IMPACT OF THE ADDITIONAL PHYSICAL EDUCATION LESSONS PROGRAMME ON THE PHYSICAL AND MOTOR DEVELOPMENT OF 7- TO 10-YEAR-OLD CHILDREN

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Abstract:
The study aimed at finding out how the programme of sports classes, through which some schools in Slovenia offer an enhanced PE syllabus to pupils, influences the physical and motor development of 7- to 10-year-old children. A longitudinal four-year study including 328 pupils in the form of a pedagogical experiment was carried out. Data were collected through tests within the framework of a Sports-educational Chart. Differences in transformation effects were analysed by means of the analysis of covariance. It was found that the programme of sports classes does have a positive impact on the development of motor abilities, particularly given that the results regarding the individual motor abilities of children of that age have been falling in Slovenia over the last few decades. After disparities in the initial status were eliminated, statistically significant differences were noted in the motor tasks obstacle course backwards, sit-ups in 30 seconds and 600-metre run. Boys were also significantly different in their body weight. The improvement of pupils from sports classes also points to the better quality of lessons consisting of a wider range of motor skills, a suitable organisation of work and greater exercising. The following recommendations are offered in response to these findings: more frequent co-operation between the PE teacher and the classroom teacher in PE lessons, the organisation of suitable programmes of additional training for teachers, who work with children from 7 to 10 regarding their developmental characteristics, flexible organisation of sports classes due to the changed demands of the school setting and the more systematic planning of lessons for sports classes.

Key words: primary school, PE lessons, sports class, motor abilities

Introduction
One of the key objectives of sports activity is to develop motor abilities which assist with more efficient and controlled movement. In addition, the fact that motor development is closely related to cognitive, emotional and social areas of a child's development should not be disregarded. A child's motor development is mainly systematically influenced by the process of physical education (PE) within the education system. The quantity and quality of PE in school is especially important between the ages of 6 and 10, when a child's physical growth decelerates, the muscular system grows intensively and when the level of maturity of movement coordination represents the ideal time to start general sports exercising or the intensive practicing of technically more demanding movements. Due to the fast development of the brain and the myelination of the cortex in particular, this is the ideal time to learn motor activities that demand a large number of learned motor patterns (gymnastics, ballet, skiing, swimming, etc.) and which cannot be found in the ontogenesis of human development (Horvat, 1994).

Nowadays PE in school is not only characterised by developing motor abilities, physical attributes and the acquiring of sports skills - it also involves a motivational process for sport and secondary socialisation, which includes the development of social values, norms, ethical rules and behavioural patterns. Consequently, primary and secondary schools in Slovenia include three hours (135 minutes) of compulsory PE each week. The only exception is the last three years of the nine-year primary school when two hours a week are compulsory (90 minutes), while children can decide for an additional one or two hours a week according to their interests and the selection of optional subjects on offer (Kovač, Jurak, Strel, & Starc, 2003).

In addition to general classes, schools in Slovenia have for the last fifteen years also been offering a programme of so-called sports classes that are today referred to as classes with additional sport lessons, which entails an enhanced PE syllabus, most often by including two extra hours of PE a week and a wider selection of sports contents, which can also be conducted out of school. This
programme of sports classes has been included in 7% of primary schools in Slovenia (Jurak, Kovač, & Strel, 2004a).

The initial goal of sports classes was to select the youngest children who were then directed towards elite sports training and to accommodate their education from the first year onwards. Since such early selection is problematic from various aspects (Šturm, 1992; Strmčnik, 1995), the primary goal of including children in schools’ sports classes soon changed (Cankar & Kovač, 1995). In comparison with secondary school sports classes, their goal today is not to synchronise academic work and training (Jurak, Kovač, Strel, & Starc, 2005) but to offer enhanced PE to all those children and parents who desire more sport (Kovač & Novak, 1998). Its placement in the school environment (the programme being carried out with the permission of the school committee, and the organisation and contents supplementing regular education) and the sports sphere (well organised, regular and well-executed optional sports activity) represents perhaps the best option for a quality regular and expanded school programme with daily PE and additional sports activities (outdoor activities, various sport courses, etc.) for the children of those parents who prefer that kind of education. Changes in the social environment (school reform, longer working hours for parents) also require a different organisation of sports classes according to the specifics of the particular school situation (Jurak, Kovač, & Strel, 2004b), yet it must still serve the same purpose: to improve on schools that offer the same to all children and to adjust to the wishes and needs of the children and their parents.1

The latest research on the organisation of work in sports classes (Jurak, et al., 2004a) found that PE lessons usually take place in the middle of the daily educational process. Sports activities that schools offer by way of courses are also usually organised during the educational process and less often after school hours, in the holidays or on weekends. In comparison to general classes, where classroom teachers teach PE from class 1 to 5, PE classes are being taught jointly by a PE teacher and the classroom teacher.

Schools that organise sports classes have good conditions for offering PE: they have large sports halls and outdoor grass or hard surfaces and the majority of them also have smaller sports halls and other special sports surfaces (athletics track, swimming pool, fitness room, long-jumping pit, jogging track, playroom, dancing room, etc.). Most schools enrol children in sports classes with the parents’ prior consent for joining these classes and the payment for additional services. The way sports classes are financed varies. Some schools cover the costs of running the programme with local and government funds, sponsors and their own resources at no cost to the children or parents, whereas others include parents’ contributions and some entirely cover the related costs through the parents’ funding. Parents’ average monthly contribution to running the programme of additional sport lessons is EUR 11.42.

Schools believe that the monthly contribution level is not high so that all parents can afford it. Further, it is believed that this is still a cheaper way of exercising than with clubs or private institutions. Namely, with clubs or private institutions parents still also have to pay membership fees, with transport becoming an additional cost; it should also not be neglected that organised exercising at school allows an important saving of time for parents (Jurak, et al., 2004a).

One aspect of the efficiency of sports classes is the programme’s impact on the motor status of children and, indirectly, the impact on the quantity and quality of sports skills, participation in sport during one’s free time, the impact on the cardiovascular system, regulation of body weight, etc. Therefore, the study sought to find out how the programme of sports classes influences the physical and motor development of 7- to 10-year-old children.

Methods

Subjects and Procedures

A longitudinal study in the form of a pedagogical experiment was carried out. The study included 328 pupils, who in the year 2000 started their first year of education (at the age of 7) and in the next three years (2001 – 2003) were tested in all physical characteristics and motor skill measurements planned. Two groups of children from the same schools were formed: an experimental group, which included children from sports classes (N = 157; 81 boys and 76 girls); and a control group, which included children from general classes (N = 171; 87 boys and 84 girls). This was done to minimise the impact of the conditions for PE offered by individual schools and the impact of the wider social environment on the results. One limiting factor is that the children were tested in April, meaning that any differences from the initial status are already the result of almost a year of systematic work in the two different programmes.

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1 The majority of Slovenian schools offer various additional programmes, such as additional foreign language lessons, music lessons or ecology lessons, etc.

2 This is 1.6% of an average monthly salary in Slovenia.
Data were collected within the framework of a Sports-educational chart (Strel, Ambrožič, Kondrič, Kovač, Leskošek, Štihec, et al., 1997), involving data collection through which the physical (3 measures) and motor (8 tasks) development of children and youth in Slovenia has been followed for 19 years (Strel, Kovač, Jurak, Bednarik, & Leskošek, 2001; Strel, Kovač, Jurak, & Bednarik, 2003; Strel, Kovač, & Jurak, 2004). Measurements are carried out every year in April. The recording, evaluating and monitoring of physical characteristics and motor abilities is conducted on the basis of the following tests (see Table 1).

Table 1. Measuring procedures for data collection using the Sports-educational Chart, their abbreviations and the dimensions they represent

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Variable</th>
<th>Hypothetical dimension measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATV</td>
<td>Body height</td>
<td>Measure of longitudinal dimensionality of the body</td>
</tr>
<tr>
<td>ATT</td>
<td>Body weight</td>
<td>Measure of the voluminosity of the body</td>
</tr>
<tr>
<td>AKG</td>
<td>Upper-arm skinfold</td>
<td>Percentage of body fat</td>
</tr>
<tr>
<td>DPR</td>
<td>Hand tapping</td>
<td>Speed of alternate movements</td>
</tr>
<tr>
<td>SDM</td>
<td>Standing long jump</td>
<td>Explosive strength</td>
</tr>
<tr>
<td>PON</td>
<td>Obstacle course backwards</td>
<td>Co-ordination of whole-body movements</td>
</tr>
<tr>
<td>DT</td>
<td>Sit-ups</td>
<td>Strength of abdominal muscles</td>
</tr>
<tr>
<td>PRE</td>
<td>Forward bend on a bench</td>
<td>Flexibility</td>
</tr>
<tr>
<td>VZG</td>
<td>Bent-arm hang</td>
<td>Muscular endurance of the shoulder girdle and arms</td>
</tr>
<tr>
<td>T6</td>
<td>60-metre run</td>
<td>Sprinting speed</td>
</tr>
<tr>
<td>T600</td>
<td>600-metre run</td>
<td>General endurance</td>
</tr>
</tbody>
</table>

In addition a value for the XT variable will be shown to represent the average value of all eight motor tasks and which is comparable with the whole general population. The tests are described in the publication Sports-educational Chart by Strel and co-workers (1997).

Data analysis

A t-test for dependent samples was used to calculate the differences between particular variables for individual groups of measured subjects. A t-test for independent samples was used to calculate the differences between the individual variables of the two groups of measured subjects. Differences in the transformation effects between the two groups were calculated by using the analysis of covariance.

Results

In the first year boys and girls from sports classes achieved better results than their peers from general PE classes in all the motor tasks (see Table 2). However, the analysis of differences between individual variables of the two groups of measured subjects shows that in the initial testing (in 2000) there were only significant differences for both genders in the variables hand-tapping, obstacle course backwards and sit-ups. For boys, significant differences were also observable in the variables, standing long jump, forward bend on a bench and bent-arm hang, and for girls in the variable 600-metre run. The average value of motor tasks (XT) shows that the motor status of pupils from sports classes was above the Slovenian average (which is 50.0), whereas that of pupils from the general classes was below the average.

At the final testing, pupils from sports classes again had higher values in all of the variables compared with their peers from the general classes (see Table 2, year 2003). Significant differences for both genders can be seen in the variables hand tapping, obstacle course backwards, sit-ups and 600-metre run. For boys, a significant difference was also noticed for the tasks bend forward on a bench and bent-arm hang. The difference in the XT value decreased as a result of the higher values of children from general classes.

In order to identify the transformation effects, the impact of the different initial status of the two groups of measured subjects was eliminated (see Table 3). It can be seen that, after eliminating this effect, significant differences at the alpha level of .05 between the groups can be seen in the following motor variables: obstacle course backwards, sit-ups and 600-metre run. Boys are also significantly different in the morphological variable body weight. A discussion of the results follows with an illustration of the trends of the results for the aforementioned variables for individual years (see Figure 1).
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ATV</td>
<td>cm</td>
<td>130.0 5.4 118.5 152.5</td>
<td>145.5 6.2 129.0 159.5</td>
<td>0.407</td>
<td>0.156</td>
</tr>
<tr>
<td>ATT</td>
<td>kg</td>
<td>26.7 4.3 18.0 46.5</td>
<td>38.9 8.2 23.5 71.0</td>
<td>0.008</td>
<td>0.290</td>
</tr>
<tr>
<td>AKG</td>
<td>mm</td>
<td>10.023 3.292 4 25</td>
<td>13.287 5.543 5 35</td>
<td>0.130</td>
<td>0.537</td>
</tr>
<tr>
<td>DPR</td>
<td>Number of repetitions in 20 seconds</td>
<td>23.322 3.832 12 37</td>
<td>32.713 4.017 23 42</td>
<td>0.003</td>
<td>0.013</td>
</tr>
<tr>
<td>SDM</td>
<td>cm</td>
<td>132.862 15.685 90 169</td>
<td>160.770 17.491 102 201</td>
<td>0.006</td>
<td>0.384</td>
</tr>
<tr>
<td>PON</td>
<td>sec/10</td>
<td>189.471 39.141 120 351</td>
<td>151.747 38.471 95 299</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>DT</td>
<td>Number of repetitions in 60 seconds</td>
<td>26.931 6.248 11 50</td>
<td>36.138 8.361 11 56</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>PRE</td>
<td>cm</td>
<td>41.471 5.793 30 55</td>
<td>42.322 6.790 20 56</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>VZG</td>
<td>s</td>
<td>22.598 17.720 3 107</td>
<td>31.391 26.374 1 120</td>
<td>0.005</td>
<td>0.024</td>
</tr>
<tr>
<td>T60</td>
<td>s/10</td>
<td>123.920 9.917 105 151</td>
<td>108.851 8.806 90 143</td>
<td>0.049</td>
<td>0.594</td>
</tr>
<tr>
<td>T600</td>
<td>s</td>
<td>206.092 39.153 155 300</td>
<td>171.494 29.923 0 120</td>
<td>0.122</td>
<td>0.000</td>
</tr>
<tr>
<td>XT</td>
<td></td>
<td>47.717 5.860 28.63 60.25</td>
<td>48.435 5.789 33.75 60.25</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>


Groups: 0_B = boys from general PE classes; 1_B = boys from sports classes; 0_G = girls from general PE classes; 1_G = girls from sports classes
Table 3. Differences in the final status (fourth year, 2003) between pupils from general and sports classes after the impact of their initial status (first year, 2000) is eliminated.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gender</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATV</td>
<td>boys</td>
<td>1.616</td>
<td>0.205</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>1.455</td>
<td>0.230</td>
</tr>
<tr>
<td>ATT</td>
<td>boys</td>
<td>8.263</td>
<td>*0.005</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>0.043</td>
<td>0.836</td>
</tr>
<tr>
<td>AKG</td>
<td>boys</td>
<td>0.920</td>
<td>0.339</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>0.002</td>
<td>0.963</td>
</tr>
<tr>
<td>DPR</td>
<td>boys</td>
<td>0.928</td>
<td>0.337</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>1.805</td>
<td>0.181</td>
</tr>
<tr>
<td>SDM</td>
<td>boys</td>
<td>0.522</td>
<td>0.471</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>0.596</td>
<td>0.441</td>
</tr>
<tr>
<td>PON</td>
<td>boys</td>
<td>3.993</td>
<td>*0.047</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>12.249</td>
<td>*0.001</td>
</tr>
<tr>
<td>DT</td>
<td>boys</td>
<td>16.965</td>
<td>*0.000</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>3.959</td>
<td>*0.048</td>
</tr>
<tr>
<td>PRE</td>
<td>boys</td>
<td>0.184</td>
<td>0.669</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>0.869</td>
<td>0.353</td>
</tr>
<tr>
<td>VZG</td>
<td>boys</td>
<td>0.370</td>
<td>0.544</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>1.651</td>
<td>0.201</td>
</tr>
<tr>
<td>T60</td>
<td>boys</td>
<td>0.493</td>
<td>0.484</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>0.457</td>
<td>0.500</td>
</tr>
<tr>
<td>T600</td>
<td>boys</td>
<td>11.315</td>
<td>*0.001</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>20.030</td>
<td>*0.000</td>
</tr>
</tbody>
</table>


Discussion and conclusions

The initial differences in motor abilities indicate that children with better motor status enrol in sports classes (Cankar & Kovač, 1995). Children who participate in various sport programmes from early childhood mature faster and have a biological advantage over other children. Presumably children enrolled in sports classes have parents with more positive attitudes to a sports lifestyle and who are also wealthy enough to provide and are prepared to pay for such a lifestyle (Gubanc, 1999). According to previous findings (Gubanc, 1999; Jurak, Kovač, & Strel, 2002) it can be assumed that these parents also more often enrol their children in sports activities during their free time and they are also sportingly active themselves. Therefore these children get ahead of their peers in motor development, and are more successful in sport and take up sports more frequently.

The higher body weight of the boys in sports classes can be explained by their greater biological maturity (Malina, 1994). It appears as if these boys have more fat and muscle tissues. An increase in body fat can be noted in boys under the age of 12 (Strel et al., 2001; Strel et al., 2004); therefore, the higher share of body fat in boys from sports classes can be explained by their higher biological age. Simultaneously, the greater differences in body weight compared with body fat indicate a larger percentage of muscle tissue.

As expected, by the end of their fourth year children from both general and sports classes (see
endurance and speed endurance). This has been physiological and motor abilities (especially muscular better aerobic endurance and higher levels of phys-
ically active (included in sports training) show proved through planned and suitable exercising. It forms of endurance, which can be signifi cantly im-
proved in some cross-studies comparing active chil-
dren (Strel et al., 2004) as well as in longitudinal studies (Mirwald, Bailey, Cameron, & Rasmussen, 1981; Kovač & Štihec, 1988; Beunen, Malina, Ren-

It could have been expected that there would be also bigger differences in the results of the oth-
er motor variables. After studying the characteristics of individual dimensions represented by mo-
tor variables, it can be seen that an improvement was not mainly achieved in those motor abilities which are largely genetically determined (speed, explosive power). In comparison, an improvement in the sports classes was mostly achieved in those motor abilities which can be significantly improved through exercise and for which the studied age group has revealed particularly negative changes in the last couple of decades (Bös, 2003; Strel et al., 2004). In addition, it is a custom in schools with sports classes that a higher level of PE for general classes is also achieved as a result of the positive transfer of knowledge between teachers (Novak, Petrović, Tušak, & Kovač, 1990). Further, a lower initial status always facilitates a bigger improve-
ment compared to those with a higher initial status. These factors could explain the smaller differences between the pupils from general and sports classes and be a result of the samples used.

By limiting the study by excluding out-of-
school factors that could have an impact on the de-
velopment of children’s motor abilities, it can be seen that the programme of sports classes in Slov-
enian primary schools does have a positive impact on the development of motor abilities, especially considering the fact that the results for the individ-
ual motor abilities of children aged 7 to 10 years have been falling in Slovenia over the last couple of decades. Strel and associates (2004) found that the body fat of Slovenian children of these ages has increased in the last ten years by 30%, whereas gen-
eral endurance has fallen by 20% while the level of whole body co-ordination has also decreased by 10%. Other European authors have come to similar conclusions (Bös, 2003, Kemper, 2004). The previous findings indicate threats stemming from changes in both the family environment (insuffi-
cient motor stimuli; changes in free-time activities whereby spontaneous activities have been replaced by computers, television and mobile phones; excess-
ive care for the comfort of the youngest children reflected in large amounts of appealing, yet unsuit-
able food and the school system (permissive educa-

tion; not enough complex movements in PE, bigger emphasis on aesthetic expression and enjoyment in less demanding physical activities; poor planning of practicing) in which the effect of PE is unsuitable as regards endurance abilities and the regulation of

Table 2; year 2003) had higher values than the ini-
tial ones in all tested variables (difference in tests at the alpha level .01). Namely, a characteristic of the studied period (7 to 10 years of age) is the posi-
tive direction of development for both genders in all of the motor abilities (Malina, Bouchard, & Bar-
Or 2004; Strel et al., 2004) as well as the higher values of all three measured anthropometric meas-
urements (Kondrič, 2000; Strel et al., 2001; 2003; Strel et al., 2004).

On the basis of the final testing results (see Table 2, year 2003) one could assume a better ef-
fi ciency of work in the general PE classes; however, a more detailed analysis (see Table 3 and Figure 1) paints a different picture.

Boys from sports classes had a higher body weight than their peers from general classes in all years (see Figure 1), however, the difference de-
creases with age, which shows that their maturity level was higher at the time of entering the school but their peers soon caught up with them. As a re-

result of the reduced difference in skin folds (see Ta-

ble 2), it can be assumed that the difference in body weight is less due to the smaller increase in body fat in the boys from the sports classes. This is a very important indicator in the light of cross-studies that point towards an increasing percentage of overweight and obese children of this age (Strel et al., 2001; Strel et al., 2004; Cacciari et al., 2002; Cole & Rolland-Chachera, 2002; Tremblay, Katz-
marzyk, & Willms, 2002).

An increase in the difference between the initial and final tests was noticed for all three motor tasks (PON, DT, T600) in favour of both boys and girls from sports classes (see Table 3). Pupils from sports classes had already achieved higher results in all tasks at the time of the first tests; nevertheless, these differences were even higher in the last tests.

A better progression in the co-ordination of the whole body movement of pupils from sports classes indicates a better quality in the running of the les-
sons, a wider range of motor skills and the suitable organisation of work, which ensured positive chang-
es in such motor abilities (Kovač & Štihec, 1988).

It can be assumed that pupils from sports classes received different motor stimuli which teachers passed on in different ways and thus they also indi-
cate a higher level of sports skills.

The better progression in the tasks sit-ups and 600-metre run can mainly be explained by the high-
er amount of exercising in the form of more hours of PE in sports classes. Tasks represent different forms of endurance, which can be significantly im-
proved through planned and suitable exercising. It is known that children of both genders who are regularly active (included in sports training) show better aerobic endurance and higher levels of phys-
iological and motor abilities (especially muscular endurance and speed endurance). This has been
body weight. These results reveal a worrying pattern of children growing up and provide an unsuitable example for their future lifestyles since indicators of health risks are now already being seen in the youngest age groups (Higgins, Gower, Hunter, & Goran 2001; Eisenmann, 2004).

The better effects of the programme of sports classes on motor development are probably a result of the better quality and higher quantity of exercising. Programme quality is chiefly achieved through the superior knowledge of teachers and the smaller number of children being taught (more individual work and better safety), whereas apart from the mentioned factors the quantity of exercising is also achieved through the larger amount of hours of PE available. Undoubtedly differences between the groups would have been even bigger if the testing had been carried out at the beginning of the first year of school and not in April.

Since the positive effects of the combined teaching of the PE teacher and the classroom teacher have often been proved (Kovač & Štihec, 1988; Muhič, 2000; Muraus, 2000), it would be sensible to offer more often that type of work which is not systematically financed. It is recommended that the responsible ministry and local communities encourage schools through co-financing to more often include a PE teacher in the PE classes of younger children. Programmes should be underpinned by the transfer of knowledge of planning PE as it has been found that classroom teachers lack skills especially in this area (Jurak, Kovač, & Strel, 2004c).

With the increased knowledge of teachers it will be possible to utilise more hours of PE as the amount of time children will spend in the modern Slovenian school will rise. Parents in larger towns finish their work in the late afternoon and therefore expect an appropriate school timetable for their children. Therefore, children will participate in sports activities as a part of extracurricular schoolwork. This kind of PE organisation will demand greater organisational flexibility than the old style of sports classes. Appropriate teaching skills will become even more important from the aspect of planning activities.

Some authors claim (Rowland, 1985; Pate & Ward, 1990) that there is no point in developing the general endurance of children in the period of their accelerated development, as the human organism does not respond to endurance exercising due to developmental characteristics. The results of our study, however, show a significant improvement in the 600-metre run, which is a good indicator of the general endurance of children of that age (Cureton, 1982; Safrid, 1990; Škof & Milić, 2002; Kropej, Škof, & Milić, 2002). These improved results are not only a consequence of the better aerobic endurance of children, as other factors also have an impact on long-distance running: persistence, technique and tactics of the running, etc. (Mrak, 2000). Especially as a result of the latter factors the claims of being too early in endurance exercising are incorrect. Namely, endurance exercising, adjusted to the developmental level of children, can create a basis for the successful development of aerobic capacities in later ages. Suitable knowledge and a sufficient amount of PE hours available are necessary for the planning and execution of this kind of exercising.

Results of the study also reveal some shortfalls of current work in sports classes. One can see that teachers in these classes do not pay enough attention to the muscular strength of arms and shoulder girdle and flexibility. Especially the former is worrying, given that the muscular strength of arms and shoulder girdle of boys and girls between the ages of 7 and 9 years has decreased by 50% in the past decade (Strel, et al., 2004). Similar trends have been estimated by Rychtecky (2004) on the sample of Czech, Polish and Slovak children. It is suggested that schools carry out a detailed analysis of the situation at the beginning of the academic year and then include those sports activities in the programme of sports classes which will improve the results of those motor abilities whose results are not so good.

Opportunities for better work also arise with the more systematic planning of lessons. Children from sports classes have around 420 hours of PE between the first and fourth years of their education, which is not negligible in terms of the development of motor abilities. A greater number of hours and the planned direction towards the development of motor abilities could bring about improved effects for the motor status of children and, indirectly, for their health status.

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3 Slovenia already had all-day primary schools in the previous decade which were then transformed into regular schools through various changes in education. PE played an important role in those schools.

4 A school lesson lasts 45 minutes.
References


Sažetak
Uvod
Uz razrede s redovnom nastavom, škole u Slo-veniji posljednjih petnaestak godina nude i program tzv. sportskih razreda, s naprednim i proširenim na-stavnim planom i sadržajem tjelesnog odgoja koji najčešće uključuje dva dodatna sata tjedno za ba-vljenje izabranim aktivnostima u okruženju škole. Dodatne sate zajednički vode nastavnik tjelesnog odgoja i nastavnik razredne nastave. Uz to, program nudi i širi izbor sportskih sadržaja, kojima se uče-nik može baviti i izvan škole. Ovaj program dodatne sportske nastave uveden je, nažalost, u manje od 7% osnovnih škola u Sloveniji (Jurak, Kovač, & Strel, 2004a). Za razliku od sportskih razreda sred-njih škola, ovdje cilj nije usklađivanje šolskog rada i sportskih treniranja (Jurak, Kovač, & Strel, 2005), nego ponuda naprednog sadržaja tjelesnog odgoja djece i roditeljima koji žele više sporta, kao i njihovo usmjeravanje zdravom načinu života (Ko-vač & Novak, 1998).

Cilj istraživanja bio je utvrditi kako program do-datnih sati tjelesnog odgoja utječe na tjelesni i mo-torički razvoj djece u oba splice s do 7 do 10 godina.

Metode
Provedeno je longitudinalno istraživanje u vidu pedagoškog eksperimenta. U istraživanje je uklju-čeno 328 učenika, koji su u 2000. g. započeli i sa redovnim sportskim provođenjem. Oblikovan je dvije skupine djece iz istih škola: eksperimentalna skupina, koja je uključivala djecu iz sportskih razreda (N=157; 81 dječak i 76 djevojčica) i kona-cionalna skupina, koja je uključivala djecu iz običnih razreda (N=152; 78 dječak i 74 djevojčica). To je učinjeno da bi se minimizirao učinak usredotoco na tjelesni odgoj koji nude pojedine škole te utjecaj ši-reg društvenog okruženja na rezultate.

Podaci su prikupljeni u okviru tzv. „Sportsko-obrazovnog kartona“ (Sportno vzgojni karton) (Strel et al., 1997), koji uključuje prikupljanje podataka na temelju kojih se kroz 19 godina pratio tjelesni i mo-torički razvoj djece i mladeži u Sloveniji (Strel et al., 2001, 2003, 2004). Korišteni su sljedeći testo-vi: tjelesna visina, tjelesna težina, kožni nabor na-dlakti, taping rukom, podizanje trupa, pretklon na klupi, izdržaj u visu zgibom, trčanje 600m i trčanje 600m. Tako-der je izračunata vrijednost XT varijable koja pre-dstavlja prosječnu vrijednost svih osam motoričkih zadataka, a uspoređiva je s cjelokupnom populacijom. Testovi su opisani u publikaciji „Sport educational chart“, Strela i suradnike (1997).

Rezultati
Analiza razlika između pojedinih varijabli dvije skupine mjerenih ispitanika pokazuje da su u inicijalnom testiranju (2000.g.) kod oba spola postojale značajne razlike samo u varijablama tapping rukom (p=0.003-.019), poligon na travaše (p=0.000-.008) i po-dizanje trupa (p=0.000-.004). Kod dječaka, značajne su razlike između experimentalne i kontrolne skupine također utvrđene za varijable tjelesna težina (p=0.000-.004), taping rukom (p=0.006), pretklon na klupi (p=0.000) i izdržaj u visu zgibom (p=0.005), a kod djevojčica za varijablu trčanje 600m (p=0.010). Prosječna vrijednost motoričkih zadataka (XT) po-kazuje da je motorički status učenika sportskih ra-zreda bio iznad (dječaci 53.114, djevojčice 54.533) slovenskog prosjeka (koji iznosi 50.0), dok je moto-rički status učenika običnih razreda bio ispod pro-sjeka (dječaci 47.717, djevojčice 49.695).

Pri završnom testiranju značajne su razlike, za oba spola, u korist učenika sportskih razreda, utvr-dene za varijable tapping rukom (p=0.013-.020), po-ligon na travaše (p=0.000), podizanje trupa (p=0.002-0.020) i trčanje 600m (p=0.000). Kod dječaka, značaj-ni je razlika također utvrđena u testovima pretklon na klupi (p=0.002-0.020) i izdržaj u visu zgibom (p=0.024).

Rasprava i zaključci
Inicijalne razlike između dviju skupina, značajne razlike između dviju skupina na razini od .05 mogu se uočiti u sljedećim motoričkim varijablama: poligon na travaše (p=0.001-0.047), podi-zanje trupa (p=0.000-.048) i trčanje 600m (p=0.000-0.001). Dječaci su se značajno razlikovali i u tjele-snoj težini (p=0.005).
u usporedbi s tjelesnom masti ukazuju na veću ko-
ličinu mišićnog tkiva.
Kao što se očekivalo, na kraju četvrte godine
školovanja djeca iz običnih kao i iz sportskih razre-
da imala su veće vrijednosti svih testiranih varijabli
u odnosu na početne. Naime, karakteristika prouča-
vanog perioda je pozitivan smjer razvoja svih moto-
ričkih sposobnosti u oba spola, kao i veće vrijedno-
sti sve tri mjernene antropometrijske mjere (Kondrič,
Na temelju rezultata završnog testiranja mo-
glo bi se pretpostaviti da je rad u običnim razredi-
ma bio učinkovitiji, no detaljnija analiza daje dru-
Kje svako.
Dječaci iz sportskih razreda su tijekom svih go-
dina imali veću tjelesnu težinu od svojih vršnjaka u
običnim razredima, no razlika se smanjivala s dobi.
Na temelju smanjene razlike u kožnim naborima,
može se pretpostaviti da je razlika u tjelesnoj teži-
ni manja zbog slabijeg porasta tjelesne masti kod
dječaka iz sportskih razreda. Ovo je vrlo važan po-
kazatelj u svjetlu presječnih (cross-sectional) studi-
ja koje ukazuju na različitu postotak djece ove dobi
koja su prekomjerne tjelesne težinom i pretila (Bös,
2003; Strel et al., 2004, 2004).
Bolji napredak u koordinaciji pokreta cijelog ti-
jela (test poligon natraške) učenika sportskih ra-
zreda ukazuje na bolju kvalitetu vođenja sati, širi
opseg motoričkih vještina i odgovarajuću organi-
zaciju rada, što je osiguralo pozitivne promjene u
svoj motoričkoj sposobnosti (Kovač & Štihec, 1988).
Može se pretpostaviti da su učenici sportskih ra-
zreda primili drukčije podražaje, koje su
mogli objasniti manje razlike između učenika obi-
cnih i sportskih razreda.
Kao odgovor na dobivene nalaze, preporuča
se sljedeće: učestalija suradnja između nastavni-
ka tjelesnog odgoja i nastavnika razredne nastave
u nastavi tjelesnog odgoja, organizacija primjere-
nih programa dodatnog obrazovanja nastavnika o razvojnim karakteristikama djece u dobi od 7 do
10 godina, fleksibilna organizacija sportskih razre-
da zbog promijenjenih zahtjeva školskog raspore-
da i sustavnije planiranje nastave za sportske raz-
rede.