PSYCHOMOTOR DEVELOPMENT OF GRADE I PRIMARY SCHOOL CHILDREN WHO ARE EDUCATED BY MEANS OF TRADITIONAL AND NON-TRADITIONAL PROGRAM

ROZWÓJ PSYCHOMOTORYCZNY UCZNIÓW PIERWSZEJ KLASY SZKOŁY PODSTAWOWEJ EDUKOWANYCH PROGRAMEM TRADYCYJNYM I NIETRADYCYJNYM

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Key words: physical activity, educational balls, general body coordination, integrated education

Stówa kluczowe: aktywność ruchowa, piłki edukacyjne, ogólna koordynacja ciała, kształcenie zintegrowane

SUMMARY • STRESZCZENIE

Aim of the work. In our study, we attempted to define the level of the general body coordination and acquisition of chosen educational competences by children taking part in one-year-long pedagogical experiment with educational balls “edubal”.

Material and methods. Our research comprised children from one of primary schools in Wroclaw. The experimental group I was represented by 8 girls and 8 boys. The experimental group II included 7 girls and 7 boys. Subsequently, the control group was composed of 8 girls and 12 boys. The general body coordination was examined with General Body Coordination and Control Test by Kiphard and Schilling for children aged 5-4, while for determination of acquisition level of chosen educational competences we used test elaborated in Competence Examination Institute in Wałbrzych.

The obtained results underwent a statistical analysis with Statistica 8.0.

Results and conclusions. Girls from experimental group I achieved better results than girls from two other groups EI and K in almost all trials in the range of general body coordination. The tests were conducted at the beginning and at the end of the experiment. The results of the second part of the research regarding general body coordination were much worse (both for girls and boys) than the results of the same groups in the first examination. Girls from the first experimental group obtained the best results among all groups in Competence Examination Institute Test. It was also the only group which improved their first results in the second part of our research. It is worth mentioning that the employment of games and exercises with the educational balls did not substantially influence the results in the test of the researched competence.

Cel pracy. W naszej pracy podjęliśmy próbę określenia poziomu ogólnej koordynacji ciała oraz opanowania wybranych kompetencji edukacyjnych wśród dzieci uczestniczących w trwającym rok eksperymentie pedagogicznym z wykorzystaniem piłek edukacyjnych „edubal”.

- 45 -
At the end of the 1990s the European educational system underwent the process of significant changes. The area where particular changes took place was the attitude towards the early school child education. The traditional model of education was modified into a contemporary model of participation – a child was no longer treated as a passive person but as an active and creative partner of interaction [1].

In Poland, the model outlined above was addressed by a reform of the education system which started in 1999. The reform was especially focused on changes with special regard to the educational process planning and school organizational structures. However, the most significant changes were introduced in the phase of early school education, which altered its name from initial education to integrated education.

According to the assumptions of the education system reform (1999), the integrated education ought to combine, in a particular way, various domains of science so that the child is enabled to perceive the image of the surrounding world as wholesome as possible [2].

The changes introduced by both the program basis of 1999 and the new program basis of 2009, which maintained most of the tasks of the integrated education, resulted in the situation in which teachers have more freedom and arbitrariness in choosing educational contents and the ways of their performance.

Although all those quite radical changes were introduced ten years ago, we can see that teachers of the integrated education, who are engaged in the process of locomotive education, still make mistakes at this stage. Unfortunately, the introduced education programs, which are numerous because they are so freely created, do not show the significance of harmonious development of all spheres of human functioning for the future of a young human being.

Therefore, during last several years, both in Poland and abroad, there have been carried out many researchers into pedagogical examinations aimed at proving the efficiency of the influence of chosen methods, forms or didactic means upon the educational achievements of students. The existence of connections between motor development of a child and his/her educational achievements was also emphasized.

As it turned out, a lower level of physical development is associated with worse results in reading and counting with first grade boys. This phenomenon was also confirmed in the research by Klausmeier and Lehman [3].

Mental maturation takes place parallel to the processes of physical development. That is why Hetzler suggested applying the physical development level as one of the criteria of school maturity [3]. Also, the development of visual perception is preceded by kinesthetic and locomotive development and both spheres – perceptual and locomotive one – are inextricably linked with each other, what has been confirmed by Kephart [3].

Chissom proved the existence of a significant interrelation between motor activity and school achievements, as well as school attitudes of grade I and III primary school pupils. Motor competence of children was assessed according to the criterion of coordination, locomotive balance and dynamic strength [3].

A very significant conclusion, from the point of view of the early school education, has been formulated by A.B. Johnson, who sought connections between school maturity tests and motor tests. On the basis of examinations and results of factor analysis he concluded that motor competence level should be adopted as one of the criteria of school maturity of pupils who start their education in the primary school [3].
A.H. Ismail and J.J. Gruber went still further in their considerations concerning searching for connections between motor activity and educational achievements of children. They draw the conclusion that intellectual achievements of children can be predicted on the basis of motor factors. According to their opinion, the greatest prognostic power is associated with the following motor features: coordination and balance [3, 4].

Among the Polish authors, who wrote about the significance of the proper development of physical ability in adaptation of a child to work and play in the school environment, were the following: S. Szuman, A. Dzierżanka, H. Gniewkowska, and B. Wilgocka-Okoń. These authors agreed that the development of motor activity is an important factor for making social contacts by a child, especially in the school environment. They also proved that good agility and high abilities in games and plays (also with balls) facilitates the process of child adaptation to the surrounding reality. The children who are more agile in games and plays are also better accepted in a peer group [3].

The examination by Pawlucki also confirmed the existence of connections between motor development and school readiness [6].

The examples from literature of the subject presented above clearly show that there exist direct connections between psychomotor development of a child and his/her school results, especially during the initial stage of school education.

Consequently, we intended to check whether the introduction of physical classes with the use of educational balls “edubal” into the education program called “Happy School” for grade I of primary school can bring about any changes in the particular tests of general body coordination of the examined girls and boys and also in the educational competencies which are acquired by them during their course of learning. For the purposes of our examinations, this unique education program “Happy School”, including physical classes with the use of educational balls, has been termed “non-traditional program”, while the same program conducted in a traditional form was addressed as “traditional program” [4].

Research material

Our research comprised three groups of students of Complex of Schools No 11 in Wrocław. 16 pupils made experimental EI group, 14 pupils – experimental EII group, and 20 pupils made the control K group. Experimental group I consisted of eight girls and eight boys; experimental group II consisted of seven girls and seven boys and the control group consisted of eight girls and twelve boys. Only the results of children who took part in both examinations were used in the elaboration. Moreover, all groups carried out their motor activities in the same conditions having a big and small sports hall at their disposal.

Research methods

In the research, we employed a pedagogical experiment along with the use of a parallel group technique [7, 8]. The planned didactic process was carried out in three groups: two experimental ones (EI and EII) and one control group (K). The classes were realized according to the education program called “Happy School” accepted for use in all grades of the integrated education process in a given school. Children from the experimental groups took part in physical classes twice a week, which were conducted by an integrated education teacher – class tutor. During these classes, educational balls “edubal” were used for exercises, games and plays and they were carried out on the basis of the scenarios which were prepared by the author of the experiment together with the tutors. They referred to learning and improving the knowledge of various problematic areas in the range of mathematics and language learning which posed special difficulties for the students.

The scenarios emphasized an element of play which was directed towards the improvement of general locomotive skills. Plays with balls constituted circa 60% of the lesson time. The remaining time was devoted to other forms of physical activity.

The control group worked under unchanged conditions carrying out the same education program in the whole experiment; physical activities, similarly to the experimental groups, were run by an integrated education teacher who was at the same time the class tutor [4].

During the experiment, which lasted one year, general body coordination and educational competencies were diagnosed twice, i.e. at the beginning and at the end of the school year.

The examination of general body coordination was carried out by means of the General Body Coordination and Control Test with children aged 5–14 by Kiphard and Schiling [9], while for the purpose of examining key competencies we employed the test elaborated in Competence Examination Institute in Walbrzych.
The obtained results underwent a statistical analysis with the use of Statistica 8.0 program.

Results

The analyzed examination results were characterized by variability which is typical for the presented material. Therefore, for the purpose of our analysis we used positional measurements – median. When comparing more than two groups, we used the non-parametrical test ANOVA by Kruscal-Wallis. All the employed statistical tests assumed the level of significance = 0.05.

With regard to the analysis of the obtained results in General Body Coordination of girls in EI, EII and K groups in the first test (Table 1), we noticed that each time the best results in walk on the beam, jumps on one leg, side jumps and carrying over the board were achieved by the girls from EI group. The worst results when compared to EI and K groups were achieved by the girls from EII group. This is further confirmed by the sum of obtained results during the whole test which differentiates the examined groups (Figure 1). Comparing the girls from EI and EII groups, this difference is 43.5 points in favor of the first group, though we did not notice any statistically significant differences between the examined groups (Table 1; Figure 1).

As for the boys in the first examination (Table 2) we can notice that in each of the examination tests the best results were achieved by the boys from EI group. The worst results when compared to EI and K groups were achieved by the boys from EII group. This is further confirmed by the sum of obtained results during the whole test which differentiates the examined groups (Figure 1). Comparing the boys from EI and EII groups, this difference is 43.5 points in favor of the first group, though we did not notice any statistically significant differences between the examined groups (Table 1; Figure 1).

Table 1. Medium results of the trials with reference to General Body Coordination of girls in groups experimental I (EI), experimental II (EII) and control (K), (examination I)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EI N = 8</th>
<th>EII N = 7</th>
<th>K N = 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>M</td>
<td>V</td>
</tr>
<tr>
<td>RÓWN_1</td>
<td>51.63</td>
<td>56.50</td>
<td>32.49</td>
</tr>
<tr>
<td>PNJN_1</td>
<td>40.25</td>
<td>42.00</td>
<td>21.53</td>
</tr>
<tr>
<td>BPRZE_1</td>
<td>44.63</td>
<td>45.00</td>
<td>17.72</td>
</tr>
<tr>
<td>PRDE_1</td>
<td>56.38</td>
<td>56.00</td>
<td>4.54</td>
</tr>
<tr>
<td>SUMA_1</td>
<td>191.75</td>
<td>198.50</td>
<td>15.84</td>
</tr>
</tbody>
</table>

RÓWN_1 – walk on the beam
PNJN_1 – jumps on one leg
BPRZE_1 – side jumps
PRDE_1 – carrying over the board
SUMA_1 – the sum of results in General Body Coordination (examination I)

Fig. 1. Medium results achieved by girls (W) and boys (M) from the experimental group I (EI), experimental group II (EII) and control group (K), in side jumping (examination I)
results were achieved by the control group. In the case of walk on the beam and jumps on one leg these results were 10.5 to 18.5 points higher than in the remaining groups.

Also a summary result for the whole test was the highest in the control group and the lowest in experimental group II; especially in girls the result seems to be simply alarming. Similarly to the comparable girls group, non-parametrical Kruscal Willis test did not show any statistically significant differences (Table 2).

Comparing the obtained results in the first examination between all the groups (girls and boys) we noticed a statistically significant difference between experimental group II and the control group in the case of side jumps test (Figure 2).

While analyzing the obtained results for girls in examination II (Table 3) we noticed that experimental group I achieved, similarly to examination I, the best results in all the tests.

There was a particularly big difference, although statistically insignificant, in the case of side jumps in which the girls from group EI obtained 57 points in relation to 46 points K and 38 in EII. Apart from this, experimental group I achieved the best general test result – 181 points. However, one fact is really intriguing: a general result in the General Body Coordination Test in examination II for each group is lower than in exami-

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Table 2. Medium results of the trials with reference to General Body Coordination of boys in groups experimental I (EI), experimental II (EII) and control (K), (examination I)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EI N = 8</th>
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<th>EII N = 7</th>
<th></th>
<th>K N = 12</th>
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</thead>
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<td>M</td>
<td>V</td>
<td></td>
<td>x</td>
<td>M</td>
</tr>
<tr>
<td>RÓWN_1</td>
<td>32.38</td>
<td>33.00</td>
<td>56.74</td>
<td></td>
<td>26.00</td>
<td>25.00</td>
</tr>
<tr>
<td>PNJN_1</td>
<td>39.88</td>
<td>37.50</td>
<td>28.73</td>
<td></td>
<td>33.00</td>
<td>33.00</td>
</tr>
<tr>
<td>BPRZE_1</td>
<td>38.50</td>
<td>41.50</td>
<td>35.96</td>
<td></td>
<td>34.43</td>
<td>34.00</td>
</tr>
<tr>
<td>PRDE_1</td>
<td>50.38</td>
<td>51.00</td>
<td>15.23</td>
<td></td>
<td>53.29</td>
<td>56.00</td>
</tr>
<tr>
<td>SUMA_1</td>
<td>161.13</td>
<td>170.00</td>
<td>24.47</td>
<td></td>
<td>146.71</td>
<td>153.00</td>
</tr>
</tbody>
</table>

RÓWN_1 – walk on the beam
PNJN_1 – jumps on one leg
BPRZE_1 – side jumps
PRDE_1 – carrying over the board
SUMA_1 – the sum of results in General Body Coordination (examination I)

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Fig. 2. Medium results achieved by girls (W) and boys (M) from the experimental group I (EI), experimental group II (EII) and control group (K). the sum of four trials in General Body Coordination (examination I)
nation I. In the case of group EI by 18.5 points, EII by 11 points and K by 13.5 points. The reason of such a poor result in all three groups can be low verbal motivation of pupils because they were not properly motivated by the teachers who ran the tests (Table 3).

When comparing the results obtained by the boys from three groups in examination II (Table 4) we noticed that, similarly to examination I, the control group achieved much better results than all the other groups. Both among boys and girls, the sum of results in all the tests is lower than in the case of examination I (Figure 3). (Table 4), (Figure 3)

However, EII group, which was undoubtedly the weakest in examination I, in examination II achieved result on a similar level, while EI and K groups had much lower results, respectively by 23.5 and 22.5 points. This can be due to, similarly to the case of girls, low involvement of the examined children in the performance of the tests.

The results obtained by girls in examination I in Competence Test (Table 5) clearly show that the female pupils who start their education in the primary school are characterized by a comparable level of the competencies under research. Further examinations of the learnt competencies, which were carried out at the end of the school year, proved that the girls from EI group (who already obtained a very good result) improved their result by 27.5 points out of 30 possible to

![Graph showing medium results achieved by girls (W) and boys (M) from the experimental group I (EI), experimental group II (EII) and control group (K), the sum of four trials in General Body Coordination (examination II)](image)

**Fig. 3.** Medium results achieved by girls (W) and boys (M) from the experimental group I (EI), experimental group II (EII) and control group (K), the sum of four trials in General Body Coordination (examination II)
achieve. On the other hand, K and EII groups had lower results, by 2 and 4 points respectively (Table 5).

Among the boys (Table 6), similarly to the case of the girls, the obtained results in examination I were comparable and the best result was achieved by EI group.

On the other hand, examination II showed that the obtained results in the competence test among the boys are undoubtedly lower than in examination I (Table 6 and Figure 4).

A particularly poor result was achieved by EII group in which pupils obtained six points less than during the first examination. There can be at least two reasons of this situation: firstly, two of the boys were absent from school for a long time during semester II and consequently, they had educational problems; secondly, the education program was not fully carried out by the teacher because of educational difficulties which appeared while carrying out the one-year experiment.

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Table 4. Medium results of the trials with reference to General Body Coordination of boys in groups experimental I (EI), experimental II (EII) and control (K). (examination II)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EI N = 8</th>
<th>EII N = 7</th>
<th>K N = 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROWN_2</td>
<td>37.88</td>
<td>35.50</td>
<td>43.62</td>
</tr>
<tr>
<td>PNJN_2</td>
<td>28.75</td>
<td>25.00</td>
<td>47.46</td>
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<tr>
<td>BPRZE_2</td>
<td>46.88</td>
<td>48.00</td>
<td>33.20</td>
</tr>
<tr>
<td>PRDE_2</td>
<td>30.25</td>
<td>30.50</td>
<td>19.97</td>
</tr>
<tr>
<td>SUMÁ_2</td>
<td>143.75</td>
<td>146.50</td>
<td>27.94</td>
</tr>
</tbody>
</table>

ROWN_2 – walk on the beam
PNJN_2 – jumps on one leg
BPRZE_2 – side jumps
PRDE_2 – carrying over the board
SUMÁ_2 – the sum of results in General Body Coordination

Table 5. Medium results achieved by girls in Competence Test in groups experimental I (EI), experimental II (EII) and control (K). (examination I and examination II)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EI N = 8</th>
<th>EII N = 7</th>
<th>K N = 8</th>
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</thead>
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<tr>
<td>KOMP_1</td>
<td>25.00</td>
<td>26.50</td>
<td>17.76</td>
</tr>
<tr>
<td>KOMP_2</td>
<td>25.13</td>
<td>27.00</td>
<td>17.98</td>
</tr>
</tbody>
</table>

KOMP_1 – result of the Competence Test (examination I)
KOMP_2 – result of the Competence Test (examination II)

Table 6. Medium results achieved by boys in Competence Test in groups experimental I (EI), experimental II (EII) and control (K). (examination I and examination II)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EI N = 8</th>
<th>EII N = 7</th>
<th>K N = 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOMP_1</td>
<td>24.63</td>
<td>25.00</td>
<td>23.97</td>
</tr>
<tr>
<td>KOMP_2</td>
<td>22.88</td>
<td>22.50</td>
<td>15.22</td>
</tr>
</tbody>
</table>

KOMP_1 – result of the Competence Test (examination I)
KOMP_2 – result of the Competence Test (examination II)
KOMP_2-1 – increase of the result in Competence Test (examination II – examination I)
Fig. 4. Increases (KOMP_2-1) achieved by girls (W) and boys (M) from the experimental group I (EI), experimental group II (EII) and control group (K), in the final result from Competence Test (examination I).

Table 7. Comparison of the medium results achieved by girls and boys in Competence Test in groups experimental I (EI), experimental II (EII) and control (K). (examination I)

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EI N = 8</th>
<th>EII N = 7</th>
<th>K N = 12</th>
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<tbody>
<tr>
<td></td>
<td>X</td>
<td>M</td>
<td>V</td>
</tr>
<tr>
<td>KOMP_K</td>
<td>25.00</td>
<td>26.50</td>
<td>17.76</td>
</tr>
<tr>
<td>KOMP_M</td>
<td>24.63</td>
<td>25.00</td>
<td>23.97</td>
</tr>
</tbody>
</table>

KOMP_K – result of the Competence Test for girls in examination I
KOMP_M – result of the Competence Test for boys in examination

Fig. 5 Medium results achieved by girls (W) and boys (M) from the experimental group I (EI), experimental group II (EII) and control group (K), in the final result of Competence Test (examination I)
The comparison of results in the Competence Test between girls and boys in examination I in each group showed minimal differences in favor of the girls. However, none of these differences was statistically significant (Table 7 and Figure 5).

The same comparison which was made after examination II (Table 8 and Figure 6) revealed the same trend and the differences were also statistically insignificant, however, in each case they were again much bigger in favor of girls. Therefore, we can conclude that girls are better at learning chosen educational competencies. Similar conclusions had been drawn at by Rokita [10] (Table 8 and Figure 6).

In Poland, pilot [11, 12] and proper examinations [10, 13, 14] concerning the employment of educational balls "edubal" at the stage of the early school education have been carried out since 2002. The goals, which the authors pursued, concerned the influence of the introduction of educational balls "edubal" in the realization of the didactic process on the motor development and on the process of learning chosen didactic program contents (e.g. language and mathematics education) as well.

Cichy and Rzepa wrote in their study about the relation between the use of educational balls "edubal" in grades I–III of primary school and the development of physical ability [12]. They carried out a one-year pedagogical experiment by means of the parallel group technique. After the realization of this experiment, they noticed that the education program which used educational balls influences the motor sphere in the same way as the traditional program. Krajewski came to the similar conclusion after he had carried out his examinations [14]. Analyzing the results obtained by the children in the range of general body
coordonation, Krajewski stated that apart from the fact that the results were higher in relation to the examination before the experiment, there was no statistically significant difference in each group both in all partial assessments and in the whole assessment of the general body coordination test. Also Rokita, who carried out his research in the rural environment, as well as Wójcik and Rzepa, who examined cases of children living in a big city, stated that independently of the environment in which the educational balls “edubal” were used, children’s physical ability is comparable and did not depend on the experimental factor [15, 16]. In their research they confirmed [11, 12, 17, 10] the existence of connections between the employment of educational balls “edubal” in the integrated education and the intellectual development of the children [10]. Rokita in his study of 2008 came to an interesting conclusion, that the employment of educational balls “edubal” enhances the speed of reading skills acquisition but it does not impinge the writing skills in the same way.

The results obtained by the authors enable to state that the employment of educational balls “edubal” during the physical classes does not bring about any unfavourable changes in the spheres of physical ability and general body coordination. On the other hand, it can contribute to the achievement of goals of education in a more effective way at this stage.

Taking into account the observations outlined above, we must conclude that the employment of the didactic means of this type can constitute an attractive supplement of the traditional classes conducted in school conditions.

Conclusions

1. Girls from EI group obtained better results than the girls from EIi and K groups in almost all of the trials in the range of General Body Coordination which were conducted at the beginning and the end of the experiment. Only in examination II in jumps on one leg the control group’s girls achieved better results.

2. Control group boys always obtained better results than the boys from experimental I and experimental II groups in both of the examinations in the tests of General Body Coordination.

3. The results of all girls and boys in examination II in the range of General Body Coordination were slightly worse than the results of the same groups in examination I. These differences were not statistically significant.

4. Girls from experimental group I in both of the examinations obtained the best results from all the groups in the Competence Test and they were the only group that in examination II improved their result in comparison with examination I.

5. The worst result among all the female and male groups in the Competence Test was achieved by control group of boys in examination I and experimental group II of boys in examination II.

6. All the girls in each of the examined groups obtained better results in both examinations than their grade peers in the range of the Competence Test.

7. We must conclude that the employment of educational balls “edubal” did not significantly influence the results obtained in the test of the examined competences.

LITERATURA • PIŚMIENNIKSTWO


[11] Rzepa T: Aktywność ruchowa z piłką w osiąganiu wybranych celów kształcenia w zakresie języka polskiego w drugiej klasie szkoły podstawowej [Locomotive Activity with the Ball in the Achievement of Chosen Goals of Education in the Range of the Polish Language in Grade II of Primary School], in Koszczyc T, Dembiński J (eds.): Instrumentalne wykorzystanie gier z piłką [Instrumental Use of Ball Games], Wrocław, WTN, 2003; 57–61.