THE ROLE OF PHYSICAL ACTIVITIES AT SCHOOL AND IN SPORTS CLASSES IN THE DEVELOPMENT OF COORDINATION ABILITIES AMONG 11-YEAR-OLD POPULATION

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Abstract:

We addressed a current issue because we aimed to point to the fact that 11-year-old students may benefit from engaging in physical activities at schools and in sports classes in terms of the development of their coordination abilities. We extended knowledge about the level and development of coordination abilities among pubertal students. To assess levels of motor coordination, we administered the KTK test battery which allows a complex assessment of coordination abilities among children from both standard classes and sports classes. The results of the study showed that physical and sports education had a positive effect on the development of coordination abilities either at the beginning or at the end of the most beneficial period for the development of motor coordination. We may conclude that there were significant differences in the levels of coordination abilities between students from standard and sports classes. Students from sports classes showed higher levels of motor coordination than their counterparts from standard classes.

INTRODUCTION

Physical and sports education is a tool used for all-round physical development, performance capacity and physical fitness enhancement while taking into consideration the individual psychomotor specificities and students' physiological levels of functioning [Bebčáková, Chovanová, 2013]. Physical and sports education play a vital role in the development of coordination abilities not only among prepubertal students. The development of motor abilities should proceed continually at the second degree of primary education and secondary education. The ability to correctly organize students' activities is a vital part of the development of motor coordination. The activity in sports classes is aimed at the most appropriate development of motor preconditions and performance enhancement of students in particular sports. Teaching and its content in sports classes depends particularly on the teaching plan of the school that runs these classes.

The issue of motor abilities has been studied by a variety of authors [Belej 2001; Kasa 2006; Moravec 2004; Raczek, Mynarski, Ljach 1998; Ružbarská, Turek 2007; Starosta 2003]. Buková [2011] studied the physical inactivity of young people in contemporary society. Lack of physical activities among school-aged youth causes various health problems, which may be prevented by doing fitness ball exercises [Bendíková 2016]. The studies on coordination abilities during the so-called sensitive period, which covers the school age, are of special

importance. The results of the educational experiments have shown that the rate of improvement in experimental classes is 20% to 50% higher than in the control classes. Iivoven, Laukkanen, Sääkslahti [2016], Chovanová, Majherová [2010, 2013], and Majherová, Chovanová [2015] found that a 6-week period is sufficient for the development of coordination abilities.

We aimed to determine and purposefully increase the levels of coordination abilities in classes of compulsory of physical education at elementary school and in sports classes. The results of the study have enabled us to considerably assess the level of instruction of physical education and elementary schools and in sports classes. This also poses an issue to experts and educators in terms of finding ways of enhancing the quality of educational process and its outcomes. These findings will provide feedback information to teachers, parents, and students. By addressing this issue, we aim to partially update information about the motor skills of school-aged children. This study was supported by project VEGA 1/0120/19 entitled *"Movement correction of the problematic behavior of students from the standard population and students with special educational needs educated under the conditions of integration"*. The purpose of the study was to extend knowledge about the benefits of physical activities in school physical and sports education and in sports classes in terms of motor coordination development among 11-year-old students.

MATERIAL AND METHODS

The research was conducted at the elementary school ZŠ Juh in Vranov nad Toplou during the school year of 2018-2019. The samples were selected randomly, but we selected formed groups – classes, 47 fifth-grade students, 23 students from standard classes, and 24 students from sports classes. The students volunteered to participate in the educational experiment, and the participation in the experiment was anonymous. Only students whose parents provided their informed consents were included in the sample. We conducted a two-group educational experiment. The baseline and follow-up levels of coordination abilities were determined in September and October 2018 and March 2019, respectively. To assess children's motor coordination, we administered the KTK test battery: walking backwards (WB; dynamic balance), hopping for height (HH; coupling ability and kinesthetic-differentiation ability), jumping sideways (JS; lower-body frequency ability), moving sideways (MS; complex body coordination). To determine the efficiency of school physical and sports education carried out according to the state education program and school's teaching plan in sports classes and standard classes, respectively, we used the t-test for dependent samples.

RESULTS

Tables 1 to 4 show baseline and follow-up data for coordination abilities of 11-year-old students. The sample included students from standard classes with two classes of physical education per week. Compared with the students from standard classes, students from sports classes participated in more classes of physical education per week. We determined the levels and the rate of development of coordination abilities: walking backwards (WB; dynamic balance), hopping for height (HH; coupling ability, kinesthetic-differentiation ability), jumping sideways (JS; lower-body frequency ability), moving sideways (MS; complex body coordination).

The control group consisted of students from standard classes where the instruction followed the state education program. The differences between baseline and follow-up scores in the KTK subtests were statistically significant (Table 1). This shown improvement in motor coordination at the follow-up. There were significant differences between baseline and follow-up scores in dynamic balance, ability to couple movements, kinesthetic-differentiation

ability, lower-body frequency ability, and complex body coordination, which was demonstrated by the total sum of MQ points. The students developed their level of coordination abilities through their attendance at classes of physical and sports education taught according to the state education program. This improvement may also be attributed to the effects of external factors such as, for instance, natural physiological maturation.

Table 1. Differences between baseline and follow-up levels of coordination abilities in 11-year-old students from standard classes

Tests	*M*	*SD*	*n*	Difference	*t*	Degrees of freedom	*p*
WB: baseline	42.3478	11.62133					
WB: follow-up	48.9565	12.02451	23	-6.609	-4.4711	22	0.000191
HH: baseline	46.1739	11.39638					
HH: follow-up	53.9130	12.75971	23	-7.739	-5.1326	22	0.000038
JS: baseline	58.5652	10.81592					
JS: follow-up	67.8696	9.01667	23	-9.304	-6.9965	22	0.000001
MS: baseline	44.2174	7.48305					
MS: follow-up	47.4783	8.10090	23	-3.261	-2.9030	22	0.008248
MQ sum: baseline	191.3043	33.89346					
MQ sum: follow-up	218.2174	32.92962	23	-26.913	-8.7292	22	0.000000

Note. WB - walking backwards; HH - hopping for height; JS - jumping sideways; MS - moving sideways; MQ - motor quotient

We administered this test battery to determine teaching efficiency in sports classes according to the teaching plan of the school that runs these classes. The assessment included the overall sum of test scores computed by converting and summing up partial test scores to MQ points. The students from sports classes showed significantly different scores in all subtests: walking backwards (WB; dynamic balance), hopping for height (HH; coupling ability, kinesthetic-differentiation ability), jumping sideways (JS; lower-body frequency ability), moving sideways (MS; complex body coordination). This shows that the follow-up level of coordination abilities was significantly different from their baseline level.

Table 2. Differences between baseline and follow-up levels of coordination abilities in 11-year-old students from sports classes

Tests	*M*	*SD*	*n*	Difference	*t*	Degrees of freedom	*p*
WB: baseline	51.2917	14.65392					
WB: follow-up	57.9583	13.26151	24	-6.667	-3.9463	23	0.000643
HH: baseline	57.4583	10.47971					
HH: follow-up	63.1250	8.77404	24	-5.667	-4.4644	23	0.000177
JS: baseline	70.1250	7.42096					
JS: follow-up	76.5417	9.90818	24	-6.417	-4.4267	23	0.000194
MS: baseline	48.4167	6.64580					
MS: follow-up	52.4167	7.06440	24	-4.000	-6.5478	23	0.000001
MQ sum: baseline	227.2917	24.87793					
MQ sum: follow-up	250.0417	29.77521	24	-22.750	-7.4550	23	0.000000

Note. WB - walking backwards; HH - hopping for height; JS - jumping sideways; MS - moving sideways; MQ - motor quotient

The differences in the levels of coordination abilities of 11-year-old students were statistically significant between the students from standard classes and their counterparts from sports classes. The students from sports classes showed significantly higher levels of motor coordination in the following tests: walking backwards – dynamic balance ($p < .05$), moving sideways – complex body coordination ($p < .05$), hopping for height – coupling ability, and jumping sideways – lower-body frequency ability. The difference in the total sum of MQ points was also statistically significant ($p < .01$).

Table 3. Differences in baseline data between students from standard and sports classes

Tests	*M*	*M*	*t*	Degrees of freedom	*p*	F-test	*p*
WB	42.3478	51.2917	-2.31184	45	0.025420	1.589995	0.281172
HH	46.1739	57.4583	-3.53576	45	0.000955	1.182593	0.691791
JS	58.5652	70.1250	-4.28840	45	0.000094	2.124256	0.079335
MS	44.2174	48.4167	-2.03623	45	0.047638	1.267835	0.575847
MQ sum	191.3043	227.2917	-4.16231	45	0.000140	1.856109	0.148325

Note. WB - walking backwards; HH - hopping for height; JS - jumping sideways; MS - moving sideways; MQ - motor quotient

The differences in follow-up test scores showed results similar to the baseline test scores. The students from sports classes showed significantly higher levels of motor coordination in the following tests: walking backwards – dynamic balance ($p < .05$), moving sideways – complex body coordination ($p < .05$), hopping for height – coupling ability ($p < .01$), and jumping sideways – lower-body frequency ability ($p < .01$). There were also significant differences in the overall number of MQ points between the sample of students (Table 4).

Table 4. Differences in follow-up data between students from standard and sports classes

Tests	*M*	*M*	*t*	Degrees of freedom	*p*	F-test	*p*
WB	48.9565	57.9583	-2.43450	45	0.018942	1.216329	0.648830
HH	53.9130	63.1250	-2.89469	45	0.005835	2.114867	0.081078
JS	67.8696	76.5417	-3.13406	45	0.003032	1.207523	0.661087
MS	47.4783	52.4167	-2.23014	45	0.030770	1.314968	0.519011
MQ sum	218.2174	250.0417	-3.47812	45	0.001132	1.223104	0.634538

Note. WB - walking backwards; HH - hopping for height; JS - jumping sideways; MS - moving sideways; MQ - motor quotient

In our educational experiment, we observed a phase for the development of coordination abilities reported by Roth, Winter (2002). The phase of relative improvement which begins at 4 years of age and ends at 11 to 13 years of age. The onset of this period is early and authors attribute this early onset to the maturation of the neural system and development of analyzers. The development is supported by the spontaneous mobility of children as well. We agree with findings of Raczek et al. (1998) who reported an improved organism's adaptation capacity between the ages of 7 and 11 to 12 years when coordination abilities are formed. The period between 7 and 12 years of age is an intense phase of the motor coordination development. As reported by Chovanová (1998), coordination abilities may be effectively developed under the conditions of school physical and sports education classes. This requires regular testing and monitoring of physical and motor development in order to most effectively control and manage the physical education process in terms of improving the physical fitness levels of students.

CONCLUSION

The topic addressed in this study may be considered topical. We determined the levels of coordination abilities and aimed to develop coordination abilities within compulsory physical and sports education and sports classes. The results of the study will enable us to considerably assess the level of teaching physical education at elementary schools and sports classes. We have found significant differences in the levels and development of coordination abilities between 11-year-old students from standard classes and sports classes. Students from sports classes showed higher levels of motor coordination than their counterparts from standard classes. The study emphasized the need to create positive conditions for the development of coordination abilities among prepubertal students, especially during the period of the most effective period of their development, to increase the number of physical and sports education classes, and to establish sports classes.

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