THE CHESS – MEANS OF DEVELOPING ATTENTION, MEMORY AND UNDERSTANDING TEXT TO CHILDREN OF 6-7 YEARS OLD FROM PREPARATORY CLASS

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Abstract: *In our research, we aimed to investigate if chess, taught at the level of initiation, determines the improvement of cognitive processes such as attention, memory and understanding of a text. For this, we applied a specific questionnaire to three groups of children enrolled in preparatory class of primary school. From these, one group did not participate in chess learning lessons, and the two other, performed introductory chess lessons 1h/week, respectively 2h/week, for 27 weeks. At the end, testing through the questionnaire showed significantly better results for the indicators targeted at those who practiced systematically chess game, especially since the volume of learning activity was higher.*

Key words: *chess, preparatory class, attention, memory, text understanding.*

1. Introduction

Chess is a game with full information, both players being in possession of all information, which is why the result does not depend on luck or the environment, but only on the level of effectiveness of practitioners, their insight, power of play, logical thinking and find the optimal time winning positions [1]. The most characteristic aspect of chess is „play" game, which like in other sports, contribute to the harmonious development of personality, to increase physical and mental resistance to specific requests as well as to the character building. Some studies show that in the case of children aged 8-9 who practice chess, they are able to play 3-hour chess games, thus gaining special endurance, high ability to concentrate, being able to focus their attention and memory for a long period supports monotony more time, however given that lack these qualities cause mistakes and loss of the game [2], [5], [10]. Also, systematic training process – long time one – experiences moments of success/failure, controlled desire to win, etc., ensures the development will and fighting spirit.

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A remarkable aspect of the game of chess is the possibility for a child to be an equal partner with an adult, which is not possible in any other sport. A remarkable aspect of the game of chess is the possibility for a child to be an equal partner with an adult, which is not possible in any other sport. By becoming aware of this, the child can increase his self-confidence, which will certainly have considerable positive consequences on his current school career, compared to all subjects of study provided in a year of education.

On the other hand, through the practice of competitive chess (as a form of competition), an objective form of feedback appears - as through the obtained results - that offers the possibility to grant a permanent evaluation about the game capacity of each one, about the knowledge, qualities and limits, desires, needs and aspirations, the way we react in different situations etc. [3], [5]. All these determine a correct capacity for self-appreciation and implicitly the conscious recognition of our own accumulated values [3], [9].

Generalizing the valences conferred by the practice of this game, we can say that who is able to master the assessment of the situation, as a series of thinking operations and use them successfully, after a while, will be able to apply them, similar in other daily activities. This is possible because in everyday life we do nothing but analyse the advantages, disadvantages, strengths, respectively our weaknesses compared to those in our social proximity, and in this context, chess urges caution, teaches us to analyse a certain problem from as many perspectives as possible and solve it favourable.

2. Purpose and Hypothesis

The normative premise of our research starts from the fact that in the Romanian education system, chess was introduce as an optional subject for study in the primary cycle, starting with the 2014/2015 school year. The specialized curriculum, generically called „Education through chess", is developed according to a model of curriculum design focused on skills, and for the realization of learning activities, is allocated one hour per week. The program stipulates that: „By going through the stages of learning chess, children accumulate and develop skills useful for life and integration into school life." [4, 5]

In this context, we aim as a goal in this experimental approach, to highlight some of the educational values of training through the game of chess. This fact is materialized by highlighting the level of improvement of the capacity of attention, memory and logical thinking (manifested, in our situation, by the ability to understand a text) of practitioners in the stage of primary learning, at the age of 6-8 years. The research hypothesis started from the presumption that „practicing the game of chess at a young school age, determines the development of attention, memory and ability to understand a text, especially since this sport is practiced in a longer time volume".

3. Methods, Content of the Experiment

Teaching approach was initiated in 2019/2020 school year and was held for all those involved, for the period 09.09.2019 - 04.04.2020 (about 7 months / 26 weeks).

Throughout this time, teaching took place in the system „face to face" until the beginning of March (11.03.20) when due pandemic caused by COVID 19, was converted into an online teaching.

The subjects were select randomly from both genders (girls, boys) without prior testing. They belong to the category of 6-7 years and are enrol in pre-university education in preparatory class. The following groups were thus formed:

- The first group (G1) consisted of 13 children from the preparatory class of the Theoretical High School „Tamási Áron". Note that students in this group did not participate in teaching initiation chess. As a result, we considered G1, as the control group, which will report some results of research.
- The second experimental group (G2) also had a number of 13 children, belonging to the same class from which was extracted the control group (G1). They were enrolled, at the request of their parents, in the optional Chess Education activity, for which they were allocate 1 hour of training / week.
- The third experimental group (G3) was composed of children enrolled in the School Sports Club from Odorheiu Secuiesc, in the category of initiation in chess (year I), they are also 13 in number, and related to the educational cycle, being also in the preparatory class. The subjects in this group were allocated 2 hours of chess training / week.

No data were collected on the family or social background of the children, but from those resulting from frequent meetings with parents; they come from all lifestyles, which reduce the likelihood that some of them have superior skills than others.

As teaching methods for groups G2 and G3, the "Dutch method" of teaching chess was used, namely step-by-step learning (from step 1 to step 6), but learning sequences were also taken from Polgár Judit's "Sakkpalota" program [6], respectively that of the Hungarian Chess Federation - the initiation stage [9]. During the experiment, we mainly used exercises from stage 1 (Step 1) [2] and those combined with the training plan for the little ones, for the first year study, a plan developed in accordance with the specialized curriculum. After 11.03.2020, every Wednesday, were uploaded to the Facebook group, problems from the program of Polgár Judit [6], [8], [9], set up for G2 and G3, and the didactic interventions were carried out during an hour/week with G2, respectively 2 meetings of one hour each, for G3, until 04.04.2020. Video through Zoom was also used. We worked on the demonstration board, both by solving some group exercises and by individual tasks. In addition to teaching the basic elements of chess, such as: chessboard, diagonals, lines and columns, respectively chess pieces and moving them, preparatory games with chess pieces were also, performed. Consequently, the independent variable of the research consisted in the methodology of teaching-learning chess, implemented within the educational process at the level of groups G2 and G3. We mention that the teaching method was similar, both at school (G2) and at the club (G3), in order to compare the evolution of the two experimental groups, the only difference between them being the weekly load (1h vs 2h/week). The dependent variable consisted in the degree of improvement of the processes of attention, memory and the manifestation of the ability to understand

a text, these being capture at the level of all subjects involved in research (G1 - partially; G2 and G3 – as a whole). Regarding the evaluation method, on the one hand the subjects were systematically observed during the 26 weeks of targeted activity (the results being recorded in the observation sheet of each student), and on the other hand, at the end of the May (2020), with the support of parents, were subjected to a test consisting of completing a specific questionnaire. The applied questionnaire contains 21 questions, divided into 4 sections. It can be consulted online in Hungarian, at [7]. Sections 1 and 2, were given to complete all subjects, and sections 3-4, only to children in G2 and G3 (who was introduced to the practice of chess). From the perspective of the purpose we set out in this research, the sections of the questionnaire are design as follows:

Section 1 – contains two questions (1-2), which are addressed to all respondents in order to identify the group, respectively G1, G2, G3.

Section 2 – contains questions 3-12 and they are addressed to both, children in the experimental groups (G2, G3) and those in the control group (G1), being in fact games that require attention, memory and understanding of a text. Questions 3, 4, 5, 6, 7, 9 and 12 were included in the attention assessment category; questions 8, 9 and 10 tested the memory, and by the way of formulating questions 5, 6, 7, 8 and 9 it was possible to investigate the ability to understand the texts. The requirements for solving questions 3 and 11 also contain elements of fine motor skills, which is why this area has also been subject to verification. In general, section 2 contains small problems of

logic, focus and memory, specific to the age of 6-7 years (such as: choosing the right path through a maze, counting problems, riddles, stories that require understanding text, memory problems using various images) [4], [7].

Section 3 – contains questions 13-19 and they require the attention and memory specific to the game of chess, the respondents using it to manifest these cognitive processes, both the chessboard and the chess pieces. The section applied only to groups G2 and G3 (experimental groups - which were subjected to the process of initiation into the game of chess). We considered that section 3, will show us if there are quantitative differences on the targeted indicators, between the children who studied the game of chess 1h/week and those who performed 2h/week, during the research period.

Section 4 – is a section less relevant to the purpose of our research, it contains questions 20-21, being introduced to know the views of children and parents on the educational values of the game of chess, although, it was completed only by G2 and G3.

Regarding the application of the questionnaire, it was initially intend that this testing procedure will be perform face to face, at the locations where the teaching process took place for most of the time allocated to the research. However, due to the interruption of courses in the traditional system, online questioning was applied, using Google forms. Thus, in interpreting the results we believe that there is a possibility to intervene (to a very small extent) the subjectivity of parents, although they were instructed/required to properly address the

issue raised by the questionnaire and not to help children develop answers, but only when stating questions.

4. Results and Discussions

All 39 children (G1, G2, G3) were asked the questions related to the first section (1-2). The data show that 76.9% of them are 7 years old, 12.8%, 6 years old and 10.3%, 8 years old. Although this difference occurs for two years, all children are students in the preparatory class. All 39 children (G1, G2, G3) were asked the questions related to the first section (1-2). The data show that 76.9% of them are 7 years old, 12.8%, 6 years old and 10.3%, 8 years old. Although this difference occurs for two years, all children are students in the preparatory class. Also, it was found that no child practiced chess, at least in an organized form.

Section 2 contains questions constructed in the form of logic, attention and memory games (3-12). In order to be able to delimit the research data, we performed a separate analysis for the indicators of attention, memory, logic / comprehension of texts and fine motor skills. It should be mention that although in total there are only 10 questions in this section (3-12), in our research it was considered that some of them, could test several indicators among those we targeted. Thus, the distribution of the questions on indicators changes the number of data subject to processing (from 10 to 17), as follows: attention - 7; memory - 3; text comprehension - 5; fine motor skills - 2.

The percentage weights of the indicators subjected to the research within Section 2 are as follows: attention 41.18%, text understanding 29.41%, memory 17.65% and fine motor skills 11.76%. To the attention testing questions (number 7 - Section 2), answered by all 39 children, the correct results were summarized for each respondent and centralized in table 1.

Table 1

Distribution of correct answers/groups to attention-type questions - Section 2

No.	Correct answer/ Question number	G1 (No. of subjects)	G2 (No. of subjects)	G3 (No. of subjects)
1	Correct answers to question 3	11	12	12
2	Correct answers to question 4	9	11	11
3	Correct answers to question 5	13	13	13
4	Correct answers to question 6	8	10	11
5	Correct answers to question 7	13	13	13
6	Correct answers to question 9	8	9	12
7	Correct answers to question 12	11	12	12
	Totally correct answers:	**73**	**80**	**84**

As can be seen by comparing the data from Table 1, the difference between the correct answers G1, G2 and G3 are relatively small. There is, however, some difference in the fact that G1 gave 73 correct answers, G2 obtained a score of 80, while G3 cumulated 84 correct answers for the given criterion (quality of attention). A more significant quantitative difference can be observed between G1

and G3, in favour of the latter (84 – 73 = 11).

As in the case of attention, for the evaluation of the memory the correct answers were summed and centralized in table 2.

Table 2

Distribution of correct answers / groups to memory questions - Section 2

No.	Correct answer/ Question number	G1 (No of subjects)	G2 (No of subjects)	G3 (No of subjects)
1	Correct answers to question 8	5	10	12
2	Correct answers to question 9	5	9	12
3	Correct answers to question 10	2	8	11
	Total correct answers:	12	27	35

As can be seen from the tabular data, in questions 8 and 9 of the questionnaire, which both address the same topic - but with different solving tasks - the subjects of group G1 had cumulatively significantly lower results than G2 and G3. The explanation for these data would be that, in addition to memory, the questions require other two qualities, namely the focus of attention and understanding text/logical thinking. These are cognitive processes with a major role in the game of chess. Regarding the 10th question, at the level of G1 there are only 2 correct answers, G2 gave 8 correct answers and G3, 11. In this case, too, the big differences between results/groups (G1-G2; G2-G3 and G1-G3) demonstrate, from the perspective of our research, that visual memory is much required in the practice of chess. It develops the children in our study more so, since this game is practice in a larger volume of time. In order to reinforce the above, in the case of question number 10 which is based entirely on the use of visual memory of those investigated (this type of memory is highly requested and important in chess),

we conducted a more detailed analysis of the answers given by children from the 3 groups. In this sense, we took into account, not only the images memorized 100% by the subjects (we mention that the item involved memorization of 7 images), but also the others, partially memorized, so we can fully capture the progress and differences between respondents fall into the 3 groups. The resulting data are presented in Table 3.

To achieve a ranking of responses from Table 3, we gave each answer identifying a certain score, conducted in ascending order as follows: 1 image identified 1pc.; for 2, 2pc; … for 7 identified images, 7pc. Following the data transformation, we obtained the score values presented also, in table 3.

As shown in the tabular data, subjects in G1 (non-practicing of chess) managed to get only 35pc after testing the visual memory capacity, while the groups that were initiated in the practice of chess, achieved a higher cumulative score, G2 = 83pc., respectively G3 = 87pc., the last one benefiting from a double volume of training in relationship with G2 subjects.

Table 3

Distribution of partial / complete answers to question 10 - visual memory
and the scores assigned to identify images

Number of identified images	G1 (No of subjects)	G1 Scores	G2 (No of subjects)	G2 Scores	G3 (No of subjects)	31 Scores
Identify 1 image	3	3	0	0	0	0
Identify 2 images	4	8	0	0	0	0
Identify 3 images	3	9	0	0	0	0
Identify 4 images	1	4	0	0	0	0
Identify 5 images	1	5	3	15	2	10
Identify 6 images	1	6	2	12	0	0
Identify 7 images	0	0	8	56	11	77
Total points / group	-	**35**	-	**83**	-	**87**

Calculating the statistical significance of the groups involved in the research, it is found that between the groups G1 and G2 there is a significant difference, the value of t calculated being 1.931, at p=0.1 (90%), compared to tabular t (1.711) to $n_x + n_y -2 = 24$ cases. The difference between the values is even more significant between G1 and G3, t calculated at p = 0.05 (95%), being in this case 2, to $n_x + n_y -2 = 24$ cases (tabular t = 2.064). According to these data, we can say that subjects who practice chess - even at the level of initiation - have a significantly higher capacity of visual memory than those who do not practice it. In addition, the data resulting from the scores obtained in children in groups G2 and G3, show an insignificant statistically difference, although from a quantitative perspective G3 has a higher cumulative score. This we have attributed to the short time allocated to research. The understanding text questions were at the level of the questionnaire in number of 5 and consisted in 3 riddles and 2 stories. The number of correct answers to each of these questions was summed, for each respondent group, and presented centrally in table 4.

Table 4

Distribution of correct answers to understanding text questions

Number of correct answers	G1 (No of subjects)	G2 (No of subjects)	G3 (No of subjects)
No of correct answers - question 5 – riddle 1	13	13	13
No of correct answers - question 6 – riddle 2	8	10	11
No of correct answers - question 7 – riddle 3	13	13	13
No of correct answers - question 8 – story 1	9	8	12
No of correct answers - question 9 – story 2	7	9	12
Totally of correct answers	**50**	**53**	**61**

Regarding the totality of the correct answers, it can be seen that between G1 and G2 there is a little significant difference, but instead, between these two groups and G3 there is a difference of 11 and 8 correct answers, respectively. It

is therefore found that the children in the group that benefited from 2 hours of chess / week obtained superior results to the ability to understand a text, compared to the other two groups. Knowing the learning environment of the children involved in the research, we consider that the small differences between the subjects of groups G1 and G2 (who practically make up the same class of students) to this indicator, are due to the professional qualities of the teacher, who uses active training methods in diversified activities, quality communication being the main way of working in that class.

The last indicator analysed in Section 2 is fine motor skills. We remind you that the questions - in this case - are multiple tasks; they do not only involve attention and observation, but also the appeal to solve the problem, to the fine motor skills of the hand. Thus, the questions require marking the correct path, which is required in items 3 and 11. The data collected are centralized in table 5.

Table 5

Distribute the correct answers to questions that require fine motor skills

Number of correct answers	G1 (No. of subjects)	G2 (No. of subjects)	G3 (No. of subjects)
No. of correct answers – question 3	11	12	12
No. of correct answers – question 11	11	12	12
Totally of correct answers	**22**	**24**	**24**

The differences between the 3 groups are not significant, between G1 and G2 - G3 there is only a plus of 2 correct answers. Two subjects belonging to G1 answered the two questions incorrectly, while in G2 and G3, only one child did not give the correct answer. Consequently, from the data of our research we cannot state that the practice of chess determines the development of fine motor skills largely than in the case of subjects who do not practice this sport.

Section 3 of the questionnaire, applied to the experimental groups G2 and G3 (7 questions with a specific theme of chess) aimed to highlight the existence/non-existence of significant influences on the processes of attention and memory by practicing chess.

As a procedure for highlighting all the data, in question 13, as in the case of the evaluation of the visual memory in section 2, in this case too, we took into account all the children's answers, not only the 100% correct. We decided to do so, because the interpretation of the problem is quite complex and the analysis of only the correct answer does not reflect the whole reality of the cognitive abilities manifested by children. Overall, we found that they were inventive and found ways to "eat all the cheese" in different ways to move the piece, although most of the answers were only partially correct, as additional moves were made with the bishop. Therefore, in order to differentiate between the answers, we marked the correct answer separately, but we also took into account the partially correct ones. The results are presented in Table 6.

The answers provided by G2 and G3 to the attention question

Answer	G2 (No of subjects)	G3 (No of subjects)
c3 d2 e3 b6 e3 f4 g5 h4 g3, collect all the pawns, but also make extra moves. Partially correct answer.		1
b6 e3 f4 g5 h4 g3 e1 d2, remains a pawn on the board. Partially correct answer.	1	
c3 d2 e3 f4 g5 h4 g3 c7 b6, collect all the pawns, but also make extra moves. Partially correct answer.	1	
c3 d2 e3 f3 g3 h4 g5 e3 b6, he got lost on the road but collect all the pawns.	1	
b6 e3 f4 g3 h4 g5 d2 c3, **Correct answer!**	4	10
c3 d2 e3 b6 c7 f4 g3 h4 g5, collect all the pawns, but also make extra moves. Partially correct answer.	1	
b6 e3 d2 c3 e5 f4 g5 h4 g3, collect all the pawns, but also make extra moves. Partially correct answer.	1	1
b6 e3 d2 c3 f6 g5 f4 g3 h4, collect all the pawns, but also make extra moves. Partially correct answer.	1	
b6 e3 d2 c3 e1 g3 h4 g5 f4, collect all the pawns, but also make extra moves. Partially correct answer.	1	
b6 e3 f4 g5 h4 g3 e1 d2 c3, collect all the pawns, but also make extra moves. Partially correct answer.	2	1
TOTALY CORRECT ANSWERS	**4**	**10**

The last 6 questions in section 3 (14-19) contain problems that can be solved based on memorization processes. Children must remember the positions of the pieces, scoring the number of correctly memorized ones. The 6th question has all the 32 pieces on the chessboard, scoring the number of pieces that were retained. The correct answers to the 6 questions were summed, centralized and calculated in percentage values, being shown in table 7.

Total G2 and G3 memorized items to questions 14 - 19 - section 3

Total memorized items	G2 (No of memorized items)	G2 (%)	G3 (No of memorized items	G3 (%)
Total memorized pieces from 47x13=611 pieces =100%	239	39,12%	293	47,95%

The totality of the data collected/processed in section 3 of the questionnaire reveals that G3 is superior to G2, even if the difference between them is not significant. We remind the fact that G2 studied 1h/week for 26 weeks (26h), and G3 studied 2h/week for the same time (52h). This fact leads us to say that the volume of activity in the study of chess, has some influence in the process of improving the attention and memory of young school children.

Section 4 contains two questions (20-21), one of which is for children (20) and the other (21) for parents. Through question 20, we wanted to find out what impact this experiment had on children and what they think when it comes to playing chess. The children's answers were varied and surprising for us. Thus, some prefer to play games, while others, more timid, who do not like direct confrontation, prefer to solve problems. To the last question in the questionnaire (21), parents were asked to answer whether they considered that the game of chess had any influence on their child. Among the outlined opinions, we mention in summary, the following: the chess is beneficial, children socialize more, their self-confidence increases; they were disciplined; more easily accept failure in competition, increased ability to maintain attention while doing homework, etc.

5. Conclusions

The action we performed at the level of some groups of children, demonstrates the fact that by systematically practicing chess at the level of preparatory classes, it is determined to improve the process of attention, memory and understanding text. These benefits can be used as an initial support for reducing the percentage of functional illiteracy, knowing that it is currently very high among students in Romania.

Also, the higher the volume of hours spent playing chess, the more significant the benefits are, at least in the direction of the main indicators referred to in section 3, namely: attention quality and visual memory.

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