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THE DEVELOPMENT OF THE BRAIN DOMINANCE PATTERNS FOR TEENAGERS AND ADULTS

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Abstract

This study aims to show:

- 1 .Brain dominance patterns (A, B, C, D) are among adolescents and adults according to age (22,20,18,16,14) years.
- 2 .The significance of statistical differences in the patterns of brain dominance are (A, B, C, D) among adolescents and adults according to age (22,20,18,16,14) years and gender (male-female).

The research sample consisted of (300) individuals male and female adults who are about 60 for each of the ages included in the research chosen randomly. To achieve the goal of the research, a scale (Herman) of brain dominance patterns was applied which was translated before by Al-Me'mar (2017). The scale consists of 56 items classified into the four types. After processing the data statistically, the following results were reached- :

- 1 .Teenagers who are (14) years old suffer from a weakness in the use of patterns (A, B, D), while type (C) was overwhelming their thinking significantly.
- 2 .Teenagers who are (16) years old suffer from a weakness in the use of patterns (A, D), while the two patterns (B, C) were overwhelming their thinking greatly.
- 3 .Teenagers and adults who are (22, 20, and 18) use the four brain patterns in their thinking.
- 4 .The use of brain dominance patterns (A, B, C, D) in thinking processes changes with age.
- 5 .The development of the four patterns of brain dominance is not affected by the gender variable (males, females) at ages (22,20,18,16,14) years.

First: the research problem

Neglecting the use of the activities of the human brain causes many shortcomings in the results of science, which are not possession of information, but knowledge of how to work on it and use it. They are intelligent thinking behavioral patterns that lead the learner to produce knowledge as a result of responding to certain types of skills, values and trends rather than remembering them. Only, and not taking into account the

patterns of brain dominance in learning negatively affects the students' tendencies, habits, attitudes and steadfast will, and it turns out that most of those concerned with learning admit that most educational institutions do not take into account the patterns of brain dominance (Souise, 2006)

The mental brain patterns are practiced by the individual in most of his behaviors, although not all of them are due to education and socialization provided by many bodies such as the family, the school, and the community (Al-Jourani, 2010).

The problem of the current research is reflected in the lack of knowledge of the development of patterns of brain dominance in teenagers and adults, and more specifically that the research problem is a scientific attempt to answer the following questions:

- 1- Do teenagers and adults possess the four types of brain dominance?
- 2- Do brain dominance patterns develop in adolescents and adults?
- 3- Are there differences between females and males in the development of patterns of brain dominance?

Research importance

There is no doubt that the activities of the human brain of the individual have a role in shaping the style of thinking and building a strong will, as it enables forming personality, and directly affects how information is prepared and processed within the human mind (Hammouda, 2015).

The topic of the control of one of the two hemispheres, or what is known as (half-brained sovereignty) was examined by researchers in an attempt to understand the thinking methods that individuals use in their treatment of the knowledge and skills they learn, as the nineties witnessed a tremendous cognitive explosion in brain research as this decade was called the brain node (Felde, 2002).

Hence, Ned Herrmann presented a concept for understanding brain functions called the quadruple brain model, which provides an explanation of thinking patterns associated with both the upper and lower hemispheres of the brain (Nofal and Abu Awwad 2011).

In addition, brain research and the half-mastery of the brain obtained financial support and attention was drawn to it through the publication of its topics in many journals and became the focus of many conferences and various media circulated. The most important findings of scientists in this field and the number of those interested in studying brain research and trying to apply it increased in the educational field (Al-Sulaiti, 2009).

Studies conducted in this field revealed that there are differences between the two spherical hemispheres in several higher mental functions. The left spherical hemisphere performs verbal, analytical and logical functions, while the right spherical hemisphere specializes in perceiving and remembering patterns of responses and thinking patterns that lead the individual to creativity and which focus on the associated functions with knowledge, emotion and motives (Al-Dossary, 2002).

Linda Farley Williams (1988) states that each of the two hemispheres of the brain has a way of looking at the world and responding to it, but in practice the two hemispheres of the brain are not separate, but rather that one of them complements the other. This integration gives the mind strength and flexibility (Kattami and Masha'leh, 2007).

The experiments indicated that the two hemispheres of the brain have full responsibility in determining thought patterns, and that most students have a distinct brain mastery of one type, while others are skilled in more than one pattern according to the quadrupole division of Herman's brain mastery, symbolized by Herrmann Brain Dominance Instrument (HBDI) (Mecarthy, 2001). Hermann was considered the first person who promoted creativity and looked at it as an integrated combination of analytical, verbal, intuitive and emotional thinking. He linked creativity learning to the overall functions of the brain. In his study (1981), individuals who excelled in creativity accounted for about 5%, reached similar levels in different thinking patterns. (Qatami and Masha'leh, 2007).

Another study by Herrmann (2002) indicated that students who learn through methods compatible with the prevailing brain dominance pattern achieve high results in the learning process (Herrmann, 2002). Herrman (2002) believes that people with similar brains communicate well with each other, and thus Herrman's model describes these strategies that help us to overcome miscommunication and disagreement (Abu Rayyash, 2007).

It is imperative for educational and psychological researchers to realize that there are four segments of students present in all academic levels, and each segment represents a special pattern of brain dominance (A B C D) patterns for the left and right hemispheres of the brain. The learning method for students with type A tends to learn through analysis. For facts and data, while students with type (B) learn in an organized and accurate manner, students with type (C) tend to learn through the sensory intuition they possess, while students with type (D) learn through imagination, exploration and creative thinking (Kazem (2011). In addition, the study also addressed an important age stage in society, which is the sample of teenagers and adults, as the former is the stage of progress towards social maturity, assuming responsibilities, social normalization, acquiring behavioral and social standards, social independence, and forming social relationships, and taking decisions regarding education, profession and marriage, and taking responsibility for self-direction. This is by introducing the teenager to the abilities and potentials and enabling him to think and adopt a philosophy in life, E and Planning for the Future (Zahran, 1985).

Piaget stresses that the teenage period is also a period of maturity in the growth of thinking. At this stage, the teenagers become able to organize facts and events through the use of complex processes of symbolic and abstract thinking, and there are also strong developments in the patterns of relationships with others, so the desire to mix and belong to peer groups reaches its peak (Ibrahim, 1985).

The teenage years are also of great importance for the mental, cognitive and psychological development of the teenagers, because in this period the person's ability to acquire and use knowledge reaches the peak of competence and if there is no noticeable progress in mental ability during these formative years, it would have been unlikely that this would happen in Later time. However, this does not at all mean that many people do not continue to develop their mental faculties into adulthood. This is

especially true of people who are in good health and lead an exciting and active mental and psychological life (Masen et al. 1986).

Hence, the importance of choosing the intermediate, preparatory and university stages in which teenagers and adults are present. This is because the sample for the current study is an important and vital stage of study by virtue of its position on the educational ladder and its responsibility to prepare human frameworks for young people to support them in the labor market. It also develops their different thinking styles and provide them with intellectual skills, in addition to confirming the use of these skills and attitudes in exploring areas of knowledge and facing various life problems (Aziz, 2006).

Thus, the importance of this research appears in the following points:

- 1 .There is no scientific research study, whether it was a foreign, Arab, or previous Iraqi, to the best of the researchers' knowledge, that dealt with the development of patterns of brain dominance among adolescents and adults.
- 2 .Taking into account the patterns of brain dominance among teenagers and adults is reflected in the performance, good thinking, and school and academic achievement.
- 3 .Shedding light on the stages of teenagers and adulthood, which are among the most important stages of a person's life.

The aim of the study

This research aims to show:

- 1 .Brain dominance patterns (A, B, C, D) among teenagers and adults according to age.(14,16,18,20,22)
- 2 .The statistical significance differences in cerebral dominance patterns (A, B, C, D) among teenagers and adult students according to age (14,16,18,20,22) and gender (male-female).

Study limits

This research is limited to middle and middle school students and university students in Wasit Governorate for morning study and for ages (14- 16-18-20-22) years (2019-2018) for the academic year.

Definitions of terminology

1 - Development

Code

Good (1959) defines development as the change in the structure, function, or organization that makes progress in size, differentiation, complexity, integration, ability, sufficiency, or degree of maturity (Good, 1959:). According to Kattami et al (1990), it is the structural, functional, and behavioral changes associated with chronological age, and these changes may be in the form of improvement or progress, as is the transition from childhood to teenage. It could also take the form of regression or deterioration as is the transition from adulthood to old age (Kattami et al., 1990).

Changes in the scores of teenagers and adults on the scale of brain dominance patterns according to age.

2 -Brain Dominance

Sperry (1993) defines brain dominance as the way the human brain deals with the "right or left hemisphere" while processing information in terms of receiving, storing and retrieving it.

Herrmann (1996) states that it is the predominant part of the brain for the thinking process and which dominates one or more directions in the growth of the individual's thinking according to the patterns of brain dominance referred to by Ned Herman as follows:

Type A: The degree of an individual's preference for activities that require information based on facts, logic, and analysis.

Type (B): It is the degree of an individual's preference for well-planned, sequenced, and regular activities and detailed information.

Type (C): It is the individual's preference for activities based on emotions, passions and feelings.

Type (D): It is the individual's preference for thinking activities that are based on concepts and a holistic view (Herrmann, 1996).

Theoretical definition of brain dominance:

The two researchers adopted Herrmann's (1996) definition of cerebral sovereignty as a theoretical definition of brain control due to the adoption of his scale in this research.

The procedural definition of cerebral control: It is represented by the total score obtained by the respondent (student) through responding to the paragraphs of Herman's brain dominance scale for each of its four patterns (A, B, C, D), which the researcher has adopted in the research.

3 -The teenager

Erikson (1950) argues that teenage extends from the age of 12 to 18 years, during which the individual develops a clear sense of self and adapts to the changes of the body. It also creates new relationships that are more mature with friends of the same age. It also includes achieving emotional independence from parents, and he turns to form a stable family life.

4 -The adult

Guindon (1982) indicates that adulthood is the stage that extends from the age of 18 years to 23 years. Adults in this stage are characterized by independence and commitment to various activities in life, determining the professional identity of the future, and mental and social maturity (Guindon, 1982).

The theoretical background includes the theoretical aspects that explained the patterns of brain dominance.

The brain dominance

1 .The concept of brain dominance

The concept of control of one hemisphere of the brain goes back to the neuroscientist, John Jackson, with his idea of the leading side of the brain. This concept is the origin from which the concept of cerebral control is derived (Springer & Deutsch, 2003).

As Jackson states that "the two hemispheres of the brain cannot be a mere repetition of each other". He shows that the damage that occurs to one of the two hemispheres of the brain, the individual loses the ability to speak, which is the highest function in humans, so it must be that one of the two hemispheres of the brain that carries out the highest of these functions.

Thus, this side is the leading side, and this is confirmed by Hugdiefman, a neuroscientist, who referred to the dominance of the left hemisphere in most individuals. The concept of cerebral control appeared refer to the distinction of one of the spherical hemispheres of the brain in controlling the behavior of the individual and in the process of education and thinking, or the tendency of the individual to depend on one hemisphere of the brain more than the other half (Nofal, 2009).

The main foundations for the evolution of brain dominance patterns:

- 1 .Patterns reflect our choices and preferences, not our capabilities. People may be able to practice any pattern, but in their choices and preferences, they may belong to one style or act according to another pattern.
- 2 .That life and its events do not oblige us to act according to a specific pattern, nor does it determine the preferred and non-preferred pattern for us. Life requires consistency between patterns, interaction between them, and complementarity.
3. Our experience tends to develop our capabilities for one direction and weakens in another.
4. Individuals producing a single style differ in the intensity of their preference for the executive tasks of that style.
5. Patterns do not only reflect inherited natures and characteristics, but they are also learned social behaviors, meaning that they grow and change and may strengthen and weaken.
- 6 .Patterns may change over time, as an individual may move from one type to another
- 7 .Patterns have a degree of stability to the extent that we can divide them so that a person obtains a limited degree within the pattern.
- 8 .Patterns are not described as positive or negative. There is no good or bad pattern at all.
- 9 .Patterns reflect our preferences, so we learn everything that suits our preferences easily and easily, and it is difficult for us to learn what is contrary to that (Abidat and Suhaila, 2005).

2 .Theories explaining the concept of brain dominance:

A. Creativity & Bisected Brain Classification Theory

The two scientists (Joseph E. Bogen & Glenda M. Bogen) believe that creativity depends on building nerve connections in the brain, which are connected to each other by the so-called rigid body. The two hemispheres cooperate. These scholars emphasized that the intuitive capabilities of the right hemisphere, as for the linguistic abilities or the linguistic creativity of the left hemisphere. Bojin and Bogen indicate that the discoveries of the two fields that appear to be independent, but coherent, crystallize an intellectual and mental complexity that stresses the duality of the brain. In the complete safety of the two halves, there is a complete mind here and supported by a strong, integrated and distinct personality. Thus, the individual who is characterized by a healthy brain with two halves has a distinct mental capacity. Therefore, it is necessary to maintain the integrity of the brain (Al-Suroor, 2002).

B. Thinking Styles Theory by Torrance

Torrance state that there a the tendency of a person to rely more on the functions of one hemisphere of the brain than the other in processing information. Torrance also pointes out that there are three modes of thinking: the left, the right, and the integrated. (Al-Taraihi, 1998: 15).

Torrance believes that the functions of the two hemispheres of the brain are represented in the following mental and psychological characteristics:

- Mental and psychological characteristics of left hemisphere users

These individuals are characterized as being good at remembering names, their response to verbal instructions is better than kinesthetic and visual, good at controlling their emotions and feelings, regular in experimentation, research and writing activities. They also prefer to deal with one problem or one variable at the same time. However, they are not good at doing humorous things and they prefer Verbal and auditory stimuli, their style is serious in solving problems. They are objective in making judgments, prefer to present stimuli in an organized manner according to a specific plan, prefer problems or simple problems, prefer clear information that has been proven correct, and they prefer to solve problems experimentally (Anakara, 1998).

- Mental and psychological characteristics of right-hemisphere users:

These individuals are characterized by being good at remembering faces. They respond to motor and visual instructions better than verbal, they tend to express their feelings and emotions openly and deal with a number of problems at the same time, prefer open-end tests (essay). They are also good at interpreting sign language. In addition, they are subjective when making judgments and good at doing humorous things having a creative mind, are automatic in their behavior. They always tend to innovate and prefer complex problems, their response to emotional situations is more than logical dealing with unspecified information, prefer creative reading. They enjoy using symbols and problem solving relying on imaginations to remember and think, love to draw, prefer research that includes multiple variables.

- Mental and psychological characteristics of users of the integrated (right-left) hemisphere These individuals remember names and faces with the same quality, rarely express their emotions and feelings. They have no difference in dealing with one problem at a time or dealing with a number of problems at the same time and are equal to their ability to use sign language and their ability to verbal expression They are equal in their objectivity and subjectivity in making judgments; their preference for simple and complex problems, their preference for clear and ambiguous information is the same, and their preference for research that includes one variable and that includes multiple variables (Al-Qaisi, 1990).

C. Whole Brain Theory Four quadrant model by Need Herрман

Hermann's theory divides the human brain into four parts, and each part is concerned with certain mental functions, and that these four regions work together to form (the total brain) and one or more regions that are dominant or dominant. Hermann names each of the four regions with certain letters and gave it a special color. Left to right as follows:

- The upper left section (A) which performs the functions of analysis, facts, data, numbers, focus, rational, mathematical, investigative, problem

solving, and firm. This section is called the logical method and it is concerned with building a knowledge base and the ability to integrate and understand cognitive processes (Mahmoud, 2006: 207).

The upper right section (D) that performs the functions of strategic thinking, creative thinking, the comprehensive view, exploratory perceptions, multiple options, and intuitive experiences. In this section, we find the following qualities impulsive, breaks rules and regulations, loves exploration, does not like routine, and does not adhere to the system And an open and spontaneous mindset, and it connects ideas and perceptions (Al-Eid, 2007).

The lower left section (B) is the executive section that performs the functions of planning and implementation, procedures, details, formulation, arrangement, methods and methods, order, time management, safety and security discipline, and preventive measures (Herrmann, 2010).

The lower right section (C) is a social aspect in nature and performs the functions of feelings and emotions, relations with others, feelings, emotions, dealing with others, human meanings, nurturing interest in parents, sensory intuition and is fluent in educational work, expression, writing, relaxes and observes signs, and convinces others He reconciles people and is concerned with values (Al-Tikriti, 2002).

Herrmann explains that every person is overwhelmed by thinking about one of the previous four sections, some of whom we find inclined to analysis, numbers and money. Some of them to creativity, composition and strategies, and some to discipline, implementation, accuracy and respect for time, and some of them to human meanings, relationships and feelings (Herrmann, 1998).

Research methodology and procedures

The researchers used the ross - SCctioral developmental studies approach, which aims to track the developmental manifestations of a group of people of different age groups in a cross-section of time in a continuum of life (1974: 33, Krech et al.).

2 .Research population: The research community includes middle schools affiliated with the General Directorate of Education in Wasit Governorate, represented by middle school students for grades (fourth, fifth, and sixth), and students of Wasit University colleges for years (second, fourth).

3 .The research sample: The researchers used the stratified random method and the equal distribution method. 180 male and female middle school students were selected and (120) male and female students from the colleges of Wasit University represent the basic research sample.

4 .Research tool: patterns of brain dominance

The researchers adopted the scale of patterns of brain dominance (by Herman), which was translated by Al-Mimar (2017) and consists of 56 items distributed into the four types (A, B, C, D) knowing that there is no right or wrong answer, but the alternative that is chosen reflects the type of brain mastery that the individual prefers.

Discriminatory strength of scale items:

The scale was applied to the sample of statistical analysis of (400) male and female students. After arranging the grades in descending order, and

determining the upper and lower end groups at a rate of 27%, it emerged that each group contains (108) forms. Following the application of the second test for two independent samples, the significance of the differences between the two extreme groups It appeared that (44) items were distinct because the other calculated values are greater than the tabular value of (1.96) at a degree of freedom (214). Also (12) items were unmarked at the level of significance (0.05) because the second computed value is smaller than the tabular value of (1.96) at a degree of freedom (214)

The correlation of the items with the total score of the scale (the reliability of the items): The researchers used the Pearson correlation coefficient to calculate the relationship between the score of each item and the total score of the subjects It appears that all the scale items are a statistical function at a significance level (0.05) because the values of the correlation coefficient are greater than the tabular value of the adult correlation coefficient (0.098) at a level of significance (0.05) and a degree of freedom.(214)

Validity of the scale

1 .Apparent honesty: This type of honesty was achieved in the current research when the items of the scale of brain dominance were presented to 8 of the arbitrators specialized in educational and psychological sciences, measurement and evaluation to judge the validity of the scale paragraphs.

2 .**Validity of construction:** The two researchers verified this type of validity by extracting the discriminatory items for the paragraphs and extracting the coefficient of correlation of the items of score with the total score of the scale.

Stability scale of brain dominance patterns

The two researchers extracted the stability of the scale in two ways:

A- Method of testing and retesting

The researchers applied the scale on a sample of (40) male and female students, then re-applied it again to the same sample after two weeks, and the stability coefficients of the four patterns (A, B, C, D) in this way reached (0.76) and (0.74).), (0.78) and (0.73), respectively. This shows good stability coefficients according to the criteria referred to by Nanli.

B - Fakronbach method

This method is also called the method of internal consistency, and the Qackronbach equation provides us with a good estimate of stability in most situations. It depends on the stability of the individual's performance on the test positions. Upon applying this equation, the stability coefficients of the four patterns (A, B, C, D) were (0, 78), (0,76), (0,80) and (0,75) respectively which are good stability coefficients.

The final application sample

After completing the research procedures, the Brain Dominance Patterns Scale was applied in its final form, consisting of (44) items. The final sample was 300 individuals by 60 for each age.

Statistical means: The two researchers used the appropriate statistical methods for the research and by using SPSS as follows: (T-test for one sample, T-test for two independent samples, Bach's alpha-Cron equation, binary variance analysis, and Scheffet test).

Results and their interpretation

The following is a review of the results of the current research according to its objectives, and their interpretation in light of the theoretical framework and as follows:

The first objective: In order to achieve the first objective of the research, the two researchers applied the scale on the current research sample of 300 male and female students distributed over ages (14,16,18,20,22) years. The arithmetic means and the standard deviations of those ages were calculated. To this end, the researcher used Fluorescence test for one sample and the tables illustrate this:

Table (1)

Type for age	Arithmetic means	Standard deviations	Theoretical mean	Calculated T Value	Tabular T Value	Freedom Degree	Statistical function 0,05
14							
A	5.2500	2.16775	5,5	0.893	2.021	59	Not significant
B	5.1667	1.75795		1,469			Not significant
C	6.6667	1.23050		7.344			Significant
D	5.2667	1.54992		1.166			Not significant

Table (2)

Type for age	Arithmetic means	Standard deviations	Theoretical mean	Calculated T Value	Tabular T Value	Freedom Degree	Statistical function 0,05
16							
A	5.1667	2.72569	5,5	0947	2.021	59	Not significant
B	6.7667	1.35755		7.227			significant
C	6.8667	1.40781		7.520			significant
D	5.4333	2.74552		0.188			Not significant

Table (3)

Type for age	Arithmetic means	Standard deviations	Theoretical mean	Calculated T Value	Tabular T Value	Freedom Degree	Statistical function 0,05
18							
A	7.7000	1.98554	5,5	8.583	2.021	59	significant
B	7.3000	2.44464		5.703			significant
C	7.0667	2.60291		4.662			significant

D	7.5333	2.25093		6.997			significant
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Table (4)

Type for age 20	Arithmetic means	Standard deviations	Theoretical mean	Calculated T Value	Tabular T Value	Freedom Degree	Statistical function 0,05
A	7.5500	2.26562	5,5	7.009	2.021	59	Significant
B	7.8500	2.32032		7.845			Significant
C	7.1333	2.53428		4.992			Significant
D	6.8000	2.74819		3.664			Significant

Table (5)

Type for age 22	Arithmetic means	Standard deviations	Theoretical mean	Calculated T Value	Tabular T Value	Freedom Degree	Statistical function 0,05
A	8.2167	2.45703	5,5	8.564	2.021	59	Significant
B	8.4667	2.32501		9.884			Significant
C	7.9000	2.75373		6.751			Significant
D	8.5167	2.45289		9.52			Significant

These tables show that the brain patterns (A, B, D) are not significant at the age of (14) years, while the pattern (C) was statistically significant. As for age (16), the two types of dominance (A, D) are not statistically significant. However, the typical (B, C) is statistically significant. For ages (18, 20, 22), the four brain dominance patterns were statistically significant.

The researchers explain this result according to Herman's neurobiological evolutionary theory, which sees that everyone is overwhelmed by thinking in one of the four brain patterns. This does not mean that the rest of the patterns are not used at ages (14 and 16), as the individual uses the rest of the patterns but in less proportions, while the the four brain patterns are more preferred and used at ages (18,20,22) years.

The second objective: To achieve the second objective of the research, the researchers used the bilateral contrast analysis, and the results were as shown in the tables.(13-6)

1- Type A

Table (6)

Variations	Sum of squares	Freedom degree	Average of squares	F Value		Statistical significance
				Calculated	Tabular	

Age	506.820	4	126.705	23.155	2,3719	Significant
Social category	8.003	1	8.003	1.463	3,8415	Not significant
Social category and age	12.313	4	3.078	.563	2,3719	Not significant
Error	1586.900	290	5.472			
Total	15891.000	299				

A . Significant differences in the pattern of brain dominance (A) depending on age

It is evident from table (6) that the FF value calculated according to the age variable (23,155) is greater than the tabular F value of 2,371, and this result indicates the existence of statistically significant differences in the pattern of dominance (A) according to the age variable. In order to discover the sources of these differences between the mean scores of the sample members according to the age variable, the two researchers applied the Scheffe test for multiple dimensional comparisons, and Table (7) illustrates this.

Table (7)

Age	14	16	18	20	22
14		0.0833	-2.4500-*	-2.3000-*	-2.9667-*
16			-2.5333-*	-2.3833-*	-3.0500-*
18				0.1500	-0.5167
20					-.06667
22					

It is evident from Table (7) that there are statistically significant differences in the pattern of cerebral dominance (A) according to the age variable between ages (14,16) and ages (22,20,18) and in favor of older ages.

B- Significance of differences in the pattern of brain dominance (A) according to gender

It is clear from Table (8) that the F value calculated according to the gender variable (1.46) is smaller than the Tabular F Value value (3.84). This means that there are no statistically significant differences according to gender.

2- Type B

Table (8)

Source of variation	Sum of Square	Freedom Degree	Square means	F Value		Statistical significant
				Calculated	Tabular	
Age	379.120	4	94.780	21.599	2,3719	Significant
Social category	5.070	1	5.070	1.155	3,8415	Not significant
Social category and age	2.613	4	.653	.149	2,3719	Not significant

Error	1272.567	290	4.388			
Total	16825.000	299				

A . Significance of differences in the pattern of brain dominance (B) according to age

It is evident from table (8) that the F value calculated according to the age variable (21,599) is greater than the tabular F value of (2,371). This result indicates the existence of statistically significant differences in the pattern of dominance (B) according to the age variable. In order to discover the sources of these differences between the mean scores of the sample members according to the age variable, the researchers applied the Scheffe test for multiple dimensional comparisons, and Table (9) illustrates this.

Table (9)

Age	14	16	18	20	22
14		-1.6000*	-2.1333*	-2.6833*	-3.3000*
16			-.5333	-1.0833	-1.7000*
18				-.5500	-1.1667
20					-.6167
22					

It is evident from Table (9) that there are statistically significant differences in the pattern of cerebral dominance (B) according to the age variable between age (14), ages (16,22,20,18), age (16) and age (22) and in favor of older ages.

B- Significance of differences in the pattern of brain dominance (B) according to gender.

It is evident from Table (10) that the calculated F value according to the gender variable (1,155) is smaller than the Tabular F value (3,84), which means that there are no statistically significant differences according to gender.

3-Type C

Table (10)

Source of variation	Sum of squares	Degree of freedom	Square mean	F value		Statistical Significant
				Calculated	Tabular	
age	128.453	4	32.113	7.429	2,3719	Significant
Social category	0.120	1	.120	0.028	3,8415	Not Significant
Age and social category	15.147	4	3.787	0.876	2,3719	Not Significant
Error	1253.667	290	4.323			
Total	17944.000	299				

A . Significance of differences in the pattern of cerebral dominance (C) depending on the age variable

It is evident from table (10) that the F value calculated according to the age variable (7,429) is greater than the tabular F value of (2,371). This result indicates the existence of statistically significant differences in the pattern of dominance (C) according to the age variable. To discover the sources of these variations between the mean scores of the sample members according to the age variable, the two researchers applied the Scheffe test for multiple dimensional comparisons, and Table (11) illustrates this.

Table (11)

Age	14	16	18	20	22
14		-0.2000	-0.7000	-1.0667	-1.8333 [*]
16			-0.5000	-0.8667	-1.6333 [*]
18				-0.3667	-1.1333
20					-0.7667
22					

Table (11) shows that there are statistically significant 4- النمط differences in the pattern of brain dominance (C) according to the age variable between ages (14,16) and age (22) and in favor of older age.

B- Significance of differences in the pattern of brain dominance (C) according to gender

Table (12) reveals the F value calculated according to the type variable (0.082). This variable is smaller than the Tabular F (3.84). This means that there are no statistically significant differences according to variable D.

Table (12)

Source of variation	Sum of squares	Degree of freedom	Means of squares	F value		Statistical Significant
				Calculated	Tabular	
Age	459.787	4	114.947	20.067	2,3719	Significant
Social Category	13.230	1	13.230	2.310	3,8415	Not Significant
Age and social category	11.587	4	2.897	.506	2,3719	Not Significant
Error	1661.167	290	5.728			
Total	15653.000	299				

A . Significance of differences in the pattern of brain dominance (D) according to age

Table (12) shows that the F value calculated according to the age variable (20,67) is greater than the tabular F value of (2,371). This result entails that the existence of statistically significant differences in the pattern of dominance (D) according to the age variable. The researchers applied the Scheffe test for multiple dimensional comparisons to discover the variation sources between the mean scores of the sample members according to the age variable and Table (13) illustrates this.

Table (13)

Age	14	16	18	20	22
14		-0.1667	-2.2667 [*]	-1.5333 [*]	-3.2500 [*]
16			-2.1000 [*]	-1.3667 [*]	-3.0833 [*]
18				0.7333	-0.9833
20					-1.7167 [*]
22					

In table (13), there are statistically significant differences in the pattern of brain dominance (D) according to the age variable between ages (14,16) and ages (22,20,18), and age (20) with age (22) in favor of older age.

B- Significance of differences in the pattern of brain dominance (D) according to gender.

Table (12) reveals that the F value calculated according to the type variable (2,310) is smaller than the Tabular F Value (3,84). Thus, no statistically significant differences according to the type variable exist.

The researchers interpret these results according to theoretical grounds into patterns of brain dominance (A, B, C, D). The results do not only reflect the inherited natures and characteristics, but are also acquired social behaviors, which means that they grow and may change over time. The individual may move from one type to another. In addition, it also has a degree of stability in the age at which it is formed.

In terms of gender. These results show that the brain patterns of dominance (A, B, C, and D) in both males and females develop similarly, i.e. grow at the same age stage for both males and females.

Recommendations

The researchers recommend the following:

- 1 .Encouraging females and males to engage in activities that require the use of the four brain patterns in order to develop the functions of using the brain patterns and the characteristics of each pattern.
- 2 .Designing training courses for faculty members in schools and educational counselors focusing on how to deal with brain activities and link them with learning activities.

Suggestions

The study suggests the following:

- 1 . Conducting a development study on larger samples and comparing its results with the results of the current study.
2. Conducting a study on samples smaller than the age of the current sample.

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