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The Impact of Physical Programs to the Level of Muscle Imbalance in Pupils of the 8th Grade at Primary School

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Abstract

The aim of this study was to find out the impact of the physical program focused on the level of muscle imbalance in boys of the 8th grade at primary school Pri kríži 11 in Bratislava, implemented at physical and sports educational classes. Average age, high and weight of subjects =13.93 years, 163 cm and 52.6 kg. The muscle diagnosis with a tendency towards shortening and weakening was carried out by examination manoeuvres according to Labudová, Thurzová 1992. Diagnosis: 11 muscles shortened, and 5 muscles weakened. The SPSS 17.0 statistical system was used to process statistical data, where the statistical significance of differences was determined by using a non-parametric WILCOXON test at 5 % level of statistical significance $p < 0.05$.

Keywords: muscle imbalance, physical program, shortened muscles, weakened muscles.

1 Introduction

The issue of muscle imbalance is currently a growing global problem, which needs to have an increased attention. As many studies have proved, a high incidence of muscle imbalance has already been shown in pupils at the young-school-age and is related to incorrect body holding. Several authors have been dealing with the issue of muscle imbalance such as Labudová, Thurzová (1992), Kováčová (2003), Kanasová (2004), Nelson (2004), Zachrla (2004), Bursová (2005), Straková (2006), Rodriguez (2008), Jurašková, Bartík (2010), Marshall (2011), and many others.

Kováčová (2003) states the 100 % occurrence of muscle imbalance in boys at the second grade of primary schools. Kanasová (2004) recorded the 100 % occurrence of muscle imbalance in 10-12 years old pupils. Bendíkova, Stacho (2011) found out, that boys on the second grade at primary school in Poniky had a 92.59 % occurrence of shortened muscles.

Kanasová (2014) states, that the functional relationship between postural and phasic muscles is more important than the quality of an individual muscle in which the damage can cause a muscle imbalance. Therefore, it is essential to recognize, that a muscle imbalance is the first stage of other more serious functional disorders of the supporting and musculoskeletal system. Muscle imbalance is a significant functional disorder, resulting in incorrect body holding, damage of movement stereotypes and limited joint mobility, which are unevenly weighted. These problems are often associated with pain and limit people in working or doing sports.

For the reasons mentioned above, people should exercise their muscle groups from the early ages and of course teachers at maternity wards and elementary schools should help them with it at physical education classes as well.

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The aim of the study:

The aim of the rigorous thesis was to find out the impact of 3 months long physical program focused on the level of muscle imbalance in boys of the 8th grade at primary school Pri kríži 11 in Bratislava, implemented at physical and sports educational classes.

Hypotheses:

Hypotheses have been developed on the basis of a number of studies on muscle disbalance and their results.

H1: It is assumed, that the muscle imbalance will be shown in more than 50 % of subjects.

H2: It is assumed, that the impact of physical program will cause a statistically significant improvement of muscle imbalance in more than 50 % of muscle groups tested.

H3: It is assumed, that after the completion of the physical program, the greater statistical significance of the differences will be demonstrated between input and output measurements in weakened muscle groups as well as in shortened muscle groups.

2. Materials and methods

The research was implemented over the following 4 months: September - December 2017. Input measurements took place on September 7, 2017 and September 12, 2017 in the gym at primary school Pri kríži 11 in Bratislava under the leadership of Mgr. M.L., Mgr. M.K. and Mgr. K.M. during physical education classes and breaks, based on the model of Labudová, Thurzová (1992) modified for the purposes of health physical education. Subsequently, pupils split up to half, 13 pupils into two groups: experimental and control. The experimental group attended between September 14, 2017 and December 14, 2017 a 3-month (13-week) physical program focused on the relaxation and stretching of shortened muscle groups followed by activation and strengthening of weakened muscles in pupils of the 8th grade. The program took place twice a week during first 30 minutes of physical education classes, always on Tuesdays at 5th class from 11:55 to 12:40 and on Thursdays at 3rd class from 9:55 to 10:40, with the exception on October 31, 2017 (fall break). At the same time, the control group attended the regular physical education classes. Output measurements took place in the gym at primary school Pri kríži 11 in Bratislava on December 19, 2017 and December 21, 2017 during the physical education classes and breaks under the leadership of Mgr. M.L., Mgr. M.K., a Mgr. K.M.

The qualitative methods of comparison, analysis, synthesis, induction and deduction were applied in the processing and evaluation of acquired research facts. From quantitative methods, the basic statistical characteristics were used such as arithmetic average, standard deviation, median, maximum and minimum. The SPSS 17.0 statistical system was used to process statistical data, where the statistical significance of differences was determined by using a non-parametric WILCOXON test at 5 % level of statistical significance $p < 0.05$ (Chráska, 2007).

3 Results

H1: Hypothesis one was confirmed because 100% of the probands in the intake measurements had muscle disbalance.

H2: Hypothesis two was confirmed because in the experimental group there was an improvement in all probands.

H3: Hypothesis three has also been confirmed because greater statistical significance has been demonstrated in weakened muscle groups.

Table 1. The results of the shortened and weakened muscles of the experimental group

	m. triceps surae	m. iliopsoas	m.rectus femoris	m.tensor fasciae latae	knee joint flexors	adductores coxae	m.quadratus lumborum	m.erector spinae	m.pectoralis major	m.trapezius, pars superior	m. levator scapulae	m.gluteus maximus	adductors of the hip joint	m. abdominis	Deep neck and head head flexors	shoulder blade fixators (lower)
nput	3,85	7,69	1,54	3,85	0,77	8,46	8,46	1,53	6,13	4,62	8,46	9,23	3,85	9,26	9,23	1,54
utput	0,77	8,46	8,46	6,92	6,15	5,38	5,38	0,77	3,08		5,38	3,07	3,07	,69	6,15	4,62
	,083	,059	,063	,038	,034	,083	,063	,046	,038	,014	,014	,014	,038	,005	,083	,020

Table 2. Results of the shortened and weakened muscles of the control group

	m. triceps surae	m. iliopsoas	m.rectus femoris	m.tensor fasciae latae	knee joint flexors	adductores coxae	m.quadratus lumborum	m.erector spinae	m.pectoralis major	m.trapezius, pars superior	m. levator scapulae	m.gluteus maximus	adductors of the hip joint	m. abdominis	Deep neck and head head flexors	shoulder blade fixators (lower)
nput	6,92	5,38	1,54	3,85	5,38	3,85	0	3,84	6,13	6,15	6,15	1,54	2,31	1,54	9,23	7,69
utput	4,62	1,54	1,54	6,15	5,38	3,85	3,85	8,46	9,23	6,15	0	3,85	8,46	6,15	3,85	6,15
	,102	,655		,414			,655	,157	,083		,317	,564	,317	,157	,157	,083

4. Discussion

In our research at the Secondary Primary School Pri Kríži 11 Bratislava, we recorded a 100% incidence of muscle imbalance in 8th grade pupils (boys). It should be noted, that we need only one shortened or weakend muscle to talk about muscle imbalance. All of the 16 tested muscles in the experimental group had an improvement. A statisctically significant improvement to 5 % of the level of statistical significance occured with up to 6 shortened and 4 weakend muscles.In the control group, we did not record statisctically significant improvement. However, we found out that by classical physical education lessons there was an improvement in 8 muscles, stagnation in 3 muscles and deterioration in up to 5 muscles.

Rodriguez (2007) says that in his experiment with the experimental group, there were positive changes after the stretching program, but in the control group there was a deterioration in some cases. In our experiment, we experienced similar positive results in the experimental group and worsening in 5 muscles in the control group.

In the experimental group, the best progression of the shortened muscles was achieved in the m. levator scapulae and m. trapezius, pars superior, where P = 0.014 was 5 % of the statistical significance. A statistically significant difference to 5 % of the statistical significance level was also demonstrated in the knee flexors P = 0.034, the m. pectoralis major and the m. tensor fasciae latae P = 0.038 and also in the m. erector spinae P = 0.046. For the rest of the muscles (m. iliopsoas, m. rectus femoris, m. quadratus lumborum, m. triceps suraem, adductores coxae) was improved by 3 month training program, but statistical significance at 5 % level of statistical significance was not demonstrated.

The largest incidence (80.77 %) of shortened muscles was recorded in the flexor of the knee joint where, after completing the three month training program, we recorded a statistically significant difference to 5 % of the statisctical significance level P = 0.034. The result coincides with the experiment Jurašková-Bartík (2010), where they recorded the greatest 75 % incidence of shortened muscles in the flexor of the knee joint, and also from Thurzová (1991), where the greatest incidence of shorteneed muscles in the flexor of the knee joint was 65.5 %.

For the weakened muscles, we recorded a statistically significant difference in the experimental group to 5 % of the level of statistical significance in 4 of the 5 muscle groups tested. The best progress was recorded in m. abdominis where the statistical significance at 5 % level of statistical significance was P = 0.005. Statistical significance at 5 % of the statistical significance level was also demonstrated in the m. gluteus maximus P = 0.014, lower blade fixators P = 0.020 and in hip abductors P = 0.038. With deep neck and head flexors, there was also improvement, but statistical significance at 5 % level of statistical significance was not demonstrated.

5. Conclusion

The results show, that a three-month physical program to eliminate muscle imbalance at the second grade at primary schools is a very effective way to prevent or eliminate muscle imbalance in pupils. In the experimental group, all muscles improved, while in the control group, due to classical physical education classes there was an improvement within 8 muscles, stagnation within 3 muscles and a deterioration within 5 muscles. Significant improvements were observed in weakened muscles, where we reached 5 % level of statistical significance with 4 muscle groups. Therefore we recommend studying muscle imbalance and physical programs focused on elimination muscle imbalance. We also recommend doing examinations focused on muscle imbalance at the beginning of the school year. According to the results, physical education teachers should use more compensatory exercises at physical and sports educational classes, and encourage pupils to exercise with a proper technique.

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