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Effect of Rhythmic Basketball Lessons on Visual Attention Ability and Lay-up Skill in School Children Aged 9-10

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Abstract The aim of this study is to examine the effect of rhythm training in basketball on the lay-up skill and visual attention ability of 9-10-year-old school children. 56 primary school children (28 experimental groups and 28 control groups) receiving education in the Republic of Macedonia took part voluntarily in the study. At the beginning of the study, the Stroop Colour Test was applied to the students to evaluate their basketball lay-up skill and to measure their visual attention ability. With the experimental group, a total of 12 lessons of rhythmic basketball (1 hour a day, 2 days per week for 6 weeks) were applied, while the control group were given basketball lessons in the traditional way, and the post-tests were repeated. To test the score increases of the groups, the non-parametric Wilcoxon signed rank test was used, while for comparisons between the groups, the Mann-Whitney U test was utilised. Results show that in the post-tests for both groups (REG and TEG) in which the lay-up skill was taught by the rhythm and traditional methods respectively, the performances for both the lay-up skill and visual attention increased, with the exception of the attention error scores. When comparing the differences in the pre-test and post-test scores between the groups for their lay-up skill and visual attention abilities, a statistically significant difference in favour of the REG group was found. It is considered that the findings of this study may (1) lead to the acquisition of new teaching methods in developing lay-up skills and visual attention skills in basketball by which students can take pleasure from the activities, and (2) contribute to the implementation of new Physical Education teaching programmes.

Keywords Rhythm Training, Children, Basketball, Attention

1. Introduction

In Latin, rhythm means “flow”. It is the explanation of movement through numbers and it is a number language. We may also explain rhythm as a whole, whereby strong and weak beats, produced by striking various instruments, form regular and flowing sounds at regular intervals in audible and silent periods [1]. A universal language, rhythm is an important tool that plays a role in the development and education of an individual from the mother’s womb onwards. The child, who moves with a certain rhythm from the time he begins to walk, also calls on rhythm when expressing his feelings and thoughts in the later stages of his development. Although education with music and rhythm is used more during the pre-school period in children’s education, it is also used to consolidate learning in the primary school years. Recent research efforts in music neuroscience indicate that rhythm can have an effect on attention and learning in the early childhood classroom [2, 3].

Rhythm is felt through the sense organs and is present in all movements. Regular movements, that is, sporting skills, are complex events occurring in the nervous system within a series of rules. Rhythm provides the order for the flow of these movements [4]. All coordinated movements include a time sequence and synchronisation of rhythmic events and actions. The rhythm ability is defined as the ability to apply the external sound and visual rhythm as appropriate, and is a coordinative skill that enhances sportive performance. The ability of rhythm, which has an important place in the acquisition and execution of sports skills; It is reported that one of the seven coordinative traits such as kinesthetic differentiation, Spatial orientation, balance, reaction, agility, synchronization of movement, movement adequacy [5]. Previous studies have also revealed importance of rhythm and rhythm ability in the teaching of skills in gymnastics, swimming, ballet, dancing, skiing, fencing and tennis [6, 7, 8, 9]

Every child has their own distinctive type of intelligence and for this reason the developments of children who are in the learning process differ from each other [10, 11, 12]. Therefore, the methods used in teaching a skill should also

be different from each other. The proposition that there are not only one or two ways to becoming intelligent forms the core of multiple intelligence theory. In this context, it may be said that if there is more than one way to becoming intelligent, there is also more than one way in teaching. In the study conducted by Ergül et al. (2007), it is stated that in children who learn by doing and experiencing, the place of rhythm in learning is great, and that in children with sensory intelligence and different types of intelligence, rhythm affects the memory [13].

The person who converted the idea of giving physical reactions to rhythm into a system was Émile Jaques-Dalcroze (1865-1950), and Dalcroze Eurythmics took up its place in literature as a method of developing rhythmic understanding. The main aim of the Dalcroze system is to create rapid and regular contact between the brain and body through rhythm and to give a physical understanding to the sensation of rhythm. This method is based on the principle of students' giving active relaxation and physical reactions [14]. In the learning of a skill through rhythm, children should be encouraged to beat rhythm with big movements. It has been determined that in the learning of a skill, participation in the movement of the large muscle groups accompanied by music is more effective. What is important here is not the sound produced while beating the rhythm, but the movement of the muscles [15, 16, 17].

In its general sense, attention is "mentally focusing on an activity". In the structure of attention, there is a state of arousal and a selection function. The mind is in a state of readiness to accept the stimuli coming from the outside world; it notices the stimuli and selects the ones suitable for the purpose from among the great number of stimuli that it is faced with. The element that directs this process is the attention mechanism [18]. The attention skill has an important role in a student's achieving success and is one of the important factors in sports education. It is observed that especially in ball sports like basketball, visual attention is very important [19, 20].

Although rhythm has begun to be included more in education nowadays, it is generally limited to folk dancing and other dance groups. In this study, the effect of rhythm training in basketball on the lay-up skill and visual attention ability of 9-10-year-old school children has been examined. Since the effect of rhythm training in the learning of a skill in 9-10-year-old school children has not been evaluated, our study may be considered as one of the few studies conducted in this field.

It is considered that the findings of this study may (1) lead to the acquisition of new teaching methods in developing lay-up skills and visual attention skills in basketball by which students can take pleasure from the activities, and (2) we will think that it will contribute to Physical Education curriculum in terms of thought and practice which will be prepared by using a collaborative approach for teaching different courses with movement and music.

2. Methods

This study was conducted with the voluntary participation of 56 9-10-year-old primary school students who are educated in the Republic of Macedonia in accordance with an informed consent form prepared according to the Helsinki criteria. Macedonia has a population of 2,081 million and Macedonia has primary students from different nations and cultures. In these schools, children are trained in Albanian, Macedonian and Turkish. Primary education is 9 years and Physical education and sports lessons are given 2 days a week and 1 hour. The fact that the students come from different cultures makes us think that they have different anthropometric features and talents. For this reason, when working groups of students, similar care was taken to ensure that students are in the same group

The experimental group of the study was composed of 28 students (14 males and 14 females), while the control group was also made up of 28 students (14 males and 14 females), selected unbiasedly. Students with no previous musical experience and who had no auditory, visual or neurological problems were included in the scope of the study. Students who failed to attend 2 out of the total of 12 lessons were excluded from the study. To ensure homogeneity, care was taken to make sure that the preferred dominant sides of all the students were the same.

The mean age of the children in the REG was 9.35 (Sd= 0.60) years, their mean height was 139.87 (Sd=6.77) cm and their mean weight was 34.11(Sd=7.96) kg, while the TEG was 9.10 (Sd=.0.49) years, their mean height was 141.75 (Sd=6.95) cm and their mean weight was 37.48 (Sd=6.70) kg.

To observe the technical developments in the basketball lay-up skills of the subjects studied, an assessment scale for lay-up skills was developed by basketball experts [21]. In this scale, to determine the technical characteristics of the movements, an assessment criterion on a scale of 1 to 5 was created. This was conducted by assessment as follows: 1. No movement observed; 2. Weak; 3. Average; 4. Good; 5. Very good. The lay-up assessment scale was prepared based on a total score of 100 and by creating phases of readiness for movement, execution of movement and completion of movement. The average speed (100 bpm) of the lay-up rhythm and dribbling rhythm were found with the aid of a metronome. For the validity and reliability of the assessment scale, firstly expert views were obtained and then the pre-test assessments were a carried out by conducting a pilot study on 10 people. In line with the obtained results, after the validity and reliability of the tests had been determined, the assessment was proceeded to ($r=0.80$-1) ($p<0.001$). During the measurements, all movements in the series were recorded by means of a video

camera. During the recording, with the aim of observing the technical characteristics of the lay-up movement more clearly, the area where the implementation was to be carried out was identified by being marked.

Assessment of the movements of the students recorded in the video was performed by three experts using the lay-up skill assessment scale. The arithmetical mean of the scores of the three experts was taken. During the implementation, all students were asked to repeat the lay-up movement 6 times and the highest score obtained from among these repetitions was taken for evaluation [22].

At the beginning of the research, to measure the basketball lay-up skills and visual attention skills of the students, the computer-adapted version of the Stroop Colour Test, with validity and reliability of r=0.80 and p<0001, respectively, and made up of three stages, was used. The tests were carried out in a room free from noise and at a constant ambient temperature at the same times each day (10.00-13.00) while body and mind were resting.

The students in the experimental group were taught the basketball unit of their physical education and sport lesson by means of a teaching method comprising 12 hours of rhythm for one hour, two days per week over a period of 6 weeks [23]. The control group, however, were taught the basketball unit of their physical education and sport lesson with the traditional method during the same period. After the pre-tests had been applied to the students, the 6-week implementation was carried out and the post-tests were repeated. At the beginning of the study, the significance level was set at p<0.05. The participants' mean scores obtained from the lay-up skills test and the mean times for the Stroop Colour Test for visual attention, the error number scores for pre-test and post-test, the arithmetic means, the standard deviations, and the highest and lowest values were all calculated separately for each group.

To determine whether or not the pre-test values conformed to normal distribution, the Kolmogorov-Smirnov and Shapiro-Wilk tests for normality were performed, and it was found that neither group conformed to normal distribution (p<0.05).

Following the two months of study with the experimental and control groups, the score increases were obtained by subtracting the pre-test scores from the post-test scores. To test whether the score increases differed or not, the non-parametric Wilcoxon signed rank test was carried out. To compare the differences between the groups in the scores they obtained for the variables, the Mann -Whitney U non-parametric hypothesis test was used.

3. Results

In Table 1, attention, attention error and lay-up scores of the REG and TEG are provided. There was no statistically significant difference between attention error (Z= -0.472; p=0.637) pre- and post-test scores of TEG groups. However, TEG attention (Z= 4.600; p=0.000), and lay-up (Z= 4.623; p=0.000) pre-test and post-test values were found statistically significant. Also, there were statistically significant differences between pre- and post-test scores for REG attention (Z= 4.623; p=0.000), attention error (Z= 2.071; p=0.038) and lay-up (Z= 4.623; p=0.000).

Table 1. Differences in pre-test and post-test for Rhythm and Traditional Groups

		Min.	Max.	Mean	Sd.	Z	p
Rhythm Group (n=28)	Attention 1	54.80	182.07	93.31	32.84	-4.62[b]	0.000
	Attention 2	31.07	119.47	48.08	17.27		
	Attention Error 1	0.00	7.33	2.67	2.07	-2.071[c]	0.038
	Attention Error 2	0.33	11.67	4.28	3.16		
	Lay-up 1	20.00	56.50	26.85	9.49	-4.62[c]	0.000
	Lay-up 2	72.75	100.00	90.82	7.12		
Traditional Group (n=28)	Attention 1	44.29	138.87	82.35	25.33	-4.60[b]	0.000
	Attention 2	32.38	74.91	53.08	12.13		
	Attention Error 1	0.00	9.00	1.98	2.09	-0. 47[c]	0.637
	Attention Error 2	0.00	9.33	2.28	2.17		
	Lay-up 1	20.00	55.75	26.79	9.92	-4.62[c]	0.000
	Lay-up 2	41.00	100.00	74.96	18.39		

Table 2. Comparison of attention, attention error and lay-up scores between Rhythm and Traditional Groups

	Group	Min.	Max.	Mean	Sd.	Z	p.
Attention difference	Rhythm (n=28)	2.96	137.02	45. 23	28.25	-2.835	0.005
	Traditional (n=28)	-0.74	89.55	29. 26	23.32		
Error difference	Rhythm (n=28)	-8.00	4.34	-1. 60	3.47	-1.48	0.138
	Traditional (n=28)	-5.00	4.66	-0. 29	2.37		
Lay-up difference	Rhythm (n=28)	43.00	79.00	63. 96	11.37	-2.90	0. 004
	Traditional (n=28)	4.75	80.00	48.16	20.45		

The results of the Mann-Whitney U test supported higher mean attention difference and lay-up difference scores for the rhythm group compared to the traditional group ($p<0.05$). The results did not support statistical differences between the rhythm group and traditional group in error differences ($p>0.05$).

4. Discussion

The findings of our study show that following the students' 6-week training programme for both groups (REG and TEG), in which the lay-up skill was taught by the rhythm and traditional methods respectively, the performances for both the lay-up skill and visual attention increased significantly, with the exception of the attention error scores. Moreover, when the differences in the lay-up skill and visual attention pre-test and post-test scores between the groups were compared with each other, a statistically significant difference in favour of the REG group was found ($p<0.05$).

Kuşçu et al. (2010) researched the effect of musical activities on attention ability in children, using the Orff-Schulwerk approach on children in the 5-6 age groups receiving pre-school education, and after 10 weeks of musical activities, a statistically significant difference was found in the children's attention increases [24]. The findings of this study support those of our study.

The studies conducted state that the teaching of movement rhythm during the learning of skills results in energy-saving when producing movement and facilitates learning [25, 26, 27] .According to Vassiliki Derri et al. (2001), giving movement rhythm during teaching of locomotor and non-locomotor movements is very important. At the same time, they stated that during teaching of movement patterns, giving rhythm patterns increases learning and improve the learning environment [28]. It can be said that the reason for this is related entirely with the cognitive and motor networks [29].

The findings reveal that the REG scores for the lay-up skill increased more than those of the TEG. In other words, participation in general or sports-related rhythmic activities enables a development in performance in learning the lay-up skill [30, 31, 32, 33, 7]. Söğüt et al. (2012) stated that development of rhythmic ability is significantly relevant to the learning of skills [6]. According to Gallahue (2006), the performing of locomotor and non-locomotor activities at different tempos and intensities provides the basic components of rhythm and ensures development of sporting skills, as well as assisting in the learning of perfectly-flowing movement [34]. According to Sakai et al. (2004), the teaching of movement rhythm facilitates learning of motor skills by ensuring correct fluency of movement through combining the parts of the movements in a definite order [35].

Takahata et al. (2004), for better karate training, gave the movement rhythm of athletes who performed the movement correctly as feedback to athletes new to the sport over a 10-month period. The experimental findings revealed that in groups new to the sport in which correct movement rhythm was applied as feedback, the athletes learned the order and timing of movements better due to controlling the rhythms of their bodies. The research findings indicate that rhythm increased the concentration and motivation required for the sport of karate [36].

Sommer at al. (2009) applied movement rhythm activities by using a metronome designed for improving motor-timing over a four-week period on 26 experienced golfers, and a statistically significant difference was found in post-tests [37].

Venetsanou et al. (2014) examined the effect of musical and movement training activities on rhythmic motor skills in nursery school children and following 20 weeks of studies, they found a statistically significant difference in the motor test scores of the students in the group receiving rhythm and movement training when compared to the control group [38].

The fact that following the 6 weeks of lessons, there was a significant difference in the scores of the REG group for the lay-up skill and attention ability at the high level of $p<0.001$ leads one to consider that movement rhythms given during skills training can be a very effective feedback, yet that this alone may not be sufficient. The fact that there was also a significant improvement ($p<0.05$) in the TEG group shows that during the teaching of lay-up skills without providing rhythm externally, learning may also be at a sufficient level. However, it is stated in many studies that for a perfect presentation of skills, the presence

and development of the rhythm skill in individuals is necessary [6, 7].

In conclusion, motivating our children, who have almost been born into technology in recent times, towards sport and movement is becoming increasingly difficult. Moreover, attention deficit is another contemporary problem facing our teachers in schools. Therefore, it is considered that there is a need to increase teaching methods and studies that will increase motivation in our students for learning and movement. The general belief is that music and doing exercise strengthen motivation and attention [39]. In this experimental study, it is considered that the basketball unit of physical education and sports lessons conducted to the accompaniment of music bearing similar rhythms, especially by identifying movement rhythms, will contribute to the learning of the lay-up skill and to visual attention ability. With instructions (rhythm) given externally, the subject's adaptation to the given rhythm of the movement and later the internalisation of the movement rhythm, that is, the increase in the individual's "rhythmification" skill clearly showed itself in the movement scores.

It is considered that the generalisation of these research findings and their use in other branches and schools will be beneficial in terms of exploring new approaches for sports-related rhythm training and preparation of curriculum for the teaching of other courses (mathematics, science, etc.) in schools in future studies.

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