Спортивная тренировка

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THE DEVELOPMENT OF CONDITIONAL MOTOR SKILLS BY MEANS OF COURSES AND APPLICATIVE CIRCUITS IN 6th GRADE GIRLS DURING THE PHYSICAL EDUCATION CLASS

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Background. The process of developing motor skills in secondary education has, over time, experienced constant improvement concerns from the part of specialists who plan and manage the physical education activities for this age group. Optimizing physical training during puberty is a much more difficult endeavour than during adulthood. Acquiring new motor skills, their correct management and guidance, as well as their application in motor mastery stages, are dependent on the development degree of conditional skills such as speed, strength, resistance, on their forms of manifestation and on their combination. **Aim.** The aim of our research was to develop motor skills in 6th grade girls by means of applicative courses and to compare the effectiveness of experimental and classical curricula. **Methods.** During school year 2016–2017, we applied an experimental curriculum on the experimental group, which focused on a number of 32 applicative courses, divided on the learning units. Out of these learning units, 8 courses are dedicated to the motor skill speed, 10 courses to the development of different types of strength, 6 to the motor skill resistance and 8 concentrate on the combinations speed-coordination or strength-resistance. **Results.** The interpretation of the difference of signification between the averages of the two groups – for the final tests – indicates a slight progress of girls form the experimental group, in all the trials used. Nevertheless, there were statistically significant differences only for 3 of the 13 trials. **Conclusions.** The insignificant differences between the two independent groups obtained at most final tests indicate the fact that the use of applicative courses is not better than the classical methodology used to develop conditional motor skills. It is indicated to continue the study on larger secondary school groups, both in the rural and in the urban environment, so that the results obtained could be representative at a national level and the conclusions drawn could be pertinent.

Keywords: *conditional motor skills, differential dosage, physical fitness, effort capacity, attractive exercises.*

Introduction. The planning and development process of motor qualities – also encountered in the domain-specific literature under the name of motor skills, psychomotor skills, physical qualities, motor abilities – represents a priority for the training process, regardless of the education cycle in which students are enrolled.

The approach of motor skills – within PE classes – is not a favourite subject for teachers because, on the one hand, the provisions of the specialized planning documents do not allocate too many content elements specific to motor skills and, on the other hand, because class activities focus on forming and applying the locomotion, manipulation, balance motor skills and the motor skills which are specific to sports games, to gymnastics, to box jumping, to athletics trials etc. The physical training process is, thus, considered a background element, a frequent argument in favour of this being that motor skills are favourably and indirectly influenced by this assimilation and application process of different motor skills, without taking into account the fact that these options are often by far less productive in comparison with the physical training indicators obtained by means of a number of PE classes that are especially focused on strength, resistance or speed. Physical training deficiencies usually also mean unwanted delays in the motor learning process and significantly restrict the students'

effort capacity and, implicitly, the ability to apply the assimilated skills in diverse situations, affecting the efficiency of the actions and the quality of the execution techniques [3, 7, 9]. (Fig. 1) summarizes the main categories of moves/motor skills taken from the school curriculum for secondary education for PE in which we may also include and selectively combine courses and applicative circuits.

The use of courses and of applicative circuits, as main means of physical training during secondary school, presents the following advantages [1, 8, 11, 14]:

– Offering creative and diversified application premises for the already assimilated motor skills, even if the respective school does not have the proper sports equipment;

– Allowing the orientation of the effort towards one or more planned skills due to the number and order of the trials: speed, strength during a resistance trial, resistance during a strength trial, speed during a strength trial etc;

– Attractiveness and greater student involvement as compared to the classical means used for physical training;

– Obtaining high functional and motor densities while forming more work groups and repeating the circuit more than one time;

– Stimulating team spirit and increasing cohesion in the group, acting in accordance with a series of clearly stipulated rules, which must be obeyed by all students;

– Developing students' creativity and imagination, by adopting some unique/personal solutions to approaching some trials;

– Facilitating a combination of a wide range of skills with varying complexity and difficulty levels;

– The modification of the circuit's elements from one lesson to the other may also have

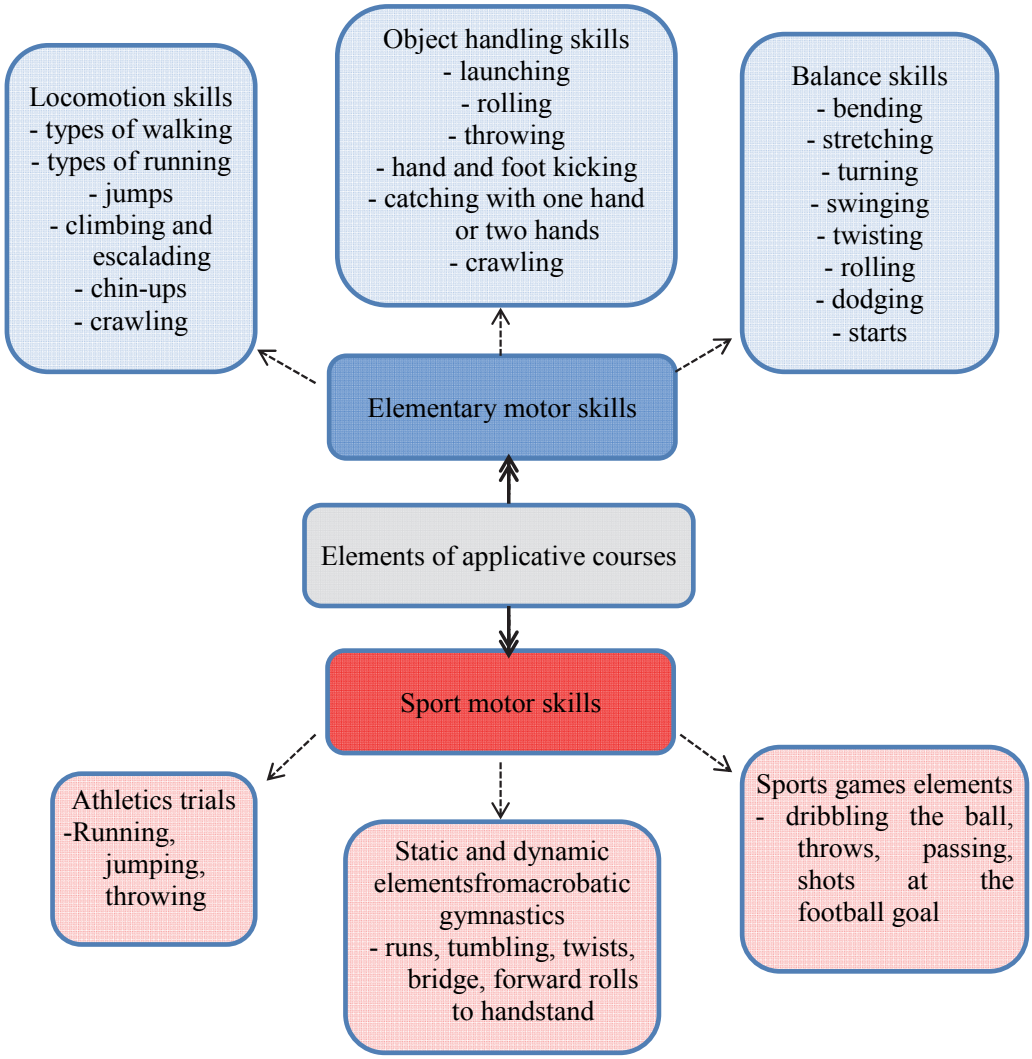

Fig. 1. The content of the secondary school curriculum that must be assimilated for the applicative courses

favourable effects on the coordination processes but, it primarily involves new challenges for the students, avoiding boredom by stimulating the body to adapt from a functional point of view.

The scientific planning of the curriculum – which represents a basic document of the official or explicit curriculum, according to [2], p. 55 – will take into consideration the vertical optimal correlation of the subjects from the motor skill area with those from motor skills. This aspect entails the association of the taught sports abilities with those skills or combination of skills which facilitate learning or consolidation, for example the subjects from jumps may be associated with those that focus on the development of explosive force, the acrobatic gymnastics subjects may be coupled with those that develop flexibility and the muscle groups involved in performing the respective moves, the sports games subjects with those that develop the reaction or the execution speed, coordination or specific resistance [14, 20].

The development of motor skills involves the selective usage of an association of methods, depending on their manifestation form, on the established combinations with other skills and the age group priorities [4, 13, 15].

The domain-specific literature [3, 11, 16, 18] makes a classification of these classical methods that have a positive influence on the physical training process, which is presented in (Fig. 2), and that may be successfully used during sports training or PE classes, with the indication that they are selectively systematized, in accordance with the motor possibilities of students who are at puberty, the ones written in italic being accessible and mainly used for the respective age group.

The conducted research was motivated by the following factors, which diminish the efficiency of the teaching process:

– Low student involvement in the PE classes, as a direct effect of the sedentary lifestyle, generated by the computer-based activities that students undertake and by avoiding the extracurricular/leisure time physical activities;

– The decreasing physical effort capacity and general physical training;

– Students' avoidance of trials that entail functional strains like speed, strength and resistance, or of their combination, an increase in the number of students who have medical exemption certificates;

– Finding some motor actions, which are available to both genders, since there are major

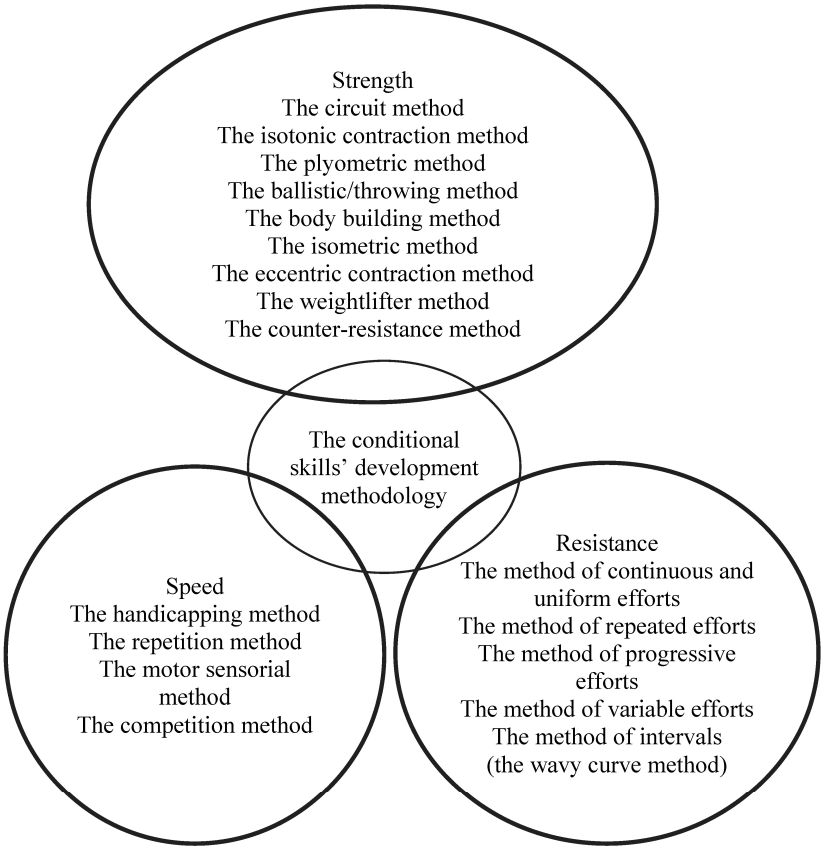

Fig. 2. The main methods used for developing conditional motor skills/classical training

changes during puberty – regarding effort possibilities – for both boys and girls;

– The stipulations concerning the number of compulsory PE classes have remained the same in the last few years, in 2016 PE classes being held twice a week for all grades – according to [5], pp. 7. Therefore, the classical methodology of developing conditional motor skills may be replaced by the rational usage of applicative courses in the PE classes that focus on developing speed, strength and resistance. By means of this option, one may obtain values for developing motor skills which are similar to those obtained by means of classical methods. The paper is equal contribution of all authors.

Materials and Methods. During school year 2016–2017, we applied an experimental curriculum on the experimental group, which focused on a number of 32 applicative courses, divided on the learning units presented in table 1. Out of these learning units, 8 courses are dedicated to the motor skill speed, 10 courses to the development of different types of strength, 6 to the motor skill resistance and 8 concentrate on the combinations speed-coordination or strength-resistance. The experimental curriculum – suggested for developing conditional motor skills – relied only on creating some learning units, which use circuits and applicative courses, for the control group, the activities being planned in accordance with the classical training methodology, shown in (Fig. 2).

The use of the above-mentioned activities was in accordance with the principles of grading/ accessibility and of systematization, in view of an active student participation, providing some effort curves, capable of generating the adaptive changes sought. The orientation of the effort towards a certain conditional motor quality was achieved by the type and number of activities planned, by the intensity of the actions, by the number of imposed repetitions, by the weight lifted, by the distances between stops, by the difficulty of the tasks etc. Most planned actions refer to: sprints on variable distances with change of direction, carrying different objects from on circle to another, pushing or pulling some heavy objects, jumps in circles, on, over and from different obstacles, crawling under obstacles, climbing and escalading abilities, target throws with different objects, maintaining muscles in an isometric tension in different positions, rolls specific to acrobatic gymnastics etc.

The subjects of the research are 6th grade girls from an urban environment, the average age being between 12 and 13 years old, corresponding to the middle of puberty stage. The experimental group was made up of 40 girls and the control group was made up of 38 girls. The subjects of the research volunteered and were informed about the conducted research and we asked for the parents' agreement in order for the girls to participate in the study.

In order to test the conditional motor skills, we used the following trials: 50 m. sprint (sec) to test the speed of movement, Touch the boards (sec) to test the repetition speed of the upper limbs (for coordination), The falling ruler (cm.) to test the reaction speed of the upper limbs to visual stimuli, Relays 5×10 m (sec) to test the agility/direction change, the acceleration and deceleration ability, Resistance running 600 m (min/sec) to test the aerobic and mixed resistance, Maintaining the hanging position (sec) to

Table 1

The content of the learning units from the experimental curriculum applied to the experimental group

Contents for the learning units from the 1st sem.	Contents for the learning units from the 2nd sem.	Number of hours per learning unit		Total number of hours	Number of applicative courses
		Sem. I	Sem. II		
Reaction and execution speed	Speed of movement on various distances and directions	8	6	14	8
Dynamic segmental force and explosive force for the lower and upper limbs	Dynamic segmental strength for the abdomen and the torso	8	8	16	10
–	Respiratory and cardio resistance to aerobic and variable efforts	–	10	10	6
Combination: speed-coordination	Combination: speed-resistance	8	6	14	8

Table 2

The difference in the significance value for the initial and the end tests regarding independent sample groups

Trials	The control group (n = 38)	The experimental group (n = 40)	t	p	The control group (n = 38)	The experimental group (n = 40)	t	p
50m-sprint (s)	9.25 ± 0.07	9.23 ± 0.09	–.578	.571	9.11 ± 0.06	9.12 ± 0.07	.078	.939
Touch the boards (s)	17.12 ± 0.79	17.07 ± 1.05	–.108	.915	16.97 ± 0.81	15.78 ± 0.64	–4.235	.000▲
The falling ruler (cm)	27.33 ± 5.49	27.40 ± 2.63	.043	.966	23.83 ± 4.44	22.20 ± 2.61	–1.223	.232
Relays 5 × 10 m (s)	22.61 ± 0.71	22.53 ± 0.39	–.370	.714	21.88 ± 0.98	22.25 ± 0.39	1.399	.174
Resistance running 600 m (min / s)	3.14 ± 0.05	3.12 ± 0.09	–1.561	.133	3.12 ± 0.04	3.07 ± 0.03	–3.057	.006**
Maintaining the hanging position (s)	28.39 ± 3.22	29.55 ± 2.06	1.155	.259	31.39 ± 3.34	34.14 ± 2.39	2.516	.019*
Rowing on the gymnastics bench	4.06 ± 0.99	4.40 ± 0.96	.893	.383	5.33 ± 1.18	5.90 ± 1.44	1.055	.307
Standing long jump (m)	1.51 ± 0.07	1.56 ± 0.05	2.049	.053	1.60 ± 0.07	1.59 ± 0.07	–.191	.850
Jumping over the gymnastics bench (reps / 30 s)	14.17 ± 2.45	15.70 ± 2.75	1.468	.161	16.33 ± 2.00	16.90 ± 2.47	.621	.543
Crunches (reps / 30 s)	16.08 ± 2.55	17.92 ± 2.76	1.737	.100	18.08 ± 2.20	19.02 ± 2.58	.975	.344
Leg raising from a lying position (reps / 30 s)	6.89 ± 1.23	7.40 ± 0.96	1.213	.238	8.28 ± 1.40	8.90 ± 1.44	1.100	.286
Back extensions from a face down position (reps / 30 s)	16.06 ± 2.55	17.90 ± 2.76	1.736	.100	18.11 ± 2.05	19.00 ± 2.58	.936	.364
Bridges (reps / 30 s)	12.44 ± 2.09	13.60 ± 2.67	1.180	.256	2.23 ± 1.01	2.47 ± 1.02	1.014	.325

Note: * – $p < 0.05$; ** – $p < 0.01$; ▲ – $p < 0.001$.

test isometric resistance strength for the upper limbs, Rowing on the gymnastics bench to test the dynamic isotonic strength of the upper limbs, Standing long jump (m) to test the explosive strength of the lower limbs, Jumping over the gymnastics bench (jumps/30 seconds) to test the strength/explosive strength of the lower limbs in resistance mode, Crunches (repetitions/30 sec) to test the dynamic strength in resistance mode of the abdominal muscles, Leg raising from a lying position (reps/30 sec) to test the dynamic strength in resistance mode of the abdominal muscles, Back extensions from a face down position (reps/30 sec) to test dynamic strength of the back muscles in resistance mode, Bridges (reps/30 sec) to test the dynamic strength of the back muscles in resistance mode.

The statistical data was processed with the help of the statistical program SPSS and use independent student test.

Results. The comparison between the averages obtained by the control group and the experimental group – at the initial tests – indicate only statistically insignificant differences as compared to the multitude of trials used. This aspect proves that neither of the groups benefits from a superior level of training, that is to say both tested groups are at the same level of training, according to the values of t, which all correspond to significance levels $P > 0.05$, according to the data presented in table 2.

The interpretation of the difference of signification between the averages of the two groups – for the final tests – indicates a slight progress of girls form the experimental group, in all the trials used, presented in table 2. Nevertheless, we may notice the fact that there were statistically significant differences only for 3 of the 13 trials: Touch the boards, with a significance threshold $p < 0.001$, 600-metre resistance running, with a significance threshold $p < 0.01$ and Maintaining the hanging position, with a significance threshold $p < 0.05$.

For all the other tests, the differences between the tested groups was insignificant, having values that correspond to thresholds $p > 0.05$. This aspect only partially confirms the working hypothesis but, nonetheless, highlights the favourable effects of applying classical methodology to the development of the motor skills for the control group and the fact that the implemented experimental curriculum may represent a valid alternative to the classical development of conditional skills.

The significant difference between the two groups regarding the final test – for the Touch the boards trial – may be interpreted by taking into account the fact that the experimental group

frequently used the successive moving actions of different objects, from one place to another, with the help of arms, in order to develop the repetition speed. For the control group, the classical actions used for developing speed imply sprints on different distances, without a different/separated use of the upper limbs, fact which explains the weaker performance of the control group.

For the 600 m – resistance running, the significant difference between the two groups at the final test may be explained by the effort made on shorter intervals of time, which are characteristic to the applicative courses, and which activates the anaerobic lactacyd mechanisms, involved in finishing the resistance tests. Resistance running in a uniform tempo – used as means of building up resistance in students – induces a higher aerobic effort but does not involve high intensities for improving performances, being most often than not avoided and perceived as a stress factor by students [10, 12, 17].

Within the Maintaining the hanging position trial, the significant difference between the two groups in the final test is explained by the fact that the strength developing methodology for secondary education avoids isometric/static contractions because of the accidents that may occur and the contraindications for the particular age group, and this is the reason why the students of the control group did not record high performances for this type of strength. Nevertheless, applicative courses included objects that could help students maintain different static positions, fact which led to better performances of the experimental group.

For the other trials used, the influence of the proposed curriculum is a favourable one, but the differences, in the final tests, between the groups that participated in the research were insignificant. Even if both groups progressed, the statistically insignificant differences lead to the idea that both methodologies are valid, and the use of the applicative courses may be regarded as a substitute for the classical methods in students' physical training.

Often tedious, the classical methods and the corresponding exercises, whether callisthenic training – push-ups, squats, chin-ups, jumps etc. – or weight training – medicinal balls, dumbbells, weightlifting, bottles filled with sand, expanders, elastic bands – prove to be useful and accessible, precisely and effectively locating movements for the desired muscle groups. The creation of some activities that are more attractive to students may constitute the key to a favourable involvement of students in the classes dedicated to conditional motor skills [6, 19, 21].

Conclusions. The statistical calculus – performed for each group – confirms significant progress for both groups, fact which leads to the conclusion that physical training at the desired level may be achieved by using both methods – the classical one or the applicative courses – a combination of the two probably being the best option.

The insignificant differences between the two independent groups obtained at most final tests indicate the fact that the use of applicative courses is not better – as far as the effects obtained are concerned – than the classical methodology used to develop conditional motor skills. Consequently, we are reluctant to expand the experimental curriculum to the whole secondary education PE classes since it is not capable of cancelling the already established methodology.

The school curriculum offers, in terms of motor skills, a variety of alternatives, which help the PE teacher to make a creative combination and adaptation to the type of planned motor skill as well as to the motor availabilities of secondary school girls.

The course may be defined in terms of number of elements, of element order, of movement frequency, of the number of repetitions etc. It is important for all the structures used to be correctly assimilated in point of execution technique and the weights used to be directed towards the combination of skills that must be influenced.

It is indicated to continue the study on larger secondary school groups, both in the rural and in the urban environment, so that the results obtained could be representative at a national level and the conclusions drawn could be pertinent. The conducted research didn't benefit from large groups of subjects, this is why the recorded results cannot be absolutized.

The experimental group's positive results can also be explained by the girls' high involvement degree in the planned activities, by the favourable participatory status, by the presence of the contest element and by the diversity of the suggested motor actions.

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РАЗВИТИЕ УСЛОВНЫХ ДВИГАТЕЛЬНЫХ НАВЫКОВ У УЧЕНИЦ ШЕСТОГО КЛАССА С ПОМОЩЬЮ ПРИКЛАДНЫХ КУРСОВ УПРАЖНЕНИЙ В РАМКАХ ЗАНЯТИЙ ФИЗИЧЕСКОЙ КУЛЬТУРОЙ

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Введение. Процесс развития двигательных навыков в рамках среднего образования со временем стал объектом пристального внимания специалистов, занимающихся планированием и организацией физической активности детей упомянутой возрастной группы. Оптимизировать физические нагрузки у подростков намного сложнее, чем у взрослых. Приобретение новых двигательных навыков, их адекватная организация и управление, а также их применение на разных этапах двигательного мастерства зависят от развития таких основополагающих качеств, как скорость, сила и выносливость, а также от их выраженности и сочетания. **Цель.** Развить двигательные навыки у учениц 6 класса с помощью прикладных курсов упражнений и сравнить эффективность экспериментальной и классической программ. **Методы.** В течение 2016–2017 года экспериментальная группа занималась по специальному расписанию, построенному на 32 прикладных курсах, каждый из которых включал в себя несколько разделов. Восемь курсов были посвящены развитию скоростных моторных навыков, 6 – развитию выносливости, и еще 8 фокусировались на развитии сочетаний навыков: скорость – координация или сила – выносливость. **Результаты.** Анализ различий между средними показателями итоговых тестов выявил небольшое преимущество экспериментальной группы во всех испытаниях. Однако значимые различия наблюдались только в 3 из 13 тестов. **Выводы.** Незначительность различий между группами в большинстве итоговых испытаний указывает на то, что эффективность прикладных курсов и классической программы при развитии условных моторных навыков сопоставима. Необходимо провести исследование на бóльших группах учащихся средней школы в городской и сельской местности. Это позволит получить репрезентативные результаты на национальном уровне и сделать более детальные выводы.

Ключевые слова: *условные двигательные навыки, дифференцированная нагрузка, физическая подготовка, емкость нагрузки, привлекательные упражнения.*

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