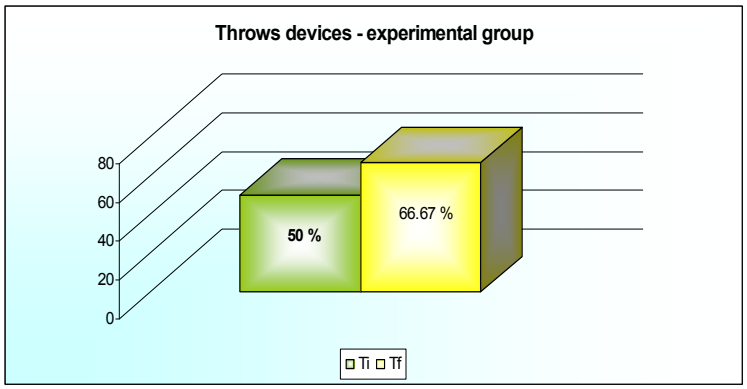

Figure 1. Throws devices experimental group, initial and final tests.

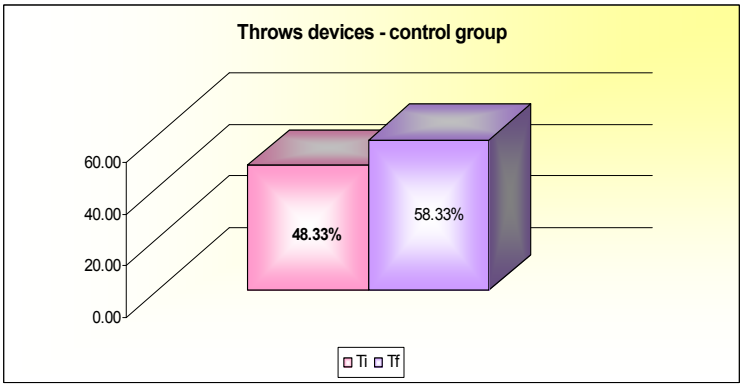

Figure 2. Throws devices control group, initial and final tests.

As a final conclusion we can say that attention plays an extremely important role in training the goal-keepers in handball game.

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CONSIDERATIONS ON COMBATING DELAYED ONSET MUSCLE SORENESS

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Abstract

Ice water immersion is a possible treatment of the delayed onset muscle soreness*. In this paper we intend to evaluate how* delayed onset muscle soreness *affects muscle strength, during evolution and immediately after remission, while being treated by cryotherapy. Research was conducted on junior football players. Muscle* strength *indices were evaluated using Squat Jump, Jump Countermovement, Free Jump, 60 ″ Free Jump tests. There were statistically significant changes in 48 hours, or 6 days, compared to the initial measurements; the recovery of muscle strength is reduced after 6 days when treated group was compared to the control one. After applying the Squat Jump test, the values obtained by the control group at 48 hours were lower, fact which contributes at the conclusion that ice water immersion is a symptomatic therapy of* delayed onset muscle soreness*, indicated for short-term recovery.*
Keywords*: delayed onset muscle soreness, cryotherapy, muscle strength.*

INTRODUCTION

Delayed onset muscle soreness *(*DOMS) causes painful swelling of the muscle, decreases muscle strength and the amplitude of moves [1], which is why it is usually countered by physical therapy and pharmacologically. Anti-inflammatory therapy has the greatest potential in combating DOMS while massage, ultrasounds and stretching have modest results [2]. Regarding cryotherapy (immersion in ice), some studies [3] have found that it is ineffective, however others [4] reached the result that has an effect in combating this type of muscular fever.

PURPOSE

In this paper we intend to evaluate how DOMS affects muscle strength during evolution and immediately after remission, while not treated or treated by cryotherapy. In the same time we want to check whether cryotherapy is effective or not in combating DOMS by assessing the degree of recovery of the muscle strength.

HYPOTHESIS

Considering that one of the factors assumed to be involved in producing DOMS is inflammation [5], that the inflammatory process plays a role in muscle regeneration and repair [6], and that the latest research showed an anti-inflammatory effect of cryotherapy [7], we believe that treating DOMS by this procedure will lead to delayed recovery of muscle strength.

MATERIALS AND METHODS

The research was conducted on two groups of 9 subjects, boys aged between 16 and 18 years (mean 17.3 years old), sportsmen, football players, at least with 12 hours of training a week. Athletes have given their consent for this research, being informed about the study that were to attend, according to WMA (Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects). During the study, athletes have performed the same training program. Also, athletes had the same food menu, the team being centralized for the training period. During the study, athletes did not take dietary supplements or medications. In a first phase, initial testing was done on the lower explosive strength assessment using the following samples: Squat Jump (SJ) Countermovement jump (CMJ) and the Free Jump (FJ). The muscle strength was measured under stress: 60 ″Free Jump (60 "FJ). Evaluation was conducted with OptoJump Next. In the next step athletes have made an effort (eccentric contraction) in order to induce delayed muscle soreness on limb thigh muscles (DOMS - Delayed Onset Muscle Soreness). The effort was to achieve the leg thigh flexion (6 sets of 6 reps with 80% of maximum force calculated individually for the extension movement). Break between sets was 2 minutes. After that, each of the two groups received a different therapy as follows:

- Group 1 - local krioterapy immediately after exercise and at 24 hours - lower limbs (20´ in ice water at 4 degrees Celsius).
- Group 2 - untreated group.

After 48 hours, explosive strength assessment was performed again on the lower limbs (SJ, CMJ and FJ) and strength under stress (60 ″ FJ). After six days, explosive strength assessment was performed again on the lower limbs (SJ, CMJ and FJ) and strength under stress (60 ″ FJ). Between assessments athletes workout was as planned for the preparatory period. During the trial, athletes did not use recovery methods or substances other than those included in the experiment. Obtained results were statistically analyzed by means of ANOVA single factor (p significant if is less than 0.05). By this method were compared simultaneously the manifestation of force evaluations (SJ, CMJ, FJ, 60 "FJ) for initial, 48 hours and 6 days tests. Differences between groups on force recovery were calculated in percentages based on average values.

RESULTS

The results of group 1 are shown in Table 1:

Table 1

Testing	**Initial testing**				**48 hours testing**				**Testing at 6 days**			
Test	SJ (cm)	CMJ (cm)	FJ (cm)	60″ FJ	SJ (cm)	CMJ (cm)	FJ (cm)	60″ FJ	SJ (cm)	CMJ (cm)	FJ (cm)	60″ FJ

				(cm)				(cm)				(cm)
Subject 1	33,4	34,7	38,3	29,4	27,7	26,4	35,7	25,1	32,2	33,1	36,6	28,3
Subject 2	29,3	31,4	35,7	27,7	23,5	24,3	31,2	23,5	28,3	30,2	34,3	25,8
Subject 3	35,8	36,6	40,2	33,3	29,3	28,5	35,3	27,4	33,7	35,5	38,4	32,1
Subject 4	37,4	36,8	42,4	31,4	31,5	30,8	36,4	27,6	36,5	34,2	40,4	30,6
Subject 5	31,6	33,2	38,4	29,3	28,4	29,4	32,6	23,4	29,5	32,8	35,7	29,4
Subject 6	35,4	36,9	41,3	27,4	30,7	29,4	35,5	23,9	34,3	34,5	41,2	29,3
Subject 7	33,7	35,2	41,4	29,5	27,4	27,6	36,3	22,4	31,4	33,3	39,7	28,4
Subject 8	33,9	35,7	39,3	28,4	27,6	26,8	33,6	22,8	32,3	33,5	37,5	28,3
Subject 9	32,8	34,5	40,5	28,7	26,5	26,3	35,5	23,5	30,2	33,3	39,3	27,2

The results obtained in group 2 are shown in Table 2:

Table 2

Testing	**Initial testing**				**48 hours testing**				**Testing at 6 days**			
Test	SJ (cm)	CMJ (cm)	FJ (cm)	60″ FJ (cm)	SJ (cm)	CMJ (cm)	FJ (cm)	60″ FJ (cm)	SJ (cm)	CMJ (cm)	FJ (cm)	60″ FJ (cm)
Subject 1	32,4	32,9	35,8	28,5	24,3	24,8	26,4	21,2	31,2	31,3	35,3	28,2
Subject 2	31,5	33,2	38,5	27,8	23,4	23,6	30,7	19,5	30,4	32,9	38,3	28,6
Subject 3	32,7	34,7	39,3	30,6	25,7	24,3	29,3	21,8	32,4	33,7	38,9	29,3
Subject 4	27,5	29,3	34,4	25,5	20,3	21,5	25,8	18,4	28,3	30,2	35,4	25,1
Subject 5	35,2	36,3	40,2	31,4	24,3	22,5	28,7	22,6	34,7	35,5	39,2	30,4
Subject 6	31,6	32,9	37,8	24,8	27,6	23,5	31,3	17,5	31	32,5	37,2	25,4
Subject 7	33,2	34,8	42,4	29,3	25,1	24,1	32,5	19,3	32,5	34,8	41,5	28,3
Subject 8	33,9	35,7	41,9	31,4	23,4	22,3	30,4	21,8	33,2	35,2	40,5	30,8
Subject 9	33,4	35,2	39,4	28,3	24,7	24,2	28,5	19,4	31,8	34,7	39,2,	27,5

Statistical comparison by Anova Single Factor (indicating the significance index) of force indicators and differences between the average value recorded at baseline, 48 hours and 6 days (with the percentage expression of differences and graphical comparison between groups) are shown in table 3, 4, 5 and 6:

Table 3 - Squat Jump (SJ)

SJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the treated group	SJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the control group	Graphical representation of the percentage of decrease in strength evaluation indices for the group treated (left) and control (right), 48 hours (left) and 6 days (right)
SJ - group 1, p=0,0002, 33,11-27,55=5,56 (16,79 %) 33,11-31,66=1,45 (4,37 %)	SJ-group 2, p=0, 31,88-23,88=8 (25,09 %) 31,88-31,33=0,55 (1,72 %)	

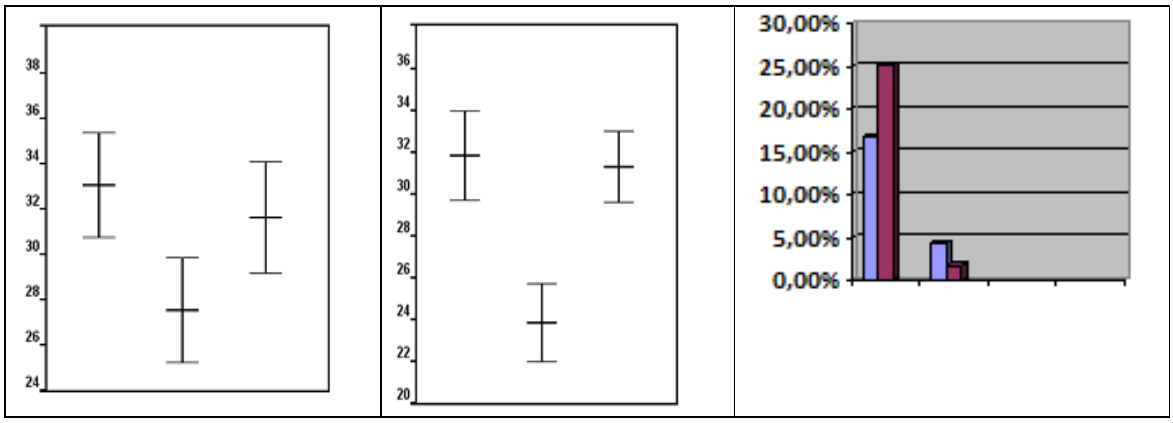


Table 4 – Countermovement Jump (CMJ)

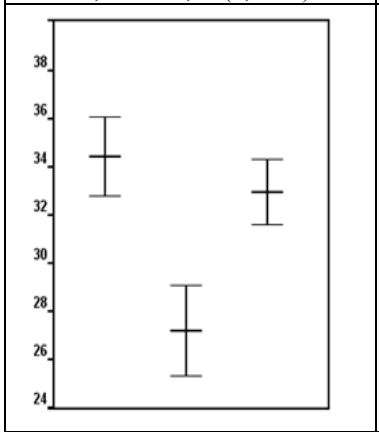
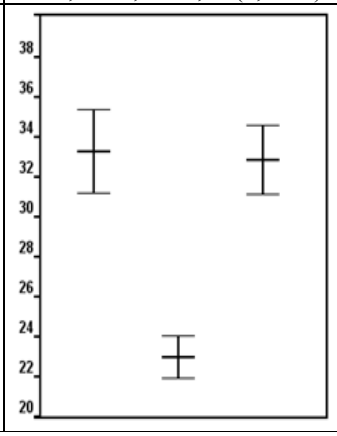
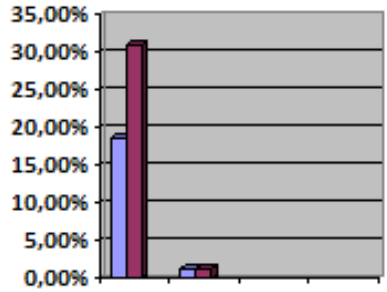
CMJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the treated group	CMJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the control group	Graphical representation of the percentage of decrease in strength evaluation indices for the group treated (left) and control (right), 48 hours (left) and 6 days (right)
CMJ – group 1, p=0, 33,44-27,22=6,22 (18,60 %) 33,44-33=0,44 (1,31 %)	CMJ – group 2, p=0, 33,33-23=10,33 (30,99 %) 33,33-32,88= 0,45 (1,35 %)	
		

Table 5 – Free Jump (FJ)

FJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the treated group	FJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the control group	Graphical representation of the percentage of decrease in strength evaluation indices for the group treated (left) and control (right), 48 hours (left) and 6 days (right)
FJ – group 1, p=0, 39,33 – 27,22 = 12,11 (30,79 %) 39, 33-33=6,33 (16,09 %)	FJ – group 2, p=0 38,33-28,77=9,56 (29,94 %) 38,33-38=0,33 (0,86 %)	

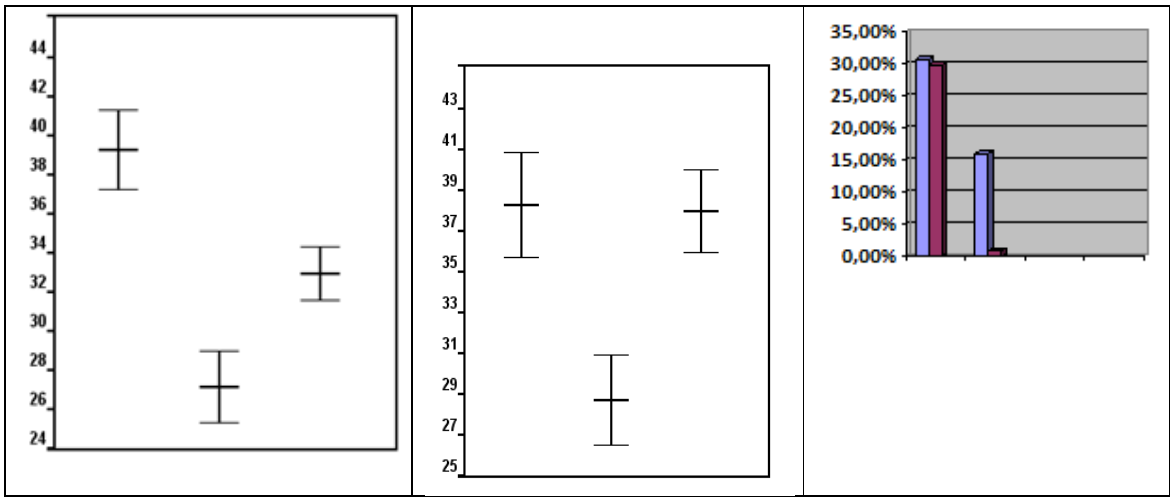
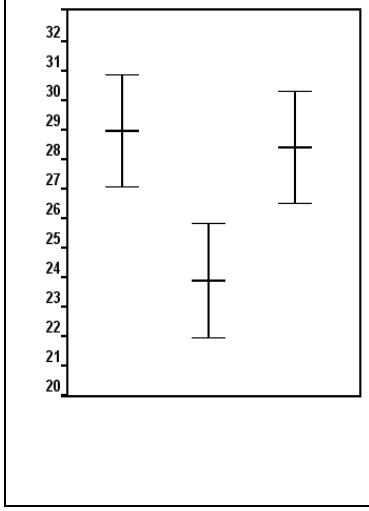
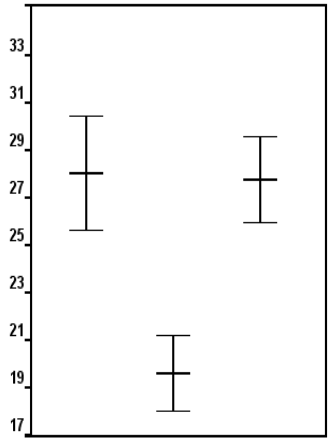
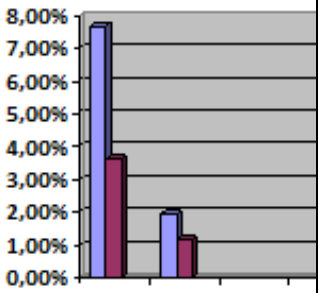


Table 6 - 60″ Free Jump (60″ FJ)

60″ FJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the treated group	60″ FJ - statistical comparison of values and differences between the initial average values and the values recorded at 48 hours and 6 days (with the expression of the significance factor p differential) for the control group	Graphical representation of the percentage of decrease in strength evaluation indices for the group treated (left) and control (right), 48 hours (left) and 6 days (right)
60″ FJ – group 1, p=0, 29-23,88=5,12 (7,65 %) 29-28,44= 0,56 (1,93 %)	60″ FJ – group 2, p=0, 28,11-19,66 = 9,45 (3,61 %) 28,11 – 27,77 = 0,34 (1,20 %)	
		

DISCUSSIONS

Analysis of Tables 3, 4, 5 and 6 shows that the values of valuation ratios of the force experienced statistically significant variations in 48 hours or 6 days compared to baseline measurements. For all indications, with the exception of CMJ that difference is minimal (0,04%), recovery of force after six days was lower for the group treated. A possible factor in muscle strength recovery delay to 6 days for the group treated by cryotherapy may be that cold application decreases the local concentration of insulin-like growth factor (IGF-1) hormone (with strong anabolic effect) [8]. SJ mean values were lower after 48 hours in the control group, fact that may be explained by the persistence of pain that generally reduces muscular force [9].

For the same period, in the treated group, pain was reduced not only because of anti-inflammatory effect of cryotherapy, but also of the local anesthetic [10]. Given that the SJ test requires a greater eccentric muscle contraction, where we assume that ruptures of Z membranes had a most significant share due to the isometric component, we believe that DOMS is more pronounced too, which explains the lower performance of the control group at 48 hours. Better SJ values recorded by the treated group at 48 hours indicates that immersion into ice-water is a symptomatic therapy for DOMS. The results may also indicate that the immersion in ice water is indicated for the short-term muscle recovery.

CONCLUSIONS

1. Values of strength evaluation indices showed statistically significant variations in 48 hours and 6 days respectively compared to the initial determination, the recovery of force after six days being lower at treated group.
2. To Squat Jump values recorded at 48 hours were lower in the control group, possibly because of the pain caused by a delayed onset muscle soreness more pronounced.
3. The results show that ice water immersion is a symptomatic therapy of late-onset muscle soreness, suitable for short-term muscle recovery.

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REDUCING SPASTICITY IN CHILDREN WITH CEREBRAL PALSY USING KINESIO TAPE

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Abstract
This paper aims to verify whether Kinesio Tape can help in reducing spasticity in children with cerebral palsy. It is known that these kinesio tapes were and are successfully used to treat muscle and joint pain among athletes. This study shows that the efficacy of the kinesio tapes is not limited to this kind of problems.
Keywords:*spasticity, cerebral palsy, kinesio tape, neuro-rehabilitation ;*

INTRODUCTION

1.1 General information about cerebral palsy

In the medical dictionary cerebral motor infirmity is defined as "a pathological non-progressive state and with an intellectual deficiency often moderate, subsequent to cerebral injury of the central motors.