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THE IMPACT OF PROPRIOCEPTION TRAINING PROGRAM ON STRENGTH IN YOUNG FOOTBALL PLAYERS

Original scientific paper

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Abstract

Participants in this study were 62 students of "Drita" high school (17 ± 0.3 years old) in Kichevo, Republic of Macedonia. The subjects were observed during a six months period. The participants were randomly divided in two groups (experimental and control) and undertook three tests of Strength: Sit Up Test, Standing Long Jump Test and Sergeant Jump Test. Post measurements presented an averaged increase of (4,82 ± 2.9) sit ups for Sit Up Test, (19.8 ± 10.1)cm for Standing Long Jump and (5.5 ± 3.2) cm for Sergeant Jump Test. The results of strength compared between initial and final measurements showed statistically significant differences ($p<0.0005$). Differences between experimental and control group in the final measurement were significant only for Sit Up Test ($p = 0.01$). Findings of this study indicated that the program has resulted partly effective because the group was small in number and there were found not statistically significant differences in all three strength tests between experimental and control groups.

Keywords: *Proprioception training, strength, six months period*

INTRODUCTION

Proprioception refers to the ability to sense movement; to know where our limbs are in space without having to look at them; to the body's ability to sense movement within joints and joint position. Good proprioception is important in all everyday movements but especially in sports because it affects balance, agility, athletic performance and injury prevention. Proprioception training involves awareness of joint position movement (kinesthesia) and force (Martin & Jessell, 1991; Riemann & Lephart, 2002) and can be considered the product of sensory information supplied by specialized nerve endings termed mechanoreceptors (Yahia, Rhalmi, Newman, & Isler, 1992). Mobility is very important to perception (Sojka et al., 1989; Johansson, Lorentzon, Sjölander, & Sojka, 1990; Needle et al., 2013) as joint proprioceptors provide input throughout a joint's entire range-of-motion under both low and high load conditions stimulating strong discharges from the muscle spindle. Various studies indicate that proprioceptive training can improve strength, coordination and balance.

METHODS

Participants

Participants in this study were 62 students of "Drita" high school (17 ± 0.3 years old) in Kichevo, Republic of Macedonia. Subjects were observed during a six months period. Participants were randomly divided in two groups (experimental and control). Participants in the experimental group were 31 players trained three times a week in 45 minutes sessions using standard football exercises during a six months period. Participants in the control group were 31 players trained three times a week in 45 minutes sessions using proprioception exercises during a six months period. The two groups undertook three tests of Strength: Sit Up Test, Standing Long Jump Test and Sergeant Jump Test.

Statistical Analyses

Statistical Analyses was conducted using IBM SPSS 20 software. Descriptives Statistics, Kilmogorov-Smirnov test of normality and t-tests were used to analyze data of this study.

Procedures

Proprioceptive training comprises six micro cycles of training implemented for 4 weeks each. Participants undertook three training sessions per week. Every training session lasts 45 minutes. Proprioceptive training comprise 12 training sessions implemented for 45 minutes each. During these sessions subjects are trained using proprioceptive exercises. Micro-cycles, sessions, duration and heart-rate intensity range for the particular sessions for are presented in the Table 1 below.

Traditional training comprises six micro cycles of training implemented for 4 weeks each. Participants undertook three training sessions per week. Every training session last 45 minutes. Traditional training comprise 12 training sessions implemented for 45 minutes each. During these sessions subjects are trained using traditional exercises. Micro-cycles, sessions, duration and heart-rate intensity range for the particular sessions for are presented in Table 2.

The two groups undertook three tests of Strength:

1. Sit Up Test
2. Standing Long Jump Test
3. Sergeant Jump Test.

The Sit Up Test was conducted as follows: the athlete lies on the mat with the knees bent, feet flat on the floor and the arms folded across the chest; starts each sit up with back on the floor; raises to the 90 degree position and then return to the floor. The feet can be held by a partner and the coach records the number of sits up completed in 30 seconds.

Table 1. Proprioceptive training micro cycles

Micro cycle (weeks)	Session	Duration	Intensity
1 – 4	1 – 12	12 × 45	45 – 55 %
5 – 8	13 – 24	24 × 45	55 – 65 %
9 – 12	25 – 36	36 × 45	65 – 75 %
13 – 16	37 – 48	48 × 45	75 – 85 %
17 – 20	49 – 60	60 × 45	85 – 90 %
21 – 24	61 – 72	72 × 45	90 – 95 %

Table 2. Traditional training comprises six micro cycles

Micro cycle	Session	Duration	Intensity
1 – 4	1 – 12	12 × 45	45 – 55 %
5 – 8	13 – 24	24 × 45	55 – 65 %
9 – 12	25 – 36	36 × 45	65 – 75 %
13 – 16	37 – 48	48 × 45	75 – 85 %
17 – 20	49 – 60	60 × 45	85 – 90 %
21 – 24	61 – 72	72 × 45	90 – 95 %

Standing Long Jump. Test was conducted as follows: the athlete places their feet over the edge of the sandpit. The athlete crouches, leans forward, swings their arms backwards, the jumps horizontally as far as possible, jumping with both feet into the sandpit. The coach should measure from the edge of the sandpit to the nearest point of contact. The start of the jump must be from a static position.

Sergeant Jump. Test was conducted as follows: the athlete chalks the end of his finger tips and then stands side onto the wall, keeping both feet remaining on the ground, reaches up as high as possible with one hand and marks the wall with the tips of the fingers (point 1). From a static position jumps as high as possible and marks the wall with the chalk on his finger tips (point 2). The coach: measures the distance from point 1 to point 2.

RESULTS

Descriptive Statistics for Sit Up Test, Standing Long Jump Test and Sergeant Jump Test are presented as a summary in Table 3. Post measurements presented an averaged increase of (4,82 ± 2.9) sit ups for Sit Up Test, (19.8 ± 10.1) cm for Standing Long Jump and (5.5 ± 3.2) cm for Sergeant Jump Test.

Paired sample T-test was used to compare differences in strength measured with T-test results pointed out a statistically significant increase in performance for the three tests of strength.

Box-plots for pre and post measurements divided by experimental and control groups are presented below. Mean differences between experimental and control groups (see Figure 1, 2, 3) could be clearly noticed in: Box-plot for Sit Up Test (experimental and control group), Box-plot for Sergeant Jump Test (experimental and control group), Box-plot for Standing Long Jump Test (experimental and control group). Although difference between two groups in the final measurement was statistically significant only for Sit Up Test ($p = 0.01$). Differences between two groups in the final measurement were not statistically significant ($p>0.05$) for the other two tests.

Table 3: Descriptive Statistics for Sit Up Test, Standing Long Jump Test and Sergeant Jump Test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	SUT_pre	22.5323	62	3.19691	.40601
	SUT_post	27.3548	62	3.52554	.44774
Pair 2	SLJT_pre	197.5161	62	19.94644	2.53320
	SLJT_post	217.3387	62	19.30170	2.45132
Pair 3	SJT_pre	39.7742	62	5.43643	.69043
	SJT_post	45.2903	62	5.59094	.71005

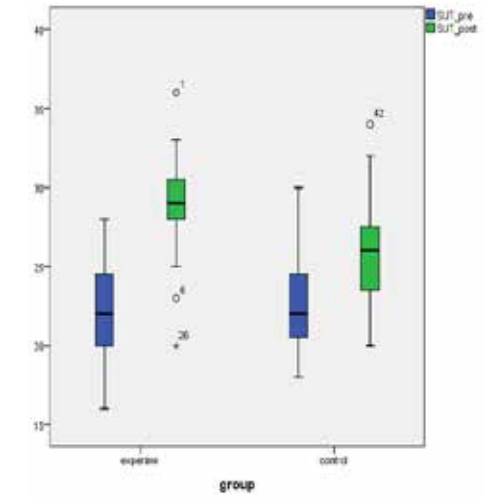

Figure 1. Box-plot for Sit Up Test (experimental and control group)

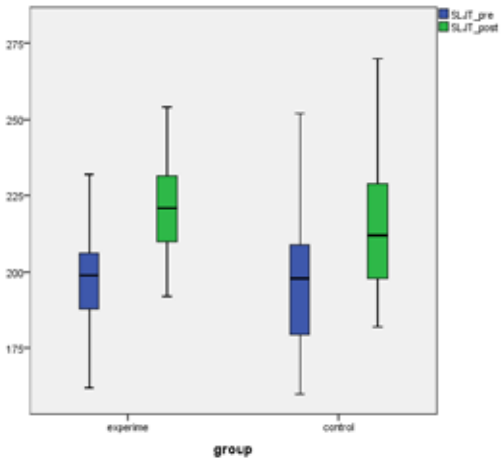

Figure 2. Box-plot for Standing Long Jump Test (experimental and control group)

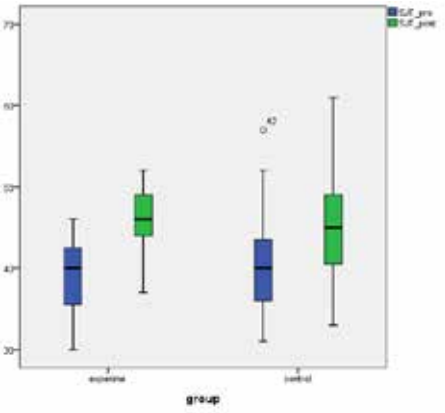

Figure 3. Box-plot for Standing Long Jump Test (experimental and control group)

Table 4. Paired t-test for Sit Up Test, Standing Long Jump Test and Sergeant Jump Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	SUT_pre SUT_post	-4.82258	2.91139	.36975	-5.56194	-4.08323	-13.043	61	.000
Pair 2	SLJT_pre SLJT_post	-19.82258	10.16346	1.29076	-22.40362	-17.24155	-15.357	61	.000
Pair 3	SJT_pre SJT_post	-5.51613	3.21238	.40797	-6.33192	-4.70034	-13.521	61	.000

DISCUSSION AND CONCLUSIONS

Results of strength compared between initial and final measurements showed statistically significant differences ($p<0.0005$). Also the experimental group differences between initial and final measurements are significant in all three tests as the p value showed $p < 0.05$. Meanwhile two groups differences for inter initial measurements were statistically not significant ($p>0.05$). But the difference between two groups in the final measurement was significant only for Sit Up Test ($p = 0.01$). Findings of this study indicated that the program has resulted partly effective because the group was small in number and there were found not statistically significant differences in all three strength tests between experimental and control groups.

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