The Relationship Between Brain Dominance Patterns and the Increase in Academic Achievement Among Psychology Students in Jordanian Universities

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This study aims to identify the relationship between the patterns of brain dominance and the increase in academic achievement among psychology students in Jordanian universities. Descriptive approach was used. The instrument used was the brain dominance patterns scale which consists of 27 items. The study sample was selected randomly and consisted of 386 male and female psychology students from Jordanian universities. The results showed a statistically significant negative relationship between brain dominance patterns and the increase in academic achievement. Also, the results showed statistically significant difference at 0.05 due to the effect of gender in all brain dominance patterns that characterize psychology students in Jordanian universities, and the differences showed that females scored higher than males.

Keywords: brain dominance patterns, increased academic achievement, psychology students

INTRODUCTION & CONCEPTUAL FRAMEWORK

Brain dominance is one of the factors that play an important role in the educational process. Interest in the educational process is not limited to filling students' minds with information and facts, but rather it is more concerned with modern teaching methods and styles (Yagoob, 2012). Universities and higher education institutions are responsible for preparing advanced cadres in society. Higher education today is no longer just added years of formal education, but rather it is an education capable of developing a sustainable habit of high-level thinking among students. In the current century, interest in studying brain anatomy, thinking processes, and learning styles has become an important matter, so educators have realized that the educational programs adopted in teaching students in different stages and levels are capable of developing high-level mental abilities (Al-Mohammadi, 2017).

Also, neuroscientists and psychologists began to search for the characteristics and features of the human brain since the middle of the twentieth century. This is based on the acceleration of information in the field of brain research, where a new educational system has emerged at the end of the second millennium, which is called 'Brain-based learning'. This pattern is expected to make changes in the learning strategies. Educational environments, thinking patterns, beliefs, etc., hoping to prepare the learner to face the challenges of the progressive era (Frank, 2001). The brain is the center of thinking and emotions for students, as it represents the center of command and control that the student uses in solving problems and planning processes. Therefore, studying the human brain helps in collecting various knowledge and information that affects students' levels, increases their motivation and affects their academic achievement. The results of scientific and psychological studies showed that the base of the mind and its main axis is the brain (Perez & Guzman, 2013). Also, it is the focal point and main source of human behavior as it influences and is influenced by human knowledge as the basis of cognitive mental activity. The brain is divided into the left and right hemispheres covered by the cerebral cortex. Although the two hemispheres are completely integrated, the functional performance of each of them differs from the other. The two hemispheres of the brain are connected to each other from the inside by means of a large bundle of transverse white fibers that represent the deep groove that separates the two hemispheres of the brain without preventing the connection between them i.e. the rigid body (Rasheed, 2013).

Al-Makhzoumi (2001) added that brain dominance is defined as "the dominant part of the brain that plays an important role in the behavior of individuals to process tasks and knowing the dominant half of the brain helps in treating and educating individuals". Hasanin and Al-Shahat (2001) indicated that the increasing interest in studying the functions of the two hemispheres of the brain as a place for mental abilities, especially thinking abilities, and their relationship to the learning process and academic achievement helps educators and those in charge of the educational process in understanding the complexity of the learning process. Moreover, Al-Dosari (2002) mentioned that the studies conducted in this field revealed the existence of differences between the two hemispheres in a number of higher mental functions. The left hemisphere performs verbal, analytical and logical functions, while the right hemisphere specializes in perceiving and remembering patterns of sensory and visual responses and thinking patterns that lead to creativity, where functions related to intuition, emotion, conscience, creativity, art, and the use of imagination are concentrated. However, there are functions that one hemisphere performs better than the other half, and therefore the concept of dominance is used to express the division of work between the two hemispheres.

Several studies dealt with the issue of brain dominance. For example, (Hamish, 2010) has conducted a study aimed at identifying some patterns of mathematical thinking and their relationship to brain dominance among ninth grade students in Gaza City. The sample of the study consisted of 134 male and female students (72 males, 62 females) who were selected using cluster random sampling. To achieve the objectives of the study, the researcher used the brain dominance test and the mathematical thinking patterns test. The study found that there is no statistically significant correlation between the patterns of brain dominance (left and right) and the mathematical thinking patterns test. It also found that there is a statistically significant interaction in mathematical thinking patterns due to the gender variable and the two hemispheres of the brain.

In addition, (Balkard, 2017) has conducted a study aimed to determine the prevailing thinking pattern according to Herrmann brain dominance theory among first-year students in Mostaganem, and to detect differences in the degree for each thinking pattern according to the gender and major variables. The sample consisted of 417 male and female first-year secondary school students in Mostaganem. The results revealed that the thinking pattern (b) is dominant among the study sample, followed by the pattern (A). Also, there are statistically significant differences between males and females in the thinking pattern (C) and (D). There are also statistically significant differences between the students of the Science and Technology department and the students of the literature department in the thinking patterns (A) and (C).

Furthermore, the study of (Al-Ouda, 2017) aimed to identify the relationship between patterns of brain dominance and metacognitive thinking skills of excellent students in the middle school in Al-Baha region. The study found that the dominant pattern of brain dominance among excellent female students in the

middle school is the left pattern (72.4%), then the integrated pattern (19.2%), followed by the right pattern (8.4%). And there are no statistically significant differences in the patterns of brain dominance among the excellent students in the middle school in Al-Baha region according to the middle school level variable (i.e. first, second, third).

The study of (Shalloul, 2017) aimed to reveal the effect of patterns of brain dominance on the mental imagination among Yarmouk University students. The sample of the study consisted of 500 male and female students. The sample was selected by simple random sampling method from science and human science faculties. The study used two instruments, which are the mental imagination scale and the brain dominance scale. The results of the study showed that pattern (D) (the upper right quadrant area) came in the first level, while pattern (A) (the upper left quadrant area) came in the last level. The results also showed that there are statistically significant differences in mental imagination due to the pattern of brain dominance in all sub-skills, except for the skill of flexibility, and statistically significant differences due to the gender variable. Also, there are statistically significant differences due to the interaction between the pattern of brain dominance and gender in patterns (A) (upper left quadrant area) and (B) (lower left quadrant area) for males, and in patterns (D) (upper right quadrant area) and (C) (lower right quadrant area) for females.

The previous studies varied in terms of objective, methodology and analysis. However, the current study focuses on investigating the relationship between patterns of brain dominance and academic achievement among psychology students in Jordanian universities. The current study benefited from previous studies in defining the study problem and identifying the appropriate statistical analysis.

Problem Statement

By reviewing the previous literature regarding patterns of brain dominance, such as the study conducted by (Al-Rimawi, 2004), which dealt with the relationship between brain dominance and a number of variables, such as academic achievement, thinking, academic specialization, and many factors that affect the mental imagination of students. The researchers are the university lecturers who looked at the curricula and the shortcomings of the role of universities in developing the higher mental abilities of students and the lack of awareness among faculty members of the activities performed by the brain that affect students and their achievement, which prompted the researchers to study the patterns of brain dominance and its relationship to academic achievement. However, the current study attempts to identify the relationship between patterns of brain dominance and the increase in academic achievement among psychology students at Jordanian universities.

The study problem includes answering the following questions:

1. What are the patterns of brain dominance that dominate students in private and public universities in Jordan?
2. What are the levels of brain dominance patterns?
3. Are there any statistically significant differences ($\alpha \leq 0.05$) in each of the brain dominance patterns that dominate students in private and public schools in Jordan and academic achievement due to the gender variable?
4. What is the relationship between brain dominance patterns and academic achievement for psychology students in private and public universities in Jordan?

Objectives of the Study

The current study aimed to:

1. Identifying patterns of brain dominance among psychology students in private and public universities in Jordan.
2. Determining the relationship between brain dominance patterns and academic achievement among psychology students in universities.

Theoretical Significance

Highlighting the importance of brain dominance patterns and their impact on the students' academic progress and achievement.

- The results of this study are expected to contribute, at least partially, by adding scientific knowledge in this field to help researchers for future studies in this field.
- Clarifying the relationship between brain dominance patterns and academic achievement, and providing university authorities with the collected data to help them make appropriate decisions in accordance with the students' academic progress and their brain patterns.

Practical Significance

- Establishing counseling programs to explain the importance of identifying brain dominance patterns for psychology students in universities.
- It is expected that the results of the study will contribute to further studies on the relationship between these two variables using instruments other than those used in this study.

Operational Definitions

- Brain Dominance Patterns: defined literally by (Al-Hazimi, 2012) as the tendency of individuals to rely on one aspect of the brain in processing information, retrieving and remembering it, and developing experiences and knowledge. It is defined operationally as: a mental process that takes place inside the brain, meaning the student's response to each pattern of brain dominance in the current research.
- Achievement: The score obtained by the examinee after answering the scale of brain dominance patterns used in this study.
- Psychology students: They are students who study in private and public universities in Jordan, and their ages range between (18-22) years.

Study Limitations

- Time: The second semester of 2022-2023.
- Place: Private and public universities in Jordan.
- Subject: Identifying the relationship between brain dominance patterns and achievement.
- Human: Psychology students in private and public universities in Jordan.

METHODS AND PROCEDURES

The following is a description of the method and procedures used in this study by the researchers. It includes a description of the methodology, the study population and sample, the study instrument, methods for verifying its validity and reliability, the study variables, as well as the statistical techniques used to answer the study questions.

Study Methodology

The researchers used the descriptive analysis approach, which is commensurate with the nature of this study. Thus, approach includes analyzing the research data, using the questionnaire applied to psychology students in private and public universities in Jordan.

Study Population

The study population consists of all psychology students in private and public universities in Jordan.

The Study Sample

The researchers selected the study sample using the simple random sampling method from the study population, where the sample consists of 386 male and female students, and Table (1) shows the distribution of the sample members according to their variables.

TABLE 1
DESCRIPTIVE STATISTICS FOR GENDER

Gender	Frequency	Percentage %
Male	160	41.5
Female	226	58.5
Total	386	100

The Study Instrument

The study used a questionnaire on "The Relationship between Brain Dominance Patterns and Achievement among Psychology Students in Private and Public Universities in Jordan." Also, a scale of brain dominance patterns was used in this study and it consisted of 27 items. Three-point Likert scale was adopted in the study instruments, by giving a score for each item (high, medium, low), which are represented numerically as 1, 2, 3 in order. The following scale was adopted for the analysis of results:

From 1.00 to 1.66 = low
From 1.67 to 2.33 = medium
From 2.34 to 3.00 = high

and so on.

The scale was calculated using the following equation:

$$\frac{Upper\ limit\ (3) - Lower\ limit\ (1)}{Number\ of\ categories\ required\ (3)}$$

$$\frac{3-1}{3} = 0.66$$

Then add the answer (0.66) to the end of each dimension.

Construct validity: the scale of brain dominance patterns:

To get the construct validity indications of the scale, the correlation coefficients of the item with the total score of the dimension to which it belongs were extracted in a pilot study from outside the study sample consisting of 30 male and female students. The correlation coefficients of the item with the total score of the dimension to which it belongs ranged between (0.39 - 0.80). The following table (2) shows that.

TABLE 2
CORRELATION COEFFICIENTS BETWEEN THE ITEM AND THE TOTAL SCORE OF THE DIMENSION TO WHICH IT BELONGS

The right hemisphere		The left hemisphere		Full brain	
Item No	Correlation Coefficient	Item No	Correlation Coefficient	Item No	Correlation Coefficient
1	.72**	13	.54**	25	.43*
2	.42*	14	.80**	26	.63**
3	.63**	15	.59**	27	.66**
4	.42*	16	.59**	21	.54**
5	.63**	17	.61**	12	.53**
6	.43*	18	.42*	11	.65**
7	.73**	19	.71**	10	.54**
8	.70**	20	.79**	9	.63
9	.70**	24	.70**		
23	.64**	22	.39*		

*. Correlation is significant at the 0.05 level.
**. Correlation is significant at the 0.01 level.

It can be observed that all correlation coefficients were of acceptable levels and statistically significant, and therefore, none of these items were deleted.

TABLE 3
INTER-VARIABLE CORRELATIONS

				Brain Dominance Patterns Scale
Left Brain	1			
Right Brain	.608**	1		
Full brain	.597**	.611**	1	
Brain Dominance Patterns Scale	.808**	.824**	.667**	1

*. Correlation is significant at the 0.05 level.
**. Correlation is significant at the 0.01 level.

Table (3) shows that all correlation coefficients were of acceptable levels and statistically significant, indicating an appropriate degree of construct validity.

The reliability of the Brain Dominance Patterns Scale:

To ensure the reliability of the study instrument, the test-retest method was used by applying the scale, and re-applying it after two weeks on a group consisting of 30 male and female students, which is not part of the study sample. Then, the Pearson correlation coefficient was calculated between their estimates in the two times.

The reliability coefficient was also calculated using the internal consistency method according to the Cronbach alpha, and Table (4) shows the internal consistency coefficient according to the Cronbach alpha and the test re-test reliability of the dimensions. These values were considered appropriate for the purposes of this study.

TABLE 4
CRONBACH'S ALPHA INTERNAL CONSISTENCY COEFFICIENT AND TEST –RETEST RELIABILITY OF DIMENSIONS

Dimension	Test re-test reliability	Reliability of Internal consistency
Left Brain	0.82	0.71
Right Brain	0.80	0.79
Full Brain	0.83	0.80

The first question: What are the brain dominance patterns that dominate students in private and public universities in Jordan?

To answer this question, the means and standard deviations were calculated for brain dominance patterns that dominate students in private and public universities in Jordan, and the table below shows that.

TABLE 5
THE MEANS AND STANDARD DEVIATIONS OF THE BRAIN DOMINANCE PATTERNS THAT DOMINATE STUDENTS IN PRIVATE AND PUBLIC UNIVERSITIES IN JORDAN

Rank	Number	The area	Mean	Std. Deviation	Level
1	1	Left	2.47	.332	High
2	2	Right	2.31	.310	Medium
3	3	Full brain	2.24	.248	Medium

Table (5) shows that the means values ranged between (2.24-2.47), where the left hemisphere dimension came in the first place with the highest mean of (m=2.47), while the full brain dimension, which constitutes of the left and right hemispheres together, came in the last rank with a mean of (m=2.24).

The second question: What are the levels of brain dominance patterns?

To answer this question, the means and standard deviations were calculated for the levels of brain dominance patterns, and the table below shows that.

TABLE 6
THE MEANS AND STANDARD DEVIATIONS OF THE LEVELS OF BRAIN DOMINANCE PATTERNS

Rank	Number	The area	Mean	Std. Deviation	Level
1	1	Right	2.11	.260	Medium
2	2	Left	2.06	.280	Medium
3	3	Full brain (Right + Left)	1.98	.274	Medium
		The levels of brain dominance patterns for the full brain	2.05	.208	Medium

Table (6) shows that the means ranged between (1.98 - 2.11), where the right hemisphere dimension came in the first place with the highest mean of (m=2.11), while the full brain dimension (right + left) came in the last rank with a mean of (m=1.98). The mean of the levels of brain dominance patterns for the full brain was (m=2.05).

The third question: Are there any statistically significant differences (α≤0.05) in each of the brain dominance patterns that dominate students in private and public schools in Jordan and academic achievement due to the gender variable?

To answer this question, the means and standard deviations were calculated for each of the brain dominance patterns that dominate students in private and public universities in Jordan and achievement according to the gender variable, and to show the statistical differences between the means, the t-test was used, and the table below shows that.

TABLE 7
MEANS, STANDARD DEVIATIONS, AND THE T-TEST FOR THE EFFECT OF GENDER ON THE BRAIN DOMINANCE PATTERNS THAT DOMINATE STUDENTS IN PRIVATE AND PUBLIC UNIVERSITIES IN JORDAN AT THE LEVEL OF THE LEFT AND RIGHT DIMENSIONS

Brain Dominance Patterns	Functions	Gender		Mean	Std. Deviation	"T" Value	df	Sig.
The left dimension level	Verbal	Male	160	2.38	2.38	-4.099	384	.000
		Female	226	2.52	.328			
	Analytical	Male	160	2.25	.322	-3.259	384	.001
		Female	226	2.35	.321			
	Logical	Male	160	2.19	.296	-3.588	384	.000
		Female	226	2.28	.249			
	Rational thought	Male	160	2.11	.240	-3.022	384	.003
		Female	226	2.20	.273			
The right dimension level	Feeling	Male	160	2.05	.252	-3.857	384	.000
		Female	226	2.15	.243			
	Imagination	Male	160	1.99	.264	-4.233	384	.000
		Female	226	2.11	.272			
	Intuition	Male	160	1.93	.276	-3.070	384	.002
		Female	226	2.02	.250			
	Brain dominance patterns scale	Male	160	1.99	.285	-4.889	384	.000
		Female	226	2.09	.189			

Table (7) shows that there are statistically significant differences (α≤0.05) due to the effect of gender in all brain dominance patterns that dominate students in private and public universities in Jordan. The results showed that females have more patterns of brain dominance. This matches with the study of (Al-

Shehri, 2009), which showed that there are differences between the means of the hemisphere, where the females scored higher than males. It is clear from the table that there are statistically significant differences ($\alpha \leq 0.05$) due to the effect of gender in the level of brain dominance patterns in all domains, where the females scored higher than males.

The fourth question: What is the relationship between brain dominance patterns and academic achievement for psychology students in private and public universities in Jordan?

To answer this question, Pearson correlation coefficient was used between brain dominance patterns and achievement among psychology students in private and public universities in Jordan, and Table 1.8 illustrates this.

TABLE 8
PEARSON CORRELATION BETWEEN BRAIN DOMINANCE PATTERNS AND ACHIEVEMENT AMONG PSYCHOLOGY STUDENTS IN PRIVATE AND PUBLIC UNIVERSITIES IN JORDAN

	The right brain dimension	The left brain dimension	Full Brain	Brain Dominance Patterns Scale
Achievement	-.289**	-.189**	-.291**	-.335**
Significance	.000	.000	.000	.000
N	386	386	386	386

*. Correlation is significant at the 0.05 level.
**. Correlation is significant at the 0.01 level.

Table (8) shows that there is a statistically significant negative relationship between brain dominance patterns and achievement among psychology students in private and public universities in Jordan.

TABLE 9
THE MEANS AND STANDARD DEVIATION RELATED TO BRAIN DOMINANCE PATTERNS AMONG PSYCHOLOGY STUDENTS IN PRIVATE AND PUBLIC UNIVERSITIES IN JORDAN

Number	Item	Mean	Std. Deviation
1	My keenness on accuracy and facts may make me look strict by others.	2.38	.614
2	I willingly work with others for a common goal.	2.38	.682
3	I realize numbers and understand their meanings	2.38	.719
4	Attributing academic failure or decline tends to be a lack of effort	2.36	.719
5	I am trying to find a way to solve a specific problem	2.41	.709
6	I am cautious and careful and care about the consequences a lot	2.45	.640
7	The most beautiful moments are the fun times I spend with others.	2.43	.604
8	I am passionate about goals and dedicate my time and effort to them	2.50	.600

Number	Item	Mean	Std. Deviation
9	I can determine the cause of the problem when it occurs, analyze it, and then find the appropriate solution.	2.47	.612
10	It is difficult for me to be patient with the mess, I rather arrange and organize all private and public matters and things	2.58	.599
11	I have the ability to develop, maintain, and communicate with others.	2.58	.599
12	I have to spend the money and it is difficult for me to save it	2.66	.537
13	I hate routine and always love change.	2.35	.625
14	I keep my items and belongings in an organized and tidy manner.	2.34	.669
15	I find that some people say of me, “You’re impulsive and unpredictable.”	2.35	.656
16	I prepare myself clearly towards my goal	2.33	.737
17	I do it step by step in my work.	2.32	.659
18	I consider my good relationships with others are my dearest possession.	2.30	.658
19	I tend to act more than my tendency to think, meditate and theorize	2.32	.724
20	I am ready to serve and offer myself to others whenever they need	2.29	.672
21	I find myself thinking and deducing far from emotion and feelings.	2.28	.721
22	I find that others depend on me and trust in my achievement	2.29	.687
23	I like to talk to others about my feelings and stories	2.28	.774
24	I have a high ability to explain events and deduce their logical effects.	2.27	.654
25	I have the ability to continue working until it is done.	2.27	.749
26	I am good at spreading enthusiasm in other people	2.27	.638
27	I find that good ideas come to me a lot	2.26	.673

It is found that item No. 12 “I have to spend the money and it is difficult for me to save it” has got the highest mean of 2.66, while item No. 27 “I find that good ideas come to me a lot” has got the lowest value, with a mean of 2.26. It is clear from this that the patterns of brain dominance vary between students and also vary according to gender. The study of (Al-Atoum, 2006) aimed to identify the relationship between brain dominance patterns, and the student’s academic specialization, the economic status of the family and the place of residence. It showed the dominance and prevalence of the right pattern among the study sample, followed by the left pattern, and then the full-brain pattern, respectively. Also, the study has recommended the need to activate the functions of the right side of the brain and the importance of the brain dominance patterns among university students. The current study agreed with the importance of activating brain

dominance patterns for university students, as it has a significant impact on students' achievement, cognitive and academic growth, being a sensitive period of age that has a great impact on society and the family.

Study Procedures

To achieve the objectives of the study, the following actions were done:

- The researchers have identified the population and the sample members of the study.
- The researchers designed the study instrument (brain dominance patterns scale) and verified its validity and reliability.
- The researchers have applied the study instrument to the sample.
- The researchers have keyed in the data collected from the sample into the computer's memory, and statistical analyses were performed using the appropriate statistical program (SPSS).

Statistical Techniques

The researchers used the following:

1. Means and standard deviations.
2. Three-way ANOVA.
3. Scheffé test to make unplanned comparisons.

RECOMMENDATIONS

- Integrate topics of brain dominance patterns into the school curricula.
- Training psychology students in Jordanian universities on how to activate their roles in the importance of brain dominance patterns.
- Integrate the concepts of brain dominance patterns in teacher preparation programs.
- Preparing educational programs for students and teachers in the field of safe use of the importance of brain dominance patterns.

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