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Original Article

Experimental Research Aimed at Developing Attention and Concentration Specific to Chess Children

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Abstract

The research is based on the practical application of actuation systems designed to develop distributive attention and concentration in groups of chess children in Brasov clubs. The research calendar spanned a period of 8 months, comprising an average of two training sessions per week. The means used were adapted to the age of the children and their level of psychomotor development. The experimental results underlined the importance of developing attention and concentration in childhood for young chess practitioners. The conclusions of the research provide clear results that can be used in future research aimed at training chess players at the age of childhood.

1. Introduction

In post-modern societies, concerns for the quality of offspring are widespread among parents compared to other macrosocial contexts. Nowadays, research related to optimal child development is a traditional and yet topical, interdisciplinary field, concerned with the internal and external factors that help children develop and improve their ability to become successful youth and adults, to conduct to a successful life. (Nanu, Coman, Bularca, Mesesan - Schmitz, Gotea, Atudorei, Turcu, Negrila, 2023).

A complex system invented by man and perfected today with the help of technology, chess is an entire science, with principles, parameters that can be manipulated and hypotheses that can be verified in the end by the result of the game

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and by the natural analysis at the end of it (Singh, Kadam, Mital, 2023). The element that seems to impress more on the chessboard than the fight itself is creativity, (Andersson, 2025) the aesthetic influence that it imposes on the participants. In the situation where chess is seen as an accumulation between science, sport and art, the dominant idea nowadays seems to be the precursor and enhancer of cognitive abilities, capacities frequently and intensely studied out of an obvious need for progress and self-improvement (Nanu, Enoiu, Teris, 2023; Kazemi, Yektayar, & Abad, 2022). The move made, a direct result of the extensive cognitive process, represents the message sent following the anticipatory analysis carried out. Chess can be placed in the category of anticipatory individual sports, along with tennis, fencing, wrestling, from this character of precaution and foresight resulting, in fact, most of its educational valences (Shymanskyi, 2025). In these sports, maximum efficiency in the development of thinking is achieved due to the promptness of feedback. Each move of the opponent made in response to the strategy started can be considered an evaluation of the previous thought process, and this provides enough information about his intentions and plans (Jankovic, Novak, 2021).

2. Material and methods

Research aim, objectives and hypothesis

The aim of the research is to explore how the child chess player can solve tactical tasks in relation to different levels of physical training. Current trends in sports in general and chess in particular suggest that a competitor must function optimally in conditions of psychophysical fatigue.

Objectives

The research proposes the use, within the training of children in the targeted group, of a specific training system, through which the aim is to optimize tactical skills and mental calculation speed at the age of 6 to 10 years old.

Hypothesis

We assume that psychomotor testing of children can provide valuable data on the main cognitive mechanisms involved in the game of chess (attention and concentration - important qualities in the process of mental calculation).

Research methods

In the present work, the controlled experiment will find how the introduction of physical exercises in training develops tactical chess performance by increasing the reaction speed and the capacity of resistance to effort of the subjects.

Measuring the reaction speed, respectively the time needed to respond to a stimulus, through the hand-eye coordination action, involves the involvement of stimuli to the targeted subjects:

Visual stimuli (light signals, sudden visible movements, changes in color or shape) correspond directly in chess by the rapid recognition of a favorable move or advantageous position.

Auditory stimuli, representing sudden sounds (stopwatch) or voice commands ("Start!", "Stop!") are found in chess in flash games, where there is an audible warning of the clock at the last available seconds of the game.

Tactile stimuli (e.g. touches or vibrations) - although they have more applicability in contact sports and less in chess, they can still have some relevance if the player notices the opponent's way of moving pieces and pressing the clock.

➢ *ADS (Signal Distributive Attention) Test*

How to perform:

- On a page there are several signs numbered from 1 to 99.
- On the last row are 7 such unnumbered signs, which represent the models.
- Take sign by sign, from 1 down and watch which one of them resembles any of the models below.
- If the similarity is found, the respective sign is circled in the table.
- The first row is solved and the substantive test is carried out.
- Runtime : 10 minutes
- Parameters followed: attention distribution, concentration, mobility
- Item: Number of correct answers.

➢ *BlazePod Test*

The BlazePod test is an innovative tool used to assess and develop reaction speed, agility, coordination, and concentration. BlazePod consists of a set of luminous wireless devices (pods) that emit visual signals (colored lights), signals to which the subject must react according to a specific task. The app connected to your phone or tablet records the reaction time and the number of correct answers. The bridges will be placed in a circle, on a table, at different heights and distances, and the subject must move quickly to reach only the indicated color, in various speed levels.

The research consisted of testing 20 junior subjects aged between 6 and 10 **y**ears, components of CS Dinamo Bucharest - Brasov Sports Center.

3. Results and Discussions

ADS (Signal Distributive Attention) Test

After checking the preconditions, the Shapiro-Wilk test indicated that the scores distributions, both at baseline (W = 0.972; p = 0.790) and at the end (W = 0.908; p = 0.059), did not deviate significantly from normal (Table 1). Although the post-test value is very close to the conventional materiality threshold (0,05), the probability of 5,9 % of registering such a deviation by chance is nevertheless high enough to consider the appropriate data for the application of the t-test for even samples.

Table 1. *Normality test of the distribution of initial and final results in the ADS Test*

	Shapiro-Wilk		
	Statistical	Df	p
ADS PERCENT - Initial	,972	20	,790
ADS PERCENT - Final	,908	20	,059

Descriptively, participants (n = 20) started with an average of 65.8 % (standard deviation 18.6 pp) and ended with 80.1 % (standard deviation 15.0 pp). The absolute difference – around 14.3 percentage points – equates to a relative increase of around 22% compared to the initial level (Table 2).

Table 2. *Statistics for ADS Test Paired Samples - Mean and Standard Deviation*

		Mean	N	Standard deviation
Pair 1	**ADS PERCENT - Initial**	,6580	20	,18608
	ADS PERCENT - Final	,8005	20	,14996

Applying the t-test for paired samples, t(19) = −2.884 was obtained, a value that corresponds to a probability p = 0.010. Therefore, it is very unlikely that the progress observed is due to chance: the chances of achieving a difference at least as large if the intervention did not have an effect are around 1%. In addition, the 95 % confidence interval for average growth is between 3.9 and 24.6 percentage points, which means that even in the most conservative scenario, the programme produces a palpable improvement (Table 3).

Table 3. *Test for even samples ADS Test - Average, t-test, Difference, P-coefficient of statistical significance*

		Differences between pairs Mean	t	Df	p
Pair 1	ADS PROCENT - Initial - ADS PROCENT - Final	-,14250	-2,884	19	,010

To quantify the magnitude of the effect, we calculated Cohen dz, an indicator adapted for pair comparisons. The resulting value, d ≈ 0.65, falls into the "medium to high" level, suggesting not only statistical significance, but also practical relevance.

The analysis confirms that the intervention applied leads to a substantial advance in the ADS score. The methodological premises (normality of the data, paired design) support the internal validity of the conclusion.

BlazePod Test

The application of the Shapiro–Wilk test confirmed that both data series follow an approximately normal distribution (W = 0.967; p = 0.695 at the pre-test and W = 0.962; p = 0.574 at the post-test). As no p approaches the materiality threshold of 0.05, the normality assumption remains unqualified and the use of the t-test for paired samples is justified (Table 4).

Table 4 *Distribution Normality Test BlazePod Test -Average Reaction Time*

	Shapiro-Wilk		
	Mean	Df	p
BlazePod (TRS Static Reaction Time) - Initial - T. Medium Reaction	,967	20	,695
BlazePod (TRS Static Reaction Time) - Final - T. Medium Reaction	,962	20	,574

Central trends and variability

At the beginning of the program, participants required an average of 0.487 seconds to react to an illuminated bridge (standard deviation ≈ 0.095 s). After the intervention, the average time was reduced to 0.462 seconds (standard deviation ≈ 0.098 s). The absolute difference of 0.025 seconds is equivalent to an improvement of about 5 % in reaction speed (Fig. 1).

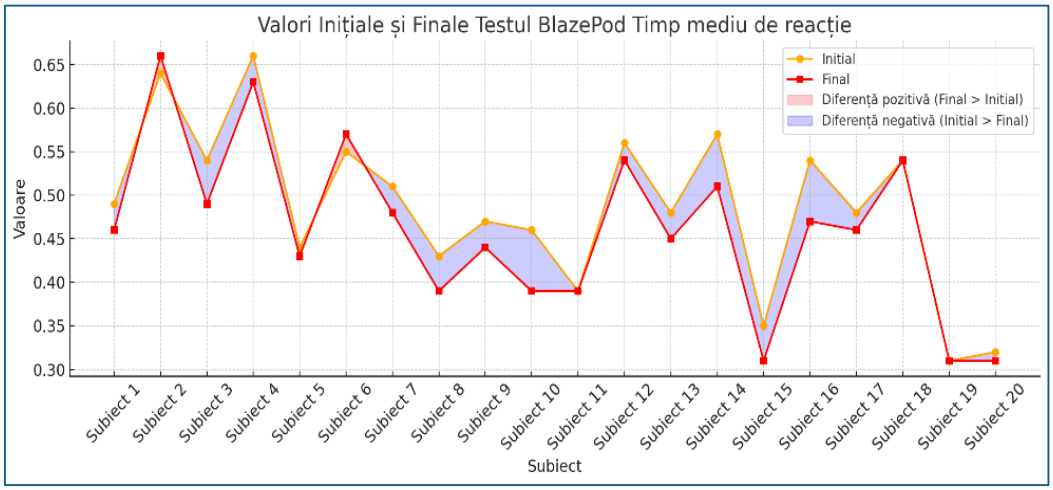

Figure 1. *Evolution of the initial and final values in the BlazePod Test - Average reaction time*

Pair t-test result

The statistical calculation led to $t(19) = 4.291$ and $p < 0.001$. Therefore, the probability of a reduction of at least 25 ms occurring randomly is less than 0.1%. The 95 % confidence interval for decreasing reaction time is between 13 ms and 37 ms (Table 5).

Table 5. *Test for Paired Samples BlazePod Test -Mean Reaction Time - Mean, T-Test, Difference, P-Coefficient of Statistical Significance*

		Differences between pairs			
		Mean	t	Df	p
Pair 1	BlazePod (TRS Static Reaction Time) - Initial - T. Medium Reaction - BlazePod (TRS Static Reaction Time) - Final - T. Medium Reaction	,02500	4,291	19	,000

The effect size, expressed by Cohen dz ≈ 0.96, indicates a large effect, revealing not only statistical significance but also practical importance.

Discussions

Practicing chess in school involves training cognitive and academic skills, critical to raising student performance, such as logical and spatial thinking, reasoning, long-term planning, evaluation, decision-making, memory, judgment, and strategy (Shahar, Avital, 2020). Sometimes we live with the false impression that it is enough to know a few rules to be able to teach chess to children.

Apparently you don't need a lot of knowledge, so as not to complicate things too much. But as studies in the field show, the heuristic "method of arriving at satisfactory solutions, using a small amount of calculation methods" (Martín-Moratinos, Rodrigo-Yanguas, 2023) and the level of the coach are essential even at a lower level of performance, a strategic approach common to both chess and mathematical problem solving. (Meloni, Fanari, 2021).

Although the elementary process of the basic rules of chess may seem simple at first glance, today, the initiation into chess has become a complex, long-lasting and maximum efficient process in the acquisition of elementary knowledge (Stegariu, Condrea, Astanei, 2025). The optimal age for starting the chess training process for children is considered by specialists to be 6-7 years old, except for gifted children who stand out easily. From the first steps in chess, the student must realize that all the figures of each side represent a team which act together to defeat the opponent - "the collaboration of the figures is actually the Alpha and Omega of chess thinking" (Dania, Kaltsonoudi, Ktistakis, 2023).

4. Conclusions

Following the application of the scientific experiment, for the BlazePod test we can formulate the following conclusions:

1. Effectiveness of the intervention – The training program produces a real and substantial acceleration of the motor response to visual stimuli; The average reduction of 25 ms can be decisive in sports contexts where differences are measured in hundredths of a second.

2. Stability of variability – The almost unchanged standard deviation (≈ 0.10 s) suggests that progress is relatively uniform: most participants improved their

performance to a comparable extent.

3. Generalization – Although the sample (n = 20) is modest, the pronounced effect and normal distributions increase the credibility of the conclusions.

In conclusion, the data indicate a rapid and consistent improvement in reaction time after the intervention, with a strong effect both statistically and practically.

After conducting the experimental research for the ADS (Attention Distributive Signals) test, we can quantify the following values according to the age of the subjects:

- 7 years - a single subject, with a significant improvement.
- 8 years - scores improved slightly, with a tendency towards higher values at the end.
- 9 years - the cast has visibly moved to better scores.
- 10 years old - the group with the best scores both initial and final, with a concentrated distribution in the upper range.

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