A study regarding the impact of motor activities on the students’ working memory

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Abstract

Problem Statement: It is widely acknowledged that memory is an indispensible process for survival, that it is the sum of all psychic processes, reason for which the study undertaken regarding the impact of motor activities on the adolescents’ working memory has raised our interest, and, as a consequence, we have attempted to describe the continuity of psychic aspects, which are due to memory, respectively to the capacity of retention within the neuro-functional and psychic structures of all experiences gathered by an individual in the presence of weekly motor activities, but also in their decrease.

Keywords: memory; working memory (WM); students; impact of motor activities, physical education

1. Introduction

Being a hyper-complex system, the psyche always acts and adjusts the human behaviour, involving memory, thus emphasizing the reflection of the manner in which a system, in our case the student, interacts with his environment through both external (motor) and internal (psychic) activities. “The research undertaken from the perspective of the cybernetic model (Tulving & Donaldson, 1972; Lindsay & Norman, 1972; Golu, 1975; Simon, 1980), taking into consideration the time necessary for the processing and integration of information in different types of real systems, emphasized the existence of certain forms of temporal memory, namely: immediate or sensory, short term memory (STM) and long term memory (LTM).” (Golu, 200, p. 394) A concept of maximum importance, to which we appeal when we discuss about memory and the importance of motor acts in its education, is represented by the guide that

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evaluates the agreement between motor activities and working memory (WM), due to the fact that memory would have the possibility of better operating, in our belief, with more enriched and complex representations and notions, but also with essential aspects when the students’ schedule has weekly Physical Education lessons, and not once every two weeks. In addition, we mentioned a widely known fact, respectively that an oxygenated brain possesses the ability of reacting faster towards information, as compared to a brain without a proper oxygenation, which has delayed reactions. We must add that the best manner of oxygenating our brain is during Physical Education lessons, where we experience simultaneous process of relaxation and oxygenation. This statement is based on the observation of physically active people, who have gained, in time, an increased capacity of , ..., coding and decoding factors utilized for operating and organizing the long term memory, through accumulations and storing of information (Verza & Verza, 1994; 2000). This phenomenon may occur through accumulations in time within the didactic process, and may be finalized, emphasized through the use of motor acts within the Physical Education lessons, due to the fact that memory works “[...] when the organism is actively involved in a physical [...] exploration, as a physical action (motor, in our opinion) and material (contact with objects may be determinant), [...] as well as in the formulation of questions [...]”, these being reference points for our research. (Gardner, 2005, p. 88). Important – We mention that this study, undertaken regarding the working memory (WM) and described in the following lines, represents a pilot study, a small part from a larger project, which is intended, presently, to be an observation study, rather than a research paper, this being the reason for which the number of subjects is not very big, and the objectives followed were only those representative for the subject, due to the fact that our entire scientific process represents only the first step for a larger study which is intended to be undertaken, and open for specialists in the future.

2. Hypothesis

The present research started from the hypothesis according to which the presence of weekly motor activities in the students’ schedule would maintain the adolescents’ working memory (WM) at a high level, and that the reduction of Physical Education lessons to one class every two weeks would have a negative impact over their working memory (WM), and not only.

3. Methods

3.1. Subjects

For the present research, we had two groups of subjects involved, who were involved in the research in two distinctive periods of time. First of the groups, from the second year of study - 24 subjects (students from 2011 - 14 lessons/semester); and the second group, from the second year of study - 18 subjects (students from 2013 with 7 lessons/semester). All subjects were students enrolled in the Petroleum-Gas University from Ploiești, therefore the group composed from a total number of 42 subjects – students (boys) came from the same institution, and possessed similar intellectual and motor activities. These subjects were researched in different time periods, because an amendment occurred in the didactic process, regarding the number of lessons distributed in a semester for the Physical Education lesson, thus decreasing the number of classes from 14 to 7 in a semester. As a consequence, the number of subjects involved in the research was not the same, as the groups formed have an oscillating number.

3.2. Research methods

The bibliographic study method; the observation method; the enquiry method (questionnaire, discussion, enquiry, etc.); the pedagogical experiment method; the statistical-mathematical method; the graphical method.

3.3. Research purpose

The purpose of the present paper is to demonstrate that Physical Education lessons have a defining role, not only for the physical status of a human being, but also for the psychological status, possessing an influence over the
latter, and acting upon it through the quality of memory at a certain time, thus proving, without being necessary, that in the absence of memory the learning process would not exist, in general, and the motor learning process, in particular. Therefore, this represents the reason for which we believe that the decrease in number of Physical Education lessons to one every two weeks would have a negative impact over the working memory (WM).

4. Research tasks

- Randomly selecting the group of students which are intended to be the respondents of the test entitled “Working memory (WM)”;
- Applying the test entitled “Working memory (WM)” on both groups of respondents;
- Registering indicators after the implementation of the test entitled “Working memory (WM)”, and the interpretation of the importance of motor acts for the education regarding the “Working memory (WM)”;
- Composing an observation protocol and a diagram regarding the “Working memory (WM)”;
- Recording in tables all the data gathered, followed by their analysis and interpretation.

5. Research content

Memory is an indispensible process for survival, it is the sum of all psychic processes, reason for which the study undertaken regarding the impact of motor activities on the adolescents’ working memory has raised our interest, and, as a consequence, we have attempted to describe the continuity of psychic aspects, which are due to memory, respectively to the experiences gathered by an individual in the presence of weekly motor activities, but also in their decrease. The diminish of motor activities in the university weekly schedule appears to have a negative influence for the adolescents’ working memory (WM) through the decrease of their assimilation-reproduction of information, perhaps due to the fact that their brain cortex is not weekly oxygenated as before, aspect which will influence the assimilation capacity of students, and which will have a probably negative impact over the didactic process of teaching-learning concerning them, even if it is presupposed that some of them would have access to various gyms, where they could practice physical exercises in addition. The practice of physical exercises in private gyms would only bring physical improvements, due to the fact that teaching a Physical Education lesson is by far different, through the structure and manners of approaching motor acts, from the manner in which an individual would have the possibility of practicing physical exercises individually in gyms. The Physical Education lesson approaches all components from the motor, cognitive and affective perspective, into a complex structure, ideal for the memory process, a structure which can not be separated, and for this reason we believe that differences may occur, or modifications, aspect which will be emphasized in the pilot study undertaken.

6. Data analysis and interpretation

Physical Education lessons have a defining role, not only for the physical status of a human being, but also for the psychological status, acting upon the latter through the quality of memory at a certain time, this representing the reason for which we believe that the decrease in number of Physical Education lessons to one every two weeks would have a negative impact over the working memory (WM). For this research we had subjects chosen from the students of the Petroleum-Gas University from Ploiești. Our research was undertaken in 2011 – 2013, when the changes regarding the number of Physical Education lessons were made within the didactic process. The researched group contained 42 subjects, and we had two sub-groups involved, named Group no. 1, and Group no. 2, observed in two different periods of time. Group no. 1 – year 2011, was composed of 24 subjects who were observed at the end of their second year of study. These students had in their schedule, for a period of two years, 14 lessons/semester, namely one module each week (100 minutes). The second group involved in our research, Group no. 2, was enrolled in the same year when the modification regarding the decrease in number of the Physical Education lessons per week was implemented. These students participated for two years to fewer lessons of Physical Education, as compared to their colleagues from Group no. 1, and they were observed in their second year of study, similar to their colleagues from the first group, at the end of a study cycle. We have to mention that in their third
year of study, students no longer have Physical Education lessons included in their schedule. Group no. 2 was composed of 18 students who ended their second year of study in 2013 with 7 lessons/semester, namely one module every two weeks. All subjects from both groups were respondents to an evaluation test, with pertinent explanatory content for the research of the proposed theme, entitled “Working Memory” (WM) / "Short Term Memory” (STM). Firstly, we implemented for the entire group an initial test (IT), and a final test (FT), in order to verify the level of the short term memory – of the memory capacity for people able to sustain physical effort, involved in the didactic process of Physical Education with a different number of lessons. The test entitled “Working Memory”, used by us for our research, has been validated and is presented in Manual of Tests for Cognitive Abilities, the ASCR Publishing House, Cluj – Napoca, 2007, and represented an instrument of standard evaluation, a strategy of information accumulation, of refining the observation process, which permitted us to obtain rapidly certain objective data. The purpose of the test entitled “Working Memory” was to evaluate: the general learning ability, as well as the ability of storing and simultaneously processing information” (Lupu, 2013). We informed the students that the purpose, for the present research, of the implemented test is to measure the ability of performing simultaneously different tasks. Then, they had to read loudly array of figures and letters, mentioning that their task is to memorize and write, firstly the figures in ascending order, then the letters in alphabetical order. With the purpose of better understanding the task, they were presented with two examples, accompanied by the right answer: Example 1 - 4, E, 8, D – The right answer for this array is: 4, 8, D, E; Example 2 - 5, P, 2, F, 4, B – The right answer for this array is: 2, 4, 5, B, F, P. As a result of the implementation of this test, the recorded indicators are presented according to the data from Table no. 1.

Table no. 1 Observation protocol regarding the comparative presentation of the statistical indicators for the total score and the level of performance of the working memory (WM) for the students of the two groups

<table>
<thead>
<tr>
<th>Total</th>
<th>Working memory</th>
<th>Working memory</th>
<th>Total</th>
<th>Working memory</th>
<th>Working memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>(B.)</td>
<td>(WM)</td>
<td>(B.)</td>
<td>(WM)</td>
<td>(WM)</td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From</td>
<td>Initial test (IT)</td>
<td>Final test (IT)</td>
<td>Total</td>
<td>Total score</td>
<td>Performance level</td>
</tr>
<tr>
<td>the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

| %     |               |               |
| B.    |               |               |
| %     |               |               |

42 B. % 42.86%

According to the results obtained, the score is reported to the benchmark taken from Annex 2 – Benchmarks for Tests from BTPAC. Depending on the score obtained, we may have one of the five categories as following: Class 5 – very good level of the working memory; Class 4 – a good level of the working memory; Class 3 – a medium level; Class 2 – a low level; Class 1 – a very low level of the working memory.

From the data registered above (Table no. 1) and from Graph no. 1 and 2, we may observe that, for the implementation of the test, we had significant differences in the observation protocol for the variation of the working memory (WM), regarding the total score and the performance level for the two researched groups.

The registered indicators for the evaluation of the working memory (WM) for students from Group no. 1, who had 14 lessons per semester, namely one module per week, revealed a surprising fact, the total score of the average \( \bar{x} \) for (IT - boys) was of 23.78\%; which was positively modified when we implemented the (FT), where we recorded a score of the average \( \bar{x} \) of 24.97\%, and the level of performance increased to 5. The value five represented the superior limit of the working memory and a very good score. The covariance, for the working memory of students who had 14 lessons per semester, namely one module each week, was, through the recorded result of -
0.128, positive, but non-linear, thus indicating a strong bond between the total score and the level of performance, in our case, between the working memory (WM) and the motor activity. The registered indicators for the testing of the working memory (WM) for students in Group no. 2, who had 7 lessons per semester, namely one module every two weeks, are inferior, as compared to the indicators recorded by subjects from Group no. 1, who were tested in the same conditions, but who had 14 lessons per semester.

Graph 1 Statistical identification of the variation for the working memory for Group no. 1
Graph 2 Statistical identification of the variation for the working memory for Group no. 2

Caption: Initial test (IT) – total score; Final test (FT) – total score;

The total score for this category of subjects had a \( \bar{x} = 16.44\% \) for (IT), recording an increase of the \( \bar{x} = 18.80\% \) for (FT), and a level of performance towards 3, corresponding to a medium category. If it were to compare the level of performance (value 5 – very good) obtained by students who had a module each week, with the score obtained by students who had one module every two weeks, we may observe that the latter recorded an inferior level of performance, thus confirming the research hypothesis, according to which the presence of weekly motor activities in the students’ schedule would maintain the adolescents’ working memory (WM) at a high level, and that the reduction of Physical Education lessons to one class every two weeks would have a negative impact over their working memory (WM), (see Table no. 1 and Graph 1 and 2).

7. Conclusions

- As a result of our research, we may state that Physical Education confirms its position as a mandatory subject in the curriculum, through the occurrence of the events;
- Memory would have the possibility of better operating, in our belief, with more enriched and complex representations and notions, but also with essential aspects when the students’ schedule has weekly Physical Education lessons, and not once every two weeks (see Table no. 1 and Graph 1 and 2).
- From the data registered above (Table no. 1) and from Graph no. 1 and 2, we may observe that, for the implementation of the test, we had significant differences in the observation protocol for the variation of the working memory (WM), regarding the total score and the performance level for the two researched groups, thus confirming the research hypothesis, according to which the presence of weekly motor activities in the students’ schedule would maintain the adolescents’ working memory (WM) at a high level.
- The reduction of Physical Education lessons to one class every two weeks would have a negative impact over their working memory (WM) (see the results of Group no. 2).
• The present research may represent an open issue, subject to perfection, but also a challenge for field specialists, as it may be amended and completed.

References