

CONCENTRATION CAPACITY OF ATTENTION AND THE EFFECT OF DIFFERENT EXERCISE INTENSITIES ON IT, IN SCHOOLCHILDREN

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Abstract: Objective: The purpose of this study was to determine the exercise intensity which have the more benefits on concentration capacity of attention in schoolchildren of 13 to 14 years old.

Research Methods and Procedures: Participants was 56 schoolchildren of 13 to 14 years old (28 girls and 28 boys). The concentration capacity of attention was determined by psychological tests administered before and after physical education class. We used three types of exercise intensities (low - FC under 120b/m, moderate - FC from 121 to 150 b/m, and high - FC bigger than 150b/m) and duration of the effort session was 50 minutes. Subjects from control group don't participated in physical education class.

Results: The low exercise intensity session don't have any effects on concentration capacity of attention; the differences between performances of experimental and control groups was not significant in this case ($p > 0,05$). After the moderate exercise intensity session the differences was significant from experimental group ($p < 0,05$). The higher exercise intensity session determined the more negative effects on concentration capacity of attention.

Discussion and Conclusions: The moderate exercise intensity session determine the best results on concentration capacity of attention in schoolchildren of 13 to 14 years old.

Key words: *concentration of attention, exercise intensities (low, moderate, high), schoolchildren.*

Background

Attention is the basic condition of the awareness of the whole psycho-behavioral life, and its absence leads to the ineffective reception and processing of external or internal information. It represents '*the function of orientation and concentration of the psychic activity, selectively, on certain objects and phenomena, with the purpose of perceiving and knowing them in order to efficiently organize the behavior*' [1].

The ability to focus attention is a focus of energy on what has appeared in the 'field of consciousness'; a voluntary and conscious guidance on the activity to be carried out, on the object or phenomenon that determined the orientation reaction. The lack of concentration capacity or its short duration can be determined by a number of external factors - the properties of the stimuli, but also by the individual's own capacity.

Most of the non-specialists consider that the activity submitted during the physical education classes determines the diminution of the attention capacity and the mental capacity of the students.

In the literature it is found that the range of effects that the physical effort has on the performances of the psychic processes of individuals varies; these can be beneficial, negative, null or reverse 'U' type [2, 3, 4, 5, 6]. These variations are determined by a number of factors such as age, gender, level of physical condition of the subjects tested, intensity of effort, duration of effort.

This experiment aims to determine what type of effort intensity is most recommended to be carried out during physical education classes, so that, at the end, the students' ability to concentrate is not disturbed.

Material and method

The experiment was conducted on a number of 56 students from the N. Tonitza Primary and middle school from Constanta (28 girls, with an average age of 13.51 ± 0.29 years, and 28 boys, with an average age of 13.46 ± 0.31 years) and consisted of:

- administration of specific psychological tests for evaluating the ability to focus attention.
- manipulating the intensity of the effort made during the physical education class.

The division of the subjects into experimental and control groups was done taking into account both the learning outcomes and their physical condition, so that both types of groups are as homogeneous as possible and do not influence (due to intellectual and physical condition) research results.

The subjects, regardless of the group - experimental or control - all participated in the psychological tests while at the time of physical education class only the students selected in the experimental groups participated. The control groups did not make any physical effort during the entire physical education class, but they stayed in class, on their desks. This was in order to be able to capture as accurately as possible the

changes induced by the physical effort on the attention of the students.

Psychological tests were administered both before and after the physical education class. Specifically, starting 10 minutes after the end of the physical education class, during which time it is normally allocated to the break between hours. All the psychological tests after the physical education class took place in the first 10 minutes of the next hour, so that the students already enter its atmosphere.

The psychological tests applied before the physical education class were different from those used after the class, in terms of their content (the words and figures of the tests were different), in order to counteract the learning effect.

The types of effort intensities that were worked on were: low intensity - which raises FC to maximum 120 bpm; medium intensity - FC between 121 bpm and 150 bpm, high intensity - FC over 150 bpm.

In the statistical analysis of the data we used the following parameters: the arithmetic mean (\bar{x}), the standard deviation ($\pm DS$) and the significance of the difference between means (the 't' student test). The minimum significance threshold was set at $p < 0.05$.

Results and discussions

The obtained results are presented in the tables below (Tables 1-3).

The analysis of the results in Table no. 1 shows that the performance of the experimental group, in terms of the results obtained when testing the psychological process, attention, both in girls and boys, is not significantly different from those of the control group ($p > 0.05$), neither in the tests carried out before the physical education class, nor in those after it. Even comparing the results obtained only by the experimental group, regardless of the gender of the subjects, leads us to the same result: statistically insignificant differences ($p > 0.05$), although the performances recorded after the physical education class are higher (as numerical value) than those recorded in the previous test.

This allows us to conclude that low intensity effort does not have the effect of considerably diminishing attention performance, regardless of its type (sciences or humanities), but neither a significant increase in them. Therefore, low intensity effort has no effect on memory performance in 13-14 year old students.

Parameter tested		Girls		Boys	
		Experi- mental	Control	Experi- mental	Control
Attentio n humaniti es	Before class	72.75 ± 4.42	70.16 ± 2.56	63.75 ± 3.36	62.58 ± 2.89
	After class	73.58 ± 3.96	69.00 ± 3.88	60.58 ± 5.42	60.08 ± 4.28
Attentio n sciences	Before class	88.83 ± 2.82	87.58 ± 2.71	83.33 ± 2.70	82.75 ± 2.32
	After class	86.66 ± 2.08	84.50 ± 3.40	80.66 ± 3.27	81.83 ± 3.20

Table no. 1: Attention psychic process performances, recorded during the low intensity test session

The analysis of the results of the second session of effort, the one of medium intensity, showed that, regardless of the type of attention tested, before the physical education class the performances of the students do not differ significantly in the experimental group compared to the control group ($p > 0.05$), this being valid for both girls and boys (Table no. 2).

In contrast, when tested after the physical education class, the experimental groups (girls and boys) recorded significantly different results from the control groups ($p < 0.05$). This means that subjects who exert medium intensity effort show a better ability to focus attention, compared

to those who are at rest, for the same amount of time (respectively, 50 minutes, representing the duration of a physical education class).

This result is also confirmed by the fact that the comparative analysis of the results obtained before and after the medium intensity effort, in the experimental groups, shows that the students' performance in the attention tests are significantly improved ($p < 0.05$).

These conclusions, also supported by the statistical treatment, determine us to affirm that the effort of average intensity, rendered during 50 minutes, has significant positive effects on the performances of the attention of the students,

regardless of its type (sciences or humanities). This means that the physical education class whose effort load does not exceed the average intensity threshold has beneficial effects on the attention of 13-14 year old students, leading to a significant increase in its performance (attention). Our results agree with other researches that have shown that the performances obtained in the

attention tests (humanities) are not affected by the physical effort made before the test [2, 7, 8]. T. Reilly; D. Smith, (1984), have shown that an average load of effort has positive effects on the burden of assembly in male subjects, aged 20 ± 0.8 years.

Parameter tested		Girls				Boys			
		Experi- mental	Control	t	p	Experi- mental	Control	t	p
Attentio n humaniti es	Before class	72.05 ± 2.01	71.92 ± 2.57	0.03	p>0.05	64.07 ± 3.67	63.92 ± 2.57	0.03	p>0.05
	After class	97.76 ± 4.53	68.19 ± 2.81	5.54	p<0.001 ^a	91.77 ± 3.08	60.10 ± 3.18	7.16	p<0.001 ^a
Attentio n sciences	Before class	111.00 ± 2.24	109.53 ± 2.14	0.47	p>0.05	89.15 ± 1.94	88.46 ± 2.85	0.20	p>0.05
	After class	138.84 ± 3.10	107.46 ± 2.53	7.84	p<0.001 ^a	122.46 ± 2.35	89.04 ± 3.03	8.72	p<0.001 ^a

Legend: a – significantly better than the control group, p<0.001

Table no. 2: The performances of the psychic process attention, recorded within test session with medium intensity effort

Analysis of the results of the test session during which high intensity effort was made, showed that when comparing the results obtained by subjects in the experimental group with those obtained by subjects in the control group, there are no significant differences in performances ($p > 0.05$), to the tests applied before the physical education class (Table no. 3). Whereas, in the tests conducted after the class, the control groups achieved significantly better performances than the experimental groups. This is true regardless of the type of subjects or the type of attention tested (sciences or humanities). And in the case of the analysis of the results recorded by the subjects in the experimental group, the performances

obtained in the attention tests applied after the physical education class are significantly reduced, compared to those performed before the class ($p < 0.05$), both in girls and in boys.

A conclusion of the analysis of the results obtained by the students during this test session entitles us to affirm that the effort of high intensity and duration of 50 minutes determines the diminution of the attention performances in students aged 11-15.

Specialized studies [4, 9, 10] also argue that high intensity effort has negative effects on the cognitive tasks of individuals, whether they are memory, attention, problem solving, time reaction tasks, etc.

Parameter tested		Girls				Boys			
		Experimental	Control	t	p	Experimental	Control	t	p
Attention in humanities	Before class	79.95 ± 2.36	72.21 ± 3.43	1.86	p>0.05	78.82 ± 3.02	73.92 ± 2.67	1.21	p>0.05
	After class	62.26 ± 3.07	72.64 ± 3.42	2.26	p<0.05 ^a	63.04 ± 3.00	76.21 ± 3.26	2.97	p<0.01 ^b
Attention in sciences	Before class	109.57 ± 3.95	101.07 ± 2.89	1.73	p>0.05	108.71 ± 2.98	103.14 ± 2.94	1.33	p>0.05
	After class	86.57 ± 2.12	100.12 ± 2.85	3.81	p>0.001 ^c	84.05 ± 2.12	106.35 ± 3.00	6.07	p<0.001 ^c

Legend: a – significantly better than the experimental group, p<0.05
b – significantly better than the experimental group, p<0.01
c – significantly better than the experimental group, p<0.001

Table no. 3: Performance of the attention psychic process, recorded during the high intensity test session

Conclusions

The most definite benefits of attention's performance are determined by the provision of a medium intensity effort during the physical education class. The high intensity effort determines the significant decrease of the performances of the attention of the students aged 13-14, regardless of their gender.

The low intensity effort does not have any effect on the attention of the students aged 13-14.

Authors' contributions. Each author contributed equally to the study and writing of the article.

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