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The Influence of Playing Chess on Football Performance in Children Aged 10-12

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Abstract: Some of the most important aspects that chess develops are the ability to concentrate, attention and the ability to anticipate, which are paramount in sport and often lead to winning or losing a match. The purpose of this experimental research is to illustrate how chess helps to develop the skills needed in football. The research was conducted over a period of nine months, and the research participants were 28 children aged 10-12 years from the FC Player football team, with 14 athletes included in the experimental group and another 14 representing the control group. The assessment tests were the following: concentrated attention tests (Kraepelin, Bourdon-Anfimov, Toulouse-Piéron), Psychological Performance Inventory, the Test of Attentional and Interpersonal Style in Football, IQ test - Raven's Matrices, a Decision-making test and a Technical test. Athletes in the experimental group participated in chess lessons for nine months, while the control group did not benefit from chess training. The chess training programme consisted in learning the basic elements of chess, tactical and strategic exercises to help athletes improve their attention, decision-making, problem-solving and anticipation skills, visualisation exercises, blitz competitions and assessment tests. The chess training programme followed by the experimental group led to better results in most of the tests, compared to the control group, where the improvement of scores was not so visible or even did not exist at all.

Keywords: *chess; football; concentration.*

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Introduction

In the last period, the benefits of studying chess have begun to be widely recognised, which has led to its introduction in schools, chess being considered an educational tool.

Since the 1950s, special attention has been paid to the mental impact over the physical one, thus determining specific psychomotor formulations. Motor ability, which is a set of physical and technical skills, has been correlated with psychophysical processes. Within these correlations, attention has established itself as a process. In sports performance, attention has always been considered a vital aspect, and Cox (1990) claims that one of the most important aspects of sports psychology is attention. Studies have also been done that show that athletes' behavior is related to their ability to concentrate (Carraça et al., 2018; Love et al., 2018; Weinberg & Gould, 2010).

In the field of sport, the assessment of attention and its development have been an object of interest (Gray et al., 2016; Kirk et al., 2016; Memmert et al., 2009; Memmert, 2011; Spaniol et al., 2018). Attention is considered to be a fundamental cognitive ability because it helps select the necessary information and facilitates proper functioning (Chun et al., 2011; Desimone & Duncan, 1995; Rosenberg et al., 2017).

It is known that being an elite athlete requires a harmonious combination of physical and mental characteristics. It has been found that sometimes players with very good motor skills do not perform as well as players with poorer motor skills but with a great power of self-realisation.

The role of psychological training in performance achievement is to maximise motor actions in terms of motivation and interest, therefore motor ability is determined by psychological ability.

The intelligence component of mental ability will act on motor ability through inventiveness, adaptation, anticipation, variety, selectivity, speed of decision, precision and accuracy in player expression. The intervention of mental skills in the expression of motor skills will lead to a successful algorithmic solution throughout the schemes, actions and learning over time in tactical sessions but also to an effective creative solution supported by the momentary intention. Depending on how the athlete's psyche is built and strengthened, the time crises appearing during the game play will also be solved.

Specialised articles talk about the so-called mental toughness necessary for any professional athlete, which includes self-confidence, motivation, attention, visualisation and psychosomatic skills (Gucciardi et al.,

2009). These skills can be educated, acquired through mental training, and this is essential for achieving performance in football.

Numerous studies have shown that attention can be trained through different methods (Olfers & Band, 2018; Posner & Petersen, 1990; Wass et al., 2011), and these methods and strategies used in sport are designed to improve the way in which athletes respond to different game situations (Calmels et al., 2004; Romeas et al., 2016).

The game of football always raises problems, and the player needs to find solutions on their own, which often consists in choosing a tactical alternative or a technical option used with effect in the past, but choosing the right action requires a certain degree of intelligence.

Another important aspect in sports performance is the ability to visualise. Jones and Hardy (1990) argued that some high-performance athletes believed that what helped them better transfer their skills from practice in a competitive context was their ability to visualize. These athletes felt that imagining or visualizing certain situations that could occur in competitions was what increased their attentional focus.

Meta-analyzes and overviews of sports psychology (Feltz & Landers, 1983; Hecker & Kaczor, 1988) have suggested that visualization may be helpful when we need to focus our attention. Visualization can make athletes more aware of the stimuli relevant to the tasks used to perform successfully, thus ignoring unnecessary and disruptive stimuli.

In sport, the level of performance also depends to a large extent on athletes' ability to make quick decisions and often to take risks.

Some of the most important aspects that chess develops are the ability to concentrate, anticipate, make quick and good decisions and visualise, which are paramount in sport and often depend on winning or losing a match.

We believe that addressing this issue, namely the impact of studying chess on football performance, is topical but also useful for increasing the performance of players. Designing a chess training plan with the help of specific means and methods and in accordance with the age characteristics will contribute to the mental development of football players, which will lead to better results in their sports activity.

The *purpose* of this experimental research is to illustrate how chess helps to develop the skills needed in football.

Research hypotheses

The research hypotheses are as follows:

- Studying and playing chess contributes to optimising the attention of athletes.
- Studying and playing chess leads to an improvement in athletes' problem-solving and decision-making skills.
- The skills acquired by playing chess help to improve sports performance in football.

The null hypothesis: we assume that there are no significant differences between the averages of the two groups in the initial and final tests or they are due only to chance.

Methodology

Participants

The research participants are 28 children aged 10-12 years from the FC Player football team, with 14 athletes included in the experimental group (EG) and another 14 representing the control group (CG). Children are divided into two groups according to the team to which they belong so that the basic team represents the experimental group (FC Player 1) that plays in value group 1, and the second team, the control group (FC Player 2) that plays in value group 2. The research was conducted over a period of nine months, between October 2018 and June 2019, one hour per week.

Assessment tests

- Concentrated attention tests: Kraepelin, Bourdon-Anfimov, Toulouse-Piéron
- Psychological Performance Inventory (PPI)
- The Test of Attentional and Interpersonal Style in Football (Broad External Attention - BET, Broad Internal Attention - BIT, Narrow Attention - NAR, Overload External Attention - OET, Overload Internal Attention - OIT, Reduced Attention - RED)
- IQ test - Raven's Matrices
- Decision-making test
- Technical test

Chess training programme

Athletes in the experimental group participated in chess lessons for nine months, while the control group did not benefit from chess training. The chess training programme consisted in learning the basic elements of

chess, tactical and strategic exercises to help athletes improve their attention, decision-making, problem-solving and anticipation skills, visualisation exercises, blitz competitions and assessment tests.

Results

Concentrated attention tests

Table 1. Percentage difference between pre- and post-test results for concentrated attention – EG and CG

	Kraepelin	Bourdon-Anfimov	Toulouse-Piéron	Kraepelin	Bourdon-Anfimov	Toulouse Piéron
		EG			CG	
Mean – Pre-test	26.86	166.36	204.14	15.29	165.29	194.14
Mean – Post-test	31.57	167.21	216.43	16.21	165.07	196.14
Progress (%)	**17.55**	**0.52**	**6.02**	**6.07**	**-0.13**	**1.03**

Source: Author's own conception

According to Table 1, there were increases in attention level for both the experimental and control groups in all concentrated attention tests; however, the control group had a slight decrease in the average Bourdon-Anfimov test results. In the Kraepelin test, the mean of the experimental group increased by 17.55%, while that of the control group increased by only 6.07%. Regarding the Bourdon-Anfimov test, the mean of the experimental group slightly increased by 0.52%, while the mean of the control group decreased by 0.13%. The average scores obtained by the two groups in the final Toulouse-Piéron test increased by 6.02% for the experimental group and 1.03% for the control group.

Table 2. T-test – Kraepelin, Bourdon-Anfimov, Toulouse-Piéron – EG and CG

	Kraepelin				Bourdon-Anfimov				Toulouse-Piéron			
	EG		CG		EG		CG		EG		CG	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Mean	27	32	15.3	16	166.4	167	165	165	204	216.4	194	196.1
p-Value	**0.02**		**0.76**		**0.32**				**0.11**		**0.77**	

Source: Author's own conception

Application of the t-test to the experimental group in order to make a comparison between pre- and post-tests reveals that there are considerable variations between the results obtained by the experimental group in the Kraepelin concentrated attention test, as $p = 0.02 < 0.05$ (Table 2). Regarding the control group, there are no considerable variations between the two tests results ($p = 0.76 > 0.05$) for the Kraepelin test. Given these data, we can reject the null hypothesis for the experimental group and for the control group, the null hypothesis is confirmed.

In the Bourdon-Anfimov concentrated attention test, there are no meaningful distinctions between the two groups as regards the initial and final test results: for the experimental group, $p = 0.32 > 0.05$, and for the control group, $p = 0.86 > 0.05$. Therefore, the null hypothesis is confirmed for both groups.

In the Toulouse-Piéron test, following the application of t-test to both groups, there were no substantial differences between the results obtained in the two tests. Thus, for the experimental group, $p = 0.11 > 0.05$, and for the control group, $p = 0.77 > 0.05$, which shows that the null hypothesis is confirmed.

Psychological Performance Inventory (PPI)

Table 3. Percentage difference between PPI results in pre- and post-tests – EG

	Self-confidence	Negative energy	Attention control	Visualisation
Mean – Pre-test	23.07	21.86	23.64	21.07
Mean – Post-test	24.07	23.43	25.64	23.71
Progress (%)	4.33	7.19	8.46	12.54
	Motivation level	Positive energy	Attitude control	
Mean – Pre-test	26.14	23.57	24.86	
Mean – Post-test	27.64	25.50	25.93	
Progress (%)	5.74	8.18	4.31	

Source: Author's own conception

Table 3 highlights that, in the experimental group, all indicators of the Psychological Performance Inventory show an increase in average results between pre- and post-tests. Of these seven indicators, we were particularly interested in Attention control, where the increase was 8.46%, and Visualisation, where the increase was 12.54%.

Table 4. Percentage difference between PPI results in pre- and post-tests – CG

	Self-confidence	Negative energy	Attention control	Visualisation
Mean – Pre-test	20.8	20.7	23.6	19.4
Mean – Post-test	21.50	20.43	23.14	19.57
Progress (%)	3.61	-1.25	-1.78	1.01
	Motivation level	Positive energy	Attitude control	
Mean – Pre-test	23.9	22.1	21.9	
Mean – Post-test	25.14	22.36	22.07	
Progress (%)	5.31	1.34	0.90	

Source: Author's own conception

Regarding the control group, Table 4 shows that five of the seven indicators improved in post-test compared to pre-test. Attention control, which is a benchmark in our research, slightly decreased by 1.78%, while Visualisation increased by 1.01%.

Table 5. T-test – Attention control and Visualisation – EG and CG

	Attention control				Visualisation			
	EG		CG		EG		CG	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Mean	23.64	26.57	23.14	23.14	21.07	25.21	19.64	19.57
p-Value	0.01		1		0.002		0.95	

Source: Author's own conception

Application of the t-test to the experimental group in order to make a comparison between pre- and post-tests reveals that, in the case of the Attention indicator, there are great differences between the results obtained by the experimental group in the two tests, as $p = 0.01 < 0.05$ (Table 5). The same cannot be said about the control group, where $p = 1 > 0.05$, which shows that there are no significant differences between the initial and final tests. Therefore, we can reject the null hypothesis for the experimental group while for the control group, the null hypothesis is confirmed.

Visualisation is another indicator that reveals great differences between the results obtained by the experimental group in the two tests, $p = 0.002 < 0.05$ (Table 5). According to the same table, the differences between the two tests in the case of the control group are not significant, $p = 0.95 >$

0.05. Thus, the null hypothesis is rejected for the experimental group but is confirmed for the control group.

IQ test – Raven's Matrices

Table 6. Percentage difference between IQ test results in pre- and post-tests – EG and CG

	IQ	
	EG	CG
Mean – Pre-test	109.86	106.86
Mean – Post-test	111.36	101.43
Progress (%)	**1.02**	**-5.21**

Source: Author's own conception

In the IQ test, the experimental group had an increase of 1.02%, while the control group had a decrease of 5.21% (Table 6).

Table 7. T-test – IQ – EG and CG

	IQ			
	EG		CG	
	Pre-test	Post-test	Pre-test	Post-test
Mean	109.85	111.35	106.85	101.42
p-Value	**0.57**		**0.19**	

Source: Author's own conception

There are no considerable variations between the two tests in either group with respect to IQ, as $p = 0.57 > 0.05$ for the intervention group and $p = 0.19 > 0.05$ for the control group (Table 7). This shows that the null hypothesis is confirmed for both groups.

The Test of Attentional and Interpersonal Style in Football

The six indicators of the attentional processes are: BET (Broad External Attention) - the higher the score obtained in this indicator, the more the athlete has the ability to pay attention to several external factors at the same time; OET (Overload External Attention) - this indicator suggests the inability of the athlete to concentrate, as he must pay attention to several stimuli simultaneously. The lower the score, the higher his attention; BIT (Broad Internal Attention) - athletes who score high on this subscale are analytical and have the ability to think about issues in different areas at a given time; OIT - (Overload Internal Attention) - compared to BIT, at this

indicator, the high score means that the athlete's mistakes are largely due to mental overload; NAR - (Narrow Attention) - athletes who get a high score on this indicator have the ability to restrict their attention when needed; RED (Reduced Attention) - the attention of athletes is not long enough, and they can not pay attention to all the stimuli relevant to the task to be performed. In the case of 3 indicators from those mentioned above (BET, BIT and NAR), the higher the scores, the higher the attention is reflected, compared to the other 3 subscales (OET, OIT and RED), where the high score suggests problems with concentration.

Table 8. Percentage difference between pre- and post-test scores for the Test of Attentional and Interpersonal Style in Football – EG

	The Test of Attentional and Interpersonal Style in Football – EG					
	BET	OET	BIT	OIT	NAR	RED
Mean – Pre-test	3.2	1.88	3.82	1.86	2.99	1.87
Mean – Post-test	3.52	1.64	4.29	1.56	3.29	1.7
Progress (%)	**10.04**	**-12.55**	**12.15**	**-16.48**	**10.29**	**-9.16**

Source: Author's own conception

In the Test of Attentional and Interpersonal Style in Football applied to the experimental group, BET, BIT and NAR indicators recorded an increase in average results between pre- and post-tests as follows: BET increased by 10.04%, BIT increased by 12.15%, and NAR increased by 10.29%. As for OET, OIT and RED, their average scores decreased, indicating improvements in athletes' attention. Thus, OET decreased by 12.55%, OIT decreased by 16.48%, and RED decreased by 9.16%. (Table 8)

Table 9. Percentage difference between pre- and post-test scores for the Test of Attentional and Interpersonal Style in Football – CG

	The Test of Attentional and Interpersonal Style in Football – CG					
	BET	OET	BIT	OIT	NAR	RED
Mean – Pre-test	2.96	2	3.41	1.99	2.86	1.99
Mean – Post-test	3.01	1.95	3.42	1.96	2.91	2.01
Progress (%)	**1.69**	**-2.5**	**0.21**	**-1.79**	**1.75**	**0.72**

Source: Author's own conception

In the Test of Attentional and Interpersonal Style in Football, in the post-test, the control group recorded a slight increase in average results for BET (1.69%), BIT (0.21%), NAR (1.75%) and RED (0.72) and a slight decrease in average results for OET (2.50%) and OIT (1.79%) (Table 9).

Table 10. T-test – The Test of Attentional and Interpersonal Style in Football – EG

	The Test of Attentional and Interpersonal Style in Football – EG											
	BET		OET		BIT		OIT		NAR		RED	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Mean	3.2	3.52	1.88	1.64	3.82	4.29	1.86	1.55	2.98	3.29	1.87	1.7
p-Value	**0.002**		**0.02**		**0.03**		**0.005**		**0.003**		**0.09**	

Source: Author's own conception

Table 10 shows that, in the case of the experimental group, the differences are significant between the post-test and pre-test results for five of the six indicators, which leads us to reject the null hypothesis (BET-p = 0.002 < 0.05, OET-p = 0.02 < 0.05, BIT-p = 0.03 < 0.05, OIT-p = 0.005 < 0.05, NAR-p = 0.003 < 0.05). Regarding the RED parameter, there are no significant differences between the results obtained in the two tests, as p = 0.09 > 0.05, which confirms the null hypothesis.

Table 11. T-test – The Test of Attentional and Interpersonal Style in Football – CG

	The Test of Attentional and Interpersonal Style in Football – CG											
	BET		OET		BIT		OIT		NAR		RED	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Mean	2.96	3.01	2	1.95	3.41	3.42	1.99	1.96	2.86	2.91	1.99	2.01
p-Value	**0.74**		**0.62**		**0.97**		**0.79**		**0.69**		**0.93**	

Source: Author's own conception

The t-test performed by the control group for the Test of Attentional and Interpersonal Style in Football indicates insignificant differences between pre- and post-tests, which confirms the null hypothesis: BET-p = 0.74 > 0.05, OET-p = 0 .62 > 0.05, BIT-p = 0.97 > 0.05, OIT-p = 0.79 > 0.05, NAR-p = 0.69 > 0.05, RED-p = 0.93 > 0.05 (Table 11).

Decision-making test

Table 12. Percentage difference between pre- and post-test scores for the Decision-making test – EG and CG

	Decision-making test	
	EG	CG
Mean – Pre-test	1.79	1.21
Mean – Post -test	2.79	1.57
Progress (%)	**35.9**	**22.73**

Source: Author's own conception

Table 12 indicates that the experimental group had an average increase of 35.90% in the Decision-making test, while the average increase was 22.73% for the control group.

Table 13. T-test – Decision-making test – EG and CG

	Decision-making test			
	EG		CG	
	Pre-test	Post-test	Pre-test	Post-test
Mean	1.79	2.79	1.21	1.57
p-Value	**0.07**		**0.39**	

Source: Author's own conception

According to Table 13, there are no significant differences between pre- and post-tests in the Decision-making test performed by the two groups, which confirms the null hypothesis; thus, p = 0.07 > 0.05 for the experimental group, and p = 0.39 > 0.05 for the control group.

Technical test

Table 14. Percentage difference between pre- and post-test scores for the Technical test – EG

	Angle shot	Dribbling	Maintaining the ball in the air	Step frequency
Mean – Pre-test	33.93	54.29	16.07	25.93
Mean – Post-test	30.36	59.29	25.36	30.64
Progress (%)	**-10.53**	**9.21**	**57.78**	**18.18**
	Hitting the ball with the head	Long pass - accuracy	Shot on goal - accuracy	Total
Mean – Pre-test	22.14	32.86	31.43	216.64
Mean – Post-test	38.57	47.14	35.36	266.71
Progress (%)	**74.19**	**43.48**	**12.50**	**23.11**

Source: Author's own conception

Table 14 reveals that all Technical test indicators have improved, except for the Angle shot, where there is an average decrease of 10.53%. Thus, for the Dribbling parameter, the progress is 9.21%, for Maintaining the ball in the air - 57.78%, for Step frequency - 18.18%, for Hitting the ball with the head - 74.19%, for Long pass - 43.48%, for Shot on goal - 12.50%, and for Total - 23.11%.

Table 15. T-test – Technical test – EG

	Angle shot	Dribbling	Maintaining the ball in the air	Step frequency
Mean – Pre-test	33.93	54.29	16.07	25.93
Mean – Post-test	30.36	59.29	25.36	30.64
p-Value	**0.45**	**0.03**	**0.18**	**0.08**
	Hitting the ball with the head	Long pass - accuracy	Shot on goal - accuracy	Total
Mean – Pre-test	22.14	32.86	31.43	216.64

Mean – Post-test	38.57	47.14	35.36	266.71
p-Value	**0.005**	**0.06**	**0.39**	**0.001**

Source: Author's own conception

Analysing Table 15, it can be seen that, after applying the t-test to the Technical test, three indicators highlight significant differences between the results obtained in pre- and post-tests, as $p < 0.05$ for Dribbling, Hitting the ball with the head and Total. Therefore, for these parameters, we will reject the null hypothesis.

As regards the other parameters, namely Angle shot, Maintaining the ball in the air, Step frequency, Long pass and Shot on goal, we can confirm the null hypothesis that there are no significant differences between the results obtained in the two tests, as $p > 0.05$.

Discussion and Conclusions

After applying the initial and final tests, we have reached some conclusions that largely confirm the research hypotheses.

The chess training programme followed by the experimental group led to better results in most of the tests, compared to the control group, where the improvement of scores was not so visible or even did not exist at all.

Next, we will analyse the tests performed by the investigated athletes in order to observe where there are notable variations between the final and initial results.

Concentrated attention tests showed improvements in most scores obtained by the two groups, with the specification that the increases were much higher for the experimental group compared to the control group in all tests. Thus, in the Kraepelin test, the experimental group progressed by 17.55%, compared to the control group, where the progress was 6.07%. The score of the experimental group increased by 0.52% in the Bourdon-Anfimov test, but the same cannot be said about the control group whose average results recorded a slight decrease of 0.13%. Regarding the Toulouse-Piéron test, both groups improved their scores as follows: 6.02% for the experimental group and 1.03% for the control group. Given the result of the t-test in the Kraepelin test, we can reject the null hypothesis. In contrast, in the case of the other two concentrated attention tests, the null hypothesis is confirmed.

Regarding PPI, the experimental group recorded increases in average scores for all its indicators, while the control group recorded improvements

in five of the seven test indicators. Thus, for the parameters that are of particular interest to us, namely Attention control and Visualisation, the experimental group had increases of 8.46% and 12.54, respectively. On the other hand, the same cannot be said about the control group, where the Attention control indicator decreased by 1.78%, while the average score for Visualisation increased only by 1.01%. After using the t-test, we can reject the null hypothesis for both parameters in the case of the experimental group, but in the case of the control group, the null hypothesis is confirmed, as there are no significant differences between the two tests.

In the IQ test, the average of the experimental group increased by 1.02%, while that of the control group decreased by 5.21%. According to the t-test, the null hypothesis is confirmed for both groups in this case.

Regarding the Test of Attentional and Interpersonal Style in Football, the improvement of attention was intended to increase BET, BIT and NAR indicators and decrease OET, OIT and RED indicators. This aspect is visible in the experimental group, where the average BET increased by 10.04%, the average BIT increased by 12.15%, and the average NAR had an increase of 10.29%; on the other hand, the average scores decreased for OET, OIT and RED as follows: 12.55% (OET), 16.48% (OIT) and 9.16% (RED). The control group also had small increases in average results for BET (1.69%), BIT (0.21%), NAR (1.75%) and RED (0.72%) and slight decreases for OET (2.50%) and OIT (1.79%). In the experimental group, the null hypothesis is rejected for five of the six indicators, and in the control group, the null hypothesis is confirmed for all parameters.

The Decision-making test reveals improved results for both groups; thus, the average of the experimental group increased by 35.90%, and that of the control group, by 22.73%. In the case of this test, the null hypothesis is confirmed for both groups, meaning that there are no significant differences between the two tests or they are due only to chance.

The Technical test shows improvements in seven of the eight indicators and an average decrease of 10.53% in the Angle shot indicator. Thus, for the Dribbling parameter, the progress is 9.21%, for Maintaining the ball in the air - 57.78%, for Step frequency - 18.18%, for Hitting the ball with the head - 74.19%, for Long pass - 43.48%, for Shot on goal - 12.50%, and for Total - 23.11%. After applying the t-test, we can conclude that the null hypothesis is rejected for three indicators, but it is confirmed for the other five indicators.

Regarding the first research hypothesis that "studying and playing chess contributes to optimising the attention of athletes", we can say the following for the experimental group:

- The null hypothesis that there are no differences between the initial and final tests or they are due only to chance is rejected for the following tests or indicators: Kraepelin, Attention control (PPI), BET, OET, BIT, OIT and NAR;

- The null hypothesis is confirmed for Bourdon-Anfimov, Toulouse-Piéron and RED. Thus, the hypothesis is rejected for seven indicators and confirmed for three indicators.

Regarding the second hypothesis according to which "studying and playing chess leads to an improvement in athletes' problem-solving and decision-making skills", the null hypothesis is confirmed. In this sense, we believe that a longer period of studying chess is needed to see viable results. Although the experimental group had better scores than the control group in the Decision-making test, the differences between the two tests are not significant.

As for the last hypothesis, namely that "the skills acquired by playing chess help to improve sports performance in football", we can say the following: in the Technical test, three of the seven indicators revealed significant differences, the most important being the total points where the null hypothesis is rejected, while four of them did not show significant differences between the two tests. An aspect that we believe will help athletes increase their performance is the visualisation ability (in which case significant differences have been noted) that will be useful for their mental training.

An increased IQ leads to better performance, which is a very important aspect that makes the difference between mediocre and top players.

Another aspect that makes us believe that the study of chess leads to the improvement of sports performance is the fact that the FC Player team had very good progress in the ranking during the 2018-2019 season; thus, it started on the 9th place in the first stage and finally reached the 6th place. Therefore, the progress of this relatively recently formed team is visible and we strongly believe that its results will improve more and more.

We think that this research can be seen as a first step towards similar subsequent steps and we hope that more and more emphasis will be placed in the future on athletes' cognitive skills and their development.

Chess needs to be constantly played over a longer period of time to notice visible improvements in certain skills it develops. Means and methods appropriate to each athlete's characteristics should be used to improve the cognitive skills needed in sport, such as attention, visual ability, thinking and memory.

This paper is based on the doctoral thesis carried out by the author at the National University of Physical Education and Sports in Bucharest and all participants in the study gave their written consent to participate, being able to withdraw from it at any time. They were informed about the purpose, objectives, duration and conduct of the study before participating in it, and entry into this study was voluntary.

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