 60-minute Abhyanga Ayurveda massage, and, the lowest price are for the following: the 30-minute facial massage, the 30-minute anti-stress massage and the 30-minute special oil massage. The analysis of the standard deviation and the coefficient of variability show us an increased value of heterogeneity Analysis standard deviation and the coefficient of variability for 7 of the 20 types of massage ( $10\% \leq Cv \leq 20\%$ ) and increased values of heterogeneity ( $20\% \leq Cv$ ), a low homogeneity of the average values, for the other types. The most homogeneous values, by translation, the most constant – in terms of the price, the massage services in the 7 countries related to the central European area, are determined for the 90-minute classical relaxation massage, and the most heterogeneous average values are shown in table no. 4 for the 30-minute facial massage. This aspect shows us that the price for the 90-minute classical relaxation massage are similar in value in the 7 countries in the region, and for the facial massage the costs incurred

fluctuating more, from one country to another (CV-44.63 %);

- for the Western European area, the cost of massage services range from 30.34 € (the smallest average value, corresponding to the 30-minute facial massage) to 82.84 € (the highest average value, corresponding to the 120-minute classical relaxation massage). The massage services with the highest price are, as is the other cases, the following: the 120-minute classical relaxation massage, the tandem massage (4 hands, 60min) and the 60-minute Abhyanga Ayurveda massage, and, the lowest price are for the following: the 30-minute facial massage, the 30-minute classical relaxation massage and the 30-minute anti-stress massage. Determining the statistical parameters (standard deviation and the coefficient of variability) shows us the values with very high homogeneity for 2 types of relaxation massage (120 min and 90 min, with  $Cv \leq 10\%$ ) and values with good homogeneity ( $10\% \leq Cv \leq 20\%$ ) for the other 10 types of massage. Almost 50% of the analysed massages in the western European area have got small oscillation of the costs from one country to another, and for the two types of massage with high homogeneity, the price fluctuations are very low. The most homogeneous values, by translation, the most constant – in terms of the price, the massage services in the 8 countries related to the western European area, are determined for the 90-minute classical relaxation massage (where Cv is below 10%, more exactly 8.42%), and for the 120-minute classical relaxation massage (Cv – 9.39%). The most heterogeneous average values are shown in table no. 5 for the 30-minute facial massage and for the anti-cellulite massage, which indicates a greater cost oscillation, from a recovery centre to another.

- The values processed for the southern and south-eastern area are the lowest of all the average values, indicating lower costs reported on the 20 types of massage covered by our research. Thus, the cost of the massage services are between 13.02 € (the smallest average value, corresponding to the 30-minute facial massage) and 56.25 € (the highest average value, corresponding to the 120-minute classical relaxation massage). The massage services with the highest price are: the 120-minute classical relaxation massage (on average 56.25 €), tandem massage (4 hands, 56.03 €) and 60-minute anti-stress massage (42.18 €). The lowest price is determined for the 30-minute facial massage, 30-minutes classical relaxation massage, and 30-minute anti-stress massage. Determining the statistical parameters (standard deviation and the coefficient of variability) shows values with very low homogeneity, therefore a low heterogeneity. Only a single value indicates a CV less than 10% - for lymphatic drainage, while for the other types of massage the costs vary considerably from one country to another (CV exceeds the 19 types of massage with a value of 20 %). The most homogeneous values and by translation, the most constant – in terms of price, for



the massage services in the 6 countries in the southern and south-eastern European area, are determined for lymphatic drainage (where Cv is less than 10 %, more exactly 7.15 %, the best coefficient of homogeneity of the 20 massages for the 4 zones).

In order to continue the analysis and interpretation of our data, we would like to highlight once more the

average values according to areas (Table 2), but emphasising on a comparative analysis within the same areas investigated. In this way, we underline with **green** the highest 3 costs for each zone (table no. 2), and with **orange** the lowest 3 costs for each area.

**Table no.2** – The highest/lowest average cost values for the analysed areas

Type of massage investigated	Northern area	Central area	Western area	Southern, South-Eastern area
Classical relaxation massage 120 min	72.54	77.29	82.84	56.25
Classical relaxation massage 90 min	50.61	58.57	63.84	37.54
Classical relaxation massage 60 min	41.85	47.25	48.83	26.40
Classical relaxation massage 30 min	27.78	37.42	33.07	17.49
Anti-stress massage 30 min	29.74	32.73	35.71	21.72
Anti-stress massage 60 min	60.93	56.43	63.00	42.18
Anti-cellulite massage 60 min	42.46	42.77	49.79	25.97
Therapeutic massage 60 min	48.39	44.45	49.07	31.54
Reflexology 50 min	40.64	40.38	42.34	27.70
Oriental Thai massage 60 min	52.15	45.68	61.04	34.09
Oriental Shiatsu massage 60 min	55.64	54.60	59.00	27.65
Abhyanga Ayurveda massage 60 min	59.54	61.81	67.76	39.21
Facial massage 30 min	31.21	26.09	30.34	13.02
Volcanic rock massage 60 min	42.66	46.51	52.68	31.85
Lymphatic drainage 60 min	51.61	54.55	52.88	36.09
Honey massage 60 min	49.33	46.61	54.17	31.43
Californian massage 60 min	37.83	41.18	44.91	25.89
Tandem massage (4 hands) 60 min	71.52	74.23	81.75	56.03
Special oil massage 60 min	43.74	32.74	34.99	24.69
Special butter massage (Shea 60 min)	39.06	34.35	41.61	27.15

**Table no.3** – Average values calculated for the 20 types of massage in the 27 EU countries

Type of massage investigated	average	max	min	stdev	Cv %
Classical relaxation massage 120 min	73.20	96.25	36.50	15.41	21.05
Classical relaxation massage 90 min	53.69	73.33	18.18	14.68	27.34
Classical relaxation massage 60 min	41.88	60.33	15.00	12.62	30.12
Classical relaxation massage 30 min	29.56	48.80	7.50	10.35	35.00
Anti-stress massage 30 min	30.50	45.50	10.50	9.24	30.30
Anti-stress massage 60 min	56.21	88.60	22.72	17.06	30.35
Anti-cellulite massage 60 min	41.05	69.15	13.63	14.33	34.90
Therapeutic massage 60 min	43.83	60.00	15.00	10.29	23.48
Reflexology 50 min	38.20	55.25	11.36	10.91	28.56
Oriental Thai massage 60 min	49.09	78.25	20.66	16.17	32.94
Oriental Shiatsu massage 60 min	49.79	77.82	12.83	16.59	33.31
Abhyanga Ayurveda massage 60 min	58.04	91.00	24.33	18.72	32.24
Facial massage 30 min	25.58	44.25	4.54	11.96	46.74
Volcanic rock massage 60 min	44.22	70.00	17.50	15.03	33.98
Lymphatic drainage 60 min	49.30	75.50	33.40	13.83	28.05
Honey massage 60 min	46.08	72.17	18.75	13.80	29.95
Californian massage 60 min	38.14	66.60	13.64	12.95	33.96
Tandem massage (4 hands) 60 min	71.81	98.58	40.00	16.24	22.61
Special oil massage 60 min	34.06	58.50	16.50	10.62	31.18
Special butter massage (Shea 60 min)	35.95	57.00	17.85	12.07	33.59

In table no. 3, we highlight the analysis and processing of the data for average costs for the 20 types of massage covered by our research. It is observed in the **green column**, the final average value of the 27 costs (27 European countries) for each type of massage of the 20 analysed.

As it can be observed, the trend highlighted in the other summarizing tables is maintained:

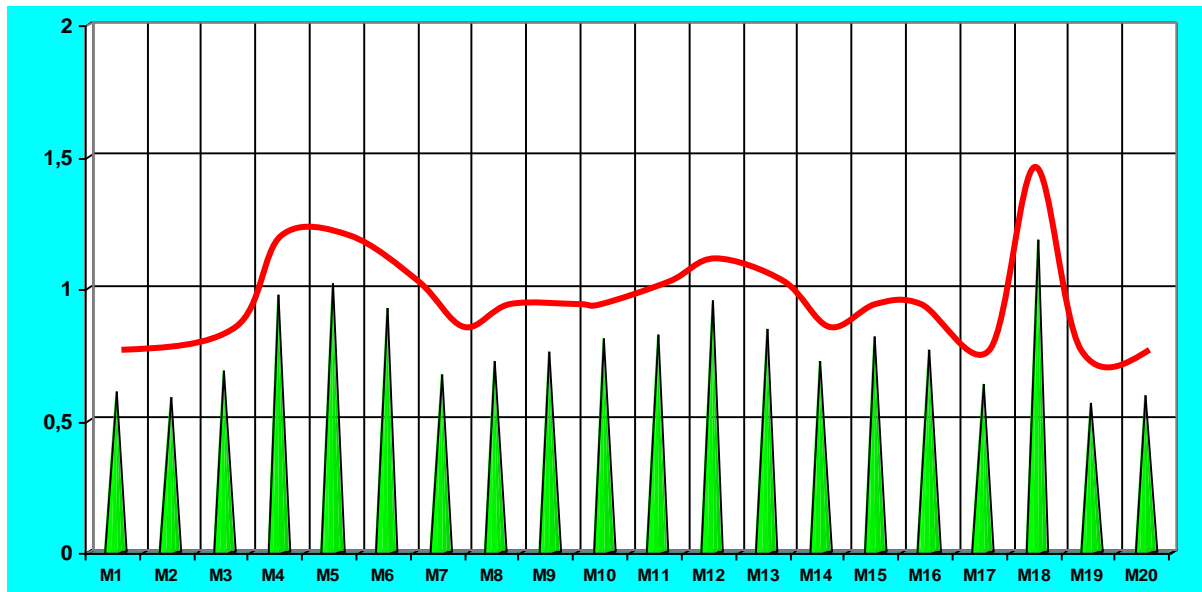
- the highest massage costs are those recorded for the *120-minute relaxation massage* (final mean 73.20 €), *tandem massage* (4 hands – 71.81 €) and *60-minute Abhyanga Ayurveda massage* (58.04 €);
- the lowest massage costs are those recorded for the *30-minute anti-stress massage* (final

mean 30.50 €), *30-minute classical relaxation massage* (29.56 €) and *30-minute facial massage* (25.58 €);

Due to the statistics available in the above tables (the average values for our variables: type of massage, duration, cost), we decided to process and analyse also the average value of a minute of massage during a massage session within a certain length of time. This analysis has revealed some interesting results, which change somehow the impression created by previous analyses. For this purpose, we divided each average cost value in the table no. 3 by the length of the session of the corresponding type of massage. As a result, we presented in table no. 4, the graph no. 1.

**Table no.4** – Summarizing table for the average value in euros per 1 massage minute

Type of massage investigated	Graphic	Mean per session	Average value € / 1 minute massage /session
Classical relaxation massage 120 min	M1	73.20	0.61 € / 1 massage minute
Classical relaxation massage 90 min	M2	53.69	0.59 € / 1 massage minute
Classical relaxation massage 60 min	M3	41.88	0.69 € / 1 massage minute
Classical relaxation massage 30 min	M4	29.56	0.98 € / 1 massage minute
Anti-stress massage 30 min	M5	30.50	1.02 € / 1 massage minute
Anti-stress massage 60 min	M6	56.21	0.93 € / 1 massage minute
Anti-cellulite massage 60 min	M7	41.05	0.68 € / 1 massage minute
Therapeutic massage 60 min	M8	43.83	0.73 € / 1 massage minute
Reflexology 50 min	M9	38.20	0.76 € / 1 massage minute
Oriental Thai massage 60 min	M10	49.09	0.81 € / 1 massage minute
Oriental Shiatsu massage 60 min	M11	49.79	0.83 € / 1 massage minute
Abhyanga Ayurveda massage 60 min	M12	58.04	0.96 € / 1 massage minute
Facial massage 30 min	M13	25.58	0.85 € / 1 massage minute
Volcanic rock massage 60 min	M14	44.22	0.73 € / 1 massage minute
Lymphatic drainage 60 min	M15	49.30	0.82 € / 1 massage minute
Honey massage 60 min	M16	46.08	0.77 € / 1 massage minute
Californian massage 60 min	M17	38.14	0.64 € / 1 massage minute
Tandem massage (4 hands) 60 min	M18	71.81	1.19 € / 1 massage minute
Special oil massage 60 min	M19	34.06	0.57 € / 1 massage minute
Special butter massage (Shea 60 min)	M20	35.95	0.60 € / 1 massage minute



**Graph nr.1** – Average euro / minute massage costs for the 20 types of massage

The presented data change the order of the best well-paid massages, if we take into account the price in euro per minute / session. Thus, the highest massage cost would be for the tandem massage (4 hands - 1.19 € /1 massage minute), followed by the 30-minute anti-stress massage (1.02 € /1 massage minute) and the 30-minute relaxation massage (0.98 € /1 massage minute). At the other end, the lowest costs are recorded as follows: the 90-minute relaxation massage (0.59 € /1 massage minute), the special oil massage (0.57 € /1 massage minute) and the special butter massage (0.60 € /1 massage minute).

#### Discussion

The analysis of the above-mentioned data highlights the clear price difference existing on the so-called European common market, the different costs of the 20 types of massage being confirmed by the values determined for the coefficient of variability (CV% - tables no. 2 and no. 3). According to the values shown in the table and taking into account the statistical limits for this item, the measured values are characterized by an increased heterogeneity (CV% > 20 %), resulting in a very low homogeneity.

The data highlighted by the statistical analysis reveal different ratios regarding the charts for the most expensive massage sessions within EU. What may seem at first sight a high cost for a certain type of massage, in the end, it could seem possible for the EU citizens to pay less, as compared with a different type of massage which at first sight would seem more expensive.

The high difference in costs at micro level (depending on the country and on the investigated geographical area) and the different ratios between cost and minute per massage session are useful in analyzing the feasibility of the complementary medical therapies within EU when regulating the cross-border

therapeutic services (Stargardt, 2008), moreover, whenever there are scientific evidences (Reilly, 2001), which certify the fact that, in terms of cost, more and more Europeans are increasingly looking for complementary and alternative medical therapies (CAM) to avoid the classical therapies, which are more costly.

#### Conclusions

Reporting the costs corresponding to the massage services according to the cost/total duration per session criterion could be a reference for classifying the most expensive types of massage in the countries of the European Union, our hypothesis being confirmed.

It can be noticed that when we report the massage costs € / 1 minute massage criterion, the highest costs are recorded in some types of massage that, at first sight, appear to be cheaper, if we take into account the general criterion - the amount as a whole, the final amount paid.

#### References

- Alexe DI, Deleu C, 2013, A comparative analysis of the financial costs for accessing the same basic kinesis-therapeutic service available to the population from different parts of the European Union, la The 8th International Conference in Physical Education, Sport and Physical Therapy - From Theory to Practice (<http://fefs.conference.uaic.ro/>), "Sport and Society" Journal (in Romanian: Revista "Sport și Societate"), Volume 14, Special Issue / 2014 pp.143-148;
- Leeuwen HV, 1995, Physiotherapy education in The Netherlands, Belgium, The United Kingdom and Ireland, presented at the General Assembly of the European Network of



- Physiotherapy in Higher Education (ENPHE). Leuven;
- Reilly D, 2001, Comments on Complementary and Alternative Medicine in Europe, in The Journal of Alternative and Complementary Medicine. December 7(supplement 1), 23-31.
- Stargardt T, 2008, Health service costs in Europe: cost and reimbursement of primary hip replacement in nine countries. Health Economics., Volume 17, Issue Supplement 1, pages S9–S20;
- Wiesener S, et all., 2012, Legal status and regulation of CAM in Europe. Part I – CAM regulations in the European countries. Final report of CAMbrella Work Package 2, Tromsø, November 5, 2012, Norway;  
<http://bbwkg.de/wp-content/uploads/2012/07/Massage-profiles-competencies-in-Italy-Germany-and-Hungary.pdf> (accesat Mai 2013)
- [http://ec.europa.eu/internal\\_market/qualifications/policy\\_developments/legislation/index\\_en.htm](http://ec.europa.eu/internal_market/qualifications/policy_developments/legislation/index_en.htm) (accesat 2012- 2013) ;



## ROLE OF EXERCISES IN FASCICULATION ANXIETY SYNDROME

DOCU ANY AXELERAD<sup>1</sup>, DOCU DANIEL AXELERAD<sup>2</sup>

### Abstract

**Objective.** The goal of this study is to make a connection between physical exercise and clinical features of fasciculation anxiety syndrome. We randomized a cohort of 30 patients in three groups: first group included 10 patients with symptomatic fasciculation and anxiety, second group included 10 patients fasciculations associated with sensory symptoms or muscle weakness and were diagnosed with neuropathy or SLA and the third group included 10 patients with fasciculations associated with cramps (cramp-fasciculation-syndrome). All three groups were included in a 3 times/week programme of exercises of 30 minutes each and we evaluated the electromyographic changes.

**Methods:** We randomized 30 patients in three groups: first group included 10 patients with symptomatic fasciculation and anxiety, second group includes 10 patients fasciculations associated with sensory symptoms or muscle weakness and were diagnosed with neuropathy or SLA and the third group included 10 patients with fasciculations associated with cramps (cramp-fasciculation-syndrome). All three groups were included in a 3 times/week programme of exercises of 30 minutes each on a 3 month period of following and we evaluate electromyographic changes.

**Results:** In the present study, a cohort of 30 patients with symptomatic fasciculations was assessed with clinical, neurophysiological and laboratory studies. The majority of cases with fasciculations were female. Triggers in all 3 groups was stress, caffeine and exercises.

Anxiety appeared as a prominent feature in the patients in the present cohort and may contribute to pathogenesis of symptomatic fasciculations in symptomatic fasciculation and anxiety, acting to promote fasciculations in Symptomatic fasciculation and anxiety.

**Conclusions:** The present study described a cohort of 30 patients presenting for evaluation of fasciculations and identified group which includes 10 patients with symptomatic fasciculation and anxiety, second group which includes 10 patients fasciculations associated with sensory symptoms or muscle weakness and were diagnosed with neuropathy or SLA and the third group which includes 10 patients with fasciculations associated with cramps (cramp-fasciculation-syndrome). All three groups were included in a 3 times/week programme of exercises of 30 minutes each and we evaluate electromyographic changes.

In the Symptomatic fasciculation and anxiety cramp-fasciculation-syndrome role of exercise appear to aggravate their symptomatology, but in the second group of patients with neuropathy and lateral amyotrophic sclerosis role of exercise is unclear but for sure it doesn't have a negative role.

**Key words:** fasciculations, amyotrophic lateral sclerosis, anxiety, benign fasciculation syndrome, cramp-fasciculation syndrome, neuropathy.

### Introduction

Clinically, fasciculations reflect spontaneous discharges that arise from single motor units that result in isolated contraction of a small portion of a muscle. Fasciculations often go unnoticed or may be merely discerned as a brief "twitch" of the muscle. Fasciculations are very common in healthy population, and from part of benign fasciculation syndrome, a disorder characterized by symptomatic fasciculations without progression to a more fasciculations sinister neurological condition (Friedman et al, 2002, Punjabi et al, 2009).

Alternatively, fasciculations may be present following peripheral nerve injury (Dumitru et al, 2001, Roth et al, 1987) or in peripheral nerve hyperexcitability syndromes (Hart et al, 2002, Newsom-Davis et al, 1993). Finally, fasciculation is the prominent feature in amyotrophic lateral sclerosis (Kiernan et al, 2011).

While fasciculations potentials can be detected by surface electromyography recording in almost 90%

of normal subjects (Mitsikostas, et al, 1998), these fasciculations potentials are symptomatic in only 50% (Jansen et al, 1991).

### Methods

We randomized 30 patients in three groups: first group included 10 patients with symptomatic fasciculation and anxiety, second group includes 10 patients fasciculations associated with sensory symptoms or muscle weakness and were diagnosed with neuropathy or SLA and the third group included 10 patients with fasciculations associated with cramps (cramp-fasciculation-syndrome). All three groups were included in a 3 times/week programme of exercises of 30 minutes each on a 3 month period of following and we evaluate electromyographic changes.

Age varies between 25 and 83 years old, mean age 53.42 (SD 15.75), 12 male patients and 18 female patients, with duration of fasciculations between 3 and 17 years, mean duration 3.90 (SD 11.03).

All three groups were included in a 3

<sup>1</sup> General Medicine Faculty, Ovidius University of Constanta, ROMANIA

<sup>2</sup> Physical Education and Sport Faculty, Ovidius University of Constanta, ROMANIA

E-mail address: docuaxi@yahoo.com

Received 28.10.2014 / Accepted 30.11.2014

times/week programme of exercises of 30 minutes each and we evaluated electromyographic changes.

Each patient underwent neurological assessment including muscle strength grading using the Medical Research Council clinical gradings of power.

A standard electrodiagnostic study was performed using conventional techniques with a Medelec Synergy. Electromyography was performed using a concentric needle electrode, with wide sampling of affected and unaffected muscles from all limbs

Laboratory studies included creatine kinase (CK).

## Results

### Clinical characteristics

We randomized 30 patients in three groups: a group of 10 patients with symptomatic fasciculation and anxiety, second group of 10 patients fasciculations associated with sensory symptoms or muscle weakness and were diagnosed with neuropathy or SLA (3 patients with SLA and 7 patients with neuropathy) and a third group of 10 patients with fasciculations associated with cramps (cramp-fasciculation-syndrome). All three groups were included in a 3 times/week programme of exercises of 30 minutes each and we evaluated electromyographic changes.

The present study shows that in some groups exercise aggravates the fasciculations.

Fasciculations were associated with sensory symptoms in 5 cases in the first group, 1 patient in the second group and 3 patients in the third group. In the second group 3 of them presented with fasciculations and distal lower limb sensory impairment and was diagnosed with a sensorymotor neuropathy of the axonal type. Finally, fasciculations were associated with limb weakness in three cases that was subsequently diagnosed with ALS.

The remaining 18 cases presented with isolated fasciculations, without other neurological symptoms.

All of these cases presented with symptomatic frequent fasciculations. Fasciculations were generalised in 4 cases, predominately affecting the lower limb in 20 cases, the upper limbs only in 2 cases, and both upper and lower limbs in 4 cases.

Exacerbating factors were identified by 20 cases, the most common trigger of these being exercise (in 20 of 30 cases), followed by psychological stress (15 of 30 cases), fatigue (10 of 30 cases) and caffeine consumption (5 of 30 cases) (Table 1)

Muscle weakness was not present on history or clinical examination in any case with isolated fasciculations. Anxiety about the possibility of ALS was described by all the cases in this group.

### Electrodiagnostic findings

Motor and sensory nerve conduction studies were within normal limits in all cases presenting with isolated fasciculations. Needle EMG demonstrated the presence of FPs in 10 out of 30 cases. In all cases FPs were simple morphology (<4turns), multiple discharges were noted in 1 out of 10 cases and cramp in 1 out of 10 cases in symptomatic fasciculation and anxiety. Neuromyotonic discharges were not detected in any of the studied cases. In terms of localization, spontaneous discharges were evident in the lower limbs in 26 of 30 cases (64%), in the upper limbs in 1 of 30 cases, and in both the upper and lower limbs in 4 cases.

Motor unit morphology was within normal limits in all muscles, including on assessment with quantitative EMG. Motor unit recruitment and interference pattern with voluntary activation was also normal.

Table 1 Clinical features and EMG findings in 30 cases with fasciculations

Case	Distribution of fasciculations	Triggers	EMG		Other abnormal tests	Diagnosis
			Before exercise	After exercise		
1	Upper and lower limbs, face	Stress, Coffeine, exercise	Normal	Multiplet discharges-TA, VL		Symptomatic fasciculation and anxiety
2	Upper and lower limbs	Stress, Coffeine, exercise	Normal	Triplet- discharges-TA, VL		Symptomatic fasciculation and anxiety
3	Lower limbs	Stress, Coffeine, exercise	Normal	FPs- bilateral TA, MG		Symptomatic fasciculation and anxiety
4	Lower limbs	Stress, Coffeine, exercise	Normal	FPs-and cramp discharges-AH		Symptomatic fasciculation and anxiety
5	Lower limbs	Stress, Coffeine, exercise	Normal	Normal		Symptomatic fasciculation and anxiety
6	Lower limbs	Stress, Coffeine, exercise	Normal	FPs-TA		Symptomatic fasciculation and anxiety
7	Lower limbs	Stress, Coffeine, exercise	Normal	FPs-TA, MG		Symptomatic fasciculation and anxiety
8	Distal upper and	Stress, Coffeine,	Normal	Triplet- discharges-TA,		Symptomatic fasciculation



	lower limbs	exercise		VL		and anxiety
9	Distal upper limbs	Stress, Coffeine, exercise	Normal	Normal		Symptomatic fasciculation and anxiety
10	Lower limbs	Stress, Coffeine, exercise	Normal	Normal	↑ck	Symptomatic fasciculation and anxiety
11	Lower limbs	Coffeine, exercise	Normal	FPS-TA		cramp- fasciculation-syndrome
12	Lower limbs and trunk	Stress, exercise	Normal	FPS-TA, MG	↑ck	cramp- fasciculation-syndrome
13	Proximal lower limbs and face	Stress	Normal	FPS-ADM		cramp- fasciculation-syndrome
14	Distal upper and lower limbs	Stress, Coffeine, exercise	Normal	FPS-Bilateral MG		cramp- fasciculation-syndrome
15	Lower limbs, left shoulder	Coffeine, exercise	Normal	Normal		cramp- fasciculation-syndrome
16	Trunk and lower limbs	Exercise	Normal	FPS-TA		cramp- fasciculation-syndrome
17	Distal lower limbs	Stress, exercise	Normal	Normal		cramp- fasciculation-syndrome
18	Distal upper and lower limbs	Coffeine, exercise	Normal	FPS-ADM		cramp- fasciculation-syndrome
19	Lower limbs	Coffeine	Normal	Normal		cramp- fasciculation-syndrome
20	Generalised	Stress, Coffeine, exercise	Normal	Multiplet discharges-TA, VL	↑ck	cramp- fasciculation-syndrome
21	Distal lower limbs	-	Chronic neurogenic MU Changes in Distal Limb Muscles	Chronic neurogenic MU Changes in Distal Limb Muscles		Polineuropathy
22	Distal lower limbs	-	Chronic neurogenic MU Changes in Distal Limb Muscles	Chronic neurogenic MU Changes in Distal Limb Muscles		Polineuropathy
23	Distal lower limbs	Stress	Chronic neurogenic MU Changes in Distal Limb Muscles	Chronic neurogenic MU Changes in Distal Limb Muscles		Polineuropathy
24	Distal lower limbs	-	Chronic neurogenic MU Changes in Distal Limb Muscles	Chronic neurogenic MU Changes in Distal Limb Muscles		Polineuropathy
25	Distal lower limbs	-	Chronic neurogenic MU Changes in Distal Limb Muscles	Chronic neurogenic MU Changes in Distal Limb Muscles		Polineuropathy
26	Distal lower limbs	-	Chronic neurogenic MU Changes in Distal Limb	Chronic neurogenic MU Changes in Distal Limb Muscles		Polineuropathy

27	Distal lower limbs	-	Muscles Chronic neurogenic MU Changes in Distal Limb Muscles	Chronic neurogenic MU Changes in Distal Limb Muscles		Polineuropathy
28	Generalised	-	Wide spread active denervation changes		↑ck	Amyotrophic Lateral Sclerosis
29	Generalised	-	Wide spread active denervation changes			Amyotrophic Lateral Sclerosis
30	Generalised	-	Wide spread active denervation changes			Amyotrophic Lateral Sclerosis

TA tibialis anterior, MG medial gastrocnemius, ADM abductor digiti minimi, AH abductor hallucis, FDI first dorsal interosseous, VL vasus lateralis, MU motor unit.

### Laboratory findings

Abnormal laboratory findings were not identified in any of the studied cases presenting with isolated fasciculations. CK was elevated in 4 cases.

### Discussion

In the present study, a cohort of 30 patients with symptomatic fasciculations was assessed with clinical, neurophysiological and laboratory studies. The majority of cases with fasciculations were female. Triggers in all 3 groups was stress, caffeine and exercises.

Anxiety appeared as a prominent feature in the patients in the present cohort and may contribute to pathogenesis of symptomatic fasciculations in symptomatic fasciculation and anxiety, acting to promote fasciculations in Symptomatic fasciculation and anxiety.

Anxiety states are associated with heightened sensitivity to bodily sensations and separately may precipitate disordered breathing regulation, including persistent hyperventilation. Hyperventilation is known to induce increased excitability of motor axons and provoke ectopic discharges such as fasciculations, through the selective activation of lower threshold persistent Na<sup>+</sup> conductances, in addition to the effects of H<sup>+</sup> and Ca<sup>++</sup> on axonal ion channels. Such processes may explain the high-frequency of fasciculations evident at presentation in the current cohort of patients and also the subjective reduction in fasciculation frequency after the reported improvement of the anxiety state.

Accordingly, anxiety management strategies appear useful in the treatment of Symptomatic fasciculation and anxiety and exercise appear to aggravate de picture of this syndrome.

Cognitive behavioural therapy for health anxiety frequently involves education to correct

idiosyncratic beliefs about health and illness, and, hence it is noteworthy that prominent anxiety about the significance of fasciculations may still be reported by highly educated patients and similar in cramp-fasciculation-syndrome exercise appear to aggravate de picture of this syndrome and behavioural therapy is also indicated. In the second group exercise not influence evolution of diseases.

### Conclusion

The present study described a cohort of 30 patients presenting for evaluation of fasciculations and identified group which includes 10 patients with symptomatic fasciculation and anxiety, second group which includes 10 patients fasciculations associated with sensory symptoms or muscle weakness and were diagnosed with neuropathy or SLA and the third group which includes 10 patients with fasciculations associated with cramps (cramp-fasciculation-syndrome).

All three groups were included in a 3 times/week programme of exercises of 30 minutes each and we evaluate electromyographic changes. Age varies between 25 and 83 years old, mean age 53.42 (SD 15.75), 12 male patients and 18 female patients, with duration of fasciculations between 3 and 15 years, mean duration 3.90 (SD 11.03).

In the Symptomatic fasciculation and anxiety cramp-fasciculation-syndrome role of exercise appear to aggravate their symptomatology, but in the second group of patients with neuropathy and lateral amyotrophic sclerosis role of exercise is unclear but for sure it doesn't have a negative role.

### References

Blexrud MD, Windebank AJ, Daube JR, 1993, Long-Term follow up of 121 patients with benign fasciculations. Ann Neurol 34: 622-625





- Dumitru D, Diaz CA, King JC, 2001, Prevalence of denervation in paraspinal and foot intrinsic musculature. *Am J Phys Med Rehabil* 80: 482-490
- Hart IK, Maddison P, Newsom Davis J, Vincent A, Mills KR, 2002, Phenotypic variants of autoimmune peripheral nerve hyperexcitability. *Brain* 125:1887-1895.
- Jansen PH, van Dijck JA, Verbeek AL, Durian FW, Joosten EM, 1991, Estimation of the frequency of the muscular pain-fasciculation syndrome and the muscular cramp-fasciculation syndrome in the adult population. *Eur Arch Psychiatry Clin Neurosci* 241: 102-104
- Kiernan MC, Vucic S, Cheah BC, Turnr MR, Eisen A, Hardiman O, Burrell JR, Zoing MC, 2011, Amyotrophic lateral sclerosis. *Lancet* 377: 942-955
- Mills KR, 2010, Characteristics of fasciculations in amyotrophic lateral sclerosis and the benign fasciculation syndrome. *Brain* 133: 3458-3469
- Newsom – Davis J, Mills KR, 1993, immunological association of acquired neuromyotonia (Isaacs` syndrome) . report of five cases and literature review. *Brain* 116 (Pt2):453-469.
- Roth G, Magistris MG, 1987, Neuropathies with prolonged conduction block, single and grouped fasciculations, localized limb myokymia. *Electroencephalogr Clin Neurophysiol* 67: 428-438



## EVOLUTION AND REHABILITATION IN ISCHEMIC STROKE OF LEFT INTERNAL CAROTID ARTERY

DOCU DANIEL AXELERAD<sup>1</sup>, DOCU ANY AXELERAD<sup>2</sup>

### Abstract

**Objective.** Decompressive hemicraniectomy was proposed as a “rescue” solution that should be taken into consideration for young patients with clinical degeneration due to extended cerebral infarction resisting medical treatment. Still, the selection criteria of the patients and the moment of the operation decision remain as debated as the moment of starting rehabilitation with survivors.

**Methods.** The research represents a case study of a 28-years-old female patient admitted to hospital with the diagnosis of malignant ischemic stroke of left ICA, operated and motor rehabilitated after a 6 months passive and active kinetics therapy program. The motor evolution of the patient is outstanding, Table 1 points out the motor progress recorded over 6 months. The Barthel Index shows the evolution of the patient as she recorded a 70 points progress after 6 months of kinetics therapy program.

**Conclusions.** The motor postoperative recovery activity started immediately after the surgical intervention, is defining in regarding the motor evolution of the patient. The passive rehabilitation, which included kinetic therapy, massage, passive gymnastics, respiratory gymnastics, was started in the first days. The active rehabilitation was strictly individualized. The rehabilitation treatment (passive kinetics therapy) was started in the first 11 days since the debut, success depending on the precocity of the recovery treatment.

**Keywords:** malignant stroke, hemicraniectomy, motor recovery, young.

### Introduction

Cerebral ischemia represents the functional and/or anatomic failure of the cerebral tissue determined by the interruption or diminution of the arterial perfusion to the cerebral territories. The consequence of cerebral ischemia is localized necrosis of the tissue (stroke) induced by a cellular metabolic deficit related to the decrease of the cerebral blood flow.

The stroke for young adults under 45 is a reality and a “sad privilege”, considering its biologic, psychic and socio-professional integration consequences. The systemic disease, the disseminated lupus erythematosus can produce large strokes and it is thought that they can appear through inflammatory arteritis, clotting anomalies and heart embolism.

The “malignant” stroke in the middle cerebral artery is recognized (Werner Hacke et al, 1996) as having a high mortality rate in the absence of adequate treatment. Despite medical management, the rise of intracranial pressure, bulging and death arise with 78% of the patients within the first five days. The cerebral edema (Eric Jüttler et al, 2007) appearing in the first few days after the massive cerebral infarction determines the neurological degeneration of the patient and threatens survival. It occurs, most often, in the total infarction in the territory of the middle cerebral artery. The clinical degeneration occurs in a few days after the stroke (usually in the third day, sometimes later), but may evolve even more rapidly, in a few hours from the debut. Decompressive hemicraniectomy was proposed as a “rescue” solution that should be taken into consideration for young patients with clinical degeneration due to extended cerebral infarction

resisting medical treatment. Still, the selection criteria of the patients and the moment of the operation decision remain as debated as the moment of starting rehabilitation with survivors.

### Case study: Material and method

The 28-years-old patient had an eight-year known history of SLE with cutaneous, articular and hematological determinations. In the personal record there was mention of four spontaneous abortions with ages between a few weeks and four months. She was under chronic treatment with Metilprednisolonum 8 mg/day, Hydroxychloroquine 200 mg/day. She was admitted to hospital two hours after the brutal apparition of right hemiplegia and aphasia. She suffered from an endometritis process with metrorrhagia that had started seven days previously. The hereditary collateral antecedents mentioned the mother's sister and the grandmother with SLE. The clinical examination revealed at hospitalization a BP of 130/70mm Hg, a regulate pulse of 60 bpm, a lax right hemiplegia, mixed aphasia, sphincter incontinence, metrorrhagia, deglutition is possible. Under the antiedematous cerebral treatment with Osmofundinum 100 mg/6 h i.v. in bolus, Metilprednisolonum, antibiotic protection, water-electrolytic balancing solutions, neuro-protectors and vitamins, the evolution over the first 48 hours was stationary. The gynecological examination revealed endometritis.

### Results

The first brain CT made at admission (2 hours after the clinical debut) was normal.

<sup>1</sup> Physical Education and Sport Faculty, Ovidius University of Constanta, ROMANIA

<sup>2</sup> General Medicine Faculty, Ovidius University of Constanta, ROMANIA

E-mail address: docuaxi@yahoo.com

Received 04.11.2014 / Accepted 05.12.2014



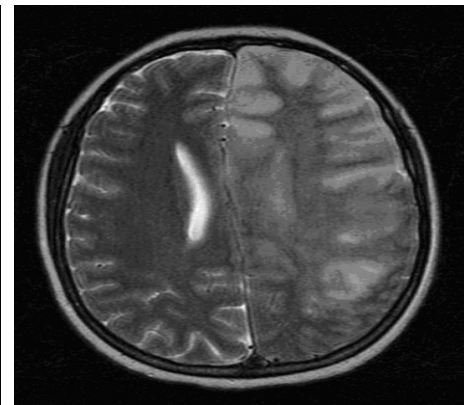
1.

1. Normal cerebral CT



2.

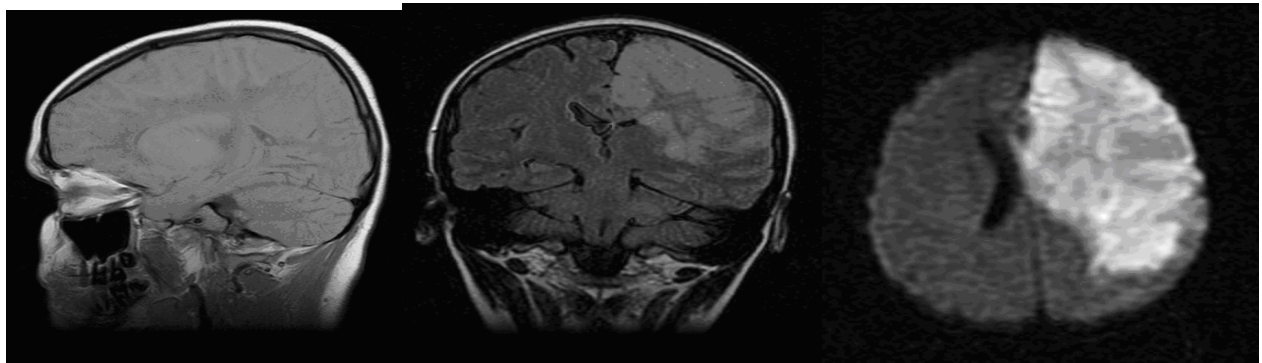
2. Angio-IMR made 24 h after clinical debut showed the absence of left MCA and ACA



3.

3. Cerebral IMR showed the infraction of the left ICA with a right-deviation of 7-8 mm.

T2 – intraaxial-supratentorial, with the emphasis of the left F-T-P-O lobe, showed a large inhomogeneous, hyper-intense T2 range. The edematous range determines a mass effect over the left VL comprising it, and over the falx cerebri, with a right-deviation of 7-8 mm.



1. T2 sagittal image: intraaxial-supratentorial, with the emphasis of the left F-T-P-O lobe, showed a large inhomogeneous, hyper-intense T2 range

2. Coronary FLAIR: intraaxial-supratentorial, with the emphasis of the left F-T-P-O lobe, showed a large inhomogeneous, hyper-intense FLAIR range

3. DWI diffusion sequence: intraaxial-supratentorial, with the emphasis of the left F-T-P-O lobe, showed a large inhomogeneous, franc hyper-intense range in the diffusion sequences.

The DWI diffusion sequence, intraaxial-supratentorial, with the emphasis of the left F-T-P-O lobe, showed a large inhomogeneous, franc hyper-intense range in the diffusion sequences that extended towards the head and body of the caudate nucleus and the homolateral lentiform nucleus. The edematous range determined a mass effect over the left LV, which it compressed, and over the falx cerebri, with a 7-8 mm right-deviation. The inflammatory tests that were run had the following values: blood sedimentation test = 90

div/h, fibrinogen = 980 mg/dl, C3c complement = 111 mg/dl (normal value = 90-180 mg/dl), the doubly catenarian anti-DNA antibodies = 5.3 (negative), lupus anticoagulant: positive, anticardiolipin: negative, plaque = 138 000/mm<sup>3</sup>. The clinic evolution was stable until the third day when there was psycho-motor unrest followed, a few hours later, by a rapidly progressive towards aggravation comatose state, thus on the fourth day, she was in a Glasgow 5 coma (motor 3, verbal 1, ocular 1), with a fixed left mydriasis, with head and eyeballs deviated to the right, photo-motor and corneal reflexes bilaterally sketched; on minor pain stimuli, or spontaneously, she presented decerebration crises intricated with decortication crises (upper limbs in flexion, lower limbs in extension or flexion). Babinski bilaterally positive, t = 37.8 °C. The cerebral CT is repeated and there showed a largely extended ischemic stroke on the left F-T-P lobe, with an emphasized mass effect over the lateral ventricles and the middle-sagittal structures, with the compression of the left LV and their movement to the right by 16 mm.



4.

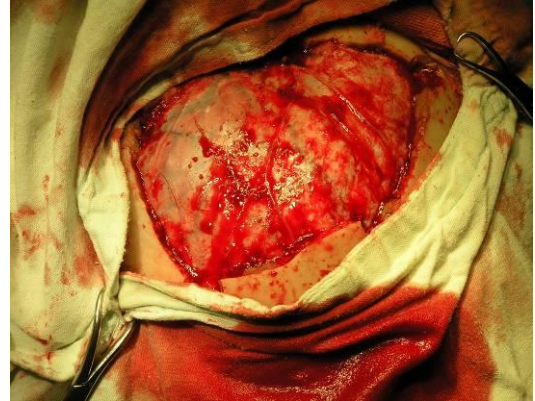
4. Cerebral CT showed a largely extended ischemic stroke on the left F-T-P lobe, with an emphasized mass effect over the lateral ventricles and the middle-sagittal structures, with the compression of the left LV



5.

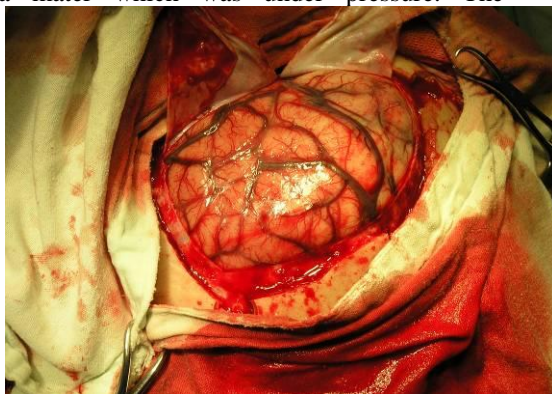
5. Cerebral CT showed a largely extended ischemic stroke on the left F-T-P lobe, with an emphasized mass effect over the lateral ventricles and the middle-sagittal structures, with the compression of the left LV and their movement to the right by 16 mm.

It is decided to initiate the neurosurgical intervention, by making a decompressive slot on the left F-T-P. There is made a curved incision as a reversed question mark; the soft layers are peeled off, there is made a temporal-parietal slot in 6 holes which lifted off without incidents. There is called attention on the dura mater which was under pressure. The



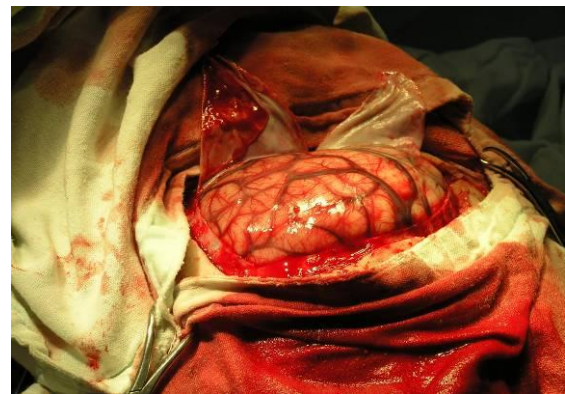
6.

pressed dura was initially incised curvedly with a temporal base, later it was opened in a star shape according to the adjacent tissues. The malignant cerebral edema was pointed out as it was swollen at the level of the surgical incision and the cerebral convolutions were smoothed and the veins were congested. The brain did not pulsate and it was extremely pale in the anterior half of the exposed area (the ACA territory) and had a small sub-arachnoidal hemorrhagic zone in the posterior half. The brain was washed with lukewarm saline solution, the dura was suspended here and there, and therefore the dura was left open. The bone slot was removed and preserved in order to be put back into place several months later; there were made sutures in the anatomic layers. The postoperative evolution was favorable.



7.

7. The incision of the dura and revelation of the malignant cerebral edema

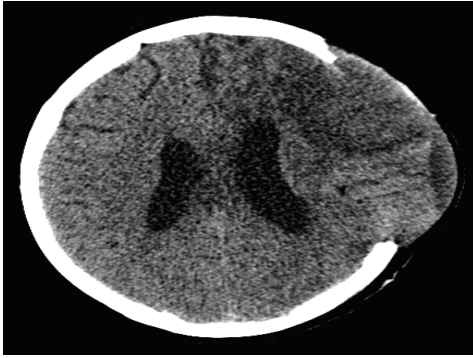


8.

8. The incision of the dura and revelation of the malignant cerebral edema

After 36 hours, the patient was able to follow with the gaze, to perform simple commands and regained deglutition. On the 4<sup>th</sup> day she was transferred back to the Neurology Clinic. There was attached a plastered splint on the lower right limb, but after four days, the patient no longer accepted it. The last stitches were removed on the 18<sup>th</sup> day. There was initiated an

early motor and speech rehabilitation. For the motor evaluation there was used the Barthel index, which was 0 on the first day. On the 11<sup>th</sup> postoperative day, the cerebral CT was repeated and showed the extended left tempo – parietal craniotomy, the inhomogeneous hypodense mass with edema and intra-axial dilacerations at the level of the left cerebral hemisphere with a protrusion through the craniotomy orifice. For a month there was a kinetics therapy program: passive (starting in the 11<sup>th</sup> day) and active (starting in the 18<sup>th</sup> day), the patient is now able to move using a waling frame.



9. The cerebral CT showing the extended left tempo – parietal craniotomy, the inhomogeneous hypodense mass with edema and intra-axial dilacerations at the level of the left cerebral hemisphere with a protrusion through the craniotomy orifice

10. The cerebral CT showing the extended left tempo – parietal craniotomy, the inhomogeneous hypodense mass with edema and intra-axial dilacerations at the level of the left cerebral hemisphere with a protrusion through the craniotomy orifice.

### Experiment protocol

The case study begun on February 2014 and ended after the Barthel Index evaluation six months after the operation. The 28- years-old patient had a 6 months passive and active kinetics therapy program for her motor rehabilitation, presented below.

### Passive and active kinetics therapy program

I. The initial phase, immediately after the surgery:

-in the early stages of the disease, the total or partial paralysis of the limbs is lax;

-the objective of the rehabilitation is the maintenance of the articular mobility in complete amplitudes and the prevention of muscular contractions;

-the correct posture of the limbs in functioning position;

-the upper limb is to be kept with the shoulder in abduction (a pillow in the axilla), the forearm in slight flexion on the arm or in extension, semisupination, the fist in slight extension, the finger in semi-flexion and the thumb in abduction;

-the lower limb is to be kept in extension, not allowing for any degree of flexion or rotation of the hip;

-the knee is to be kept in extension, and the lower foot at a right angle with the lower leg with the aid of a posterior splint, well cushioned in order to avoid compression or skin injuries.

### II. The functional recovery of the hemiplegic upper limb

The rehabilitation of the hemiplegic fist and arm is the most difficult problem for the rehabilitator.

The rehabilitation of the upper limb started early, in our case – on the 18<sup>th</sup> day since the debut of the neuromuscular deficit. It is the period of flaccidity when, first of all, we must proceed to correctly posture the entire upper limb:

-the arm in 45° abduction, the elbow in slight flexion or extension, the fist in extension, the fingers in slight flexion, the thumb in abduction (it is repeated every 5' with 30" breaks after each minute of maintenance);

-gradual tactile and proprioceptive stimulation, from facilitating positions; (sensory stimulation is used in the direction of increasing the desired responses and inhibiting the unwanted ones);

-muscle tapotement associated with light pressure, joint light compression, in rapid alternation (5-6' with 30" breaks).

-form the seated position, we use the normal reactions of stability and equilibrium, which we challenge through light pushes of the upper body so as to unbalance the patient who, trying to maintain balance, initiates muscle contractions in the upper limb (5' with 30" breaks after each minute).

### Methodic indications: the rehabilitation therapy develops in two phases:

A. In the initial phase, when the proximal extremity of the upper limb is taken care of, there must be voluntary control of the shoulder and elbow, if possible, in different plans; all movements should be as far away as possible from the sinkinetic schemes. In the beginning, there is recommended to accentuate the spasticity of the hand to any movement of the upper limb root. Therefore, during the active mobilization of the proximal extremity, the hand shall be kept in an inhibition position, that is: total extension of the fingers and of the fist with the thumb in abduction.

-the passive mobilization of all of the joints of the affected limb is done gently, but it must be insisted in order to carry on the full amplitude of the movement. Every joint should be separately mobilized, holding at the extremities of the mobilized segments ( a joint is not passively mobilized through another joint);

-the training of the body symmetry is made through bilateral activities, then alternative unilateral ones, and finally through reciprocal activities;



-when the overall condition allowed it, (on the 30<sup>th</sup> day since the debut), the Kabat technique is applied, the diagonals for the upper limb; once the spasticity is installed, the new conditions of the neuromuscular deficit forced the adjustment of the therapeutic tactics;

-the traction exercised by the upper fascicles of the trapezius and the sternocleidomastoid flexes the head on the affected side and rotates it on the healthy side.

-the body has a lateral inflexion on the hemiplegic part, with lifting and retraction of the basin with the descent and retrusion of the humeroscapular belt due to the traction exercised by the broadest muscle of the back.

--the entire hemiplegic part is rotated backwards; in order to inhibit or reduce the spasticity that generates this attitude, as well as to correct the abnormal tonic reflexes, the change of the key points: the neck, the spine, the scapular belt and the pelvic belt, the fingers and toes: these reflex positions should be localized with every patient and correct every time it is necessary; at the same time there should be attempted to reduce the spasticity through the methods described in the general part;

-it is important to know that with some hemiplegics there may reside a lack of usage of the hand, although motility is recovered. This is explained by the profound sensory disorders due to the involvement of the upward sensory paths which are very close on the pyramidal path, at the level of the cortex and the inner capsule.

The prognosis of the functional rehabilitation of the hand is linked to many aspects, among which we mention some references to the etiology and topography of the lesion:

-the most serious, from a functional point of view, and, unfortunately, the most frequent, are the cortical or capsular lesions following an ischemia, such as is our case in the ICA territory. If at the debut of the illness, the functional prognosis cannot be determined, two months later it may be known according to: the topography of the lesion, the importance of the sensory and motility disorders.

-the functional prognosis is initially mediocre, and its primarily purpose is that of preventing the elbow-shoulder syndrome and learning how to use the arm as a basic helper, as well as the preservation of the future, in case the rehabilitation should occur (after a year), which is sometimes the case.

The functional rehabilitation was proximally started, then distally.

B. Afterwards, the evolution was the following. During hospitalization, the patient went through:

1. Initially, the hand had no voluntary command or can only flex through stereotype movement.

2. At release, she can actively flex her fingers and thumb, but she cannot extend them except in one

position; we explain that it is required to have precision in movement, and not force and execution speed.

The rehabilitator tries the "awakening" of the extensor muscles, with the help of the facilitating techniques, especially those that use the position shifts (Bobath). We used the following:

- vertical rising or at a certain angle of the upper limb;
- passive forced abduction of the thumb (several successive repetitions)
- in ventral decubitus, resting the hand on the lumbar region (*the unlocking reflex* described by T. Fay)
- the flexion of the fist (several successive repetitions).

We have noted the extension of only one finger (on the 25<sup>th</sup> day) – the fifth finger (in the second month).

As we record the progress, we reduce facilitation in order to obtain, if possible, the extension of the finger regardless of the upper limb position.

The simultaneous extension of the fingers and of the fist always remains difficult because of the deficit in the extensors muscles, the spasticity of the flexors and the paralysis of the intrinsic ones.

Prehension in such cases can only remain basic and it is realized through the fingers and palm hold. The lack of force and of opening of the hand does not allow for light and small objects to be held. At prehension, the entire limb is risen so that, due to the fist flexion, the extension of the fingers and the slight abduction of the thumb to be possible after the termination of the voluntary contraction.

The best work technique is the alternation of the antagonists and rhythmic stabilization. The pivot joint should permanently be changed. After the global labor of the upper limb, there should be strived to realize the analytical movements, such as:

-close the fist, open and extend the thumb, open the fist and extend the index, open and extend the thumb and index; (10 series x 10-15 repetitions, passive break of 1' between the series);

### III. The functional rehabilitation of the lower hemiplegic limb and walking

The major objective of the lower limb rehabilitation is thus defined: obtaining a balanced command on different antagonist groups and eliminating the sinkinetics in order to recover a walking as close to normal as possible. Most statistics give percentages between 85 and 95 of recovering walking for hemiplegics.

Methodic indications: in order to prevent the typical flexion stiffness and the external rotation of the hip, knee flexion and equinovarus, we install the patient so as to have the basin flat on the bed, with no flexion of the hip and knee, the lower limb totally coupled so as to avoid its fall in external rotation, the feet is maintained at 90° on the lower leg.

Spasticity is announced through the exaggeration of the deep reflexes and usually begins with the abductors of the thighs and the quadriceps, in our case, on the 30<sup>th</sup> day.

For a good rehabilitation of the walk, it is necessary to make a thorough analysis of the muscular deficit, of the repartition and intensity of the spasticity, of the intensity of the sin-kinetics, to sum up, it is necessary to make a functional evaluation of the patient.

The muscular deficit is mostly recorded (the general scheme of hemiplegia) on the following muscles: psoas, abductors and internal rotators of the hip, the knee flexors, and the leg dorso-flexors. The ischio-tibial muscles are partially respected.

During the evolution, the deficit is modified; the first muscles to recover voluntary contraction capacity are the abductors, the quadriceps and then gluteus maximus.

The muscles that remain most often, deficient, are the common extensor of the fingers, the peroneals, and the middle and small gluteus.

Bearing this in mind, the importance of the correct positioning during the flaccidity period is thoroughly justified.

#### The analysis of walk in hemiplegics

In order to rehabilitate walk, it is absolutely necessary the recovery of verticality and balance. The sense of verticality is recovered in time, and its training is very important. Concerning balance, it must be progressively trained from decubitus to semi-sitting with adequate lateral support, thus stimulating labyrinthine reflexes, and therefore, the contraction of the neck muscles which hold the head in a correct position. ( Gudrun, 2009)

In order to decrease the motor deficit, we must use the Kabath technique, the diagonals for the lower

limbs. Sinkinetic are a negative element in recovering correct walk and must be eliminated as early as possible.

In order to eliminate sinkinetic contraction of the long peroneal during the active contraction of the quadriceps, there must be done the following kinetic program for 30” and it must be repeated twice a day:

1. the patient is laid on the kinetics table, the lower leg is freely hanging, and must contract the quadriceps and palpate its increased tonus. The patient is instructed to notice the sin-kinetic contraction of the long peroneal and should try to voluntarily eliminate it.
2. the knee is extended, and the hock is held by the therapist; the patient must actively mobilize the patella upwards and downwards. At the same time, she should try to relax the long peroneal as much as possible.
3. the knee should be extended without support and hold the leg as free as possible
4. the knee should be actively extended, the therapist should palpate the long peroneal and, the moment he feels the sinkinetic contraction, he should ask the patient to regain the start position and repeat the extended movement of the knee.
5. the knee should be actively extended, the therapist should apply his hand on the planta, the tension of the long peroneal has as a result the modification of the position of the leg and the patient should feel this through the amplification of the pressure that the therapist is applying on the planta.

The patient of the present study stopped at the second stage after a month and at the third stage after the 6 months evaluation.

After 6 months of motor recovery, the patient obtains 70 points, 30 more than after the accumulated rehabilitation after one month of kinetic therapy. (Table no 1).

Activity	Date			Activity	Date		
	0 day	1 month	6 months		0 day	1 month	6 months
1.Feeding 0= unable 5=needs help cutting, spreading butter 10=independent	0	5	5	7.Toilet use 0=dependent 5=needs some help 10=independent	0	5	10
2.Bathing 0=dependent 5= independent (or in shower)	0	0	0	8.Transfer(bed to chair and back 0=unable, no sitting balance 5=major help 10=minor help, verbal or physic 15=independent	0	5	10
3.Grooming 0=needs help but can do about half unaided 5= independent face/hair/teeth/shaving	0	0	5	9.Mobility(on level surfaces) 0=immobile or<50yards 5=wheelchair independent, including corners,>50 yards 10=walks with help of one person>50 yards 15=independent	0	5	10
4.Dressing 0=dependent 5=needs help but can do about half unaided	0	0	5	10.Stairs 0=unable 5=needs help(verbal, physical, carrying aid) 10 independent	0	0	5
5.Bowels 0=incontinent 5=occasional accident 10=continent	0	10	10				
6.Bladder							



0=dependent	0		
5=needs some help, but can do something alone		<i>TOTAL (points)</i>	0 40 70
10=independent	10 10		

**Discussions**

Among the rare causes of stroke, there lies the inflammatory arteritis of collagenosis, in our case, the systemic lupus erythematosus (SLE) [Kitagawa,1990, Kushner M,1989]

In the first days after the massive brain damage, the cerebral edema of the necrotic tissue can threaten life. It most frequently appears in the complete infraction of the middle cerebral artery (MCA) [Werner Hacke, 1996]. The additional infraction in the territory of the anterior cerebral artery (ACA) only makes the situation worse. The clinical deterioration occurs in the following days after the stroke, most frequently on the third day, just as in the case presented above. The clinical signs of the aggravation are represented by sleepiness, fixed pupil, but not necessarily mydriasis, bilateral Babinski. Controlled hyperventilation may be useful in order to delay the neurosurgical intervention, but not in all cases of malignant infraction of MCA or ICA. Another useful help is i.v. osmofundin 1g/kg, then 50 g every 2-3 hours. Still, in the vast majority of these cases of comatose patients, the hemicraniotomy is necessary, otherwise, they die. The hemicraniotomy, together with the free dura, reduces the mass effect and intracranial pressure in these cases where the patient progresses from stupor to coma and the cerebral imagistic reveal the mass effect increase [Werner Hacke, 1996].

The earliest the kinetic therapy starts, the more effectively and efficiently it may be acted against static and motor disorders [Diedler,2009]. Treatment individualization represents an essential condition of recovery initiation; the patient must meet some essential requirements: stable clinical state, no speech impairments, no sphincter disorders, and no psychic or behavior disorders. The rehabilitating treatment in ischemic stroke is usually started in the first 3-4 days since the debut, its success depends on its precocity , but in the case of the malignant stroke, the recovery is started after stabilizing the patient – in our case, on the 11<sup>th</sup> day. In the first 6-8 months since the debut of the stroke, there must be continuous rehabilitation. On the Barthel Index, that was 0 in the beginning (on the 18<sup>th</sup> day), evolved to 40 after a month, and to 70 after six months of rehabilitation, which means that the patient became independent, with minimal help, a fact which points out the importance of the early start of rehabilitation, even for the patients with malignant stroke. The passive rehabilitation, which includes kinetic therapy, massage, passive and respiratory gymnastics, must be started right from the first days. Active rehabilitation is strictly individual and depends on the character of the cerebral infraction. The patient startet therapy on the 18<sup>th</sup> day, but started walking only on the 27<sup>th</sup> day with a walking frame, making 2-3 steps progress, and after 6 months she still uses a walking

frame, but she is able to manage her physical necessities (urinate, defecate) all by herself. The distances covered every day grew from 20-30 steps on release, to 50-60 steps on the walking frame after 6 months (Table no 1).

**Conclusions**

The motor postoperative recovery activity started immediately after the surgical intervention, is defining in regarding the motor evolution of the patient. We have presented the case of a 28-years-old patient, with a 8 years history of SLE with cutaneous, articular and hematological determinations and who was admitted to hospital with sudden debut right hemiplegia and mixed aphasia on the endometritis process with metrorrhagia that had started seven days previously. The evolution was stationary until the 3<sup>rd</sup> day when the general state rapidly deteriorated and the patient entered a coma. The repeated cerebral CT revealed a malignant infraction of the left internal cerebral artery and the neurosurgical intervention that consisted of a decompressive left fronto-temporo-parietal slot, saved the life of this young woman.

Moreover, the rehabilitation measures had a very important role, and they were taken as early as possible after the stabilization of the patient. The passive rehabilitation, which included kinetic therapy, massage, passive gymnastics, respiratory gymnastics, was started in the first days. The active rehabilitation was strictly individualized. The rehabilitation treatment (passive kinetics therapy) was started in the first 11 days since the debut, success depending on the precocity of the recovery treatment. In the first 6 months since the debut of the stroke, it is necessary to make continuous rehabilitation. By analyzing the motor performances over the hospitalization period and afterwards, there is a clear significant improvement (Table no 1).

**References**

Diedler et all, 2009, Decompressive Surgery for Severe Brain Edema, J Intensive Care Med 2009;24:168-178

Eric Jüttler MD., Stefan Schwab MD., Peter Schmiedek MD. et all, PhD for the DESTINY Study Group\* 2007, Decompressive Surgery for the Treatment of Malignant Infarction of the Middle Cerebral Artery (DESTINY)A Randomized, Controlled Trial. Stroke. 2007; 38:56.

Gudrun B., Lars-Henrik K., Xianrong Z., et all., 2009, For the ExStroke Pilot Trial Group ExStroke Pilot Trial of the effect of repeated instructions to improve physical activity after ischaemic stroke: a multinational randomised





- controlled clinical trial, BMJ 2009 339: b2810.
- Kitagawa Y., Gotoh F., Koto A., and Okayasu H., 1990, Stroke in systemic lupus erythematosus Stroke 1990;21;1533-1539
- Kushner M., Simonian N., 1989, Lupus anticoagulants, anticardiolipin antibodies, and cerebral ischemia. Stroke 1989; 20: 225-229
- Kummer MD., 1996, 'Malignant' Middle Cerebral Artery Territory Infarction Clinical Course and Prognostic Signs . Arch Neurol. 1996; 53(4):309-315
- Werner H., Schwab S., Mareus H., et all, 1996, 'Malignant' Middle Cerebral Artery Territory Infarction , Clinical Course and Prognostic Signs, Arch Neurol. 1996;53(4):309-315.



Science, Movement and Health, Vol. XV, ISSUE 1, 2015  
January 2015, 15 (1): 30-34  
*Original article*

## MUSIC INFLUENCE IN THE RECOVERY OF THE YOUNG ADULTS AFTER STROKE-CVA(30-40 YEARS OLD)

GIDU DIANA VICTORIA<sup>1</sup>, ENE-VOICULESCU CARMEN<sup>1</sup>, STRATON ALEXANDRU<sup>2</sup>, MICU ALEXANDRU<sup>2</sup>, BORZIAN GRIGORE<sup>3</sup>

### Abstract

Lately, the probability of a CVA (cerebrovascular accident) suffered a considerably growth in the young population and is still growing, representing approximately a third of all cases of CVA. The reports confirm that the number of CVA among young people suffered a growth of 25% percent in the past years.

Regarding the problem of recovery of the young after CVA, the studies shown the efficacy of the music therapy. As a complementary therapy, the music is beneficial in the recovery of the motric skill that suffers a grow in speed, precision and the motion smoothness on the patients that suffered a CVA.

*Key words:* CVA, young people (30-40 years old), music therapy.

### Introduction

World Health Organization (WHO) defines the cerebrovascular accident to be "a fast development of clinical signs of disorder of the cerebral function, focused or global, that lasts for more than 24 hours (if it's not interrupted by a surgical intervention or by death) with no apparent cause, other than vascular origin" (Tunstall-Pedoe, 2003). CVA appears when a blood vessel (artery) that provides blood for a certain area of the brain is blocked by a blood clot or is broken.

CVA may be:

-hemorrhagic (caused by a bleeding inside the brain-intracerebral hemorrhage or in the space surrounding the brain-subarachnoidian hemorrhage)

-ischemic (caused by a blood clot that blocks the blood flow of the brain)

Those two types of CVA are generally speaking, classified by the nature of the disorder resulted by the depreciation of the blood flow on the brain level-circulatory insufficiency. CVA ischemic is caused by atherothrombosis or the embolism of a major cerebral artery, while the hemorrhagic CVA is associated with a broken saccular aneurysm, avascular malformation or bleeding disorders (Adams et al, 1997; Alexander, 1997; Stedman's medical dictionary, 2000). Australian Institute of Health and Welfare (AIHW) declared that the rate of ischemic CVA is 5 times bigger than the rate of hemorrhagic CVA, but the deaths caused by hemorrhagic one is much bigger (AIHW-2004).

Each type of CVA is classified in many subcategories. One of the most accepted classifications belongs to Adams et al (1993) that splits CVA ischemic in 5 categories:

1. Atherosclerosis of a large artery

2. Cardio-embolism

3. Occlusion of a blood vessel of little importance

4. CVA caused by other strictly determined causes

5. CVA caused by other factors undetermined and unknown (Adams, Bendixen, Kappelle, Biller, Love & Gordon, 1993).

Hemorrhagic CVA can be also divided in two main categories, depending on the location of bleeding:

1. Intracerebral hemorrhage (ICH) that appears as a result of a bleeding from an arterial source directly in the brain

2. Subarachnoidian hemorrhage - when the breaking of a blood vessel is produced in the subarachnoidian space (D'Esposito, 1997; Sims & Korowhertz, 2004).

### Causes of the CVA hemorrhagic:

- a bleeding inside the brain (called intracerebral hemorrhage) or in the space surrounding the brain (subarachnoidian hemorrhage).

- bleeding inside the brain may be the result of a high blood pressure that persists over a long period of time

- the bleeding in the space surrounding the brain may be caused by the breaking of an aneurysm or by the high blood pressure that hadn't been held in control

Other less frequent causes of CVA hemorrhagic are:

- the inflammation of the blood vessels, that may appear in syphilis or in tuberculosis

- blood coagulation disorders, like hemophilia

- injuries of the neck or of the head that affects the blood vessels from this region

### Causes of the ischemic CVA

The main cause is a blood clot that blocks the blood flow of the brain.

The following may be encountered:

- hardening of the artery walls (atherosclerosis). This

<sup>1</sup> Faculty of Physical Education, Sport and Kinetotherapy, "Ovidius" University, Constanta, ROMANIA

<sup>2</sup> Department of Physical Education and Sport, Maritime University, Constanta, ROMANIA

<sup>3</sup> Faculty of Medicine, "Ovidius" University, Constanta, ROMANIA.

Email address: campiap@yahoo.com

Received 28.10.2014 / Accepted 08.12.2014



is caused by the high blood pressure, diabetes and the increased level of blood cholesterol

-arterial fibrillation or other heart arrhythmias (irregular heart rhythms)

-certain diseases of the heart valves, such as an artificial heart valve, a cardiac valve repaired, mitral valve prolapse or orifice valvular stenosis

-infection of the heart valves (endocarditis)

-blood coagulation disorders

-inflammation of the blood vessels (vasculitis)

-myocardial infarction

Less often, low blood pressure can cause an ischemic cerebrovascular accident.

### Features:

Brain attacks that occur in the left half of the brain affect the right half of the body and vice-versa. People who have a dominant left hemisphere and suffer a stroke in this area, develop the language and speech deficits. Accidents of this kind in the right area of the brain affect the spatial perception and can make it difficult for patients to deny the disease, neglect the affected area of the body or to have an impulsive behavior.

- Weakness of a body part (left or right): problems at work, catching objects or other tasks. After the CVA, it highlights some aspects of motor dysfunction which are obvious on upper and lower limbs and severely limiting the motor control. The most frequent motor dysfunction, obvious at the lower limbs is hemiparesis, it is representing about two-thirds of all deficiencies encountered in the case of CVA (Mohr, Foulkes, & Polis, 1993).

- Painful and rigid joints.

- Spasticity or muscle stiffness.

- Problems with the sense of touch and the ability to differentiate the sensations of hot and cold.

- Incapacity of representing the position of different body parts.

- Inability to perform intentional motions (Kane & Buckley, 2004).

- Pain, numbness or tingling in the extremities.

- Problems with walking and in coordinating the various movements of the body.

- Problems to swallow and chew (dysphagia).

- Urinary Incontinence

- Speech problems/pronunciation (aphasia)- when the STROKE is left side of the brain. They may not understand written or spoken language, they can't write or read, or cannot express their own thoughts.

- Cognition or memory Problems: can't apprehend, can't concentrate, can't remember, can't learn new activities.

- Problems of perception: they can't appreciate distances, shape, size, position, different body parts or whole body, they can't feel their extremities

- Vision problems.

- Emotional problems: fear, anxiety, anger, sadness, anger, frustration, depression.

The ability or inability of a person to recover after a STROKE depends on:

- which part of the brain was affected (dependent on the dominant side of each)

- How much of the brain was affected by STROKE

- The general health of the patient, before the STROKE

The rate of stroke among young and middle-aged people worldwide is increasing, currently representing nearly a third of all strokes. An analysis of data collected between 1990 and 2010, found that the number of strokes among people between the ages of 20 and 64 increased by 25 percent during this period, and that this age group now represents 31 percent of the total number of strokes, compared to 25 percent before 1990. It is expected that, in the absence of preventive measures implemented quickly, the rate of occurrence of STROKE in young and middle-aged people from around the world will increase (Valery Feigin, director of the National Institute of Neuroscience and applied to the STROKE of the University of New Zealand AUT)

On the adults, the majority of the strokes are ischemic (caused by a blood clot that blocks the blood flow of the brain). Only in 20% of cases are hemorrhagic CVA. Though, hemorrhagic CVA type is the most common cause of CVA among the young adults. Studies estimate that about 40-50% of the CVA among the young adults are hemorrhagic (stroke.org.uk, STROKE Association-April 2012)

What leads to the appearance of CVA in young? All the causes that lead to the appearance of the STROKE on adults may also occur in young people. Certain risk factors, such as atherosclerosis is less likely to occur in young people. However, there are certain risk factors that tend to affect young people in particular. These would be the following:

- High blood pressure: Although this is the most common cause while you age, high blood pressure can affect the young too. It's the most dangerous risk factor encountered in STROKE, both the young and the elderly. About 30% of population below 50 years that had a Stroke has high blood pressure too (stroke.org.uk, Stroke Association-April 2012)

- Diabetes: is a condition in which the body is not able to process glucose. This leads to the appearance of large amounts of sugar in the blood. Some studies show that diabetes is put on the second place after the high blood pressure in the context of the risk factors in the production of CVA among young people.

- Dissection: sometimes blood can penetrate the layers of the walls of the arteries and may further result in the formation of a clot in the artery or blood to enter the brain. This

phenomenon is called dissection and sometimes occurs without a reason, but can also be the result of a lesion (stroke.org.uk, Stroke Association-April 2012).

- Problems of the blood vessels: in general, hemorrhage are often the result of a weakness of a part of the vascular system. For example, a weakness of the wall of an artery may lead to bloating it out-this is called an aneurysm. The aneurysm may burst, leaving blood to leak into the brain. Untreated, the increased tension could lead to aneurysms, because it weakens the walls of the arteries. In rare cases, people are born with the fuss of blood vessels in the brain. These are called arteriovenous malformations (AVMs), because they include the arteries and veins. If AVMs, blood vessels are fragile and may break, causing bleeding (stroke.org.uk, Stroke Association-April 2012).
- Heart diseases: there are many heart conditions that may increase the risk of STROKE. The most important of them is atrial fibrillation (AF) that the irregular heart beat. In the case of AF, the heart does not pump blood as they would under normal circumstances. AF can cause blood clots that can travel to the brain, causing STROKE (the Stroke Association-stroke.org.uk April 2012)
- Another frequent disease among young people is the interatrial septum defect (ISD), which is a hole in the wall separating the two atria of the heart. To most people it closes immediately after birth, but about one-third of the population it remains open. In people under 55 years of DSI is associated with a significant increase in the risk of ischemic stroke production, although it is not entirely clear how, through what mechanisms lead to DSI this growth.
- Ethnic Background: those in South Asia and the Caribbean-African population poses the greatest risk to make a CVA. The Caribbean-Africa in particular, tend to have a first STROKE in his youth, compared to those in the UK. This may be caused by genetic disposition. Certain conditions that increase the risk of stroke, such as high blood pressure, and diabetes are more common in these ethnic groups.
- Migraine: recent studies have confirmed that migraine with Visual aura (disturbance of vision) is a predisposing risk factor for the occurrence of STROKE in women between the ages of 15 and 45 years. Smoking and the use of oral contraceptives lead to increase this risk (stroke.org.uk, Stroke Association-April 2012)
- Atherosclerosis:represents fat deposition on artery walls. It is a common risk factor in older adults, but the young below 35 years has only a minor role in the occurrence of STROKE. The risk of STROKE due to atherosclerosis presents an increase of between 30 and 45 years.
- Other factors:Many other factors can cause Stroke.Those other factors may be responsible for 26% of the strokes among the young adults.We will present you those less frequent causes:
  - Problems of blood clotting, which can lead to the formation of blood clots in the small vessels of the brain.
  - Hughes syndrome or antiphospholipid Syndrome, occurs when the immune system attacks the fats and proteins in the blood, thus leading to modification of its consistency. This can lead to the formation of clots in the arteries of the brain. Hughes ' syndrome is believed to be responsible for 20 per cent of STROKE occurring in people aged under 45 years of age.
  - Certain rare genetic diseases can develop the risk of STROKE. For example, Fabry disease affects metabolism, leading to an accumulation of fat in the cells of the blood vessels or anywhere else in the body (stroke.org.uk, Stroke Association-April 2012).
  - Lifestyle Factors:
    - Smoking: doubles the risk of STROKE due to the fact that smokers are more prone to blood clots and narrowing of the arteries, which leads to blockage of blood vessels.
    - Alcohol: alcohol consumption over long periods of time and excessive can increase blood pressure. Execiv consumption is ingesting more than 8 units once in males or more than 6 women. There is an association between consumption of recently (especially excessive) and ischemic stroke in those 16-40 years and who have no other known risk factors.
    - Drugs: drug use increases the chances of developing AVC with 6.5. It has been estimated that 14 per cent of AVC at those aged between 18 and 44 years are caused by the consumption of drugs, including ecstasy (MDMA), cannabis and stimulants, such as cocaine and amphetamines. There are several possible reasons for this, but a sharp rise in blood pressure due to the stimulus is likely to be a key cause of hemorrhagic STROKE especially in people with aneurysms or AVMs.
    - The diets and exercise: Healthy Diet lowers the risk of having a stroke. In particular, a diet that is rich in fruits, vegetables, whole grains, fiber and potassium may protect against STROKE. Also, avoid excessive consumption

of salt and saturated fats may reduce this risk. Regular exercise can reduce the risk of the stroke. Just 30 minutes of activity five days a week can reduce your risk (stroke.org.uk, Stroke Association-April 2012).

-A combination of oral contraceptives: pill can lead to blood clotting and may increase your blood pressure. Should be avoided by women who have other risk factors for STROKE, such as high blood pressure or smoking.

- STROKE of unknown causes: In about a third of cases of stroke in younger people, the cause cannot be identified. The rate of STROKE of unknown causes is higher in young than in the elderly. However, thorough investigations might find a question if there is none of the common risk factors.

The risk of having another stroke is relatively low, if there are many risk factors to a single person or other medical disorders.

Studies have shown that just listening to music every day, can contribute to better recovery after a stroke. According to the researchers, patients who have suffered a STROKE and who listens to music 1-2 hours a day, recovers better both verbal memory and attention and concentration ability. Also those who listens to music, are happier than those who listen to books (audio tape format) or than those who don't listen to anything.

Music could contribute to the stimulation of the brain, due to its plasticity, tries to adjust to losses incurred as a result of STROKE. In particular, losses are represented by speech disorders, attention and movement.

It is important to begin to listen to music as soon as possible after admission to hospital, the brain can change spectacularly during the first weeks and months. The beneficial effect of music, in the recovery of patients could be blamed on the combination between the vocal and instrumental.

Recent studies have examined the effects of music therapy on the patients with STROKE, when he (music therapy) is associated with traditional therapies. One of the studies found that the inclusion of music in the recovery of upper limb leads to the emergence of positive effects not present in the therapy without music (Kim, 2005). In another study, Navak et al found that subjects in the group who were conducting recovery music were more actively involved and cooperating in therapy, more than patients in the control group (those who were recovering without a musical background) (Nayak et al. 2000). His research was preliminary support of the efficacy of therapy through music, as a complementary therapy.

Recent research has shown that when music therapy is used in conjunction with traditional-style recovery, the rate of recovery in terms of emotional

and social deficit resulting from a STROKE are improved. (Nayak et. al., 2000, Kim, 2005, Schauer, Mauritz, 2003, Schneider, Schönle, Altenmüller, Münte, 2007, Jeong, Kim, 2007, Wilson, Parsons, & Reutens, 2006).

Jeong and Kim have examined the impact it has on the CVA music therapy when combined with traditional therapy. Thirty-three STROKE survivors were divided in two groups: the experimental, which was combined with rehabilitation of motor heavy rhythmic music and the control group, which was just recovering based on traditional techniques. After 8 weeks, the results showed that patients in the experimental group had better values at the level of flexibility, the greater the amplitude of movements, a general positive feeling better and an increase in the frequency and quality of social interactions (Jeong, Kim, 2007).

Also, music therapy was used in recovery of motor skill. It has been shown to increase the ability of going on the patients with CVA, application of music therapy (chanting songs), combined with the recovery through traditional methods (Schauer m., Mauritz KH, 2003). Thus, patients in the experimental group were significantly better in terms of speed, stride length, displacement and the deviation from the straight line (all these are indicators of improving walking). (Schauer, Mauritz, 2003).

Schneider et al. have found that patients whose recovery has been used and musical rhythms were significantly better in terms of speed, precision and smoothness of movements, compared with patients in the control group. (Schneider, Schönle, Altenmüller, Münte, 2007).

### Conclusions:

- cerebrovascular accident (STROKE) occurs when a blood vessel (artery) which supplies blood to the brain a break or is blocked by a blood clot.
- STROKE can be ischemic or hemorrhagic . Ischemic stroke is caused by atherothrombosis or embolism of a major brain artery, while hemorrhagic STROKE is associated with rupture of aneurysm, vascular malformation, a sacular or bleeding disorders.
- The rate of stroke among young and middle-aged people worldwide is increasing, currently representing nearly a third of all strokes.
- the number of strokes among people aged 20 to 64 grew by 25 percent between 1990 and 2010, and that this age group now represents 31 percent of the total number of strokes, compared to 25 percent before 1990.
- Hemorrhagic stroke is the most common cause of CVA among the young adults(40-50%)
- the risk factors tend to affect young people in particular: increased tension, diabetes, blood

vessel problems, heart diseases, lifestyle factors.

- studies have shown that just listening to music every day, can contribute to better recovery after a stroke
- The incorporation of music in the recovery of upper limbs leads to the apparition of positive effects that are not present in the therapy without music
- music therapy is beneficial in recovery of motor skill. Has been demonstrated to improve the ability of waling to the patients with CVA, application of music therapy (chanting songs), combined with the recovery through traditional methods.
- music therapy increases the speed, precision and smoothness of movements in patients who have suffered a STROKE

### References

- Adams HP, Bendixen, Kappelle LJ et al., 1993, Classification of subtype of acute ischemic stroke. Definitions for use in a multicenter clinical trial. *Stroke*, 24(1), 35-41.
- Adams RD, Victor M, Ropper A., (Eds.). 1997, Principles of neurology (6th ed.). New York: McGraw-Hill, Health Professions Division
- Alexander M., 1997, Medical, neurologic, and functional outcome of stroke survivors. In V. Mills, J. Cassidy & D. Katz (Eds.), *Neurologic rehabilitation: a guide to diagnosis, prognosis, and treatment planning* (pp. 29-57). Malden, Mass: Blackwell Science.
- Australian Institute of Health and Welfare. 2004, Heart, stroke and vascular diseases: Australian facts 2004. Canberra: National Heart Foundation of Australia
- D'Esposito M, 1997, Specific stroke type. In V. M. Mills, J. W. Cassidy & D. I. Katz. (Eds.), *Neurologic rehabilitation: a guide to diagnosis, prognosis, and treatment planning* (pp. 59-103). Malden, Mass: Blackwell Science
- Kane LA, Buckley KA, 2004, Functional mobility. In G. Gillen & A. Burkhardt (Eds.), *Stroke rehabilitation: a function-based approach* (2nd ed., pp. 271-311). St. Louis, Missouri: Mosby
- Jeong S, Kim MT, 2007, "Effects of a theory-driven music and movement program for stroke survivors in a community setting". *ApplNursRes* 20 (3): 125-31. doi:10.1016/j.apnr.2007.04.005. PMID 17693215.
- Kim SJ, 2005, The Effects of Music on Pain Perception of Stroke Patients During Upper Extremity Joint Exercises. *Journal of Music Therapy*. 42(1) 81-92
- Mohr JP, Foulkes MA, Polis AT, 1993, Infarct topography and hemiparesis profiles with cerebral convexity infarction: Stroke Data Bank. *Journal of Neurologic Neurosurgery Psychiatry*, 56, 344-351.
- Nayak S et. al., 2000, Effect of music therapy on mood and social interaction among individuals with acute traumatic brain injury and stroke. *Rehabilitation Psychology* 45(3) 274-283.
- Sarkamo T., Tervaniemi M., Laitinen S., et al., 2008, Music listening enhances cognitive recovery and mood after middle cerebral artery stroke. *Brain*. 131(3), 1-11
- Sarkamo T., Pihko, E., Laitinen, S, et al., 2010, Music and speech listening enhance the recovery of early sensory processing after stroke. *Journal of Cognitive Neuroscience*, 22, 2716-2727.
- Schauer M, Mauritz KH, 2003, "Musical motor feedback (MMF) in walking hemiparetic stroke patients: randomized trials of gait improvement". *ClinRehabil* 17 (7): 713-22. doi:10.1191/0269215503cr668oa. PMID 14606736.
- Schneider S, Schönle PW, Altenmüller E, Münte TF (2007). "Using musical instruments to improve motor skill recovery following a stroke". *J. Neurol.* 254 (10): 1339-46. doi:10.1007/s00415-006-0523-2. PMID 17260171.
- Sims J, Korowhertz W., 2004, Subtypes of ischemic stroke. In K. Furie & P. J. Kelly (Eds.), *Handbook of Stroke Prevention in Clinical Practice* (pp. 19-34). Totowa, New Jersey: Humana Press.
- Stedman's Medical Dictionary. (27 ed.) 2000, Philadelphia: Lippincott Williams & Wilkins
- Tunstall-Pedoe H. (Ed.). 2003, MONICA monograph and multimedia sourcebook: world's largest study of heart disease, stroke, risk factors and population trends 1979-2002. Geneva: World Health Organization
- Wilson S, Parsons K, Reutens D, 2006, Preserved Singing in Aphasia: A Case Study of the Efficacy of melodic intonation therapy. *Music Perception*. 42(1) 23-36.
- Yoo J, 2009, The role of therapeutic instrumental music performance in hemiparetic arm rehabilitation. *Music Therapy Perspectives*, 27 (1), 16-24.
- \*\*\* www.stroke.org.uk, Stroke Association – April 2012, Stroke in younger adults.



Science, Movement and Health, Vol. XV, ISSUE 1, 2015  
January 2015, 15 (1): 35-40  
Original article

## THE CORRELATION BETWEEN ISCHEMIC STROKE, ATRIAL FIBRILLATION AND EARLY NEUROREHABILITATION

GOGU ANCA<sup>1</sup>, LUPU MIRELA<sup>1</sup>, PARV FLORINA<sup>2</sup>

### Abstract

**Objective.** Atrial fibrillation is the most common cause of ischemic strokes. The inadequate therapy of this heart arrhythmia can lead to brain damages associated with paralysis and various other symptoms depending on the affected territory. The early kinetotherapy and the appropriate treatment play the major role in the recovery of these patients.

**Methods.** Between January 2013 – November 2014 we hospitalized on emergency 186 patients with acute ischemic stroke caused by deficient treatment of the atrial fibrillation. The demographic data, clinical, imagistic (cerebral-CT, cerebral-MRI, extracranial ultrasound, minimum two ECGs, Echocardiography), paraclinic data, as well as risk factors (hypertension, diabetes mellitus, valvulopathies, carotid stenosis, diffuse carotid atheromatosis, dyslipidemia, obesity, chronic renal insufficiency, polyglobulie, cancer), treatment, kinetotherapy were all considered.

**Results.** We studied 186 patients, 127 females and 59 males (68,28 % versus 31,72 %). Most of the patients are with permanent atrial fibrillation (172 cases, 92,47 %). The biggest number of our cases were treated with antiplatelet therapy for atrial fibrillation (88 cases, 47,31 %), followed by anticoagulant therapy (77 cases, 41,4 %), antiplatelet + anticoagulant therapy (14 cases, 7,53 %), dual antiplatelet therapy (5 cases, 2,69 %), dual antiplatelet + anticoagulant therapy (2 cases, 1,07 %). According to the age group, the highest frequency of ischemic stroke is between 70-79 years old (78 cases, 41,94 %). More than 50 % had an inappropriate international normalized ratio. Valves insufficiency were diagnosed at 66 cases, 35,48 %, as well as prosthetic heart valves and dilated cardiomyopathy (21 cases, 11,29 %), atrial trombi (5 cases, 2,68 %), hypertension (167 cases, 89,78 %), diabetes mellitus (46 cases, 24,73 %), carotid stenosis (6 cases, 3,22 %), diffuse carotid atheromatosis (17 cases, 9,13 %), dyslipidemia (39 cases, 20,96 %), obesity (13 cases, 6,98 %), polyglobulie (21 cases, 11,29 %), chronic renal insufficiency (40 cases, 21,5 %), cancer (8 cases, 4,3 %). We have taken into consideration also the dimension of the affected cerebral territory, as well as the muscular deficiency caused by it (123 cases, 66,13% with large territory affected and total muscular deficiency and 63 cases, 33,87% with small territory affected and partial muscular deficiency or not at all). After 14 days of kinetotherapy and appropriate treatment, 112 cases, 60,21 % had a favorable recovery, 50 cases, 26,88 % remained stationary and 24 cases, 12,90 % died.

**Conclusions.** Incorrectly treated atrial fibrillation causes lots of ischemic strokes nowadays, especially in women between 70-79 years old, associated with various risk factors. Strokes lead to depression and social disability, there's why kinetotherapy initiated in 48 hours after the stroke onset and continued till 6 months has an important role in the rehabilitation of the muscular deficiencies and quality of life.

**Key Words:** Kinetotherapy, stroke, atrial fibrillation, antiplatelet/ anticoagulant therapy.

### Introduction

Atrial fibrillation is a very commonly heart arrhythmia which can be paroxysmal, persistent or permanent. Can be diagnosed at normal patients especially after stress, surgical interventions, effort or alcoholic intoxication. Also hypoxia, hypercapnia or metabolic and hemodynamic disturbances can lead to this arrhythmia. Permanent atrial fibrillation can be produced by various cardiopathies (rheumatismal, nonrheumatismal valvulars, hypertensive, BPCO), tyretotoxicity (Avram et al, 2006).

It is well known that patients with atrial fibrillation have of a higher risk of thromboembolism causing especially strokes with a high impact in the quality of life. Patients with paroxysmal atrial fibrillation experience a similar risk of thromboembolism compared to patients with persistent atrial fibrillation. Therefore, consensus guidelines

recommend anticoagulant therapy in those at risk for thromboembolism irrespective of atrial fibrillation classification (Hsu et al, 2014).

Not all patients with atrial fibrillation can receive anticoagulant therapy because of the associated pathologies or high risk of bleeding. There is why they are treated only with antiplatelet therapy. The purpose of our study was to compare the prevalence of acute strokes caused by atrial fibrillation depending on the antiplatelet/anticoagulant therapy.

Acute strokes represents one of the main causes of mortality and morbidity in the world. The most common substrate for cerebral embolism in older patients is atrial fibrillation. There are also a lot of risk factors such as hypertension, diabetes mellitus, valvulopathies, carotid stenosis, diffuse carotid atheromatosis, dyslipidemia, obesity, chronic renal insufficiency, polyglobulie, cancer which, associated

<sup>1</sup> Department of Neurology, University of Medicine and Pharmacy "Victor Babes", Timisoara, ROMANIA

<sup>2</sup> Department of Cardiology, University of Medicine and Pharmacy "Victor Babes", Timisoara, ROMANIA

Email address: agogu@yahoo.com

Received 25.10.2014 / Accepted 21.11.2014

with atrial fibrillation, raise the changes to develop an acute stroke.

The concept “time means brain” refers to the fact that the treatment of the acute stroke is an emergency (Bajenaru 2012).

The second important role in the recovery of the patients with paralysis plays the early kinetotherapy. It should be initiated in 48 hours after the stroke onset and continued till six months because the most rapid recovery takes place in the first few weeks and then the largest amount of recovery occurred within the first three to six months.

**Material and methods**

**Patients:**

Between January 2013 – November 2014 we hospitalized on emergency 186 patients with acute ischemic stroke caused by deficient treatment of the atrial fibrillation. The demographic data, clinical, imagistic (cerebral-CT, cerebral-MRI, extracranial ultrasound, minimum two ECGs, Echocardiography), paraclinic data, as well as risk factors (hypertension, diabetes mellitus, valvulopathies, carotid stenosis, diffuse carotid atheromatosis, dyslipidemia, obesity, chronic renal insufficiency, polyglobulie, cancer), treatment, kinetotherapy were all considered.

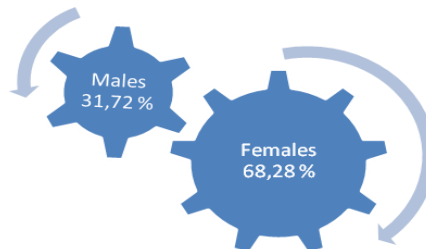
**Investigations:**

- Electrocardiogram (ECG): for each patient we have made a first ECG in the Emergency Unit and another one later. All of them had atrial fibrillation at admission.
- Native Computer Tomography (CT) made in the emergency showed us either the exactly lesions or only indirect signs, but we could exclude hemorrhages.
- Carotid ultrasound was used to diagnose carotid stenosis and diffuse carotid atheromatosis
- Echocardiography was util to diagnose various valvulopathies, prosthetic heart valves, cardiomyopathy, atrial trombi
- Cerebral MRI was useful for us to discover the exact lesions or to monitored the lesions already showed in the cerebral CT
- Blood pressure measurement
- Blood tests: CBC, glycaemia, total cholesterol, creatinine

**Results**

We studied 186 patients, 127 females and 59 males (68,28 % versus 31,72 % ). (Fig.1.)

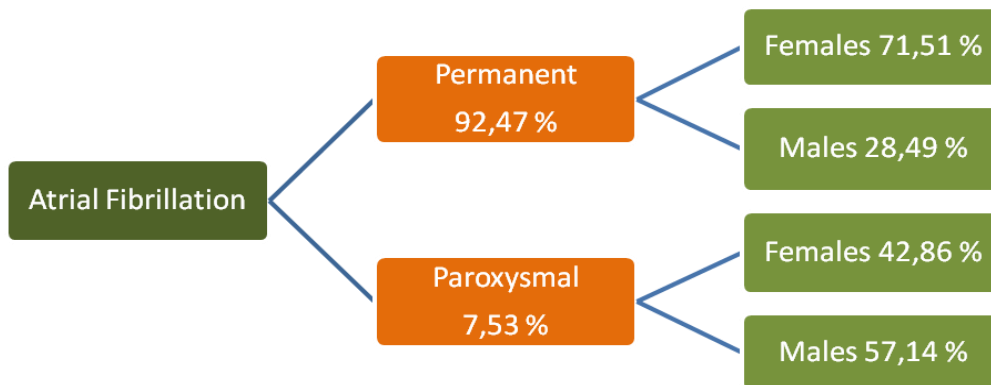
Fig.1. Distribution of cases according to sex



Most of the patients are with permanent atrial fibrillation (172 cases, 92,47 %), 123 females, 71,51 % and 49 males, 28,49 % and only 14 cases, 7,53 % are

with paroxysmal atrial fibrillation, 6 females, 42,86 % and 8 males, 57,14 % . (Fig.2.)

Fig.2. Distribution of the cases according to atrial fibrillation type

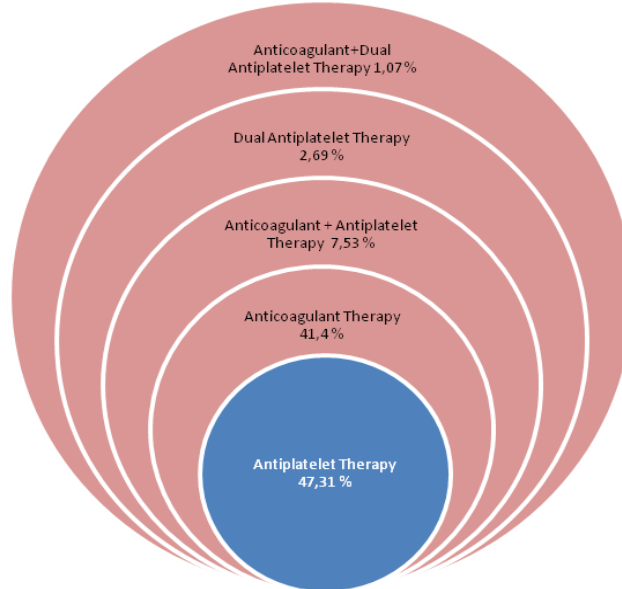




The biggest number of our cases were treated with antiplatelet therapy for atrial fibrillation (88 cases, 47,31 %), followed by anticoagulant therapy (77 cases, 41,4 %), antiplatelet + anticoagulant therapy (14 cases,

7,53 %), dual antiplatelet therapy (5 cases, 2,69 %), dual antiplatelet + anticoagulant therapy (2 cases, 1,07 %). (Fig.3.)

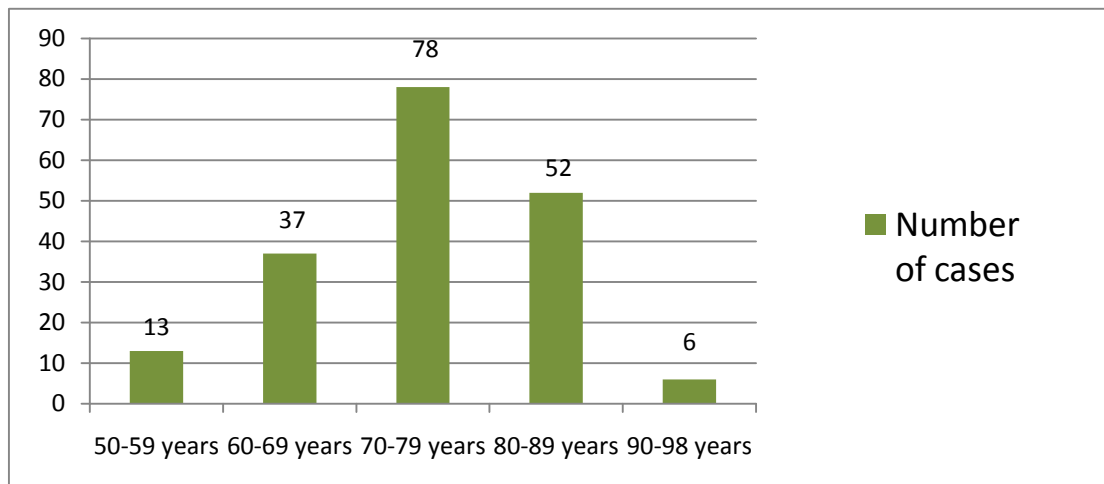
Fig.3. Distribution of the cases according to antiplatelet/anticoagulant therapy



According to the age group, the highest frequency of ischemic stroke is between 70-79 years old (78 cases, 41,94 %), followed by 80-89 years old

(52 cases, 27,96 %), 60-69 years old (37 cases, 19,89 %), 50-59 years old (13 cases, 6,99 %) and 90-99 years old (6 cases, 3,22 %). (Fig.4.)

Fig.4. Distribution of the cases according to age groups



More than 50 % had an inappropriate international normalized ratio. More exactly 48 patients from 83 with dicumarinic treatment (57,83%), 28 females versus 58,33 % and 20 males versus 41,66 %.

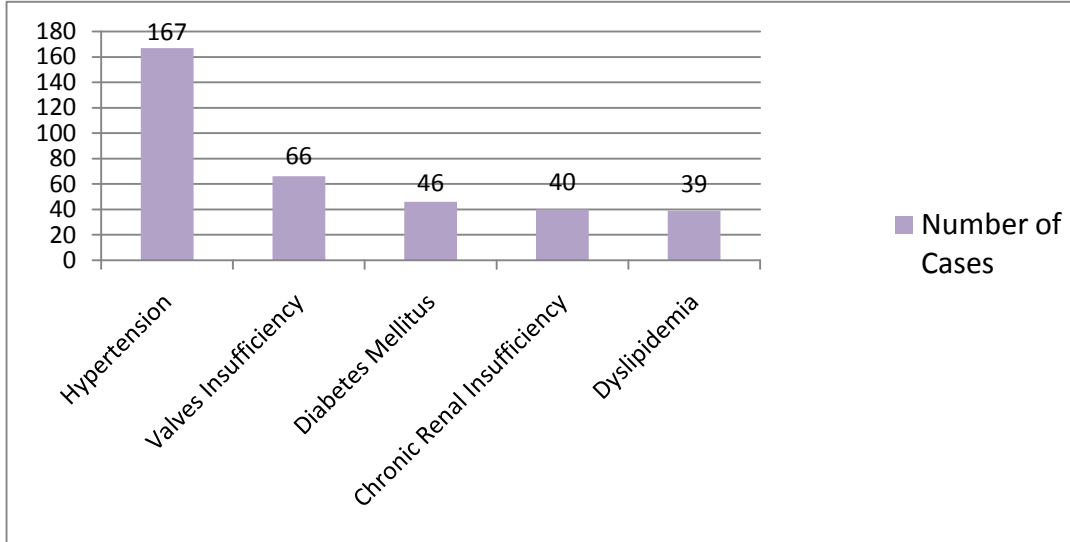
**Valves insufficiency** were diagnosed at 66 cases, 35, 48 %, (40 females versus 60,60 % and 26 males versus 39,39 %), as well as prosthetic heart valves and dilated cardiomyopathy (21 cases, 11,29 % ; 13 females versus 61,9 % and 8 males versus 38,1 %), atrial trombi (5 cases, 2,68 %; 4 females versus 80 %

and 1 male versus 20 %), carotid stenosis (6 cases, 3,22 %; 2 females versus 33,33 % and 4 males versus 66,67 %), diffuse carotid atheromatosis (17 cases, 9,13 %; 13 females versus 76,47 % and 4 males versus 23,53 %), obesity (13 cases, 6,98 %; 9 females versus 69,23 % and 4 males versus 30,77 %), polyglobulie (21 cases, 11,29 %; 19 females versus 90,48 % and 2 males versus 9,52 %), cancer (8 cases, 4,3 %; 5 females versus 62,5 % and 3 males versus 37,5 %).

But 167 cases, 89,78 % had also **hypertension** (117 females versus 70,06 % and 50 males versus 29,94 %) and 46 cases, 24,73 % **diabetes mellitus** (29 females versus 63,04 % and 17 males versus 36,96 %),

**chronic renal insufficiency** (40 cases, 21,5 %; 24 females versus 60 % and 16 males versus 40 %), **dyslipidemia** (39 cases, 20,96 %; 29 females versus 74,36 % and 10 males versus 25,64 %). (Fig.5.)

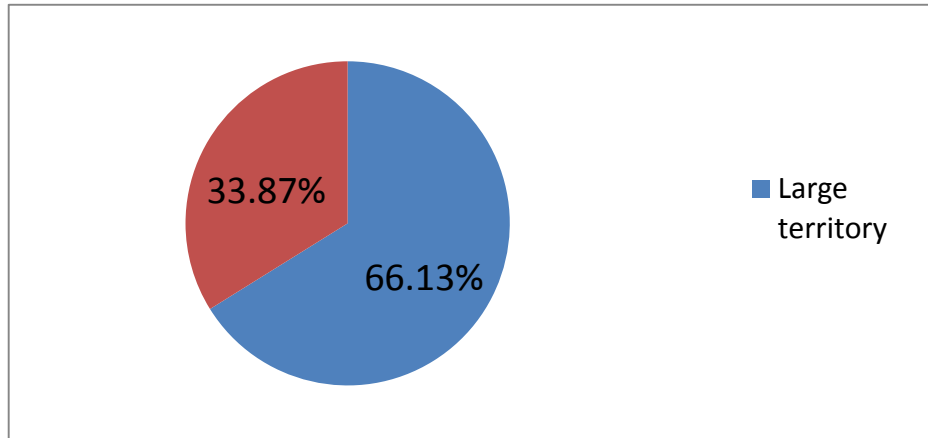
Fig.5. Distribution of the cases according to risk factors



We have taken into consideration also the dimension of the affected cerebral territory, as well as the muscular deficiency caused by it :123 cases, 66,13% (90 females versus 73,17 % and 33 males versus 26,83 %) with large territory affected and total

muscular deficiency and 63 cases, 33,87% (37 females versus 58,73 % and 26 males versus 41,27 %) with small territory affected and partial muscular deficiency or not at all). (Fig.6.)

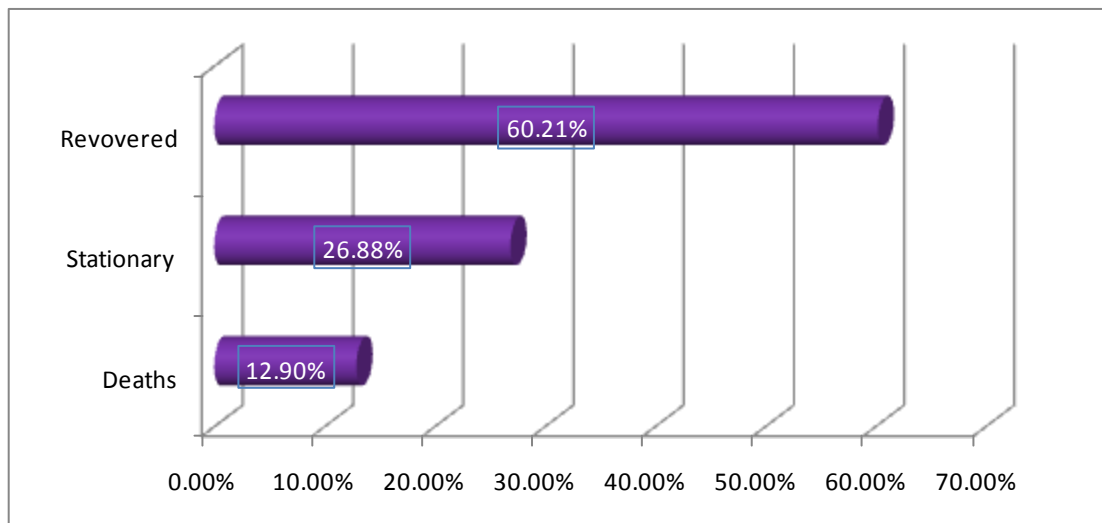
Fig.6. Distribution of the cases according to dimension of the territory affected



After 14 days of kinethotherapy and appropriate treatment 112 cases, 60,21 % had a favorable recovery,

50 cases, 26,88 % remained stationary and 24 cases, 12,90 % died.

Fig.7. Distribution of the cases according to prognostic



### Kinetherapy

Neurorehabilitation is a complex medical process whose purpose is to minimize or to compensate alterations resulting from a brain injury. In the neurorehabilitation process is not only the kinetherapist implied, but also the family of the patient. A particular focus is given to improving mobility and strength, as this is the key to a person's independence.

Rehabilitation of stroke patients, is a complex chain of consistently conducted medical and social measures aimed at rehabilitation, health or possible adaptation to self-service in the presence of a persistent neurological defect. Already in acute stroke patient needs not only to drug therapy and care, but also in the emotional and psychological support for the type of "cautious optimism." It should be explained to the patient a temporary, reversible nature of its existing motor. With relatives patient should discuss the real situation, prognosis, rehabilitation opportunities, the need for hospitalization or appropriate treatment at home, put them in front of clear objectives for the near future (Murashko, 2012).

Impaired motor function after stroke is a major cause of disability in young stroke survivors. The plasticity of the adult human brain provides opportunities to enhance traditional rehabilitation programs for these individuals. Younger stroke patients appear to have a greater ability to recover from stroke and are likely to benefit substantially from treatments that facilitate plasticity-mediated recovery (Stein, 2004).

Approximately one-third of patients with stroke exhibit persistent disability after the initial cerebrovascular episode, with motor impairments accounting for most poststroke disability. Exercise and training have long been used to restore motor function after stroke. Better training strategies and therapies to enhance the effects of these rehabilitative protocols are

currently being developed for poststroke disability (Dimyan, Cohen, 2011)

### Discussions

Atrial fibrillation is a devastating heart arrhythmia, which incorrectly treated, and associated with other risk factors can produce serious brain damages. The consequences of these damages are decreasing significant the quality of life of the affected patients because they can lead to serious disabilities and loss of independence.

To avoid these catastrophes, the scientists are trying to discover the best treatment for this arrhythmia. Although a substantial proportion of patients with atrial fibrillation who have an ischemic stroke are already receiving oral anticoagulation. Sub-optimal levels of anticoagulation and additional etiologies explain, only in part, this failure. Further research is needed to help find adequate therapeutic strategies in atrial fibrillation patients who sustain an ischemic stroke while receiving oral anticoagulation.

The recovery of the stroke patients depends on a number of factors. Firstly the adequate medical treatment, secondly the kinetherapy and finally the optimism of the patients. Also a lot of risk factors should be taken into consideration.

Kinetherapy should be done by a kinetherapist during the hospitalization and then by the family. He should teach the patient's family all the techniques needed to work with each segment of the body and then with the whole body.

Definitely detecting this heart arrhythmia is crucial for each patient and the correct treatment is essential to avoid a ischemic stroke. Otherwise, the consequences are devastating and a big team of medical personal must work together for the neurorehabilitation of these patients.



### Conclusions

Incorrectly treated atrial fibrillation causes lots of ischemic strokes nowadays, especially in women between 70-79 years old, associated with various risk factors.

The ischemic strokes lead to depression and social disability, there's why the correct treatment and kinetotherapy initiated in 48 hours after the stroke onset and continued till 6 months has an important role in the rehabilitation of these patients and in the quality of life.

### References

Avram R, Branzan L, Ivan V, et al, 2006, Elemente de Clinica Medicala, p. 257.

Hsu JC, Chan PS, Tang F, et al, 2014, Differences in Anticoagulant Therapy Prescription in Patients with Paroxysmal Versus Persistent Atrial Fibrillation, Abstract-Background.

Bajenaru O, 2012, Ghiduri de Diagnostic si Tratament in Neurologie, p.12.

Murashko NK, 2012, Stages of kinetotherapy and therapeutic massage for long time bedridden patients, Abstract

Stein J, 2004, Motor recovery strategies after stroke, Abstract.

Dimyan MA, Cohen LG, 2011, Neuroplasticity in the context of motor rehabilitation after stroke, Abstract.



## DIFFERENCES AND SIMILARITIES IN CURRICULUM AND ASSESSMENT IN PHYSICAL EDUCATION IN EASTERN EUROPEAN STATES

ICONOMESCU TEODORA MIHAELA<sup>1</sup>, ALEXE DAN IULIAN<sup>2</sup>

### Abstract

*Objective.* Physical education and sport have many objectives like getting a good health, a good physical development, a healthy lifestyle and not at least, pleasure to practice exercises independently or in the team. Most studies highlight the importance of physical education classes without making details about a wide range of activities which are included in the curriculum at primary and secondary level.

*Methods.* Therefore, at the basis of this study, we tried to realize the analysis of the activities contained in the physical education curriculum in South-East Europe.

*Results* Following the analysis of country specific documents we could see that physical education activities are different from one country to another and have a different weight in primary and secondary levels. Most of optional activities are at school's option and contents the same activities as those which are mandatory. Important differences are notice at the assessment process, each country having specific methods of evaluation for both levels studies, primary and secondary.

*Conclusions.* The difference seen in the objectives is also due to the social and economic development of each of the countries analysed, and to the infrastructure made available to schools. That is why it is our opinion that the central decision maker should first consider the school infrastructure and then propose the sport activities to take place.

*Key Words:* Curriculum, objectives physical education, physical education, assessment.

### Introduction

Physical education is at the core of a comprehensive approach to promoting physical activity through schools (Pastorek, 2009). Defining the concept of curriculum and its analysis poses several problems in point of theory and methodology, which reflects the complexity of the issue, i.e. the feasible, organized and actually implemented education, with its numerous components, conditions, factors, perspectives, faces, etc. In most definitions, the essential defining notes of the curriculum converge towards the following: the entire system of learning experiences of the students under the auspices of a school; (Doll, 1988), any educational activity designed in school and aiming at a purpose taking place inside and outside school. (Homes, as per Ungureanu, 1999). The interpretation of the definitions describing the curriculum leads to the fact that the theory of the curriculum requires giving up the traditional pair teaching-learning, seen as a sequence of activities involving transmitting and receiving information. The curriculum means a path to cover, organizing and triggering learning, transforming the student in an adaptive manner.

### Materials and Methods

An objective is the means used to archive a goal. Objective are the observable, measurable and quantifiable statements that guide the teacher in selecting appropriate educational strategies that help obtain the goal of the program. Quality physical education program establish clearly define objectives and the content of the program reflects constant effort

toward attainment of these objectives (Gallahue & Donnelly, 2003)

The complex situation, fast changes and various educational traditions make it difficult to systematise the curricular reform of present-day PE. The objective of the present paper is to describe the contents of the PE curriculum in the countries of South-East Europe, the differences and similarities of the subjects studied in the primary and secondary cycle, as well as those in the extracurricular activity, and to explain curricular dissimilarities in the selected countries. Another objective was also to study the assessment methods of the PE content in the primary and secondary cycle in the selected countries. Educational reform initiatives include aligning assessment to a program with a fully integrated teaching process which provides meaningful information about student learning and achievement. The transformation of assessment programs is moving toward performance-based assessments that focus on high-priority objectives and significant outcomes for students. The primary goal of assessment should be the enhancement of learning, rather than the documentation of learning for the purpose of determining a grade (Pastorek, 2009).

### Purpose

The purpose of this analysis is to focus on basic information on the differentiated curriculum in the primary and secondary school, and the PE assessment and development in the selected countries, thus allowing further comparisons with the planned reforms in the field of physical education.

<sup>1</sup> Department of Games of Sport and Physical Education, Faculty of Physical Education and Sport, University „Dunarea de jos“, Galati, ROMANIA

<sup>2</sup> Department of Physical Therapy and Occupational Therapy, "Vasile Alecsandri" University of Bacău, ROMANIA

Email address: ticonomescu@ugal.ro

Received 19.10.2014 / Accepted 29.11.2014



## Methods

The study of vast literature has led to a wide range of primary and secondary sources, governmental and non-governmental reports, international and national articles in academic and professional journals, secondary source texts, including qualitative studies of continental and regional PE.

### Curricular objectives of physical education

The main objectives of physical education in school cannot be limited to improving physical skills, as it covers a wider range of abilities, some emotional and social in nature, some others cognitive processes, motivation and moral concepts. That is why all the countries considered in the study identify as the main objectives the youths' harmonious physical, personal and social development. Consider tracking your students' progress to help motivate them and to let them see the progress they are making. (Alberta, 2006). The modern curricular reform allows teachers and students to choose different ways of teaching process depending on goals, preferences, aspirations, desires and capacities of students, connected to the main objectives of physical education.

#### *Harmonious body development*

Due to the very nature of physical education, throughout the classes in this subject, major importance is given to physical and motor skills. The pupils are thus taught to develop their physical abilities, to acquire better coordination, faster reactions, higher speed, endurance, suppleness, balance and strength. Some countries refer to the opportunity of acquiring additional skills, such as the right posture and regular breathing. The physical education lessons aim at developing the motor skills related mainly to certain sport branches and movement games. Another concern of physical education is to compensate for the hours spent in a static position during the other classes, and generally to discourage a sedentary lifestyle. Physical development is closely linked to promoting a healthy lifestyle, including by means of developing the pleasure of exercising throughout the entire life. Almost all countries stress the importance of this type of activity to health, in order to increase life quality. In school pupils have to be offered the opportunity to learn more on the factors affecting their motor skills. Ultimately, physical education provides them with a framework to independently test their physical ability, experiment with certain activities and practice in their free time if they want.

#### *Personal development*

Physical education may contribute to the pupils' personal development by helping them improve their physical self-awareness and the confidence in their own physical skills, together with a general feeling of physical well-being, and thus, higher self-confidence and self-esteem. Also, physical education develops their moral and volitional skills such as will, the sense of responsibility, patience and courage. Thus they become more realistic in regard to their own

physical abilities, decisions and actions, learning to accept themselves as they are, as well as tolerate the differences in comparison to others. The health benefits of physical exercise also contribute to well-balanced mental skills. Physical education aims at developing a stable assertive behaviour, in a variety of situations, allowing pupils to discuss and discover means to successfully face negative emotions and stress.

#### *Social development*

Social development comprises a wide range of skills and abilities. Many countries stress the value of integrating pupils in society, cultivating and developing solidarity, social interaction, team work and team spirit, honesty, rule-observance and respect for others, as part of the maximum development of the pupils' personality. Certain countries also stress the importance of physical education to sport in society. Hungary emphasizes the fact that young people should follow and attend sporting events and also get informed about sport on a regular basis.

Process of globalization, increasing global communication systems, marketing and global sports phenomenon cannot equalize national standards therefore development of universal standards is of no help, as PE and sport always depend on interpretation a national and local level as well as the specific policies regarding this subject (Burger, Housner, Lee, 2008; Fisher, 2003; Pühse & Gerber, 2005).

### Trends, issues and controversies of the curriculum physical education

All countries rely on the independent study of the mother language, mathematics, physical education, education through art, natural and social sciences. However, the name PE differs from a country to another. In Hungary and Romania, the name of the subject is Physical Education and Sport, in Slovenia it is Physical Education (i.e. Sport), in Croatia Physical education and culture for health. (Rodic, 2002) The goals of the subject vary from a country to another, but still they share certain characteristics, such as developing physical skills, acquiring moving competences and elementary theoretical knowledge.

The central authorities in many countries include in the curriculum of the initial years of primary school the main basic motor skills (acquired all throughout life), such as walking, running, jumping, catching, throwing. Little by little, the curriculum builds on these basic skills, extending the sphere of motor skills to include specific motor skills that children possess in practicing various sports. The most common are shown in Tables 1 and 2, with a clear-cut distinction between compulsory and optional activities, which are sometimes left at the decision of school in certain educational systems. Besides, there are no significant differences between primary and secondary education. In almost a third of the educational systems both types of schools are allowed to decide which activities are compulsory. Schools and teachers thus decide which physical activities are most likely to

result in desirable effects. Although in some countries schools are significantly autonomous, there are also compulsory activities which are prescribed, recommended or carried out frequently, thus being shown in Table 2. An issue that is becoming more and more relevant in many countries is the relevance to the outer world, the quality of school and the PE study programs. In the context of the educational reforms, associated to philosophical and pedagogical changes, and in response to the active lifestyle concepts in the process of learning throughout life, certain curricular changes have occurred in certain parts of the south-Eastern region. From this angle the curricular objectives in PE are redefined to the purpose of getting integrated in the larger concept of lifelong education, including in obtaining a state of well-being. Yet, there are still tendencies towards those activity programs related to sport performance (for each country) as apparent in the time span devoted to games, athletics

and gymnastics, which account for more than 70% of the PE curriculum for both levels, i.e. primary and secondary (Table 1). Such an orientation is against the social tendencies outside school, thus posing problems of meaning and relevance to the young people's lifestyle, as well as raising quality issues for the programs which are planned and implemented. Among the compulsory activities of school PE, games are the most common. Certain countries report that the games planned in the curriculum are ball games. Others prefer movement games which are specific to the skills necessary in daily life, such as jump, displacement with an object, throw, catch and throw. The next in order of frequency are gymnastics, athletics and dancing.

Other activities shown in Tables 1 and 2, as reported by certain countries, fall mainly in the area of martial arts and water sports. These activities are grouped under the heading „OTHERS”.

Table 1 Compulsory activities in the PE curriculum (source European Commission, 2013)

Activities in the PE	BG	EL	CY	HU	HR	RO	SI
Athletics		●	●	●	●	●	●
Dancing		●	●	●	●	●	●
Games	●	●	●	●	●	●	●
Gymnastics	●	●	●	●	●	●	●
Health and fitness							●
Leisure time activities			●				●
Swimming		●		●			●
Winter sports							●
Others					●		

primary education → ● ← secondary education  
 BG-Bulgaria, EL-Greece, CY-Cyprus, HU-Hungary, HR-Croatia, RO –Romania, SI-Slovenia

Table 2: Optional activities in the PE curriculum (European Commission, 2013:20)

Optional activities in the PE	BG	EL	CY	HU	HR	RO	SI
Athletics							●
Dancing			●				●
Games			●				●
Gymnastics							●
Health and fitness	●						●
Leisure time activities	●						●
Swimming	●		●				●
Winter sports							●
Curriculum decided by the school			●	●	●	●	●
Others	●						

primary education → ● ← secondary education  
 BG-Bulgaria, EL-Greece, CY-Cyprus, HU-Hungary, HR-Croatia, RO–Romania, SI-Slovenia

In Hungary compulsory activities are based on developing the children's psychosomatic state and their interest in games, improving their movement skills and developing the cult for physical activities. This involves developing basic motor skills suitable for activities of motor and sport learning, stressing the motor skills and solving motor skill issues specific to children. The content of the curriculum is divided into

four objectives as follows: harmonious corporal development (various life situations, breathing exercises ending on music, a system of movement-based activities and exercises for the well-being of the body), development of the interest in an active lifestyle (content related to acquiring various natural forms of movement in different circumstances), motor skill development (influencing the development of basic and



specific skills) maintenance of movement requirements (systematic interest in a hygienic lifestyle and physical exercise).

In Slovenia PE objectives include optimal physical and motor development, as well as functional development abilities, acquiring various natural forms of movement, play and sport, acquiring the pleasure of practicing sports, game education, together with the introduction of theoretical knowledge. In the first two grades, pupils learn and acquire natural forms of movement and games, athletics, gymnastics, swimming, dancing, ball games, picnics and trips. Moreover, the 4th, 5th, 6th grades continue the acquisition of natural movement forms, focused on general training and games. Pupils learn athletics, rhythmic gymnastics through dance, basketball, volleyball, handball, mini football, swimming and certain water-related activities, skiing and other winter activities. In addition, they go on picnics and mountain trips.

In Croatia the curriculum is meant to develop physical activity, sport and technical education by

connecting physical education to life and the workplace in general. The curriculum includes natural movement forms (walking, jumping, throwing and catching, pulling and pushing, balance, etc.), apparatus exercises, floor exercises, balance exercises, games, rhythmic exercises, and folk dances. The 4th grade curriculum also includes athletics and football, as well as the threshold educational requirements to be assessed.

In Romania the curriculum is based on the main PE objectives, gradually developing motor skills (walking, running, throwing and catching), applicative-utilitarian skills (weight carrying, climbing, jumping, escalade), and motor skills specific to sports (athletics, gymnastics and sport games). The content diversifies at secondary level, focusing on learning several sport games according to the logistics of each school. Optional programs provided alternatively, are formal in character, as their implementation requirements cannot be met cumulatively as stipulated in the very curriculum.

Table 3 PE curriculum activities areas in primary and secondary schools in Europa(%) (Hardman, 2008)

Activity Area	Primary Schools		Secondary Schools	
	Countries %	Curriculum %	Countries %	Curriculum %
Games	97	41	100	42
Gymnastics	97	17	100	13
Dance	80	78	74	5
Swimming	80	7	74	6
Outdoor adventure	71	4	69	7
Track & Field	94	14	100	17
Other	51	9	63	10

By comparison with the study of Hardman (2008) table 3, it may be seen that the areas of the PE field are not too differentiated from the ones shown in Table 1, the only one missing being athletics and health and fitness as compulsory activities for both educational levels. Thus, it may be concluded that within 2008-2012 the PE curriculum underwent changes to adapt to the social market.

### Educational policy in selecting certain compulsory activities

Although East-European schools have included in the curriculum certain physical activities and sports in the past few decades, the reasons behind their choice are not very clear. The countries usually stress the value of long-term commitment in practicing physical exercise.

Physical education is seen as a means of inspiring young people and children to experiment with various activities, so that to be motivated to enjoy the independent practice of physical exercise throughout life. They should dispose of the infrastructure and the equipment necessary to teach these physical activities. The existence of an adequate sport infrastructure at the level of the local community may also increase the opportunity to practice organized physical activities

and improve their quality. The central authorities in some countries prescribe compulsory activities for the physical education classes, while other countries in the same region the schools are at liberty to choose these activities. There is also a third category of countries providing the possibility to adopt both versions of curricular proposals. Yet, all countries select compulsory activities according to a set of criteria considered significant. The arguments of educational policy or the reasons behind choosing activities are based on curricular objectives and the results of research. Irrespective of the decision level the systems of the countries under study select physical activities considered as the most adequate to reaching their goals. Certain countries mention specific reasons behind selecting certain compulsory physical activities, such as cultural, historical or performance traditions. These reasons are also reflected in teaching traditional dances and games, rooted in the society's culture, as well as traditional sports. The evolution of the new sport subjects or of the subjects considered fashionable may also motivate pupils in practicing physical activities.

### Pupils' assessment
















In all European countries, the pupils' involvement, progress and development through





physical education are monitored and assessed periodically, throughout the school year. However, the assessment methods may vary, according to the country and education level. This section deals with the formative and summative methods which are the most commonly used. Besides, the main assessment tools, especially designed for physical education, are described. Physical education is compulsory, both levels in the educational systems of all the countries included in the study. In most cases, the pupils' progress in the field of physical education is assessed

like in any other subject. Most countries issue clear recommendations on the assessment methods to be used in school-level physical education. According to the countries under study, the most common assessment methods in physical education are the formative and the summative one. Formative assessment is mainly qualitative and descriptive. It identifies the results of learning and the pupils' performance during a certain period, as well as anticipating the progress they may make.

Table 4 Assessment in PE (source European Commission, 2013)

Assessment methods	BG	EL	CY	HU	HR	RO	SI
Formative assessment							
Summative assessment							
Scales of central assessment							

 primary education →  ← secondary education  
 BG-Bulgaria, EL- Greece, CY- Cyprus, HU- Hungary, HR- Croatia, RO – Romania, SI- Slovenia

In Cyprus, the formative assessment in lower secondary education relies on the following criteria: the progress made over a period of time; active and positive participation in the physical education classes; and the pupils' attitudes towards the physical education classes and during the exercises for sport and health.

In the lower primary and secondary educational system in Slovenia, during the school year and in all the stages of the learning process, teachers apply formative assessment monitoring the physical, motor and functional development of their pupils, and their command of various sporting skills. The involvement in the extracurricular activities and the results registered in other sports competitions contribute to the assessment of the pupils' activity. On the other hand, summative assessment is usually performed by grades, expressed by numbers or letters, aiming at performing activities or meeting requirements for a given period of time.

In the lower secondary education in Greece, physical education teachers assess pupils during the lesson or on the basis of short physical education tests they have to carry out. The time allotted to assessment should be as short as possible so that not to shorten the time devoted to teaching. The grade for the annual performance in physical education is the average of the grades on the three terms.

Although half of the countries use both formative and summative assessment methods in physical education at both educational levels under analysis, it seems that the summative assessment is the most common, according to Table 4. Some countries use summative assessment as unique method in primary education and lower secondary education, as it happens in Bulgaria. In other countries using summative assessment in primary education (see Table 4), grades are given in the first year of the level in question. This is the case in Greece, Hungary and Slovenia. During these years, formative assessment is used regularly, being later combined with summative

assessment. As previously shown, summative assessment tends to use grades applicable to all the other subjects in the curriculum. It is not unusual that schools develop specific assessment tools for physical education to assess the results of learning in this particular subject, as accurately as possible. Such tools are usually under the form of a scale made up of the list of sports activities, the description of the desired results of the learning process, and the expectations regarding performance, as well as the grades on which assessment relies.

Romania and Slovenia - secondary education, have created central assessment scales, in order to provide a standard assessment for the entire physical education system in the country, and also in order to allow the comparison of the results of the learning process on a national level.

### Conclusions

From the analysis of the data it may be concluded that in Eastern Europe the curricular physical education activities differ at primary and secondary education level. The compulsory activities found in each curriculum include a common group, common to all countries, consisting of track and field, gymnastics, games, and a group only certain countries studying health and physical fitness, swimming, outdoor adventure/ leisure time activities, and winter sports. An additional reason why these activities differ from one country to another consists of the different PE objectives, some of them stressing the development of motor skills, and some other the achievement of a state of physical well-being throughout the entire life. The difference seen in the objectives is also due to the social and economic development of each of the countries analysed, and to the infrastructure made available to schools. That is why it is our opinion that the central decision maker should first consider the school infrastructure and then propose the sport activities to take place.



In all the countries included in the study the compulsory activities should be diversified, both at primary and secondary level, increasing the focus on obtaining a state of well-being by practicing physical exercise and lifelong learning, thus reaching a curriculum centred on an active lifestyle. The assessment of the physical education activities is also different from one country to another. Most countries employ the formative and summative assessment, but there are no assessment scales. The lack of assessment scales may lead to the pupils' losing interest in obtaining performance or acquiring a sport skill. The assessment scale allows pupils to compare their own performance with the best performance they can achieve, as well as the model of a sport skill. The assessment scale is also useful in comparing the level of the learning results on a national level and thus in re-thinking the PE curriculum.

### References

- Alberta Education, 2006, Daily physical activity: a handbook for grades 1–9 schools, Retrieved April, 2014 from Alberta Education Web site: <https://education.alberta.ca/media/318500/handbook.pdf>.
- Burger S, Housner L, Lee A, 2008, Curriculum alignment: a view from physical education teacher education. *Journal of Physical Education, Recreation and Dance*, 79(7), pp 44-49. DOI:10.1080/07303084.2008.10598215.
- Doll R, 1988, Curriculum Improvement, Harcourt, New York: Brace and World Publish pp 23.
- European Commission/EACEA/Eurydice, 2013, Physical education and sport in Europe schools. Rapport Eurydice, Luxemburg: <http://eacea.ec.europa.eu/education/eurydice>, pp.17-20, 32, DOI: 10.2797/22564.
- Fisher R, 2003, Physical education in Europe: Policy into practice. In K. Hardman (Ed.), Sport science studies, physical education: deconstruction and reconstruction – issue and direction, ICSSPE, Berlin, Schorndorf: Hofmann. pp 137-152.
- Gallahue DL, Donnelly FC, 2003, Developmental Physical Education for All Children, 4th Edition, Human Kinetics, pp 10.
- Hardman K, 2008, The situation of physical education in school: a European perspective, *Human Movement*, 9(1), pp 5-18, DOI: 10.2478/v10038-008-0001.
- Pastorek PG, 2009, Physical Education. Handbook Grade-Level Expectations, Louisiana Department of Education, pp.11, 16.
- Pühse U, Gerber M, (Ed.) 2005, International Comparison of Physical Education – Concepts, Problems, Prospects. Aachen: Mayer & Mayer.
- Rodic N, 2002, Development of Primary Physical Education Curricula, Proceedings of the 6th International Symposium Interdisciplinary Regional Research, Novi Sad, pp.1-6.
- Ungureanu D, 1999, Theory of curriculum, Timișoara: Mitron Publishing House, pp.112.
- [www.mon.bg/?h=downloadFile&fileId=673](http://www.mon.bg/?h=downloadFile&fileId=673)
- <http://www.nefmi.gov.hu/kozoktatatas/archivum/testnevel-es-sport>
- [http://www.masht.gov.net/advCms/documents/TJELESNI\\_ODGOJ\\_I\\_SPORT\\_10.pdf](http://www.masht.gov.net/advCms/documents/TJELESNI_ODGOJ_I_SPORT_10.pdf)
- [http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/podrocje/os/prenovljeni\\_UN/UN\\_sportna\\_vzgoja.pdf](http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/podrocje/os/prenovljeni_UN/UN_sportna_vzgoja.pdf)
- [http://www.edu.ro/index.php/articles/curriculum/c539+591+/-](http://www.edu.ro/index.php/articles/curriculum/c539+591+/)
- [http://www.moec.gov.cy/analytika\\_programmata/nea-analytika-programmata/proscholiki\\_ekpaidefsi.pdf](http://www.moec.gov.cy/analytika_programmata/nea-analytika-programmata/proscholiki_ekpaidefsi.pdf)
- <http://www.minedu.gov.gr/aristoteleio-panepistimio-thessalonikis/tmima-epistimis-fysikis-agogis-kai-athlitismoy.html#>

Science, Movement and Health, Vol. XV, ISSUE 1, 2015  
January 2015, 15 (1): 47-51  
*Original article*

## SURVEY BASED ON A QUESTIONNAIRE TO ASSESS THE TRAINING LEVEL OF REFEREES IN THE MALE AND FEMALE NATIONAL BASKETBALL LEAGUE

MARTINESCU FABIANA<sup>1</sup>

### Abstract:

**Objective.** The aim of the experiment is to verify in practice the current level of training of the National League referees and finding their views on the role, importance and how to optimize the training process for them.

**Method.** The questionnaire contains 13 questions specifically designed, which should include both issues regarding the physical training and the technical and psychological one, and highlight the importance of umpirage in modern basketball game, be able to observe the training of referees, as well as their gender. These questions were applied on 31 referees from LNB (National Basketball League), given the fact that inside LNB there are 55 referees.

**Results.** We can assert that the work of a referee to become the best is similar to the work of a top player. He must have a significant amount of talent, and we mean by talent the „feeling of the game”, which is indispensable for a referee who reaches the highest levels.

**Conclusions.** We can point out that at this time the tests applied to the basketball referees are hardly relevant to the level of umpirage, of the training and performance of referees for best results. We wanted to form a coherent notion about the training of referees for game and competition.

**Key words:** basketball, referees, umpirage, training.

### Introduction

In recent years the subject of umpirage was studied increasingly more, this subject being considered a starting point of the wish to revolutionize more and more basketball as a team sports game. Just like in the case of the athletes also the referees who want to achieve performance must follow training programs throughout the entire year.

A good insight of the rules does not necessarily make a good referee. „When a referee realizes that he is responsible to see all the players on the field, refuses to be intimidated by players, coaches or fans and give the game his full judgment's flexibility, and implements knowledge with skill and courage, only then he can be considered worthy of his name” (FRB. 1995)

Umpirage is an open field. But it is understood that in a job as exact as umpirage, where one is permanently observed and criticized only the best get to be referees. You must have the appropriate attitude towards the game and qualities needed, few but which must be strong enough to get over all obstacles with firm determination to the top. Good view, a sense of fair-play, courage of opinions, humour and diplomacy are essential.

„ A good referee must have the ethics of a doctor, the blood of a thief, the physical qualities of an athlete, be outgoing and devoted to the religion of umpirage.”(FRB, 1995)

In the work that interests us, namely assessing referees, these instruments such as try-outs, standard tests, battery of tests, are particularly useful. In the medium and long term planning of referees' performance, an ingenious and elaborate work is required, which is determined by carrying out the

conditions that optimize the investigation process. Therefore, we tried to adapt to our own requirements the sensitivity and validation factors. (according to Dragnea 1984).

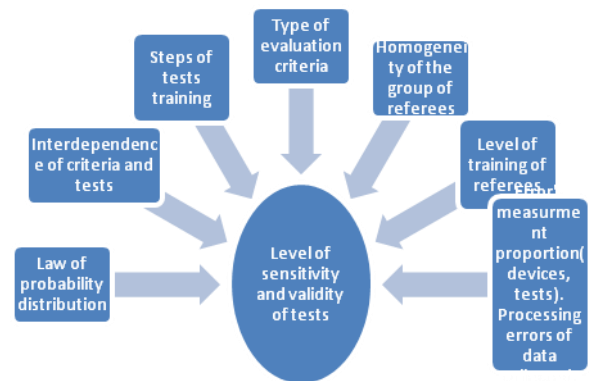


Figure 1. Sensitivity and validation factors (after Dragnea)

„The ideal of objectivity during assessment can be made by errors and fluctuations of the assessor.” (Tataru C., 2005)

### Methods

The ascertaining study was carried out based on the results of the developed questionnaire. The questionnaire contains 13 questions specifically designed, which should include both issues regarding the physical training and the technical and

<sup>1</sup> Romanian-German University of Sibiu, ROMANIA  
Email address: fabiana.martinescu@yahoo.com  
Received 05.10.2014 / Accepted 22.11.2014

psychological one, and highlight the importance of umpirage in modern basketball game, be able to observe the training of referees, as well as their gender. These questions were applied on 31 referees from LNB (National Basketball League), given the fact that inside LNB there are 55 referees.

The questionnaire is compiled concisely, the questions are in point without leaving room for interpretations. The answers are grid type and we consider that they are making the object of our research. (Martinescu Nițu 2011)

### Results

On question no.1 „Which is the level at which you are refereeing?” After the statistical analysis of the obtained data after applying the questionnaire, we received the following answers. The umpirage level of the respondents is noticed from the following chart, of which 51% carry out their activity in the LNBM (Men’s National Basketball League), 33% of the referees in the LNBF (Women’s National Basketball League), and 16% at international level.

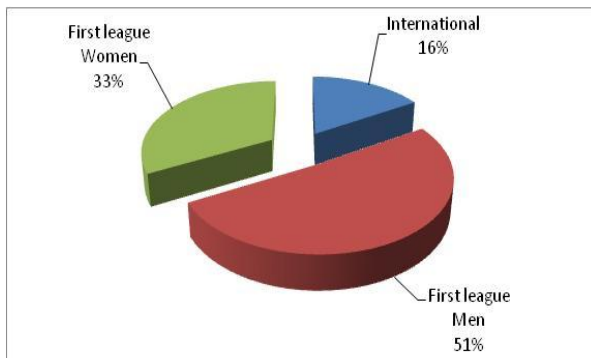


Chart 1. Level of umpirage

At question no. 2 „Which is your experience in umpirage?” we notice a share of the National League referees between 15-20 years. So, we can conclude the fact that the referees on this level have a certain experience in the field of umpirage.

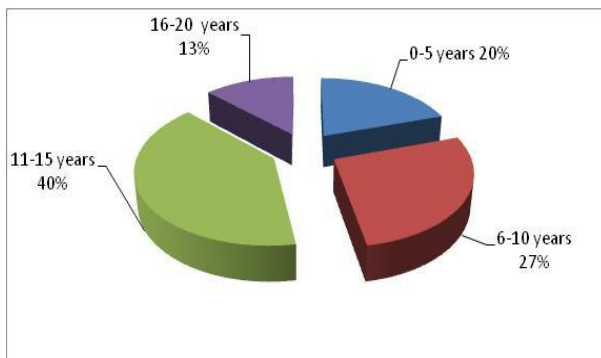


Chart 2. Experience in umpirage

Question no. 3 „Please give your consent regarding the following statements about the basketball game?” is a question with multiple answers, from which we notice that we have a bigger share of affirmative answers of the subjects of our research about the popularity of this sport.

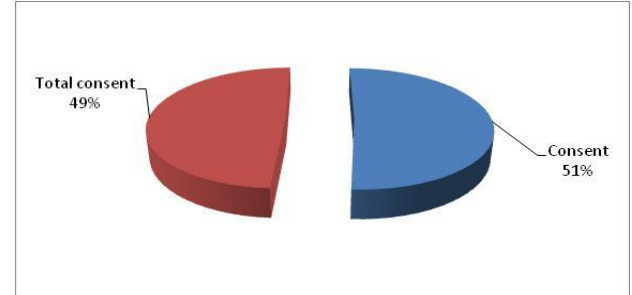


Chart 3. The game of basketball at a high level

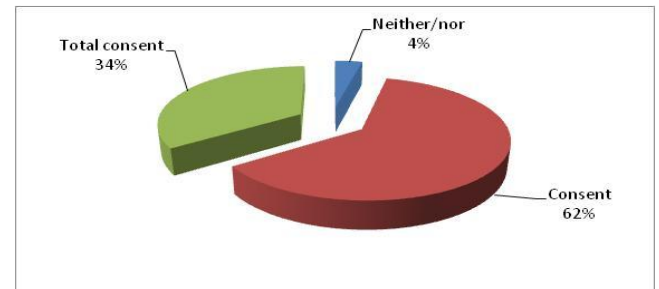


Chart 4. The basketball game in Romania is very popular in Romania

In your opinion, “which do you think is, currently, the umpirage level conducted in the field of basketball in Romania compared to the game itself?” is the question no. 4, from which we can see that 69% of respondents answered that it is high. This is of major importance because we need to be aware that our survey respondents are the specialists, namely the referees in the top echelon of the country.

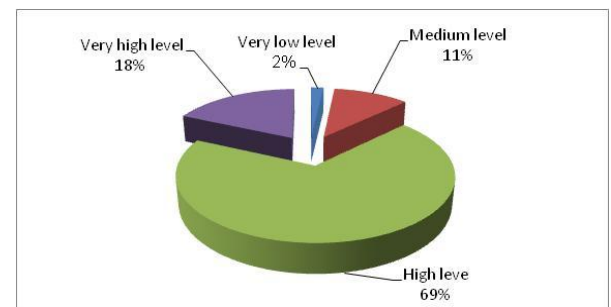


Chart 5. Umpirage level in basketball

Question number 5 “In your opinion, to what extent do you think the two tests that are carried out at present correspond to the situations faced by the referees from Romania?” reveals that 49% of the survey’s respondents answered in a small extent and 2% in a very small extent.

For example, we can conclude that the referees in the top echelon, with greater experience, consider the current testing as insufficient in relation to the problems they face today.

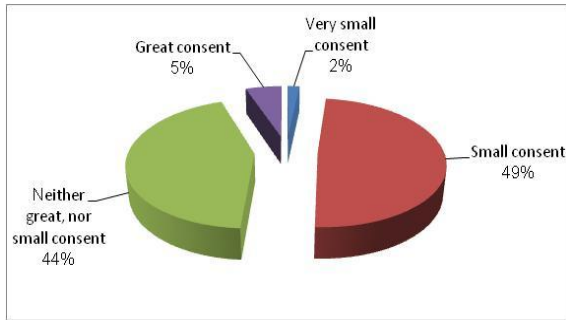


Chart 6. Relevance of the referees' current tests

Question no. 6 is "Please show your agreement to the following statements relating to umpirage in the game of basketball?"

Using the 5 steps Likert scale it was obtained an overall score for this statement is 4,00, which is a positive assessment of the respondents in terms of "It is necessary to introduce new physical tests for the basketball referees in Romania", for the second statement "It is necessary to introduce psychological and behavioural-decision-making tests for referees", the same measurement reveals a score of 3,67, also a positive appreciation, for what the third statement "The work of basketball referee is stressful", the score is 4,49, the assessment being also positive in this case.

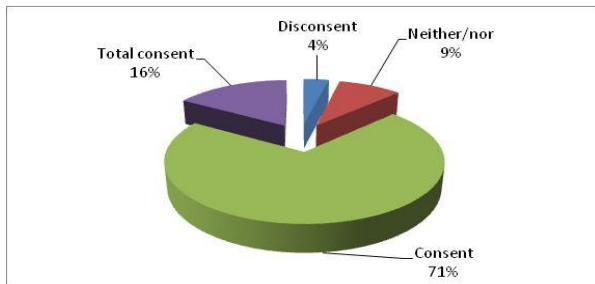


Chart 7. New physical testing

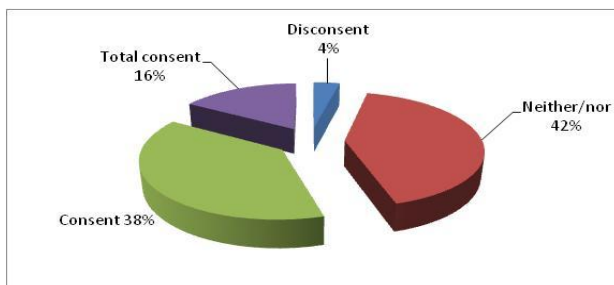


Chart 8. Introduction of psychological tests

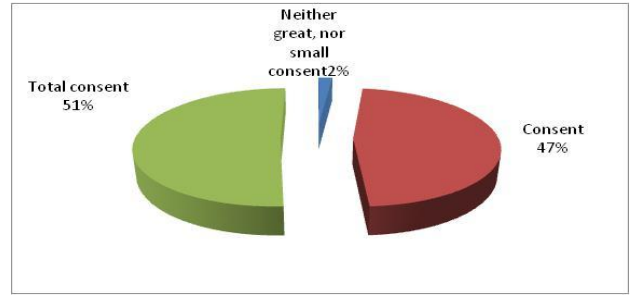


Chart 9. The work of referees is stressful

At question no. 7 "Which of the following components of the athletic training do you consider are being used more particularly in the basketball referees' activity?", the answer could be but multiple, so we notice that the largest share have a physical training of 93% and the psychological training of 51%.

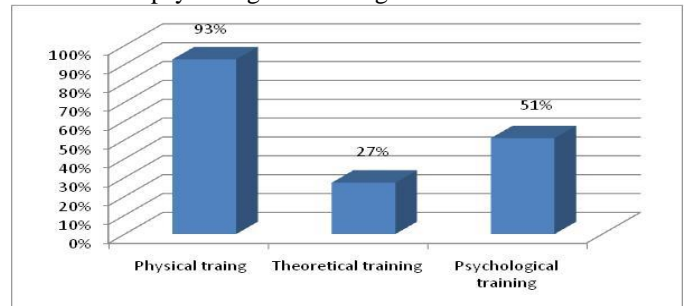


Chart 10. Training components to referees

Question no. 8 "Which of the following types of physical training is used by you in the work you carry out?", the respondents' answers were divided as follows, 71% answered for both the specific physical training and general physical training, 25% general physical training and 4% for the specific physical preparation.

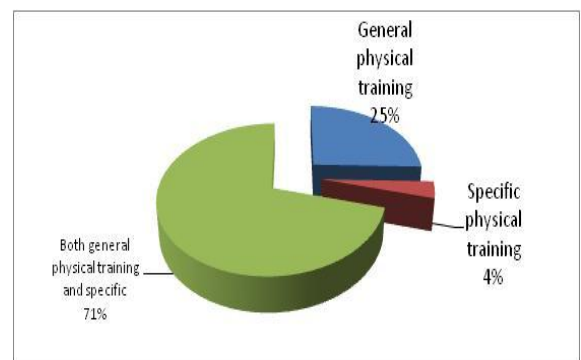


Chart 11. The percentage of physical training in the referees' training

In carrying out the questionnaire, question no. 9 "How much time are you willing to assign to training from pre-competition period?" reveals that most referees, namely 34%, are willing to spend three days a week for training, 33% two days and 31% four days a

week. Only 2% said they would like to train five days a week.

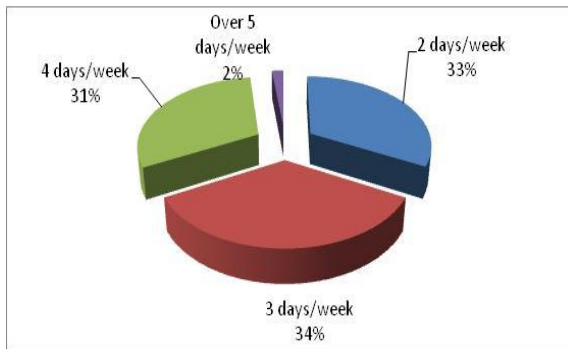


Chart 12. Time spent for training during pre-competition period

In question no.10 „How much time are you willing to spend for training in the competition period?“, the big share of responses was 53% 2 days a week, 43% 3 days a week and only 4% 4 days a week.

These responses, as well as the bigger share of the small number of training days per week are to be understood from the group discussions we had with the subjects and the lack of time in the competition period. The large number of games as well as the rest of activities which they have are limiting the time of training.

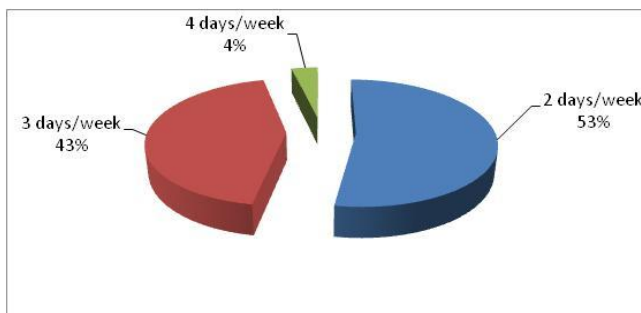


Chart 13. Time spent for training during competition period

The share on question no. 11 „In which category of age do you fit?“, is shown in the following chart and is 36% between 26-31 years, 33% between 32-37 years, 20% between 18-25 years, the rest of the results being under 10%.

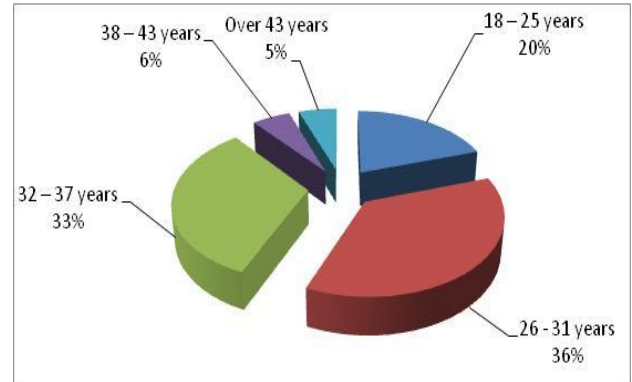


Chart 14. Respondents' distribution on age

In question no. 12 „Which is your gender?“, we notice a big share of referees of male gender, 89%, although the questionnaire has been applied on the entire echelon of referees from the first league championship, both women and men.

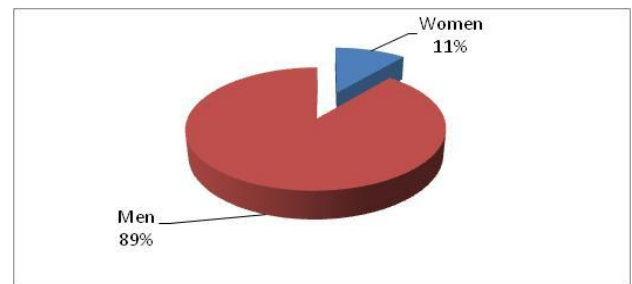


Chart 15. Which is your gender

The last question in the questionnaire, question no. 13 „Which is the last education level you have graduated from?“, we notice from the chart that the biggest share is represented by the Bachelor's degree - 63%, 20% the master degree, 13% high-school graduation and only 4% postgraduate studies.

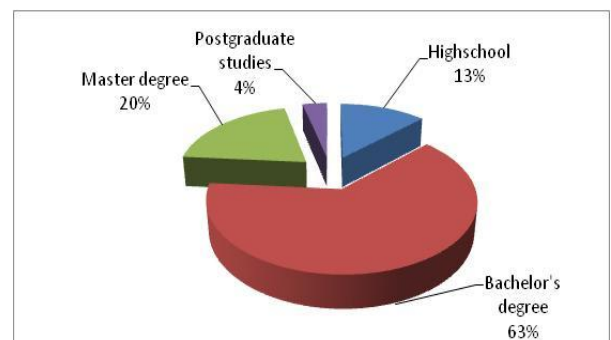


Chart 16. Respondents' level of studies

### Discussions:

This study is about the standards that you must have for going up in your carrier as a referee. We can find some good authors who helped us in our way to develop this study, Jerry and Gregory in Basketball and Philosophy, thinking outside the paint. From this we

tried to the referees in front of their own questions, their own doubts and to have good idea about what supposed to be their work.

So, in one sense, then, the referees are supposed to play the role of God in terms of ensuring that a contest is as fair as possible and practical. (Jerry, Gregory, 2008).

We can also find an accurate study nearly this year, in Journal of Economic Behavior and Organization. Their study of the behaviour of professional referees in the context of offensive fouls. We can see also in this study about the approach for the mistakes of referees are either rational or due to the representativeness heuristic.

(<http://www.sciencedirect.com/science/article/pii/S0167268114000924#>)

After this examples, we can assert that the work of a referee to become the best is similar to the work of a top player. He must have a significant amount of talent, and we mean by talent the „feeling of the game”, which is indispensable for a referee who reaches the highest levels.

### Conclusions

The basketball game, invented as a fruit of human intelligence, is the sports game with the fastest evolution rhythm - this is the opinion of the specialists in this field; (Negulescu, 2000) it is regulated by standards, which in a permanent improvement and completion, made the basketball game with only 13 very simple articles to develop now, based on a very rich regulation containing currently 50 articles.

All these changes did not affect by anything the spirit and essence of the game, have not distorted it by anything, they are designed to increase the dynamism of the game, its momentousness and beauty. However, from the point of view of the specialist, any change in rules has implications on the game components. Thinking of the games in which only a few "goals" were scored, in nowadays basketball games the scores are of 150-200 points.

It should be noted that over the years, these changes have led to increased importance and responsibility of the referees during the games. We

must not forget that the referee is the very judge in the field who has the power and responsibility to make decisions.

As a result of all these changes, we can state the following:

➤ The game of basketball is a sports game with the fastest rhythm of evolution, it is governed by rules that continually improve;

➤ Although it is a game with many restrictive rules, basketball evolved into a dynamics unrivalled by any other sport;

➤ All changes made on the articles of the current regulation are based on knowledge of current techniques and tactics of the game of basketball;

➤ The continuous adaptation of umpirage to the demands of the game can be noticed also from the significant change in the number of referees on the field (from 2 to 3 referees).

### References:

- F.I.B.A., 2012, Regulamentul oficial al jocului de baschet", FRB, București
- FRB, 1995, International Referee Candidates Clinic, Cluj Napoca, Buletin de lucru p.3-5
- Jerry LW, Gregory B, 2008, Basketball And Philosophy, thinking outside the paint Journal of Economic Behavior and Organization ,<http://www.sciencedirect.com/science/article/pii/S0167268114000924#>
- Martinescu (Nițu) F, 2011, Cercetări propriu-zise, personale de verificare a unor strategii privind optimizarea arbitrajului în baschet, Raport de cercetare științifică nr.3, UNEFS, București.,p.32-33
- Negulescu C, 2000, Compendiu cu regulile jocului de baschet și tehnica arbitrajului", MET, IEFS, București
- Tătaru C, 2005, Baschet perfecționare aruncărilor la coș, ed. Alma Mater, Sibiu, p.125,
- Tătaru C, Martinescu (Nițu) F, 2011, Măsurare și evaluare în educație fizică și sport, ed.Alma Mater, Sibiu.p.26-33



January 2015, 15 (1): 52-56

Original article

## THE ANALYSIS OF THE RESULTS OBTAINED IN THE MEN 100 M EVENT IN THE 12<sup>TH</sup> EDITION OF THE ATHLETICS WORLD CHAMPIONSHIPS

MIHĂILESCU LIVIU<sup>1</sup>, MIHĂILESCU PETRUȚA<sup>1</sup>

### Abstract

Studying the specialty researches we found that the best sprinters get 92 – 95 % from their maximum velocity (10 – 11,5 m/s), after approximately 30 m of running, meaning at the end of the start launching. The acceleration of the running is based on the gradually increasing of the steps length and frequency, in an optimum correlation. In the next 50 – 60 m, the running velocity is oscillating, reaching peak moments in several times and then, after 80 – 90 m, decreases. The obtaining of some international value results is conditioned by the reaction velocity to the start pistol, the quality of the start and the start launching, the velocity that the athlete can develop during the running, the strength and endurance related to velocity.

*Keywords:* record, athlete, velocity, effectiveness.

### Introduction

In Athletics, in 100 m and 200 m sprint events, the appearance of the Jamaican Usain Bolt gives hope to the world that the 21<sup>st</sup> century man can run the 100 m in less than nine seconds and a half. Bolt succeeded in running the 100 m, without showing that he worked too much, in 9, 58 seconds. The progress is enormous, because, in 1900, the fastest man was running the 100 m in 12 seconds. In 1950, man was hardly working to run below 10 seconds, and in 2000 the records were around 9, 8 seconds. So, here, the saturation platform seems to be a little bit too far. Especially if we add the fact that, during a 150 m race, Bolt run the last hundred of meters in 8, 7 seconds, this being the best time ever run on one hundred meters. Transforming the Bolt speed in km/h, we obtain an average velocity of approx. 38 kilometers per hour.

It can be easily said, at this moment, who is the fastest man in the world, but studying the race where Usain Bolt broke the world record we concretely observed what makes the difference between him and the other participants. We conducted our research from the curiosity to see how different is the Bolt world record race from the other participants of the final,

from the reaction velocity view point, knowing that he doesn't has a very good start, what was the time to the maximum velocity and what is the difference at each 20 m of the race.

### Methods

Documentation method, comparing method, statistical method, graphical and table method

### Results

For a better representation we used the International Athletics Amateur Federation (IAAF), where there are presented the results of the 100 m final from the Athletics World Championship, Berlin 2009, but also the reaction times the times recorded at 20 m, 40 m, 60 m, 80 m, and 100 m of the race. These data allowed us, based on some calculations and graphics, to analyze this race and to make some conclusions. From the 8 finalists, 5 of them run the 100 m below 10.00 seconds, 2 of them run exactly 10.00 seconds and only one broke the 10.00 seconds barrier, what makes us to say that it was the fastest final of all times, the results average being 9.92 seconds.

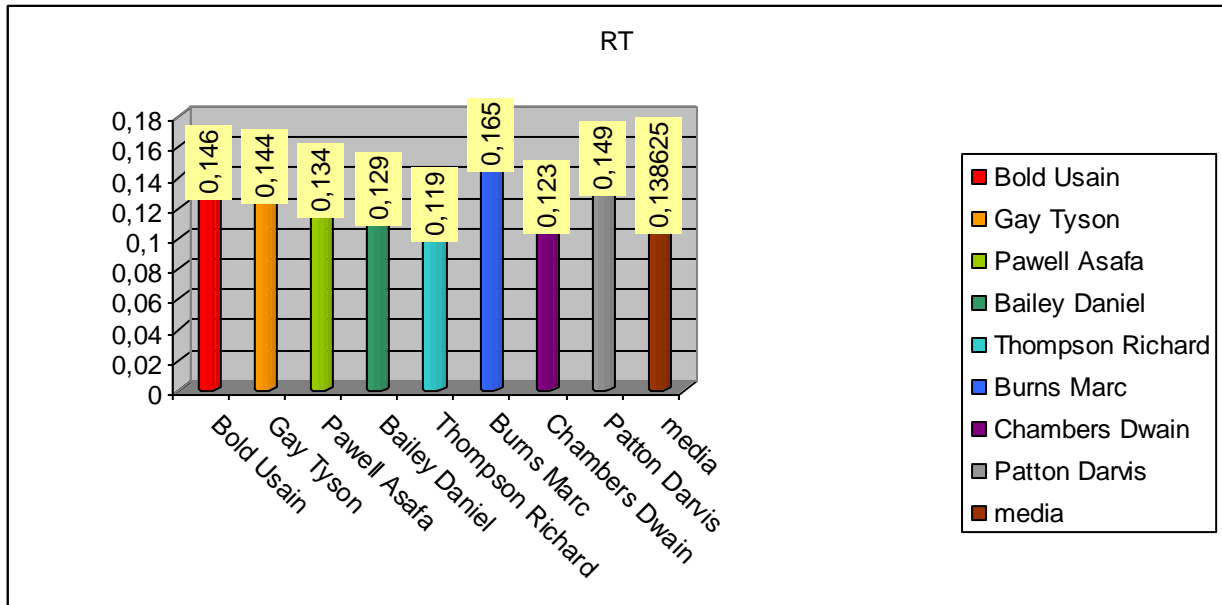
Athlete	RT	t20m	t40m	t60m	t80m	t100m
Bolt Usain	0,146	2,88	4,64	6,31	7,92	<b>9,58</b>
Gay Tyson	0,144	2,92	4,7	6,39	8,02	<b>9,71</b>
Powell Asafa	0,134	2,91	4,71	6,42	8,1	<b>9,84</b>
Bailey Daniel	0,129	2,92	4,73	6,48	8,18	<b>9,93</b>
Thompson Richard	0,119	2,9	4,71	6,45	8,17	<b>9,93</b>
Burns Marc	0,165	2,94	4,76	6,52	8,24	<b>10,00</b>
Chambers Dwain	0,123	2,93	4,75	6,5	8,22	<b>10,00</b>
Patton Darvis	0,149	2,96	4,85	6,65	8,42	<b>10,34</b>
Media	0,139	2,92	4,73125	6,465	8,15875	<b>9,92</b>

<sup>1</sup> University of Pitesti, Faculty of Physical Education and Sport, ROMANIA  
 E-mail address: liviumihailescu2006@yahoo.com  
 Received 19.10.2014 / Accepted 26.11.2014



It is known that, in the 100 m race, an important factor in achieving a time as good as possible is the starting reaction time. With all these, the athlete that achieved a world record in this race had the 6<sup>th</sup> reaction time, this athlete having some small problems in this direction as he mention this during a after race

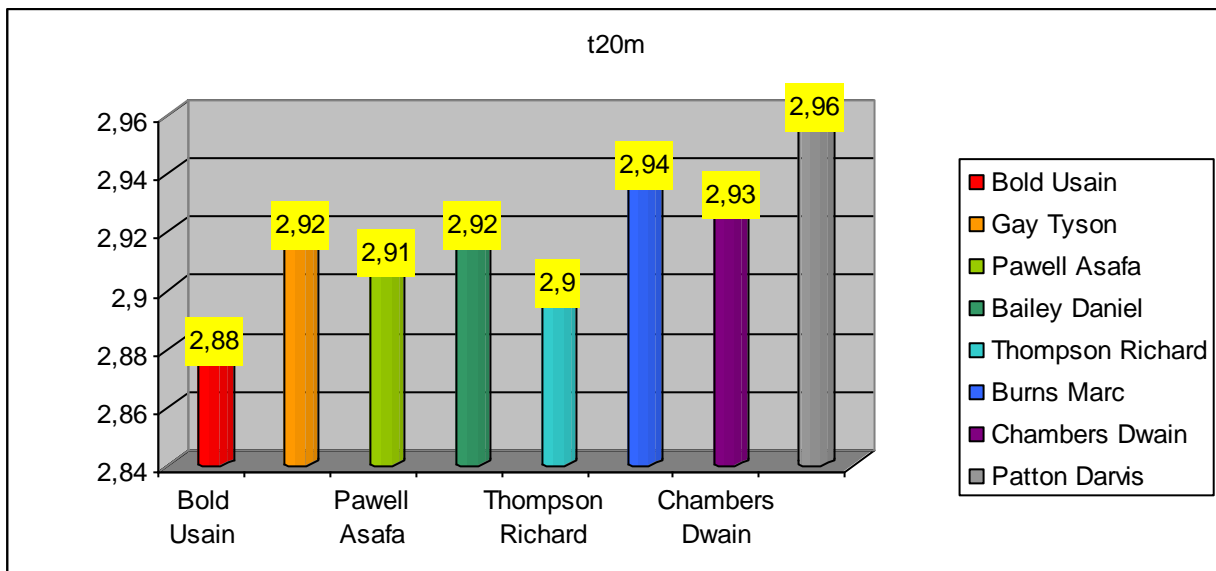
statement. This makes us to believe that in a near future this record could be overcome. He tried this during the next World Championships, but the desire to demonstrate that he is the best and achieve a new world record made him to get a false star.



### Discussion

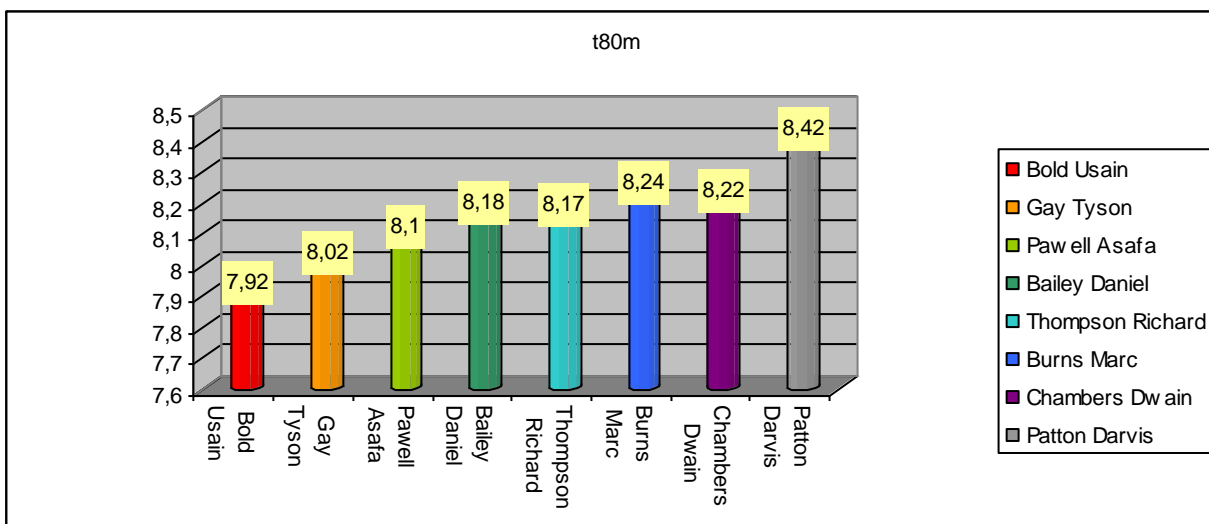
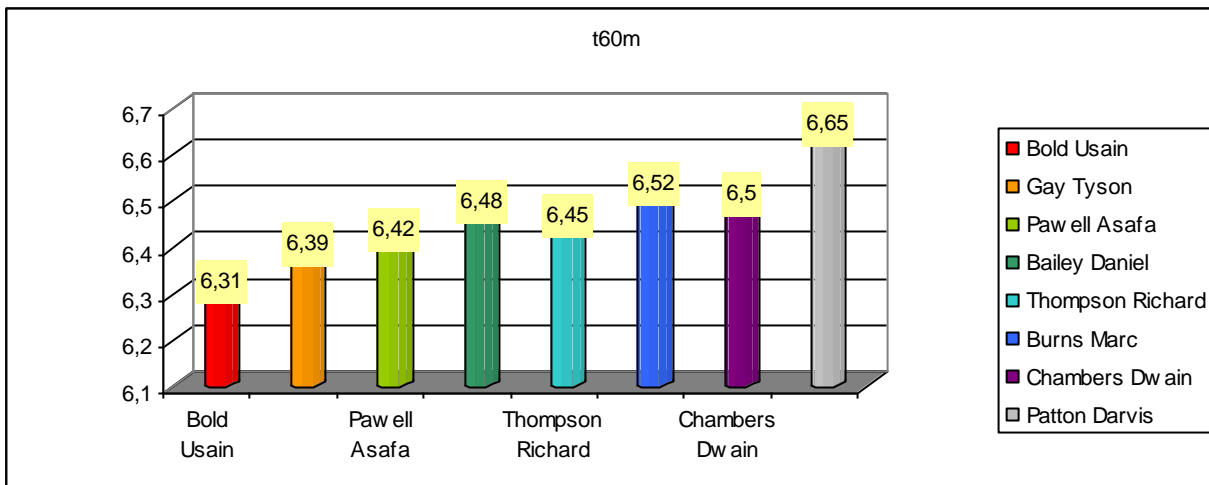
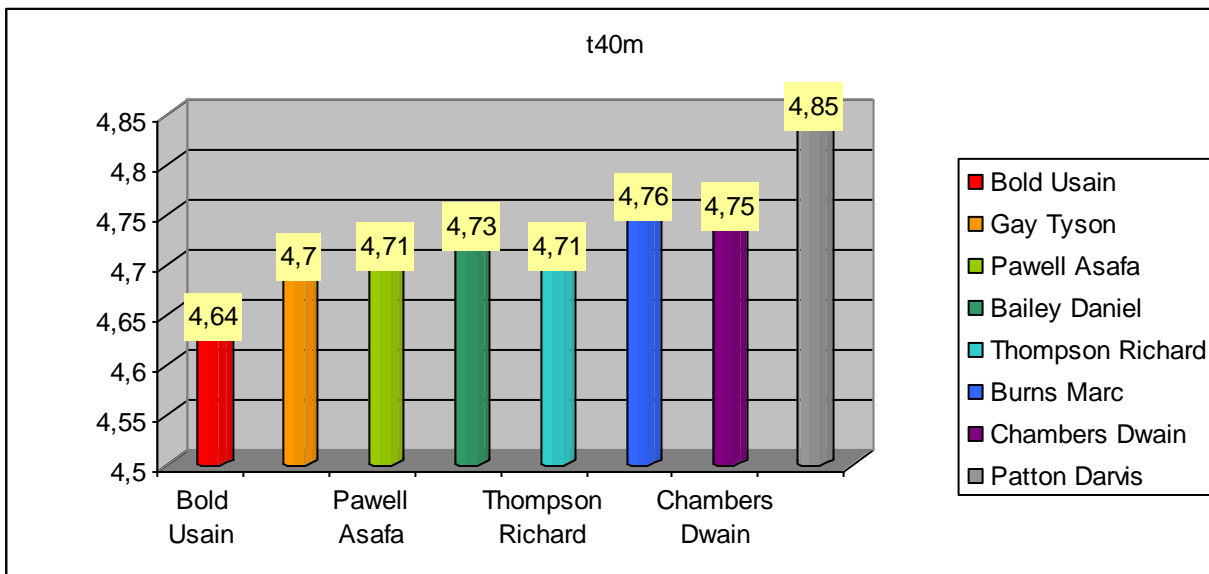
Studying the race by fragments, from 20 to 20 meters, we can observe the strengths that provided the world record. At 20 m, despite the fact that the athlete

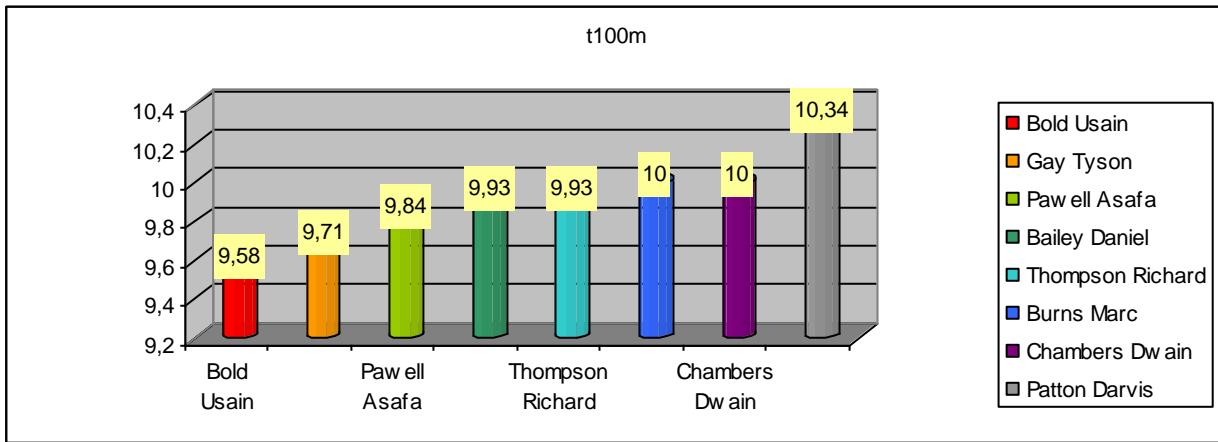
is very tall, with long lower limbs and hard to integrate in a rapid motion, is already the first with a 2,88 s time and a 0,04 s before the one who will come on the second place.



At 40 m the final configuration of the race was already established, the first three athletes leading already, with Bolt having an advantage of 0,06 s. At 60 m the advantage increases to 0,08 seconds, and at 80 m the distance increases to 0,1 second. Studying

the values recorded at every 20 m of the race we observe that the first athlete wins 0,02 seconds at every recording, excepting the last distance where he gets an advantage of 0,03 s.

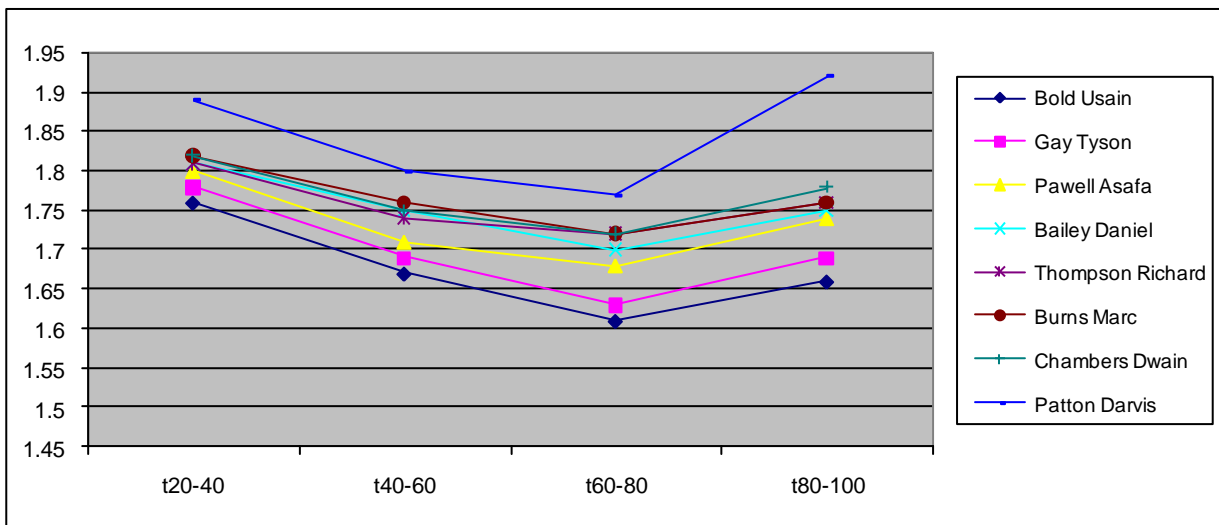




Studying the recordings achieved by the finalists at every 20 m of the race, we can observe that these are decreasing, the lowest value being recorded between the 60 m and 80 m of the race, for all the athletes, what allows us to say that the maximum velocities of the greatest athletes of the 100 m are obtained at the approximately 50 – 60 m of the race. Also, the recorded values during this distance are the

best from all, even from the ones recorded during the last part (80 – 100 m), concluding that, despite the fact that we are talking about the best sprinters of the world, ones they are obtained, the maximum velocities can't be maintained until the end of the race, being approx. equal to the ones obtained during the third interval (40 – 60 m).

Athlete	t20-40	t40-60	t60-80	t80-100
Bold Usain	1,76	1,67	1,61	1,66
Gay Tyson	1,78	1,69	1,63	1,69
Pawell Asafa	1,8	1,71	1,68	1,74
Bailey Daniel	1,81	1,75	1,7	1,75
Thompson Richard	1,81	1,74	1,72	1,76
Burns Marc	1,82	1,76	1,72	1,76
Chambers Dwain	1,82	1,75	1,72	1,78
Patton Darvis	1,89	1,8	1,77	1,92





### Conclusions

- The world record in the 100 m men events can be improved if the athlete that obtained it improves the reaction time.
- In this event the athletes have values approximately equals, the difference being very small and determined by a very good start or the obtaining of a superior velocity and its maintaining during a distance as far as possible
- All the athletes obtain the maximum velocity around 60 m distance and have the best recorded interval between 60 m and 80 m, and also, they cannot maintain this speed until the end of the race

### References

- Anderson MK, Hall SJ, Martin M, 2004, Foundations of Athletic Training – prevention, assessment, and management- , LWW, USA.
- Noakes T, 2001, Lore of running - fourth edition, Human Kinetics, Oxford University Press, Southern Africa
- Mihailescu LE, 2008, Instructional strategies that offer quality and efficiency for the training of junior athletes, Doctoral Thesis, Pitesti
- [www.iaaf.org](http://www.iaaf.org).
- [www.fra.ro](http://www.fra.ro)



Science, Movement and Health, Vol. XV, ISSUE 1, 2015  
January 2015, 15 (1): 57-61  
*Original article*

## THE CONTRIBUTION OF THE GOALKEEPERS OF THE FRANCE NATIONAL TEAM IN WINNING THE INTERNATIONAL HANDBALL COMPETITIONS

ROMAN CĂLIN<sup>1</sup>

### Abstract

*Objectives:* I assumed that by studying the performances of the most representative handball team, of the last decade, for goalkeeper position at senior level, it can be known their performance capacity at international competitions.

*The aim of this research* is the improvement of handball sport training, based on the study of the male French handball goalkeeper's performance capacity at international competitions. Review and generalization of scientific literature data regarding the ideal model of high performance handball goalkeeper; Appreciation of France team's goalkeepers performance capacity at important international competitions: 2006 and 2010 European Championship; 2009 and 2011 World Championship; 2008 and 2012 Olympic Games; was possible only with the help of some goalkeepers of great international value whose performance capacity is statistically presented in 1-9 tables.

*Conclusions:* we notice the major part that Thierry Omeyer played in winning all the competitions being the principal goalkeeper of the France's handball team, having a 38,13 % efficiency to this study.

*Key words:* handball, goalkeeper, international competitions, performance.

### Introduction

In defining the notion of sport game, to which handball also subscribes, Bota and Colibaba (1998) mentions the fact that there are three different aspects. These are the player's activity; the idea of the game and not the least the game regulations. The player's activity can be presented watching carefully "What is he doing?" and "How does he behave?" a sportsman during the game.

Therefore we can show that he behaves more or less spontaneously, purposeful and efficient according to the vocational predispositions, the practical and theoretical knowledge acquired before, the game conditions (environment, opponent, materials, audience, game's stake, etc.), the starting (the pleasure of playing) but in the end also the desire for victory.

The sport activity is generating different types of value (biological, aesthetics, ethical, psychological, etc.) to which human communities show appreciation, numerous of its members aspiring to them. Sport generated values greatly objectify the human essence, favoring the scientific creating value, theoretical, practical, ethical and aesthetical. From all of this we emphasize the main sport specific value: the sports performance asserted through records, points, qualifications in the superior stages of the competitions, appreciation at international level. The masculine handball team of France gathered all these values by:

- ⇒ Winning the 2006 and 2010 European Handball Championship;
- ⇒ Winning the 2009 and 2011 World Handball Championship;
- ⇒ Winning the 2008 and 2012 Handball Olympic Games.

**Assumption:** I assumed that by studying the performances of the most representative handball team, of the last decade, for goalkeeper position at senior level, it can be known their performance capacity at international competitions.

**The aim of this research** is to enhance handball sport training, based on studying their performance capacity at the international competitions.

**Objectives of the research:** Analysis and generalization of the scientific literature data on the ideal model of the high performance handball goalkeeper, appreciation of the performance capacity level of the France team's male goalkeepers at the important international competitions.

**The research methods** used have been: scientific documentation method; observation method; statistical method.

In this study it has been used the registration sheets of the games conducted under the IHF's aegis, using the data from Hego Group, and for the competition organized by the EHD it has been used the registration sheets using the SWISS TIMING program.

### The length of the study

The study was performed in 2006-2011, at four major competitions/final tournament: Beijing Olympic Games 2008, London Olympic Games 2012; World Championship 2009 in Croatia, World Championship 2011 in Sweden, European Championship in Austria; at representative teams level, where the subjects: Thierry Omeyer/Karaboue Daouda and Ploquin Yohann together with his team won the World, Olympic and European title. A number of 52 games was centralized, out of which the team of France won twice the Olympic, World and European title having our subjects as goalkeepers.

<sup>1</sup> Department of Physical Educations, Sports and Kinetotherapy; University of Oradea, Faculty of Geography, Tourism and Sport, Oradea, ROMANIA.  
E-mail address: croman@uoradea.ro  
Received 27.10.2014 / Accepted 03.12.2014

## Results

In table no. 1 are presented the international competitions where the masculine handball national team won a competition, the year of the competition and the age of the three goalkeepers at that time is being mentioned. Thierry Omeyer and KraboueDaouda

participated in all the competitions and the third one PloquinYohann participated only in the 2006 edition of the European Championship. It can be surprisingly noted that the three goalkeepers achieved the best sport results of their career between the age of 28 and 36.

Table no. 1 The age of achieving the sport performances by the French goalkeepers in chronological order

Competition	Year	Place	Omyer Tierry	KaraboueDaouda	PloquinYohann
European Championship	2006	I	30	31	28
Olympic Games	2008	I	32	33	No
World Championship	2009	I	33	34	No
European Championship	2010	I	34	35	No
World Championship	2011	I	35	36	No
Olympic Games	2012	I	36	37	No

The effectiveness of the goalkeepers during the 6 international competitions included in this study is presented in the Table no. 2. It can be observed that there was a number of 1944 throws, out of which 764 throws were defended, the general effectiveness being of 39,30%.

There were a number of 316 of 6m throws, out of which the goalkeepers managed to defend 88 the effectiveness being of 27,85%. There is a total of 241 throws from wingers zone out of which 101 were defended, the effectiveness being of 41,91%.

The highest number of throws were the 9m ones, from a total of 831 throws the goalkeepers managed to defend a maximum number of 436 throws, the effectiveness reaching the highest value: 52,47%. When it comes to the 7m throws there is a total of 152

throws, of which 33 throws were defended. In this case the effectiveness is minimal compared to the other columns, being of 21,33 %.

From a total number of 235 fastbreak shots the goalkeepers managed to defend 55 throws, the effectiveness in this case being of 23,40%. The in-going throws had the effectiveness of 30,18%, from a total number of 169 throws, 51 were defended.

Analyzing the method used to score there can be observed the fact that in masculine handball there is a tendency of scoring from the distance, because modern handball is based of strength followed by technicality. The moment the goalkeeper is alone against the attacking player (7m throws, 6m throws and counterattack throws) the goalkeeper's effectiveness is lower compared to the long distance throws.

Table no. 2 Number of balls defended by the goalkeepers during the 6 competitions included in the study

Actions	6 m shots	Wing shots	9 m shots	7 m shots	Fastbreak shots	Breakthroughs shots
Defended	88	101	436	33	55	51
Throws	316	241	831	152	235	169
Effectiveness	27,85%	41,91%	52,47%	21,33%	23,40%	30,18%
Arithmetic Average	12,56	16,83	72,67	5,5	9,17	8,50
Standard deviation	±5,38	±3,87	±12,29	±1,76	±3,97	±8,46
Variability coefficient	42,83%	22,99%	16,91%	32%	43,29%	99,52%
MINIMAL	8	12	54	4	5	2
MAXIMAL	21	22	86	8	16	23

Analyzing the total number of balls defended in each tournament, there can be seen values between 84 and 113 which added up at the end of all 6 editions a total of 591 balls were defended. The number of throws varies from a competition to another and in this case there are values between 204 and 301 goal throws. The

effectiveness values show in a transparent way the performance capacity and also the part this player played in winning the competitions. There are effectiveness values between 37 % and 41% that specialists in handball field consider as being very good.

Table no. 3 The effectiveness of the goalkeeper OmeyerThiery

Edition	Defended	Shots	Effectiveness
2006=8 games	99	258	38%
2008 = 8 games	84	204	41%
2009 =10 games	91	244	37%
2011 = 10games	110	293	37%
2010 = 8games	113	301	38%
2012= 8 games	94	252	37%
Total = 52 games	591	1552	38,13%

Statistically speaking the effectiveness of the subject is: 12,38 throws defended/game in 2006; 10,5 throws defended/game in 2008; 9,1 throws

defended/game in 2009; 11 throws defended/game in 2011; 14,13 throws defended/game in 2010; 11,75 throws defended/ game in 2012.

Table no. 4 The effectiveness of the goalkeeper Omeyer Thierry per game

Ediția	Defended game	Average/ Shots	Average/ game	Effectiveness/ game
2006	12,38		32,25	38,03%
2008	10,5		25,5	41,18%
2009	9,1		24,4	37,30%
2011	11		29,3	37,54%
2010	14,13		37,63	37,55%
2012	11,75		31,5	37,30%
Total	68,86		180,58	38,13%

Being the lead goalkeeper of the national team of France, it can be noticed that during the 6 international tournaments he defended in total 43 hours, 37 minutes

and 22 seconds, a percent of 83,56 out of a total game time of 52 hours.

Table no. 5 Thierry Omeyer's game time at all studied competitions

Competition	Number of games	Total game time	Game time Min/sec	Percentage of the game time	Effectiveness %
Olympic Games 2008	8	480`	386` 34"	81%	41%
Olympic Games 2012	8	480`	425` 46"	89%	37%
World Championship 2009	10	600`	491` 40"	82%	37%
World Championship 2011	10	600`	445` 40"	75%	37%
European Championship 2010	8	480`	460` 55"	96,04%	38%
European Championship 2006	8	480`	396` 47"	82,5%	38%
Total	52	3120`	2607` 22"	83,56%	38,13%



### Discussionns

The development of men's handball was analyzed by Bilge M. (2012) using data from the Olympic, World and European Championships held within the 2004-2012 years.

The technical variables used to compare the tournaments included: the average number of attacks, the efficiency of attacks, the efficiency of goal throws, fast break goals per game, the efficiency of fast breaks, the efficiency of the goalkeeper, saves by the goalkeeper per game, number of turnovers per game, and the efficiency of position throws (wing, pivot, back court, break-through, fast break, and 7-meter). This technical analysis used cumulative statistics from the European Handball Federation and International Handball Federation.

Fuertes et al. (2010) using data from the last 6 seasons of the ASOBAL League (from the 2001-2002 to the 2006-2007 seasons), analyze the influence of the goalkeeper efficiency on handball team performance. Results point out that goalkeeper efficiency is a relevant variable for explaining the team performance: the higher the efficiency of the goalkeeper, the better the classification of teams. Moreover, top teams have better goalkeeper efficiency than the rest of the teams. Subsequent combination of these variables may be used to develop a model to predict future position within ASOBAL League.

Performance measurement is one of the main subjects of movement and training sciences. Game analysis methods used in this field have gradually improved.

Many of the most popular and original recent studies in this field have involved recording performance variables during or after competitions, and visual and written storage of these records in the computer environment. The measurement and assessment of performance play an important role in planning the training process and competition (Taborsky, 2011).

### Conclusions

1. Winning the 6 important international competitions by the masculine handball national team: The 2006 and 2010 European Championship; 2009 and 2011 World Championship; 2008 and 2012 Olympic Games; was possible only with the help of some goalkeepers of international value whose performance capacity is presented statistically in tables 1-9.
2. Asserting the major input Thierry Omeyer had in winning all the competitions as titular goalkeeper of France's masculine handball national team, having an effectiveness of 38,13% in this study.

3. The importance of this position (goalkeeper) in the main structure of the team reflects on the performance of the whole team. Therefore a good goalkeeper, with a high percentage of defended balls pulls down the opponents, contributing at the same time to increasing the trust in their own strength and in team spirit. His calm, his confidence in interventions, his courage and his spirit of sacrifice influences the state of mind of his teammates, mobilizing them during the game.

### Conflict of interest

Nothing to say

### Specifications

This research is based on the statistical results of the International Handball Federation site: <http://ihf.info/IHFCompetitions/CompetitionsArchive>, and also the European Handball Federation site: [www.activities.eurohandball.com/analyses](http://www.activities.eurohandball.com/analyses).

### References

- Abas A., 1993, La poarta de handbal. Bazele științifice ale antrenamentului, CCPS, București.
- Bilge M, 2012, Game Analysis of Olympic, World and European Championships in Men's Handball. Journal of Human Kinetics. Dec 2012; 35: 109–118. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3588687/> accessed on 21.01.2015.
- Biro F, Roman C, 2010, Handbal –inițiere, ediția a 2-a. Editura Universității din Oradea, Oradea.
- Bota I, Macovei B, 1983, Handbal- Antrenamentul portarului. Editura Sport-Turism, București.
- Bota M, Bota I, 1987, Handbal. Editura Sport-Turism, București.
- Fuertes X, Penas, CL, Martinez L, 2010, The influence of the goalkeeper Efficiency in Handball Teams Performance. Apunts. Educación Física y Deportes 2010, N.º 99, 1.er trimestre, pp. 72-81
- Colibaba-Evuleț D, Bota I, 1998, Jocuri sportive, Teorie și Metodică. Editura Aldin, București.
- Ghermănescu IK, 1978, Handbal. Editura Sport-Turism, București.
- Ghermănescu IK, Gogăltan V, Jianu E, Negulescu I, 1983, Teoria și metodică handbalului. Editura Sport-Turism, București.
- Sotiriu R, Sotiriu D, 1996, Handbal, Teoria și metodică jocului. Universitatea Ecologică, București.
- Sotiriu R, 2000, Handbal, de la inițiere -la performanță. Universitatea Ecologică București.
- Taborsky F, 2011, Competitive loading in top team handball, EHF Web Periodical 2011.





Available  
at:[http://home.eurohandball.com/ehf\\_files/Publikation/WP\\_Competitive\\_20Loading\\_20in\\_20Top\\_20Team\\_20Handball.pdf](http://home.eurohandball.com/ehf_files/Publikation/WP_Competitive_20Loading_20in_20Top_20Team_20Handball.pdf); accessed on 21.01.2015.

Vick W, Busch H, Fisher G, Kock R, 1995, Pregătirea de handbalînsală. C.C.P.S., Bucureşti.

Zamfir G, Florean M, Toniţa T, 2000, Handbal, iniţiere-consolidare.Editura Casa Cărţii de Ştiinţă.

Zamfir G, Florean M, Toniţa T, 2001, Handbal, TeorieşiMetodică. Editura Casa Cărţii de ŞtiinţăCluj- Napoca.

#### Websites

<http://www.eurohandball.com/> in 1.10.2013.  
<http://ihf.info/IHFCompetitions/CompetitionsArchive> in 1.10.2013.



Science, Movement and Health, Vol. XV, ISSUE 1, 2015  
January 2015, 15 (1): 62-69  
*Original article*

## SENSITIVITY TESTING STUDY PROPOSED BY METHOD AND APPARATUS FOR DETERMINING MUSCLE IMBALANCES AT THE TRUNK LEVEL

STAN ZENOVIA<sup>1</sup>, BAȘTIUREA EUGEN<sup>1</sup>, RIZESCU CONSTANTIN<sup>2</sup>

### Abstract

**Objective.** The purpose of this study is to determine whether the measurements made with the device for determining muscle imbalances present in the trunk are significantly delimited by age, in order to demonstrate the sensitivity of the proposed tests.

**Methods.** The study was conducted on 120 subjects aged from 6 to 18 years. The total sample is divided into six groups, with age as the independent variable, as follows: 6, 7, 12, 14, 16 and 18 years old. 9 tests were applied to measure muscle strength in the trunk as follows: testing of the flexion muscle strength from sitting; testing of the flexion muscle strength on the left side slope from sitting; testing of the extension muscle strength from sitting; muscle strength testing on the right side slope, from sitting; flexion muscle strength testing of standing; muscle strength testing on left lateral tilt of standing; muscle strength testing the extension from standing; muscle strength testing on the right side slope of standing; lumbar muscle strength testing (classic test).

Unifactorial dispersion analysis is used (One Way ANOVA); the method by which the multiple comparisons are done by repeated measurements.

**Result.** Mauchly's test results Test of sphericity is not statistically significant ( $p > 0.05$ ) and therefore the spherical condition is met. All values of F are greater than 0.05 then the null hypothesis is rejected.

**Conclusions.** All tests have a significant sensitivity taking into account differences between subjects; in this case the independent variable is age. It highlights the differences between groups and differences between subjects in each group. Null hypothesis is rejected and the alternative hypothesis is accepted that media groups are significantly different from each other and not due to chance alone.

**Keywords:** sensitivity tests, muscle strength, patented method and apparatus.

### Introduction

In the area of motor activities, the measurement is the primary source of obtaining information. Measurement enables quantitative determinations, and is the starting point in assessing self-regulation system, causing changes in the strategy used in business objectives. Evaluation of the trunk in all forms was an important research field of motor activities. The prevention of installation of spine deficiencies in children, by measuring muscle strength in the trunk, has become a permanent concern (Stan, 2006).

These studies support the idea of prophylactic application of physical exercise in order to achieve a harmonious development at an early age and to avoid extremely laborious recoveries later.

Sommer, Hofmeier, Berschin (2002) discusses a study on the importance of the muscles around the knee in static and dynamic status of the whole body. It is already known about the influence of posture of the head and cervical muscles over the extensor muscles of the knee.

In this study, it was demonstrated by measuring muscle strength around the knee in different body positions, the high influence of neck and pelvis area and especially the area of the thoracic and lumbar vertebrae body motility.

Voisin, Bibra, Goethals, Masse and Weissland (2002) was studying the concentric and eccentric isokinetic force of the trunk in men, by standing on the

moments of maximum and average, taking into account the angular velocity and the number of repetitions.

Focusing only on extension gives details of neurophysiological model of muscles that are usually involved in the dysfunction of the spine.

These studies support the idea of prophylactic application of physical exercise in order to develop harmonious at an early age and to avoid extremely laborious recoveries later. Berschin and Sommer (2002) proposed a new method for active control of posture subjects have been applied sensors in the lumbar and thoracic area, data recorded in instrument being very useful for muscle development. Increased trunk strength with age is evidenced by Manini, Sagendorfa, Mayer and Ploutz-Snyder, 2005.

The way of how the erector muscle fatigue decreases correct positioning of the trunk is studied by Kazuhiko, Miyamotob and Katsuji, 2005. There are different ways to measure the trunk force which include power boards for leg strength and pelvic fixation (Mockova, Greenwood, Day, 2006, Rizescu, Georgescu, 2009). The importance of creating a stable foundation for limb movement is evidenced by Kane and Barden (2012).

In this study we present briefly a method and a device patented in Romania (Patent no. 123013/30.07.2010, *Method and apparatus for determining muscle imbalances present in the trunk*, issued by OSIM Bucharest, Romania, inventors: Stan, Baștiurea,

<sup>1</sup> Faculty of Physical Education and Sport, University "Dunarea de Jos" of Galati, ROMANIA

<sup>2</sup> Faculty of Physical Education and Sport, University Ovidius of Constanta, ROMANIA

E-mail address: zenoo\_stan@yahoo.com

Received 03.11.2014 / Accepted 09.12.2014

Marcu, Chiculiță). The new method of evaluation of trunk muscle strength or force measurement on the main directions of movement and objective evidence of the existence of muscle imbalances will provide a concrete application exercises enabling the a customized approach. The method and apparatus have been shown in exhibitions of inventions which have received awards and honours. Also, studies on how the influence of trunk muscle strength and exercise influences the capacity of effort and breathing (Baștiurea, Stan, Andronic, Gutiérrez, 2010; Stan, Baștiurea, 2008).

If we prove that the measurements made with the device for determining muscle imbalances present in the trunk are delimited significantly by age, we strengthen such idea of the patent by the proposed sensitivity tests.

Under the null hypothesis of differences in values obtained from tests according to age group are not significant.

### Methods

#### Subjects

The study was conducted on 120 subjects aged 6 to 18 years. The total sample is divided into six groups with 20 members, with age as the independent variable, as follows: 6, 7, 12, 14, 16 and 18 years old.

#### Test Procedure

For all subjects where applied 9 tests; in table 1 are found the abbreviations used in this study: the flexion muscle strength testing, from sitting; muscle strength testing on the left side slope, from sitting; muscle strength testing the extension of sitting; muscle strength testing on the right side slope, from sitting; flexion muscle strength testing of standing; muscle strength testing on left lateral tilt of standing; muscle strength testing the extension from standing; muscle strength testing on the right side slope of standing; lumbar muscle strength testing (classic test)

**Table 1.** Testing muscle strength of the trunk (Marcu, Stan, Baștiurea, Chiculiță, 2008; Stan, 2009)

	Abbreviations
Flexion muscle strength testing of sitting	<b>T1</b>
Muscle strength testing on the left side slope, from sitting	<b>T2</b>
Muscle strength testing on extension of sitting	<b>T3</b>
Muscle strength testing on the right side slope of standing	<b>T4</b>
Testing flexion muscle strength in standing	<b>T5</b>
Testing muscle strength on the left lateral tilt of standing	<b>T6</b>
Testing the extension muscle strength in standing	<b>T7</b>
Muscle strength testing on the right side slope of standing	<b>T8</b>
Lumbar muscle strength testing (classic test)	<b>T9</b>

#### Description of test

##### Sitting muscle strength testing in flexion

To measure the muscle strength from sitting, the seat height set will be adjusted so that the subject's feet will be placed on the ground, and the legs are bent at 90°. The subject sits astride on the bench, back to stand tall feet are placed as described above, to not push into the soil and thus supplement thrust (figure 1). Fasten the belt then passes through acromial points and the middle belt coincides with the midline anterior chest. The trunk will be the vertical position.

Adjust the vertical transducer holder so that it will be in the T1-T2 vertebrae region.

The arms are crossed over the chest to keep the subject (especially children tend to grab something to help traction) to find a way to supplement thrust. At the signal, the subject will execute a strong traction trunk flexion, keeping a uniaxial direction (left-right swing is avoided during the action).

The computer will retain maximum traction force transducer and recorded transposed graphically in real time on the chart.



**Figure 1.** Sitting muscle strength testing in flexion

### Muscle strength testing on the left and right lateral tilt of sitting

The subject sits on the bench, with left or right side to frame so that the soles are slightly apart, with feet resting on the ground, the leg is bent at 90° (figure 2). The legs are placed as described above, to not push into the soil and thus supplement thrust, then snaps belt which passes through the acromial point and will coincide with the mid-point belt.

Adjust the vertical (if necessary) the transducer support. The arms are crossed over the chest to keep the subject (especially children tend to grab something to help traction) to find a way to supplement thrust.

The stand 14 will slide horizontally and will be fixed next to pelvis, with screws, in the direction of bending of the trunk, to prevent the pelvis to move aside, and to add this this way. In the initial position, the trunk will be vertical. At the signal, the subject will execute a strong thrust movement of the trunk and lateral bending; keeping a uniaxial direction (avoids rocking back and forth during the action). The computer will retain maximum traction force transducer and recorded transposed graphically in real time on the chart.



**Figure 2.** Muscle strength testing on the left and right lateral tilt of sitting

### Muscle strength testing on extension of sitting

The subject sits astride facing seat frame so that the soles of the subject will be placed on the ground; the leg is bent at 90° (figure 3). The legs are located as described above, not to push the ground and thus supplement the thrust. Fasten the belt then passes through acromial points while the middle belt line coincides with the spine. If the case, adjust vertically the transducer's support, so that it is in the T1-T2 vertebrae region.

The arms are crossed over the chest to keep the subject (especially children, tend to grab something to

help traction) to find a way to supplement thrust. The support will slide horizontally and will be fixed with screws, stop prevent the pelvis to run backwards during the traction and to add thus this way. In the initial position, the trunk will be vertical.

At the signal, the subject will execute a strong traction trunk extension keeping a uniaxial direction (left-right swing is avoided during the action). The computer will retain maximum traction force transducer and recorded transposed graphically in real time on the chart.



**Figure 3.** Testing muscle strength on extension of sitting

#### Muscle strength testing on the right side slope of standing

To have this measurement done, the height is adjusted so that the pelvis is supported during testing in the sacral region. The subject sits upright on the plate back to the stand with your feet slightly apart, parallel to each other, with basin supported by the support plate, the vertical trunk and arms crossed over the chest (figure 4).

Fasten the belt then passes through acromial points



**Figure 4.** Muscle strength testing on the right side slope of standing

#### Testing muscle strength on the right and left lateral tilt of standing

The subject is standing on the plate, with the shoulder toward the support, feet slightly apart, parallel to each other, the pelvis supported by the support plate, the trunk in vertical position and arms crossed over the chest (figure 5). Fasten the belt then passes through the acromial point and will coincide with the mid-point



**Figure 5.** Testing muscle strength on the right and left lateral tilt of standing

#### Testing the extension muscle strength in standing

The subject should stand upright facing the support plate with feet slightly apart, parallel to each other, with the pelvis supported by support plate, the trunk in vertical position and arms crossed over the chest (figure 6).

Fasten the belt then passes through the acromial points until the middle belt coincides with posterior midline of the thorax.

and the middle belt coincides with the midline anterior chest. Adjust the vertical transducer holder so that it will be in the T1-T2 vertebrae region. At the signal, the subject will execute a strong traction trunk flexion keeping a uniaxial direction (left-right swing is avoided during the action), taking as a support for the basin, especially support 7.

The computer will retain maximum traction force recorded transducer and implemented in real time chart.

belt. Adjust the vertical transducer holder. At the signal, the subject will execute a strong tensile lateral bending of the trunk, keeping a uniaxial direction (avoids rocking back and forth during the action), taking as a foothold for pool, specialty media. The computer will retain maximum traction force transducer and recorded transposed graphically in real time on the chart.

Vertical support of the transducer is adjusted so as to be in the region of the vertebrae T1-T2.

At the signal, the subject will execute a strong traction trunk extension, keeping a uniaxial direction (left-right swing is avoided during the action), taking as a foothold for pool, specialty media.

The computer will retain maximum traction force transducer and recorded transposed graphically in real time on the chart.



**Figure 6.** Testing the extension muscle strength in standing

Lumbar muscle strength testing (classic test)

The subject should stand upright facing the support plate with feet slightly apart, parallel to each other, the trunk horizontally bends so hands to reach the knees and grabbed the handle attached to the transducer (figure 7).

At the signal, the subject will execute a strong

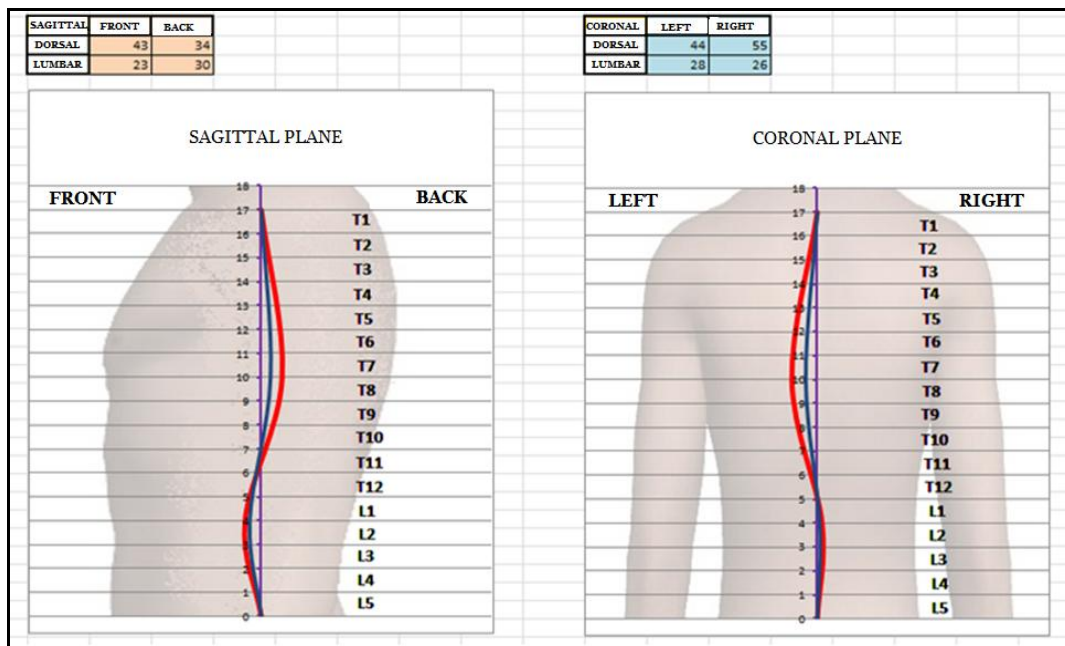
traction trunk extension, keeping a uniaxial direction (left-right swing is avoided during the action).

The computer will remember the thrust, the maximum value recorded by the transducer and implemented in real time chart diagram.

The final graph shown in figure 8.



**Figure 7.** Testing lumbar muscle strength (classic test)



**Figure 8.** The graph muscle imbalances presented in coronal and sagittal plane

**Results**

The data collected were processed using SPSS v. 20 for Windows. Unifactorial dispersion analysis is used (One Way ANOVA), the method by which the multiple comparisons is the one with repeated measurements. The report compares the variation between Fisher groups and intra-group variation. In

table 2 are the internal variations in each group for each test. The ratio of the number of cases and variables should be 5-1 (some analysts go up to 2-1). With a ratio of 3.33 to 1 we fit between the two values. There is a standard deviation increase with age differences are highlighted in the group of subjects.

**Table 2.** Descriptive Statistics

		6 years	7 years	12 years	14 years	16 years	18 years
<b>T1</b>	Mean	6.35	8.50	13.85	18.20	17.30	20.50
	<b>Std. Deviation</b>	1.927	1.318	4.017	4.008	2.975	3.086
	N	20	20	20	20	20	20
<b>T2</b>	Mean	6.55	8.45	10.05	14.00	13.90	18.35
	<b>Std. Deviation</b>	1.669	1.669	3.017	4.039	2.989	3.297
	N	20	20	20	20	20	20
<b>T3</b>	Mean	7.50	10.85	21.30	29.65	30.50	23.50
	<b>Std. Deviation</b>	1.732	3.297	7.234	8.683	8.172	5.790
	N	20	20	20	20	20	20
<b>T4</b>	Mean	6.30	8.55	10.05	13.35	14.60	17.35
	<b>Std. Deviation</b>	1.976	1.849	3.000	4.209	3.251	3.014
	N	20	20	20	20	20	20
<b>T5</b>	Mean	9.95	13.60	25.50	29.00	32.40	50.65
	<b>Std. Deviation</b>	2.874	3.424	7.837	6.061	9.372	13.712
	N	20	20	20	20	20	20
<b>T6</b>	Mean	9.85	12.00	22.20	29.45	26.90	42.25
	<b>Std. Deviation</b>	2.961	2.974	6.371	5.414	5.757	8.765
	N	20	20	20	20	20	20
<b>T7</b>	Mean	12.20	14.25	28.85	35.60	34.63	50.65
	<b>Std. Deviation</b>	3.518	3.432	6.401	9.011	9.622	14.225
	N	20	20	20	20	20	20
<b>T8</b>	Mean	9.45	12.10	22.15	29.05	28.00	45.25
	<b>Std. Deviation</b>	2.523	3.478	5.923	4.751	6.139	7.960
	N	20	20	20	20	20	20
<b>T9</b>	Mean	22.35	28.15	53.10	69.65	75.80	126.25
	<b>Std. Deviation</b>	5.019	6.352	13.611	18.712	12.051	13.935
	N	20	20	20	20	20	20

Values shown if the condition of sphericity;  $p > 0.05$ .

**T1**, the flexion muscle strength testing, from sitting; **T2**, testing muscle strength on the left side slope, from sitting; **T3**, muscle strength testing the extension of sitting; **T4**, muscle strength testing on the right side slope, from sitting; **T5** flexion muscle strength testing of standing; **T6**, testing muscle strength on the left lateral tilt of standing; **T7**, muscle strength testing the extension from standing; **T8**, muscle strength testing on the right side slope of standing; **T9**, lumbar muscle strength testing; **Mean**; arithmetic mean; **Std. Deviation**; standard deviation; **N**, the number of cases.

For repeated measures with ANOVA, appears an additional condition called sphericity condition. This implies the assumption of a similar relationship between each pair of experimental conditions; it is a more general condition of complex symmetry. The latter is satisfied if the variance is equal in all experimental situations (homogeneity of variance).

In practice it is noted that it is very difficult to meet

the double condition, in the majority ANOVA method with repeated measures more than two groups were violating this condition.

It is noted that Mauchly's test result Test of Sphericity is not statistically significant ( $p > 0.05$ ) and therefore the spherical condition is met. The tests most "sensitive" are T5 and T7 (table 3).

**Table 3.** Mauchly's Test of Sphericity

	Mauchly's W	Approx. Chi-Square	df	sig.
<b>T1</b>	0.319	19.564	14	0.148
<b>T2</b>	0.295	20.901	14	0.107
<b>T3</b>	0.105	38.519	14	0.000
<b>T4</b>	0.247	23.928	14	0.49
<b>T5</b>	0.065	46.747	14	0.000
<b>T6</b>	0.186	28.792	14	0.012
<b>T7</b>	0.060	48.059	14	0.000
<b>T8</b>	0.229	25.195	14	0.034
<b>T9</b>	0.130	34.879	14	0.002

Values shown if the condition of sphericity;  $p > 0.05$ .

**T1**, the flexion muscle strength testing, from sitting; **T2**, testing muscle strength on the left side slope, from sitting; **T3**, muscle strength testing the extension of sitting; **T4**, muscle strength testing on the right side slope, from sitting; **T5**, flexion muscle strength testing of standing; **T6**, testing muscle strength on the left lateral tilt of standing; **T7**, muscle strength testing the extension from standing; **T8**, muscle strength testing on the right side slope of standing; **T9**, lumbar muscle strength testing; **Mauchly's W**, Mauchly's Test of Sphericity; **Approx. Chi-Square**; **df**, degrees of freedom; **sig.**  $p > 0.05$ ;

Fisher report has significant value at  $p < 0.05$ . It is observed in table 4 that all values of F are greater than 0.05 so the null hypothesis is rejected. The F value will increase over, the probability of being wrong in

rejecting the null hypothesis will decrease. In all cases the variation explained by differences between groups is greater than the variation due to random errors.

**Table 4.** Tests of Within-Subjects Effects

	Sphericity Assumed				
	Type III Sum of Squares	df	Mean Square	F	sig.
<b>T1</b>	3189.867	5	637.973	66.592	0.000
<b>T2</b>	1879.167	5	375.833	42.581	0.000
<b>T3</b>	9109.400	5	1821.880	44.762	0.000
<b>T4</b>	1697.200	5	339.440	39.239	0.000
<b>T5</b>	21297.200	5	4259.440	61.774	0.000
<b>T6</b>	14366.675	5	2873.335	89.055	0.000
<b>T7</b>	20860.247	5	4172.049	59.799	0.000
<b>T8</b>	16982.667	5	3396.533	109.306	0.000
<b>T9</b>	143447.300	5	28689.460	176.103	0.000

Values represent the results of analysis of variance.

**T1**, the flexion muscle strength testing, from sitting; **T2**, testing muscle strength on the left side slope, from sitting; **T3**, muscle strength testing the extension of sitting; **T4**, muscle strength testing on the right side slope, from sitting; **T5** flexion muscle strength testing of standing; **T6**, testing muscle strength on the left lateral tilt of standing; **T7**, muscle strength testing the extension from standing; **T8**, muscle strength testing on the right side slope of standing; **T9**, lumbar muscle strength testing; **Type III Sum of Squares**, Sum of squares; **df**, degrees of freedom; **Mean Square**, the mean square; **F**, fisher report; **sig.**  $p > 0.05$ .

### Discussions

A sensitive problem of achieving measurements with dynamometers, meaning the influence of gravity on their accuracy and correction made to dynamometers for trunk muscle strength during measurements on different degrees of motion is studied by Bygott, McMeecken, Carroll and Story (2001). Researchers have assumed that while performing

correction by this method, the gravitational force acting on the trunk is being treated as a vertical vector forces that influence the process. To correct this shortcoming is proposed a method of establishing a predetermined angle (as a formula) to be placed in the trunk during testing, thereby cancelling the influence of gravity. Six Ways gravity correction was found that the method is not reliable enough to be trusted, being influenced by





the strain relaxation and subjects.

With this method and the apparatus shown in this study, the method of testing includes fixed positions on the starting traction on the dynamometer, following that trunk not to use too much leverage to amplify the values obtained. It was intended to adopt a position as close to normal.

On this principle were corrected to athletes from the trunk muscle imbalances (Baštiurea, Stan, Andronic, 2009). It was conceived as a way of primary prevention of physical deficiencies attitude (Stan, 2006).

### Conclusions

All tests have a significant sensitivity taking into account differences between subjects; in this case study is the age factor. It highlights the differences between groups and differences between subjects in each group.

The lower is the T4, muscle strength testing on the right side slope, which means that independent factor affecting less dependent factor here laterality intervening trunk influenced by skilful arm. This influence increases with age.

Differences between groups justifies a significant part of the variation in the independent variable, the results are not accidental.

Null hypothesis is rejected and the alternative hypothesis is accepted that media groups are significantly different from each other and not due to chance alone. The conclusions must be accepted with care, as it concerns only this group of subjects.

### References

- Baštiurea E, Stan Z, Gutiérrez AÓ, Andronic F, 2011, Study regarding the degree of correlation between the capacity of effort and the values of muscle strength Measured on the main directions of the torso's movement at young handball players. The Annals of the University "Dunarea de Jos" Galati, Fascicle XV: Physical Education and Sport Management 2011; 1:65-69.
- Baštiurea E, Stan Z, Andronic F, 2009, Study on increasing the values of trunk muscle force and correcting the imbalances in handball players. The Annals of the University "Dunarea de Jos" Galati, Fascicle XV: Physical Education and Sport Management 2009; 1:181-184.
- Berschin G, Sommer HM, 2002, A new way of active control of posture in muscle testing apparatus based exercise. *Isokinetics and Exercise Science*, 2002; 10(1):51.
- Bygott L, McMeeken J, Carroll S and Story I, 2001, Gravity correction in trunk dynamometry: Is it reliable? *Isokinetics and Exercise Science*, 2001; 9(1):11-19.
- Kane K, Barden J, 2012, Contributions of trunk muscles to anticipatory postural control in children with developmental coordination disorder and without. *Human Movement Science*, 2012; 31:707-720.
- Kazuhiko I, Miyamoto K and Katsuji S, 2005, Erector spine muscle effects of fatigue on trunk repositioning accuracy in forward and lateral flexion. *IOS Press, Back and Musculoskeletal Rehabilitation Journal*, 2005; 18:61-66.
- Manini T, Sagendorfa K, Mayer J and Plutz-Snyder L, 2005, Trunk extensor muscle function in young and old women: A pilot study. *IOS Press, Back and Musculoskeletal Rehabilitation Journal*, 2005; 18:5-13.
- Marcu V, Stan Z, Baštiurea E, Chiculiță C, 2008, Determination of muscle imbalances present in the trunk - a method and apparatus. Galati: Academica Publishing House, 2008; 81-114.
- Mockova M, Greenwood RJ, Day B, 2006, A method for quantifying directional strength and motor control of the trunk. *Journal of Neuroscience Methods*, 2006; 156:211-217.
- Sommer HM, Hofmeier A, Berschin G, 2002, Proprioception and thus muscle strength measurement of the knee joint. *Isokinetics and Exercise Science*, 2002; 10(1):44.
- Rizescu C, Georgescu A, 2009, Development of the explosive power at the beginner in handball, 11-th International Conference of Sport Kinetics, "Current and Future Directions in Human Kinetics Research", final program & book of abstracts, Kallithea, Chalkidiki, Greece, 2009; 258-259.
- Stan Z, 2009, Evaluation and functional motor – course. Galati: Publisher Zigotto, 2009; 108-116.
- Stan Z, Baštiurea E, 2008, The values of the muscular force measured with SMFMT on flexion, at preschool aged children. International Scientific Conference "Creativity and competition, European scientific and sporting attributes of manifestation" Academic Publishing, Galati, 2008 may; 536-541.
- Stan Z, 2006, Prevention installation deficiencies spine in children, by measuring muscle strength in the upper body *Romanian Journal of Physical Therapy*, 2006; 17:58-68.
- Voisin P, Bibra P, Goethals M, Masse P and Weissland T, 2002, Eccentric concentric isokinetic evaluation of trunk vs. extensors in standing position. *Isokinetics and Exercise Science*, 2002; 10(1):54-55.



## Content

**ABDUSSALAM KANNIYAN, ABRAHAM GEORGE, SHAFEEQ VALIYAKATH**  
**PERSONALITY TRAITS: AN ANALYTICAL STUDY BETWEEN SEDENTARY MALES AND SPORTS MALES / p. 5**

**ALEXE DAN IULIAN, DELEU CRISTINA, NIȘU SILVIU**  
**A STUDY ON THE FINANCIAL COSTS OF THE U.E. POPULATION ACCORDING TO THE "COST PER MINUTE" RATIO OF A MASSAGE SESSION / p. 10**

**DOCU ANY AXELERAD, DOCU DANIEL AXELERAD**  
**ROLE OF EXERCISES IN FASCICULATION ANXIETY SYNDROME / p. 17**

**DOCU DANIEL AXELERAD, DOCU ANY AXELERAD**  
**EVOLUTION AND REHABILITATION IN ISCHEMIC STROKE OF LEFT INTERNAL CAROTID ARTERY / p. 22**

**GIDU DIANA VICTORIA, ENE-VOICULESCU CARMEN, STRATON ALEXANDRU, MICU ALEXANDRU, BORZIAN GRIGORE**  
**MUSIC INFLUENCE IN THE RECOVERY OF THE YOUNG ADULTS AFTER STROKE-CVA(30-40 YEARS OLD) / p. 30**

**GOGU ANCA, LUPU MIRELA, PARV FLORINA**  
**THE CORRELATION BETWEEN ISCHEMIC STROKE, ATRIAL FIBRILLATION AND EARLY NEUROREHABILITATION / p. 35**

**ICONOMESCU TEODORA MIHAELA, ALEXE DAN IULIAN**  
**DIFFERENCES AND SIMILARITIES IN CURRICULUM AND ASSESSMENT IN PHYSICAL EDUCATION IN EASTERN EUROPEAN STATES / p. 41**

**MARTINESCU FABIANA**  
**SURVEY BASED ON A QUESTIONNAIRE TO ASSESS THE TRAINING LEVEL OF REFEREES IN THE MALE AND FEMALE NATIONAL BASKETBALL LEAGUE / p. 47**

**MIHĂILESCU LIVIU, MIHĂILESCU PETRUȚA**  
**THE ANALYSIS OF THE RESULTS OBTAINED IN THE MEN 100 M EVENT IN THE 12<sup>TH</sup> EDITION OF THE ATHLETICS WORLD CHAMPIONSHIPS / p. 52**

**ROMAN CĂLIN**  
**THE CONTRIBUTION OF THE GOALKEEPERS OF THE FRANCE NATIONAL TEAM IN WINNING THE INTERNATIONAL HANDBALL COMPETITIONS / p. 57**

**STAN ZENOVIA, BAȘTIUREA EUGEN, RIZESCU CONSTANTIN**  
**SENSITIVITY TESTING STUDY PROPOSED BY METHOD AND APPARATUS FOR DETERMINING MUSCLE IMBALANCES AT THE TRUNK LEVEL / p. 62**

**ALPHABETICAL AUTHOR INDEX / p. 63**

**Technical Requirements to Elaborate Scientific Papers / p. 64**



## ❖ ALPHABETICAL AUTHOR INDEX

### A

ABDUSSALAM K. / p. 5  
ABRAHAM G. / p. 5  
ALEXE D.I. / p. 10, 41

### B

BAȘTIUREA E. / p. 62  
BORZIAC G. / p. 30

### D

DELEU C. / p. 10  
DOCU A.A. / p. 17, 22  
DOCU D.A. / p. 17, 22

### E

ENE-VOICULESCU C. / p. 30

### G

GIDU D. / p. 30  
GOGU A. / p. 35

### I

ICONOMESCU T. / p. 41

### L

LUPU M. / p. 35

### M

MARTINESCU F. / p. 47  
MICU A. / p. 30  
MIHĂILESCU L. / p. 52  
MIHĂILESCU P. / p. 52

### N

NIȘU S. / p. 10

### P

PARV F. / p. 35

### R

RIZESCU C. / p. 62  
ROMAN C. / p. 57

### S

SHAFEEQ V. / p. 5  
STAN Z. / p. 62  
STRATON A. / p. 30



## Technical Requirements to Elaborate Scientific Papers

### TITLE OF THE PAPER

### NAME AND SURNAME of the paper's author or authors<sup>1</sup>

Example:

**FISHER DIANA<sup>1</sup>, VIOLETT ANNA<sup>2</sup>, LE BOUC IANS<sup>3</sup>**

Footnotes will consist of:

a) name of department, name of institution (if necessary), name of university, city and address of university, native country (Home, Times New Roman, Size 8, Justify),

b) for the author who deals with the correspondence for the paper or reprint: name of department, name of institution (if necessary), name of university, city and address of university, native country followed by the phrase CORRESPONDENCE AND REPRINT REQUESTS: (Home, Times New Roman, Size 8, Justify, Caps Lock) name of the author, address, e-mail, phone and/or fax number (if necessary) (Home, Times New Roman, Size 8, Justify) and

c) in a new paragraph, the source of the material support in the shape of GRANT-s (if necessary)(Home, Times New Roman, Size 8, Justify), written after the phrase GRANT SUPPORT: (Home, Times New Roman, Size 8, Justify, Caps Lock).

(follow as example the footnotes)

### Technical requirements to elaborate the structured informative abstract:

#### Abstract

*Objective.* The aim of this study is to examine the relationship between skinfolds method (accu-measure caliper) and near-infrared method (FUTREX 1000 Personal Body Fat Tester)

*Methods.* We used Romanian university students (27 males and 97 females). The body fat percentage was measured by two methods: the skinfolds measurements...

*Results.* Body fat estimated with accu-measure caliper was moderate correlated with body fat estimated with FUTREX for women ( $r = 0.41$ )...

*Conclusions.* We cannot consider that one method of body composition analysis (skinfolds method or near-infrared method) is more accurate than...

*Key Words:* skinfolds method, near-infrared method, percentage of body fat, fat mass, free fat mass, Romanian students.

### Technical requirements to elaborate the non-structured indicative or informative abstract:

#### Abstract

The aim of this study was to examine the relationship between skinfolds method (accu-measure caliper) and near-infrared method (FUTREX 1000 Personal Body Fat Tester) for body fat percent, fat mass and free fat mass estimations, in Romanian university students. We used Romanian university students (27 males...

*Key Words:* skinfolds method, near-infrared method, percentage of body fat, fat mass, free fat mass, Romanian students.

The page layout of the research paper is 2.5 cm from the top, bottom, left and right margins (Page Layout, Margins, Top 2.5cm, Bottom 2.5cm, Left 2.5cm, Right 2.5cm), portrait oriented (Page Layout, Orientation, Portrait), A4 (Page Layout, Size, A4 - 21cm x 29.7cm).

The title of the paper, the name of the author (authors) and the abstract will be written on a single column, following the rules of laying out the page.

The chapters: Introduction, Methods, Results, Discussions, Conclusions, Thanks (if necessary) and Bibliography will be written on two columns, except for the tables and charts which will be written on a single column, following the rules of laying out the page..

<sup>1</sup> Department of Obstetrics, Gynecology and Women's Health, University of Missouri, Columbia, MO 65212, USA.

<sup>2</sup> Department of Obstetrics, Gynecology and Women's Health, Division of Biological Sciences, University of Missouri, Columbia, MO 65212, USA. CORRESPONDENCE AND REPRINT REQUESTS: Alissa Viollet, NW509 Health Sciences Center, 1 Hospital Dr., Columbia, MO 65212, USA. [aviollet@missouri.edu](mailto:aviollet@missouri.edu), tel. 573-882-6334, fax. 573-882-6399

<sup>3</sup> Department of Anatomy, Institute of Biomedical Sciences, University of São Paulo, CEP São Paulo 05508-900, Brazil. GRANT SUPPORT: Eunice Kennedy Shriver National Institute of Child Health and Human Development HD055231.



The space between the title of the paper, the name of the author or authors of the paper, abstract, introduction, methods, results, discussions, conclusions and bibliography is one line (Enter, Font Size 10); the space between the writing and the tables or charts is also one line (Enter, Font Size 10).

The titles of the sub-chapters will be written in bold (Home, Times New Roman, Size 10, Bold, Justify, First Line Indent 0,5cm). All the paragraphs will present a 0,5 cm size compared to the margin (First Line Indent 0,5cm). The text will have the following technical characteristics: Home, Times New Roman, Size 10, Justify. Between the titles of the sub-chapters and the text there will be no space.

Example of laying out the page and arranging the text:

## Relationship between skinfolds and near-infrared (FUTREX 1000) methods for body fat estimation in Romanian university students

IONESCU TUDOR MADALIN, PHD<sup>1</sup>, MARCU ANDREI, MS<sup>2</sup>

### Abstract

**Objective.** The aim of this study was to examine the relationship between skinfolds method (accu-measure caliper) and near-infrared method (FUTREX 1000 Personal Body Fat Tester) for body fat percent, fat mass and free fat mass estimations, in Romanian university students.

**Methods.** We used Romanian university students (27 males and 97 females). The body fat percentage was measured by two methods: the skinfolds measurements (accu-measure caliper) and near-infrared measurement (Futrex 1000).

**Results.** Body fat estimated with accu-measure caliper was moderate correlated with body fat estimated with FUTREX for women ( $r = 0.41$ ) and for men ( $r = 0.55$ ). Fat mass (skinfolds method) skinfolds method and free fat mass (skinfolds method) were moderate correlated with fat mass (near-infrared method), respectively free fat mass (near-infrared method) for women ( $r = 0.41$ , respectively  $r = 0.41$ ) and correlated for men ( $r = 0.60$ , respectively  $r = 0.60$ ).

**Conclusions.** We cannot consider that one method of body composition analysis (skinfolds method or near-infrared method) is more accurate than the other because we don't apply a gold standard method of measurement, for subjects. However, near-infrared method trends to have higher estimations of body fat, then skinfolds method on Romanian students.

**Key Words:** skinfolds method, near-infrared method, percentage of body fat, fat mass, free fat mass, Romanian students.

### Introduction

The increase in obesity is a global phenomenon that is even being addressed by the World Health Organization (World Health Organization, 2003), as well as by medical and government organizations in the world.

One of factors that contribute to body composition changes, respectively to body fat percent grow up is physical inactivity or sedentary lives (National Institutes Of Health, 1998).

Factors, such as age, gender, level of adiposity, physical activity and ethnicity influence the choice of method and equation. To date, race-specific SKF (American Indian women, Black men, and Asian adults), BIA (American Indian women and Asian adults), and NIR (American Indian women and White women) equations have been developed (Heyward, 1996).

Infrared is not an indicator of body composition in the pre-adolescent population on an individual basis. This method continues to be no accurate, cost-effective means to assess individual body composition by a rapid, noninvasive methodology (Michael, Jan, Wendy, 2003).

Larger prediction errors have been reported with the lower cost, hand-held Futrex 1000 model. Because of these errors, the manufacturer's equations for the

Futrex 1000 are not recommended to assess body composition (Wagner and Heyward, 1999).

Kamimura et al. 2009, cannot consider that one method of body composition analysis (SKF method, bioelectrical impedance analysis, or NIR method) is more accurate than the other because they didn't apply a gold standard method, for patients on long-term hemodialysis therapy. However, the most simple, long-established, and inexpensive method of SKF thickness seems to be still very useful for assessing body fat (Kamimura, Jose Dos Santos, Avesani, Fernandes Canziani, Draibe, Cuppari, 2003).

In a healthy group of 29 subjects examined by Elia et al., NIR method had little or no advantage over other simple methods in predicting body composition measured by classical whole-body densitometry. NIR method was also found to underestimate body fat increasingly as the degree of adiposity increased. This under-estimation was found to be particularly marked in a small and separate group of grossly obese women, BMI greater than  $50 \text{ kg/m}^2$ , whose body composition was assessed by total body potassium as well as by densitometry (Dumitru, 1997).

Heyward et al. concluded that all three field methods, respectively SKF, bioelectric impedance and NIR compared with hydrostatic weighting, accurately estimate the percent of body fat for nonobese women; however, none of these three



methods is suitable for estimating the percent of body fat for obese women (Heyward, Cook, Hicks, Jenkins, Quatrochi, Wilson, 1992).

One study concluded that, SKF is higher correlated with under water weighting than did FUTREX 5000 with under water weighting for males (0.95 versus 0.80), females (0.88 versus 0.63), and the whole group (0.94 versus 0.81) and FUTREX 5000 overestimated body fat in lean subjects with less than 8% fat and underestimated it in subjects with greater than 30% fat. Analyzing this, the authors concluded that, SKF give more information and more accurately predict body fat, especially at the extremes of the body fat continuum (McLean and Skinner, 1992).

The present findings indicate that, the FUTREX 5000 provide more accurate estimates of body fat percent than the FUTREX 5000A or FUTREX 1000 instruments (Smith, Johnson, Stout, Housh, Housh, Evetovich, 1997). Continued research with expanded populations is needed to further demonstrate and evaluate the utility of FUTREX 5000A device (Cassady, Nielsen, Janz, Wu, Cook, Hansen, 1993).

Conway et al. concluded that, body composition (percentage fat) estimated in 53 adults (23 to 65 years of age) by infrared interactance, is correlated with SKF ( $r = 0.90$ ) measurements. They concluded that, the method is safe, noninvasive, rapid, easy to use, and may prove useful to predict percentage body fat, especially in the obese (Conway, Norris, Bodwell, 1984).

SKF method is still a reliable technique of BF estimation, but if it's not realized with the most accurately instruments the results tends to have errors in BF estimation and FM, respectively FFM (Cyrino, Okano, Glaner et al., 2003). The NIR method is still a questionable technique for BF estimation (McLean and Skinner, 1992; Michael, Jan, Wendy, 2003; Wagner and Heyward, 1999).

The objective of this study is to examine the relationship between skinfolds (SKF) method (accu-measure caliper) and near-infrared (NIR) method

(FUTREX 1000 Personal Body Fat Tester) for body fat percent (BF), fat mass (FM) and free fat mass (FFM) estimation, in Romanian university students.

### Methods

The subjects were white Caucasian and students at faculties of Ovidius University in Constanta. The aims and methods of the study were explained to the participants, who chose freely to participate in this study. As a result, the sample included 127 students (97 females and 27 males), with age between 18 and 23 years old.

Body height was evaluated with an error of 0.1 centimeters and body weight was evaluated with a calibrated digital scale, with an error of 0.25 kilograms. For this measurement the subjects were dressed summarily. BMI was calculated to estimate the category of weight for each subject by using the Quetelet formula (Dumitru, 1997).

Percent of body fat was estimated with two methods. The first method consisted in calculation of body fat percent with Jackson and Pollock, (1978), equation, for male subjects and Jackson, Pollock and Ward, (1980), equation, for female subjects. The abdominal (taken vertically with a broad grip, 5cm. lateral to the omphalion (centre of the umbilicus)), chest (taken obliquely along the natural cleavage line of the pectoral between the axilla and nipple) and thigh (vertical fold taken midway between the inguinal crease and proximal border of the patella) skinfolds were measured for ...

.....  
 .....  
 .....  
 .....

### Results

In table 1 the differences between sexes were significant only for body height ( $t = 9.838$ ) and body weight ( $t = 5.841$ ).

**Table 1.** Physical characteristics of the subjects

Variables	M ± SD	
	Males (n = 27)	Females (n = 97)
Age (years <sup>months</sup> )	19 <sup>7</sup> ± 0 <sup>11</sup>	20 <sup>1</sup> ± 2 <sup>8</sup>
Body height (cm)	1.789 ± 0.078 *	1.63 ± 0.059
Body weight (kg)	66.074 ± 11.135 *	52.722 ± 7.842
BMI (kg/m <sup>2</sup> )	20.598 ± 2.929	19.811 ± 2.485

\* differences between sexes,  $p < 0.05$ .  
 BMI, body mass index; M, mean; SD, standard deviation; n, number of subjects.

In table 2 the differences between sexes were significant for all variables (BFskf,  $t = 13.278$ ; FMskf,  $t = 6.346$ ; FFMskf,  $t = 11.498$ ; BFnir,  $t = 7.856$ ; FMnir,  $t = 2.883$ ; FFMnir,  $t = 9.861$ ). All variables from SKF

method had significant correlations with their correspondent variable from NIR method, when body height, body weight and age were controlled. BFskf was moderate correlated with BFnir for women ( $r =$



0.41) and for men ( $r = 0.55$ ). FMskf and FFMskf were moderate correlated with FMnir, respectively FFMnir

for women ( $r = 0.41$ , respectively  $r = 0.41$ ) and correlated for men ( $r = 0.60$ , respectively  $r = 0.60$ ).

**Table 2.** Differences between SKF method and NIR method

Variables	Skinfold method (Accu-measure caliper) M ± SD	
	Males (n = 27)	Females (n = 97)
BFskf (%)	8.962 ± 4.407 * †	21.886 ± 4.704 *
FMskf (kg)	6.25 ± 4.006 * †	11.806 ± 4.085 *
FFMskf (kg)	59.824 ± 8.207 * †	40.915 ± 4.512 *
Variables	Infrared method (Futrex 1000) M ± SD	
	Males (n = 27)	Females (n = 97)
BFnir (%)	13.074 ± 5.988 †	22.805 ± 4.475
FMnir (kg)	8.97 ± 5.431 †	12.164 ± 3.615
FFMnir (kg)	57.104 ± 8.225 †	40.557 ± 5.486

\* correlated with BFnir, FMnir and FFMnir for males, respectively for women, when height, weight and age are controlled,  $p < 0.05$ ;  
 † differences between sexes,  $p < 0.05$ .

BFskf, body fat - skinfolds method; FMskf, fat mass - skinfolds method; FFMskf, free fat mass - skinfolds method; BFnir, body fat - infrared method; FMnir, fat mass - infrared method; FFMnir, free fat mass - infrared method; M, mean; SD, standard deviation; n, number of subjects.

**Discussion**

Compared with the anthropometric reference data 1988 – 1994 from United States (National Health and Nutrition Examination Survey, 2005), body height for our subjects was slightly higher for men and slightly lower for women, compared with the corresponding values for Americans. The body weight was lower, for both men and women, compared with the corresponding values for Americans.

**Conclusions**

The conclusions must be reported directly to the hypotheses of the paper and derive directly from the chapter Discussions. The conclusions that are not fully backed-up by the data found or that are based on unjustified affirmations must be avoided. New hypotheses can be concluded or attach some recommendations, if the case be.

**Acknowledgments**

I thank all students for participating in this study. No funding was used for this study.

**References**

Cassady SL, Nielsen DH, Janz KF, Wu YT, Cook JS, Hansen JR. 1993, Validity of near infrared body composition analysis in children and adolescents, Med Sci Sports Exerc, 1993 Oct; 25(10):1185-1191.  
 Conway JM, Norris KH, Bodwell CE. 1984, A new approach for the estimation of body composition: infrared interactance. Am J Clin Nutr, 1984 Dec; 40(6):1123-1130.  
 Cyrino ES, Okano HA, Glaner FM et al. 2003, Impact of the use of different skinfold calipers for the analysis of the body composition. Rev Bras Med Esporte, 2003; 9(3):150-153.  
 National Institutes of Health (NIH). Clinical Guidelines On The Identification, Evaluation, And Treatment Of Overweight And Obesity In Adults. The Evidence Report. Publication No. 98-4083, 1998 Sep: XI-XXX.

**Attention!!!** First of all, the article is written on a single column until it is finalized. After finalizing it, you select the whole text after the abstract until the first table or chart and you turn it into two columns. The same operation is done, in order, for (the whole) texts between charts and/or tables; also, the (whole) text, from the last table or chart until the bibliography inclusive, will be turn into two columns. **The paper must be 5-10pages.**

**Tables**

The tables including data will be done on a single column and they cannot be introduced into the text as photographs. The counting (consecutive) and the title of the table (conclusive and concise) will be written on the top right hand. The

reference to the table (the quotation in the text) will be found in the text that precedes the table. The number of the table, the title of the table, the results, the statistical section and the abbreviation section will be a constitutive part of the table. It is recommended that you merge the data in as few tables as possible. The additional black lines in the tables including data will be colored in white (Table Tools, Design, Pen Color, White, urmat de Draw Table prin care se trasează peste liniile negre suplimentare culoarea albă).

Table 1. Physical characteristics of feminine subjects

Variables	Subjects with dominant upper and lower right limb(n = 8)		Subjects with dominant upper and lower left limb (n = 8)	
	Height (cm.)	163,25 ± 4,95	3,032%	162,5 ± 4,309
Weight (kg.)	66,088 ± 7,343	11,111%	67,038 ± 5,352	7,984%
IMC (kg/m <sup>2</sup> )	24,745 ± 1,827	7,383%	25,368 ± 1,439	5,673%
Percentage of body fat(%)	26,625 ± 2,873	10,791%	26,55 ± 2,964	11,164%
Fat mass (kg.)	17,739 ± 3,56	20,069%	17,91 ± 3,235	18,063%

The values are presented as M ± DS și CV%.

IMC, index of body mass; M, mean; DS, standard deviation; CV, variability coefficient; n, number of subjects.

The connection between the data in the table and the statistical section will be done through identification letters counted in alphabetical order or identification symbols used in the order \*, †, ‡, §, ||, ¶, \*\*, ††, ‡‡, etc.; inside the table, the letters or the identification symbols will be written in the superscript(Home, Superscript) immediately after the data, and inside the statistical section, the identification letters will be written before the hyphen and the statistical comments and the identification symbols immediately before the statistical comments (without a hyphen).

The tables from other publications should be used with the author's (authors') permission, indicating the bibliographic source where it was taken from.

Example: 0,851 ± 0,044<sup>a</sup>

Example: a – significantly different compared to the force ratio F150 Right side flexion/ F150 Left side flexion, 0°, for the subjects who practise football, respectively athletics (triple jump), F(2, 12) = 5,5;

Table 2. Means of results of maximum isometric force ratios for feminine subjects who practise different sports

Force ratio	Handball (n = 5)	Football (n = 5)	Athletics (triple jump) (n = 5)
F130 Flexion/ F110 Extension (30°)	0,589 ± 0,109 18,506%	0,556 ± 0,075 13,489%	0,565 ± 0,05 8,85%
F150 Right side flexion/ F150 Left side flexion (0°)	0,851 ± 0,044 <sup>a,b</sup> 5,17%	0,942 ± 0,056 <sup>c</sup> 5,945%	0,919 ± 0,03 <sup>d</sup> 3,264%
F120 Right side rotation/ F120 Left side rotation (-30°)	0,972 ± 0,07 7,202%	0,825 ± 0,227 27,515%	1,052 ± 0,019 <sup>e</sup> 1,806%

a – significantly different compared to the mean of the force ratio F150 Right side flexion/ F150 Left side flexion, 0°, for subjects who practise football, respectively, athletics (triple jump), F(2, 12) = 5,5;

b – significantly different compared to the mean of the force ratio F150 Right side flexion/ F150 Perfectly ballanced left side flexion (when all the force ratios are equal to 1), 0°, t=7,572;

c – significantly different compared to the mean of the force ratio F150 Right side flexion/ F150 Perfectly ballanced left side flexion (when all the force ratios are equal to 1), 0°, t=2,316;

d – significantly different compared to the mean of the force ratio F150 Right side flexion/ F150 Perfectly ballanced left side flexion (when all the force ratios are equal to 1), 0°, t=6,037;

e – significantly different compared to the mean of the force ratio F120 Right side rotation/ F120 Perfectly ballanced left side rotation (when all the force ratios are equal to 1), -30°, t=6,12;

The values are presented as M ± DS and CV%; Significance limit established at p<0,05.

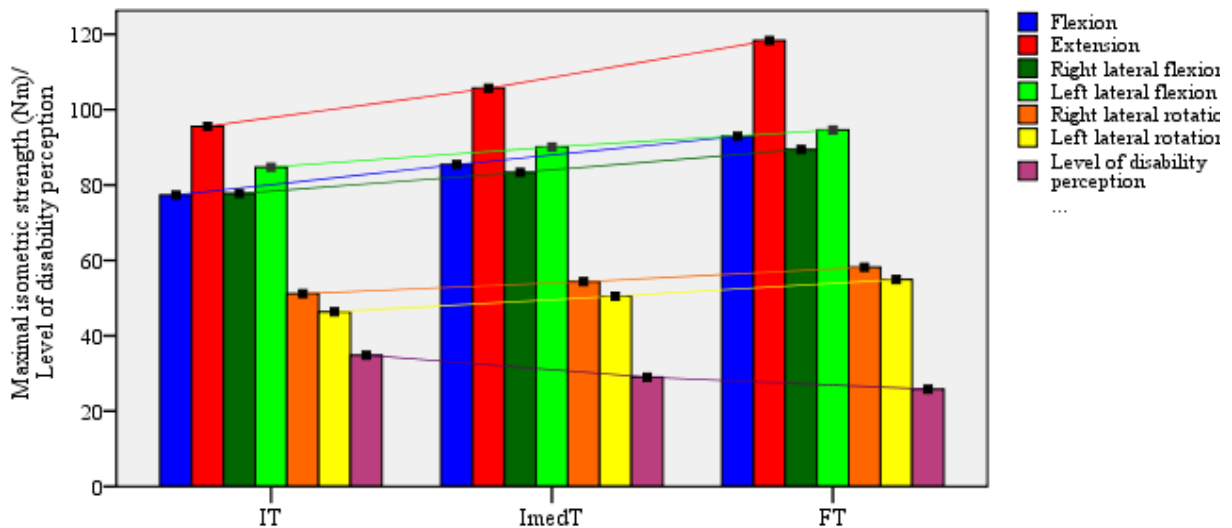
M, mean; DS, standard deviation; CV, variability coefficient; n, number of subjects; t, test t student ; F, test ANOVA.

## Figures

The tables which contain figures will be done on a single column. The counting (consecutive) and the title of the figure (conclusive and concise) will be written on the bottom left side immediately after the figure. The reference to the figure (the quotation in the text) will be found in the text that precedes the table which contains the figure. The figure, the number of the figure, the title of the figure, the statistical section (if necessary) and the abbreviation section will be a



constitutive part of the table that contains the figure. When symbols, numbers or letters are used to identify the parts of the figure, each of them should be explained clearly in the statistical section. It is recommended that you merge the data in as few figures as possible. The lines of the table that contains the figure will be transparent. (Table Tools, Design, Borders, No Borders).



Section 1.01 Figure 27. The evolution of means of maximum isometric force and the degree of perception at different tests.

Section 1.02 Nm, Newton\*meter; IT, initial testing; ImedT, intermediary testing; FT, final testing.

The figures will have a resolution of minimum 250 dpi for a better understanding after the print. The figures will be presented in original sizes in the text (sizes chosen by the author(s) of the paper), not to be subsequently modified. The electronic formats accepted are: Bitmap (.bmp), JPEG (.jpg, .jpeg) or GIF (.gif).

The results and the statistical explanations will be presented in one way – data in the table, figure in the table or text; these ways of presenting can be combined but they do not have to repeat themselves.

### Measures

Length, height, weight and volume will be specified in metrical units (meter, kilogram or litre or their decimal multiples). Temperature will be specified in degrees Celsius (°C). Blood pressure will be specified in mm column of mercury (mmHg). Other clinical measurements will be specified in the International System of Units (International System of Units (SI)).

### Abbreviations and symbols

The standard abbreviations must be used. You should avoid introducing abbreviations into the title or in the abstract. An abbreviation in parentheses will be preceded by the full description, only the first time the abbreviation is used in the text and only if the abbreviation is not a standard measure unit.

**Example:** Body weight, body composition, resting metabolic rate (RMR), respiratory quotient (RQ), temperature, fasting serum glucose, insulin, free fatty acids, and ghrelin were assessed at baseline and after 21 d (12-h fast) and 22 d (36-h fast) of alternate-day fasting.

RMR and RQ did not change significantly from baseline to day 21, but RQ decreased on day 22 ( $P < 0.001$ ), which resulted in an average daily increase in fat oxidation of  $\geq 15$  g.

### Bibliography

Wuthiekanun V, Chierakul W, Langa S, et al. 2006, Development of antibodies to Burkholderia pseudomallei during childhood in melioidosis-endemic northeast Thailand. Am J Trop Med Hyg 2006 Jan 12;74(10):1074-5.