

FEATURES OF WORKING CAPACITY PERFORMANCE OF JUNIOR SCHOOLCHILDREN IN STUDYING THE “CHESS” SUBJECT

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AUTHOR’S DATA

Armine Khachatryan, PhD, Associate professor

Chair of Developmental and Pedagogical Psychology, Chess Research Scientific Institute

Khachatur Abovian Armenian State Pedagogical University, Republic of Armenia

Contacts: khachatryanarmine-1@aspu.am

Anzhela Sargsyan, University Lecturer

Mkrtich Mazmanyany Chair of Psychology, Chess Research Scientific Institute

Khachatur Abovian Armenian State Pedagogical University, Republic of Armenia

Contacts: sargsyananzhela54@aspu.am

ABSTRACT

The article demonstrates the experimental research results' analysis which was organized and carried out in 2022 by the psychologists of the “Chess” Scientific Research Institute. The research is aimed at revealing the level of performance of the working capacity components for chess-studying schoolchildren. It is noteworthy that the sample of the research includes children with Special Educational Needs (SEN), who were one group of participants. The experimental research was carried out by applying the "Landolt rings" methodology included in the "Egoscope" psychological analysis and testing complex. The analysis of the results demonstrated the following:

1. Students with Special Educational Needs, who showed low academic progress, as a result of the experiment demonstrated a high index of endurance, as well as students with high and medium academic progress.

2. The indicators of the reliability of the average work precision and working capacity, as well as the average efficiency level, are also the same among students with high, medium and low academic progress.

3. The results of information processing are medium for students with low and medium progress and high for students with high progress.

Keywords: *working capacity, Egoscope, Landolt rings, children with special educational needs, residual knowledge of chess.*

INTRODUCTION

The relevance of this research is conditioned by the lack of experimental data aimed at studying the performance of students at teaching and mastering the “Chess” subject. In our research, the theoretical and methodological basis is the theory of Edmund Landolt. Landolt rings (Landolt optotypes) are optotypes developed by the Swiss ophthalmologist Edmund Landolt in 1888. Initially developed for ophthalmology, they have also found applications in psychology. They are a set of rings with gaps from different sides, resembling a differently rotated Latin letter “C” . For the gaps, either a simple form of four options is used (top, bottom, right and left; north, south, east and west; 12, 6, 3 and 9 hours), or a more complex of eight options (plus four oblique). In psychology, Landolt rings are used in tests to assess attention and perseverance - for example, in a modification of the Bourdon correction test (Schraufa & Stern, 2001). As in ophthalmology, testing using rings does not depend on the patient's literacy or language. At the same time, the peculiarity of testing is not the different sizes of the rings (as in an ophthalmological examination), but their number - the test sheet may contain several hundreds or thousands of rings. When reviewing the test results, the number of viewed rings, and the proportion of correctly identified, incorrectly identified and/or missed rings are evaluated.

LITERATURE ANALYSES

The analysis of the results of the research carried out by researchers at the “Chess” Scientific Research Institute of Khachatur Abovian Armenian State Pedagogical University (ASPU) evidence the positive influence of chess on the development of psychic processes among children with Special Educational Needs contributes to the maximum level of capacities, in particular, in connection with attention, memory, sensory perception, speech perception, logic, imagination and space perception and orientation (Charchyan & Khudoyan, 2016).

Armenia has adopted the "Chess" subject in primary school programs since 2011, and different types of research have been conducted to evaluate the effectiveness of this implementation. One of the questions to be addressed after chess adoption is: “What are the main and contextual factors of the effectiveness of that implementation?”, or “How these factors have been changed?”.

1. Chess as an educational tool is widely used as a significant way to develop the intellectual skills of schoolchildren. This belief appears to be more widespread among female than male teachers.

2. Students’ progress in chess is mostly in line with their skills and knowledge of their native language and mathematics at the primary school level.

3. The role of chess as a school subject has continuously been increasing while students have been learning how to apply chess skills to develop their problem-solving abilities. When teachers help students to solve different chess tasks and problems, applying a wide range of techniques, students

believe they become more effective problem solvers.

4. The development of student's independent learning abilities and the implementation of working-in-small-groups skills, as well as other interactive and reflective teaching/learning methods, are becoming significant factors for developing problem-solving abilities through chess.

5. Teachers' classroom management and motivating skills have become the most critical factors for chess education. Nevertheless, it is commendable that teachers focus not only on quick acquisition/assimilation but also on reflective and deep learning. Teachers should take into account that students' motivation is also confirmed by the level of difficulty of chess tasks and homework.

Hence, perceiving chess as more difficult than other subjects can hurt their progress in chess in general (Sargsyan, Gevorgyan & Gevorgyan, 2021).

The authors summarize and present the analysis of the results of the research conducted by the inclusive working group of the "Chess" Scientific Research Institute in 2015-2021. Critical discourse analysis was used as a methodology for this research. The inclusive workgroup that works at the "Chess" Scientific Research Institute at the Armenian State Pedagogical University has conducted a range of studies aimed at exploring the issue of involvement and participation of students with Special Educational Needs in "Chess" lessons at the 2nd-4th grades, finding out the attitude of chess teachers to chess mastering by these students in conditions of total inclusion, and the effect of chess on the mental development of children with SEN. Analysis of the obtained data unveils the fact that there is still a lot of effort required to provide equal involvement and participation of students with SEN alongside their peers and other studies are needed (Charchyan & Karapetyan, 2022).

The main idea of the "Infinite Chess" research project was the absence of limitations on people's capabilities and opportunities and, the absence of borders between different groups of society all over the world. This project is at the intersection of several important current social ideas. It combines the issues of innovative education, social inclusion and balanced development, cognitive development and disabled children, and tries to find new and non-standard solutions. *Educational content recommendations for the Project are:*

- The adoption of the "Chess" subject in the school curriculum for the benefits it has on the skills and mental abilities of the students with ASD and ADHD.
- There should be a clear guide to whom to teach chess or it should be planned. For the further stage of the project, it is recommended to have an individualized program for children based on their sphere/objects of interest. It would make it probable to get their attention, which is critical for any teaching/development process.
- Using an Individual educational plan (IEP) for each student will help to apply appropriate support and teaching methods. Therefore, we recommend using a diary (portfolio) for individual assessment

relying on the functional description in correspondence with the International Classification of Functioning, (ICF). We also recommend having preparation training for professionals to use a similar approach. Involving specialists from the sphere of special education is also critical for project success.

- Taking into account that the majority of participants considered the children's emotions of joy and **happiness as an important indicator** of the progress of the project, we during the project evaluation propose to introduce mechanisms that will enable the objective evaluation of these indicators along with the feedback tool.

- To succeed in teaching chess to a greater number of children it would be preferable to have alternatives for using verbal communication during the lessons. The best practice in this sphere shows that as many senses are included in the teaching process, more members are about to succeed in their learning.

- For enhancing mechanisms of collaboration with family members we recommend using the “DIR floor time” methodology which has been successfully used in working with young children many times (Sargsyan, Nersisyan, Sargsyan & Gevorgyan, 2022).

A chess game is very popular also for visually impaired players. To some extent, we can see similarities to the blindfold chess game of sighted players. However, blindfold chess is played by master players only. Thus, blind beginners are facing demanding conditions for playing chess. Researchers started with the initial observation of gameplay of blind chess players and indicated signs of using mental images, limits in learning efficient chess play, or accessibility problems. They extracted 114 findings from the semi-structured interviews conducted with 5 blind advanced chess players. Based on these findings we propose directions for future research and development.

We conducted a qualitative user study with five blind chess players. We collected and categorized 114 findings covering several topics like chess playing, training and studying, problems, assistive aids, etc. We concluded with a set of future research directions such as research on the formation of mental images of blind chess players, or the development of new kinds of accessibility aids. It seems that a deeper understanding of mental processes related to problem-solving situations brought by playing chess can substantially help in the design and development of aids, that will free the mental potential of blind chess players (Balata, Mikovec & Slavik, 2015).

METHODOLOGY

A laboratory experiment was carried out to reveal the stability of attention concentration, voluntary attention, working capacity and monotonous activity of students in the 5th grade. In 2022, the team of psychologists of the "Chess" Research Scientific Institute conducted an experimental research with the following successive stages:

1. Development of video-methodological bases of research;

2. Selection of research method, experimental application, adaptation;
3. Implementation of scientific research work,
4. Analysis of received data, and formulation of conclusions.

RESEARCH SAMPLE

The experimental research was conducted in 2022 at schools No. 50 and 144 of Yerevan, Republic of Armenia, with a total of 60 students in the 5th grade. Based on the fact that, according to the educational standard, teaching a “Chess” subject contributes to the development of students' working capacity (“Chess” subject standard, 2022). The formation of the research sample was conditioned by the fact that the students of the 5th grade have already completed studying the program "Chess" subject, therefore, it will be possible to record reliable indicators of their working capability. The participants were selected according to the level of academic progress demonstrated in the given academic year: high, medium and low. We would like to highlight the fact that the students who need special educational conditions showed low progress.

Table 1.
Research sample

N	SCHOOL	GRADE	PARTICIPANTS (students) NUMBER /Total/	The academic progress of students		
				High	Medium	Low
1.	School N50 Yerevan	5 th	30	10	10	10
2.	School N144 Yerevan	5 th	30	10	10	10

For the laboratory experiment implementation, a scientific hypothesis was formulated, according to which the level of working capacity of students with Special Educational Needs in the 5th grade and stability towards monotonous activities is determined by the level of residual knowledge of chess.

The stages and methods of experimental research

The research was carried out in two stages.

1. Selection of the appropriate methodology from the "Egoscope" psychological objective analysis and testing complex, experimental application (Egoscope, 2014),
2. Quantitative analysis of research results.

Following the purpose of the research and the scientific hypothesis, the "Landolt rings" methodology was selected and conducted from the complex psychological objective analysis and testing of

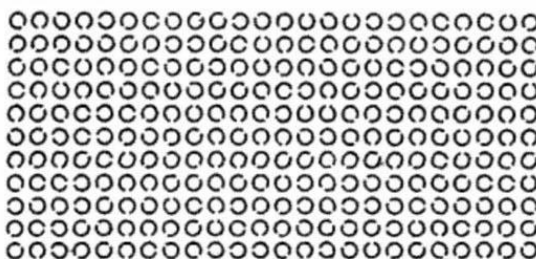
"Egoscope" (Egoscope, 2014). The objectives of this laboratory research experiment are: to find out students':

1. speed of information processing,
2. average work efficiency level,
3. average precision level of the work,
4. coefficient of endurance,
5. reliability of working capacity.

The "Landolt rings" method consists of 5 stages, the duration of each stage is 2 minutes. The participants were given the following instructions: "Let's start the task. We need an electronic pen. Try to write your name with it in the open space of the screen. Then click on the ">>" icon in the upper right corner of the screen. Please handle the electronic pen as carefully as possible. Tables with 1, 3, 5, 6, 7, 9, 11, and 12-hour intervals appear on the screen. It is necessary to carefully look at the rings from left to right, and find and check those rings that have an open section on the left side. Try to complete the task as quickly and correctly as possible. When you're ready, click the ">>" icon in the upper right corner of the screen. Before starting the main task, you have a chance to test it. Are you ready? Let's start."

Figure 1.

The image displayed on the screen during the application of Landolt rings methodology



RESULTS

The results of the quantitative analysis of research, based on the average values, are presented below in the form of tables. In the tables, the values are presented on average separately according to the academic progress of the subjects. It should also be noted that the analysis of the results was carried out according to stages; the duration of each stage is 2 minutes. The total duration of the test is 10 minutes.

Table 2.

"Landolt rings" methodology analysis of results. Medium progress

N	PARAMETERS	1-2 MINUTES	3-4 MINUTES	5-6 MINUTES	7-8 MINUTES	9-10 MINUTES

1.	Total number of viewed rings (Q), pc.	445	512	575	581	520
2.	Quantity of correctly crossed-out rings, pcs.	10	10	12	13	15
3.	Quantity of incorrectly crossed-out rings, pcs.	4	4	2	2	2
4.	Quantity of missed rings, pcs.	38	46	54	48	39
5.	Work productivity indicator, (P), points	56	58	89	112	127
6.	Work accuracy indicator (A), %	16	14	19	22	27

Table 3.
"Landolt rings" methodology analysis of results. High progress

N	PARAMETERS	1-2 MINUTES	3-4 MINUTES	5-6 MINUTES	7-8 MINUTES	9-10 MINUTES
1.	Total number of viewed rings (Q), pc.	317	359	444	416	461
2.	Quantity of correctly crossed-out rings, pcs.	12	12	15	11	15
3.	Quantity of incorrectly crossed-out rings, pcs.	2	1	2	5	1
4.	Quantity of missed rings, pcs.	23	28	38	30	31
5.	Work productivity indicator, (P), points	92	97	109	91	139
6.	Work accuracy indicator (A), %	30	32	29	25	32

Table 4.*"Landolt rings" methodology analysis of results. Low progress*

N	PARAMETERS	1-2 MINUTES	3-4 MINUTES	5-6 MINUTES	7-8 MINUTES	9-10 MINUTES
1.	Total number of viewed rings (Q), pc.	349.8	533	481.5	502.8	451.5
2.	Quantity of correctly crossed-out rings, pcs.	3	2.77	4.5	6.25	4
3.	Quantity of incorrectly crossed-out rings, pcs.	6	3.25	6.75	6.5	6.75
4.	Quantity of missed rings, pcs.	34	57.25	52.25	47.25	40.5
5.	Work productivity indicator, (P), points	-28.2	-3.5	-22.1	0.6	-21.9
6.	Work accuracy indicator (A), %	-9.53	-9.73	-1.63	6.875	-0.43

Table 5.*Analysis of the results of the "Landolt rings" methodology*

N	PARAMETER TITLE	ACADEMIC PROGRESS OF STUDENTS		
		INDICATORS OF STUDENTS WITH MIDDLE PROGRESS	INDICATORS OF STUDENTS WITH HIGH PROGRESS	INDICATORS OF STUDENTS WITH LOW PROGRESS
1.	SPEED OF INFORMATION PROCESSING	MEDIUM	HIGH	MEDIUM
2.	LEVEL OF WORK PRODUCTIVITY	MEDIUM	MEDIUM	LOW
3.	LEVEL OF PRECISION OF WORK	LOW	LOW	LOW
4.	ENDURANCE	HIGH	HIGH	HIGH

	LEVEL			
5.	PERFORMANCE RELIABILITY	LOW	LOW	LOW

CONCLUSION

Thus, the analysis of the results demonstrates that in the case of teaching and mastering the "Chess" subject:

1. Students with Special Educational Needs, who showed low academic progress, as a result of the experiment demonstrated a high index of endurance, as well as students with high and medium academic progress.

2. The indicators of the reliability of the average work precision and working capacity, as well as the average efficiency level, are also the same among students with high, medium and low academic progress.

3. The results of information processing are medium for students with low and medium progress and high for students with high progress.

Chess testing is aimed at identifying the level of residual knowledge, skills and capacities of students in accordance with the expected final results of the standard for the "Chess" subject.

The maximum score is 25

0-7 is low, 8-16 is medium, 17-25 is high.

Table 6.

Academic progress with indicators

ACADEMIC PROGRESS OF STUDENTS	AVERAGE INDICATORS OF RESIDUAL CHESS KNOWLEDGE
Students with low academic progress	4 points
Students with medium academic progress	7 points
Students with high academic progress	13 points

Thus, the results analysis demonstrates the indicators which performance level is the same for the students with low, medium and high academic progress (Table 6). They are reliability of average precision of work and working capacity, as well as endurance. Comparing the average results of the chess test, it is noticeable that under the conditions of teaching and mastering the "Chess" subject,

students with Special Educational Needs show a high level of endurance, but the reliability of working capacity is low, as well as the residual knowledge of chess.

1. Mastering "Chess" subject contributes to the performance of one of the most important qualities in the academic process of students with Special Educational Needs which is a high level of endurance.

2. Endurance is a possible condition to contribute to the preservation of the residual knowledge of both "Chess" and other subjects and therefore to improve the reliability and efficiency of working capacity.

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