

## The effect of chess on thinking patterns according to Hermann's scale

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### Abstract:

The aim of this study was to investigate the effects of recreational activities, specifically chess, on thinking patterns in adolescents in Saida state in Algeria. A sample of 14 randomly selected children participated in the study, which utilized a descriptive approach and relied on the Hermann brain theory to assess thinking patterns. Results showed that after learning and practicing chess, there were changes in the thinking compass of the sample (A = 75 < 79; B = 98 > 89; C = 94 > 90; D = 76 < 82), as evidenced by posttest recordings. Value for emotional and executive thinking styles decreased, while scores for rational and creative thinking styles increased. There were no statistically significant differences between pretest and posttest results for the four thinking styles ( $T^A = -1,263$ ;  $T^B = -3,365$ ;  $T^C = 1,052$ ;  $T^D = -1,074$ ) but the values for the rational and creative styles increased in the posttest, while the values for the executive and emotional styles decreased. The study also found differences in brain region usage between the pretest and posttest. Based on these findings, the authors propose promoting the practice of chess through the establishment of clubs, courses, and other activities that value this mental-emotional activity on a national level.

**Key Words:** recreational activities; chess; thinking patterns; Hermann's scale

### Introduction

The desire for recreation is one of the practices that indicate the formation of a person and is related to him, and to the various aspects of his life and conditions (work, worship, health, illness, etc.), and with the multiplicity and diversity of human societies and cultures, recreation - like other human behaviors - is usually subject to the customs of the society, and therefore it is affected by what the society can be affected by in its different cultural contexts (socially, economically, educationally, etc.). (Stephens, 1988) Sports recreation is one of the activities that have received great attention from scientists and researchers in this field, because there is no type of recreational activity that attracts the spontaneous attention of individuals and seizes their attention more than sports activities.

After the scientific and technical progress in the modern era, it led to an increase in leisure time, and this time occupied a prominent place in the discussions about progress and social development and its prospects, because of its importance in building the individual and society (Vale et al., 2018), and these changes and their acceleration led to an increase in the demand for the practice of recreational activities. Sports is for everyone. Social development, scientific progress, the growing increase in leisure time, the desire to increase production rates, and the prevention of modern diseases related to obesity, heart disease, and psychological and nervous tension have led to interest in providing opportunities to practice recreational and sports activities with various goals. (Hallmann & Giel, 2018) Therefore, investing leisure time and facing increased demand for recreation has become a challenge facing the societies of the current era, and the developed countries have become civilized not only interested in providing leisure time for their children, but rather they are concerned primarily with scientific planning for the ways and forms of investing it, so that this time does not turn into a time during which deviations that harm their lives are committed. individual and society (Goodwin, 2003).

This importance of sports and intellectual recreation is supported by what was stated in (Article 4) of the Charter for Recreation and Leisure Time, which was drawn up by the World Leisure and Recreation Association, which indicated that "every person has the right to participate in all kinds of recreation and to engage in it during leisure time, such as sports, games, and enjoying the outdoors" (*World Leisure Organization*, n.d.). It is clear from the foregoing the importance of practicing recreational, intellectual and sports activity and its positive repercussions on the individual physically, psychologically, mentally, socially and educationally. Given this importance, the institutions of modern societies have placed it among their organizational priorities at all levels (educational, educational, social, correctional, etc.). In order to reach an integrated system for sports recreational activity and reliable results, the importance of recreation does not focus or is limited to the activity in itself, but as an important means of preparing young people and providing them with the desired standards to form a better society (Hoge & Dattilo, 1995).

The individual needs to satisfy several needs, including physical needs - psychological needs - social needs ... and other things. Or intellectual has a positive effect on the individual in all its stages. The idea of research came about the importance of sports recreation, especially mental recreation or the practice of mental recreational activities on a stage of life and psychological growth, which is the stage of adolescence, which is considered a sensitive and critical stage (Wong et al., 2011).

The interest in recreational sports activity prevailed over the interest in mental recreational activities and their impact on the individual's mental and psychological health, so we wanted, through research, to find out the impact that the practice of chess plays as a mental recreational activity on thinking patterns according to what was determined by Hermann's ladder to study thinking patterns or as you know With the compass of thinking of the new practitioners of the game of chess, therefore, we ask the following questions:

- Does mental recreational activities "chess" have an effect on thinking patterns according to Hermann's scale?
- Is the thinking compass affected according to the Hermann scale to determine the patterns of thinking after practicing recreational activities "chess"?
- Are there statistically significant differences in the effect of practicing recreational activities "chess" on thinking patterns between the pre and post test?

#### Search Terms:

- **Recreational Activities:** It means the activities that are practiced in free time, whether individual or group activities, with the aim of bringing pleasure to the soul without waiting for any reward, or it is all exercises and activities that are directed by giving special attention to the benefit of people. (Asztalos et al., 2009; Grabner et al., 2007; Hoge & Dattilo, 1995)

- **Chess:** It is one of the most famous games in the world, and it is considered a mental game, as the game requires two players, each of whom has 16 stones, and requires great mental ability and intense focus in order to make the right decisions to achieve victory, as the player needs to develop strategies and plans that help him On protecting his stones and on winning this game depends on getting to the king's stone so that he can't escape again. (Dauvergne, n.d.; Ferguson, n.d.; Puddephatt, 2003)

- **Thinking Styles:** They are the ways and methods by which the individual deals with information, and is preferred by him in acquiring his knowledge, employing his capabilities, organizing and expressing his thoughts, and searching for the meaning of action and saying that is appropriate to the situations he is exposed to, which is linking information and searching for the meaning of action and saying. (Hu et al., 2012; Kazemi et al., 2012)

#### - Hermann scale:

The Hermann Brain Dominance Instrument Test (HBDI) is a test that amazingly identifies the different thinking patterns of individuals and organizations. The other quarters, and these patterns were divided into: pattern (A), pattern (B), pattern (C), pattern (D). (*The HBDI® Profile Explained - Ppt Download*, n.d.)

#### Previous and Similar Studies

Study by Johann Christiaen This study was conducted in Belgium, with the aim of knowing the effect of playing chess on developing the cognitive abilities of schoolchildren in the fifth grade, where the average age was 10.5 years. Motivating and training pupils to think in the early school stages. (Lammers, n.d.)

An other study by Ferguson robert 1987-1988 During the academic year 1987-1988, the researcher Ferguson carried out this study with the aim of knowing the effect of learning and playing chess on the development of thinking and memory. All students in the independent classroom in the sixth grade at M.J.RYAN School were required to participate in chess lessons. None of the students had ever played chess. This experiment was more intense than Ferguson's other studies because the students played chess daily over the course of the project. Where the researcher relied on the experimental method to suit it with the research topic. Finally, the researcher recommends the need to exploit the game in the field of education, especially in the primary stage. (Ferguson, n.d.) and the study of Michel Noir Study 2002 titled of this study was: Developing the cognitive and mental abilities of the child through the practice of chess, where this researcher carried out a set of experimental studies within his doctoral dissertation, conducted on middle school students in some French schools, where the rate of development among students who practiced chess was 50% in attention focus, 22% in memory, and 32% in logical thinking, compared to students who did not play chess. (Noir, 2002)

#### Material & Methods

- **Study Methodology:** The completion of this research required the use of the descriptive method

#### - Research community and sample

- **Research community:** The research community includes children involved in the chess club at the Aban Ramadan Youth House in Saida. (Algeria)

#### - Research Sample

It was randomly selected to represent this community, and it consisted of 14 children involved in the chess club at the Aban Ramadan Youth House in Saida (Algeria), where their ages range between 12 and 18 years.

#### - Research areas

- **Time frame:** from the beginning of February 2022 until the beginning of June 2022.

- **The spatial framework:** Our research was carried out at the level of the Chess Club at the Aban Ramadan Youth House in Saida in Algeria .

- **Study Tools**

**Hermann Scale (HBDI)**

In this study, we relied on the measure of thinking patterns according to Hermann's theory, as it relied in preparing it on the theory of brain control, through the characteristics and characteristics that characterize each of the four sections of the brain that Hermann developed and linked to thinking patterns, where each pattern represents a sub-dimension in the scale that has its own characteristics. And its characteristics that you know, and this is as follows:

**Type (A):** The person with this style is characterized by the fact that he loves to work with facts, prefers the language of numbers, is interested in technical matters, relies on accuracy, deals with issues with explanation and reasoning, is rational in his decisions, and relies on logic in solving his problems away from intuition and emotion.

**type (B):** The person with this style is characterized by the fact that he prefers traditional ways of thinking, cares about arranging and organizing his purposes, prefers to work in a stable and safe environment, accomplishes his tasks after prior planning, and values time.

**Type (C):** The person with this type is characterized by being sympathetic to people and relying on his feelings and feelings in solving his problems instead of logic. He uses symbolic language in his communication. He has communication skills through the body.

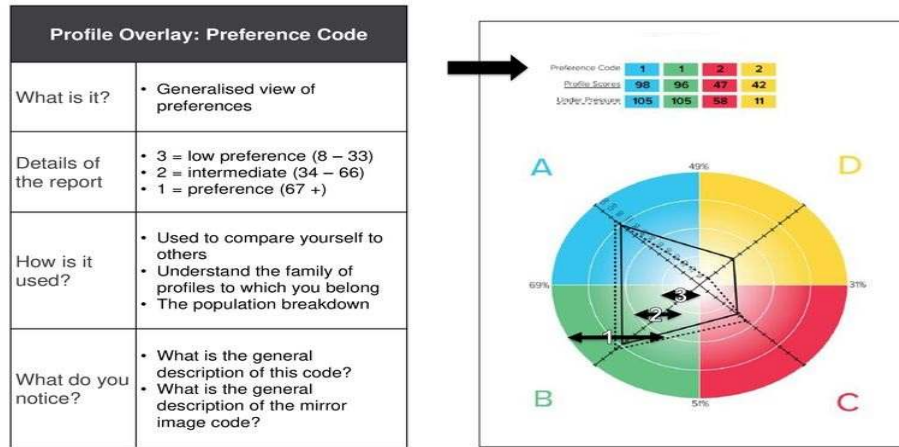
**Type (D):** The person with this style is distinguished by being renewable and loves change. He is enthusiastic about new ideas and experiences. He has a holistic view and does not pay attention to details. He is preoccupied with several things at one time. He loves adventure and challenge, and is not inclined to respect laws.

The measure of thinking patterns according to Hermann's theory, designed by Dr. Belkurd Muhammad, contains (64) positive and negative items distributed over four dimensions, which are answered by using alternatives (yes, no, sometimes).

It is corrected by granting a score (08) for yes, a score (04) for sometimes, and a score (02) for no. The scores obtained in each pattern are interpreted as follows:

- **From 08 to 34:** This indicates a lack of preference for this type of thinking, and we symbolize it (3).
- **From 34 to 66:** This indicates a secondary preference for this type of thinking, and we symbolize it (2).
- **From +67:** This indicates a basic preference for this style of thinking (strong control of this style, i.e. the dominant and dominant style). We denote it (1).

**Figure 01** explain the hermmann (HBDI) profil(*The HBDI® Profile Explained - Ppt Download, n.d.*)



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Thus, each individual gets four degrees, each one for each style.

- **Chess Learning Program:**

We also followed the club's program of carefully lined chess to match the age group of educated children.

So that the number of classes each week is 03, and the duration of each class is from one and a half to two hours, and the method of work is as follows:

The child learns to play with one piece for two weeks, that is, during these six sessions, the learner masters how to move the piece well.

After the child is good at playing with the first piece (for example, the pawn), the coach adds a second piece for him as well for a period of two weeks, that is, playing with the first and second pieces together during this piece (for example, playing with the pawn and the castle), and so on until he completes all the pieces.

The pre-tests were conducted before the players learned to play, meaning that the pre-test was distributed to the sample before learning the basic principles of playing in the game of chess, while the post-test was conducted after the players learned how to move all the pieces that make up the game of chess.

**- the Results of Psychometric Transactions**

**- Cronbach's Alpha Validity Coefficient**

**Table 1 shows the Cronbach's alpha coefficient values for the scale**

Statistiques de fiabilité	
Cronbach's alpha	Nombre d'éléments
,796	4

This table appears to display a statistic related to the reliability of a measure or assessment tool. Specifically, it shows the Cronbach's alpha coefficient, which is a commonly used measure of internal consistency reliability. The value of .796 indicates the degree to which the items on the measure are related to each other and how consistently they measure the construct of interest. A higher alpha coefficient indicates greater internal consistency reliability, meaning that the items on the measure are more strongly related to each other and that the measure is likely to provide consistent results over time.

**- Validity Coefficient by Split half Method**

**Table No. 02 shows the values of the stability coefficient in the split half of the scale**

Reliability Statistics			
Cronbach's Alpha	Part 1	Value	,776
		N of Items	2 <sup>a</sup>
	Part 2	Value	,628
		N of Items	2 <sup>b</sup>
	Total N of Items		4
Correlation Between Forms			,659
Spearman-Brown Coefficient	Equal Length		,795
	Unequal Length		,795
Guttman Split-Half Coefficient			,777
a. The items are: type A, tupe B.			
b. The items are: type C, type D.			

This table appears to display a statistic related to the reliability of a measure or assessment tool. Specifically, The value of .777 indicates the degree to which the two halves of the test are related to each other and how consistently they measure the construct of interest. A higher Guttman Split-Half Coefficient indicates greater reliability, meaning that the two halves of the test are more strongly related to each other and that the test is likely to provide consistent results over time.

**- Calculating the Reliability Coefficient Using the Internal Consistency Method of the Questionnaire:**

**Table No. 03 shows the values of the Internal Consistency Validity**

		type A	tupe B	type C	type D	all questionn
type A	Pearson Correlation	1	,635**	,301	,637**	,769**
	Sig. (2-tailed)		,000	,120	,000	,000
	N	28	28	28	28	28
tupe B	Pearson Correlation	,635**	1	,511**	,599**	,830**
	Sig. (2-tailed)	,000		,005	,001	,000
	N	28	28	28	28	28
type C	Pearson Correlation	,301	,511**	1	,458*	,747**
	Sig. (2-tailed)	,120	,005		,014	,000
	N	28	28	28	28	28
type D	Pearson Correlation	,637**	,599**	,458*	1	,851**
	Sig. (2-tailed)	,000	,001	,014		,000
	N	28	28	28	28	28
all questionn	Pearson Correlation	,769**	,830**	,747**	,851**	1
	Sig. (2-tailed)	,000	,000	,000	,000	
	N	28	28	28	28	28
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

After examining the table displaying the internal consistency values of the questionnaire, it is evident that the consistency and validity coefficients were statistically significant at either the 0.05 or 0.01 level. This indicates that the questionnaire has high internal consistency and validity, which enhances its reliability as a measurement too.

**Results:**

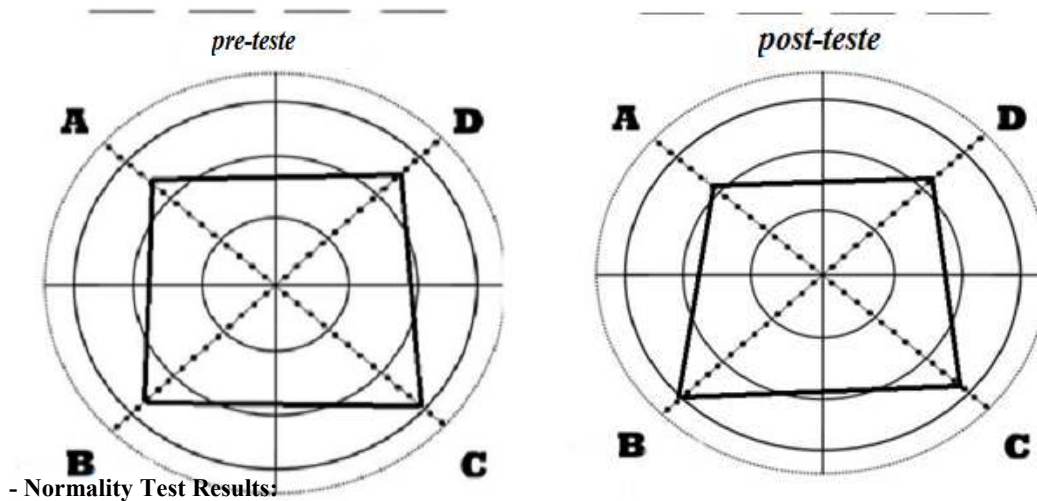
Displaying the results of the sample answers on the Hermann scale:

**Table No.04 results of the full sample answers on the Hermann scale**

dimension or style	A	B	C	D
Pre-test results	75	98	94	76
Postest results	79	89	90	82

We note that the predominant style in the sample as a whole is the executive (B) style with a score of 98 in the pre-test, while the emotional style (C) came in order with a score of 94, then the creative style (D) with a score of 76 and finally the rational style (A) with a score of 75. As for the test The post- type came first with (C) with a score of 90, which is the emotional type, and the second with (B) the executive style with a score of 94, then the creative type (D) with a score of 82, and finally the rational type (A) with a score of 79. And what can be said through the comparison between the two tests is that the sample in the post-test increased the results of each of the rational style and became within the first circle of interest in the sample's thinking style. The creative style also increased and the results of both the objective and emotional style declined compared to the results of the sample in the pre-test.

**Figure N.02 Displays sample responses on Hermann's chart in pre and post-tests**

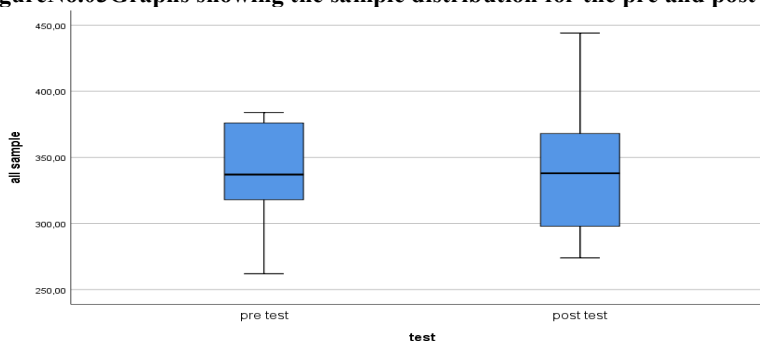


**Table No.05 shows the value of test for normality**

Tests of Normality				
	test	Kolmogorov-Smirnov <sup>a</sup>		
		Statistic	df	Sig.
all sample	pre test	,140	14	,200*
	post test	,143	14	,200*
*. This is a lower bound of the true significance.				
a. Lilliefors Significance Correction				

We notice through the table for presenting the values of the Kolmogorov-Smirnov test to know the normality of the sample that it amounted to 1.40 and 1.43, all of these values are not statistically significant. 0.05 and it is greater than it, so there are no statistically significant differences, which indicates that the sample has homogeneity among them, so the T-student test is used as a test to study the significance of the differences between the pre and post test.

figureNo.03 Graphs showing the sample distribution for the pre and post tests



- the Results of the Student’s Test between the pre and post test in the Hermann scale of thinking patterns:

Table No. 06 shows the student test values between the pre and post test

**Paired Samples Test**

		Paired Differences		Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviation		Lower	Upper			
Pair 1	type A pre-test - type A post-test	-6,14286	18,20337	4,86505	-16,65317	4,36746	-1,263	13	,229
Pair 2	tupe B pre-test - type B post-test	1,71429	17,59121	4,70145	-8,44257	11,87115	,365	13	,721
Pair 3	type C pre-test - type C post-test	7,28571	25,90643	6,92378	-7,67221	22,24364	1,052	13	,312
Pair 4	type D pre-test - type D post-test	-5,71429	19,90527	5,31991	-17,20725	5,77868	-1,074	13	,302

We note through the comparison table between the pre- and post-test of the sample's response to the scale of Hermann's scale to determine thinking patterns, that all student results were non-significant at the level of significance 0.05 and the degree of freedom 13, where the value of t calculated in the comparison between the pre- and post-test in the rational style was ( A) 1.26- When comparing the two tests in the objective mode (B), the value of the student t was 0.36, while the t was equal to 1.05 in the emotional mode (C). When comparing the two tests in the creative mode (D), the calculated t value was -1.07 Finally, in the comparison between the two tests in the results of the questionnaire as a whole, the t value was equal to 0.05.

Within the limits of the results of the statistical study obtained from emptying the Hermann scale or scale to determine thinking patterns.

**Dicussion**

Through the comparison of the post-test and pre-test results, for each member of the sample or the entire sample, the average of what the sample obtained in each of the thought patterns was determined. After clarifying the snapshot or drawing the shape of the thought pattern according to what is determined by the Hermann scale to determine the compass of thought, we observed an increase in the values of each of the rational style (A) and the creative style (D) at the post-test, with a decrease in the values of each of the executive style (B) and emotional (C). This indicates that the thinking compass has changed from the pretest. This result is consistent with Johann Christian's study (Johan Christiaen, 1976), where the researcher recommended using chess as a means of motivating and training students to think in the first stages of teaching. It is also consistent with what was defined by Robert Fergusson (Fergusson Robert, 1988) during the school year 1987-1988 at the primary level, where he showed that the rate of development in students who practiced chess focused attention at 50% and memory at 22% and 32%(Lammers, n.d.).

Upon observing the results of the Student T test shown in Table 06 for the comparison between the pre-test and post-test in the thinking patterns specified in the Hermann scale, we note that there is no statistically significant difference between them in any of the thinking patterns specified in the Hermann scale, including the rational style (A), the executive style (B), the creative style (D), or the emotional style (C), or even in the comparison between the results of the scale as a whole. Although the differences were not statistically significant in the comparison between thinking styles, according to the Hermann scale, the change that is considered significant is the change in the thinking compass. Hermann himself emphasized that the four thinking patterns specified in the scale work in harmony, which indicates that the four parts of the brain work together, and that most people have either a dominant pattern or two or more patterns. This was confirmed by Adams' study in 2003, through which he wanted to find out which patterns are more common in controlling the brain. He noticed that 7% of the sample he studied had a dominant unilateral pattern, while 60% had two dominant patterns, and

nearly 30% had a predominant trio pattern, while those who had a quadruple pattern mostly reached 3%(Ferguson, n.d.).(Noir, 2002).

Although there were no statistically significant differences in the effect of practicing mental recreational activities on thinking patterns between the pre- and post-tests, it can be said that mental recreational activity such as chess has an effect on thinking patterns, according to Hermann's scale. This scale determines the thinking compass and identifies which patterns are most used after learning and practicing the game of chess. Based on the fact that the thinking compass of the sample has changed, we noticed an increase in the values of the rational style (A) and the creative style (D) in the post-test, with a decrease in the values of the executive style (B) and the emotional style (C). This indicates that the patterns of thinking of the sample have changed and that the most dominant styles have been rearranged after practicing and learning the game of chess(Korsant, 2022; Peterson, 2012; Shaw, 2021).

For example, the increase in the rational style (A) indicates that the upper left part of the brain has become more active and in control. The left part represents a person who is in control and deals with facts and issues accurately and in studied ways, and deals with problems in ways that are subject to logic, rationality, and accuracy. This person loves dealing with language and numbers, tends to analyze ideas and events away from emotion, is interested in high performance at work, and prefers analyzing and evaluating facts (Kazemi et al., 2012). The executive style (B), on the other hand, is responsible for the lower left part of the brain. The person in whom this part is dominant prefers traditional ways of thinking, is organized, loves arranged facts, and is sequential. This person prefers to deal with things and ideas one after the other and to have stable and steady work. They feel satisfied and safe with specified methods of work, prefer security and stability over risk and adventure, and plan their methods and means to achieve their goal. They tend to complete tasks under work in a timely manner and are interested in the details of things. They have the ability to operational planning (Tongal & Dagar, 2022).

The emotional style (C) is responsible for the lower right hemisphere of the brain. The person in control of this part is sympathetic and has the ability to use language towards people and events. They have a symbolic and non-verbal intuition, which is represented by communication skills through body language and body parts, beautifying the face and its expressions. This person feels empathy for others and deals with problems (Bawaneh et al., 2010).

The thinking pattern (D), which is responsible for the upper right hemisphere of the brain, is characterized by seeing and perceiving images and things as a whole rather than a partial way. This person can focus on several things at the same time, is not easily convinced, looks for other alternatives to be convinced, enjoys risks and challenges, has a high sensitivity towards problems, and the ability to rearrange ideas and put them together in unfamiliar ways and combinations. They do not tend to always do things in the same way, like to find connections between things, do not tend to abide by laws, and rely on feeling and emotion rather than logic in facing problems. This person is intuitive with a high ability to imagine and plan strategically(Froehlich et al., 2002).

Hermann points out that there is no comparison between thinking patterns, but rather each pattern indicates mental processes that are dominant in the person if a certain pattern prevails. However, when linking thinking patterns with the nature of the chess game, we can differentiate between thinking patterns and say that the rational pattern (A) and the creative style (D) are considered the most suitable thinking styles for the nature of the game of chess. (Gliga & Flesner, 2014; Kazemi et al., 2012; Korsant, 2022; Shaw, 2021) Learning and becoming professional in it leads to the control of each of these two styles of thinking, even if only while playing the game.

### **Conclusion:**

Based on the data collected from the pre and post-tests using the Hermann brain dominance instrument, it can be concluded that learning and practicing chess mental activity can significantly impact an individual's thinking compass. The footage obtained in the post-test (figure02) shows that the sample's thinking compass has been affected after learning the game of chess. Specifically, the results of the post-test show decreased values of the emotional and executive style, and higher values of both the rational and creative style.

While there are no statistically significant differences between the results of the pre and post-tests for the comparison in the four thinking styles (rational, executive, emotional, creative) of the sample specified in the Hermann scale, high values of each of the rational (A) and creative (D) styles were observed in the post-test, with low values of each of the executive (B) and emotional (C). This suggests that practicing and learning chess can promote logical and creative thinking while reducing emotional and impulsive decision-making tendencies. Additionally, there is a difference in identifying the most used brain region for the research sample, compared between the pre and post-tests. This finding further supports the idea that learning and practicing chess can change an individual's thinking compass(Romanova et al., 2018).

Overall, the results indicate that the sample's thinking compass is affected and changed in the post-test compared to the pre-test after practicing and learning chess as a spiritual mental activity. This suggests that chess can be an effective tool for improving cognitive and emotional functioning, which may have practical applications in various domains, such as education, therapy, and personal development(Hall, 1983).



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