

Lateral Thinking According to Brain Dominance Patterns and its Relationship to the Accuracy of Complex Skill Performance Among Football Students

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ABSTRACT

This study aimed to examine the relationship between brain dominance tendencies and an individual's creative thinking ability, as well as its impact on high level performance in football. The participants consisted of 59 third year students from the College of Physical Education and Sports Sciences at the University of Samarra. A descriptive research design with a correlational approach was employed. All participants were assessed using the Torrance Brain Dominance Scale to classify them into three categories: right-brain dominant (22 students), left-brain dominant (19 students), and integrated (both right and left-brain dominant)(18 students). Lateral thinking ability was measured using the Lateral Thinking Scale developed by Al-Qazwini. In addition, four performance tests previously developed and standardized for the same sample were used to assess skill performance. The results revealed a statistically significant negative (inverse) correlation between lateral thinking ability and final skill performance across all brain dominance patterns. The integrated group demonstrated the best performance, with a mean lateral thinking score of 16.4 and an average performance time of 59.8 seconds. This group also showed the strongest negative correlation coefficient ($r = -0.63$; $p = 0.006$). In contrast, the left-brain dominant group exhibited the weakest correlation ($r = -0.38$). Based on these findings, it can be concluded that integrated brain dominance enhances an individual's ability to process complex skills. This advantage is reflected in faster response times, greater accuracy, and improved execution of innovative actions under test conditions, resulting from the effective integration of both left and right brain functions.

Keywords: Brain Dominance; Lateral Thinking; Complex Skill Performance; Football; Cognitive Function

ABSTRAK

Penelitian ini bertujuan untuk mengkaji hubungan antara kecenderungan dominasi otak dengan kemampuan berpikir kreatif, serta dampaknya terhadap performa tingkat tinggi dalam permainan sepak bola. Subjek penelitian terdiri dari 59 mahasiswa tingkat III pada

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College of Physical Education and Sports Sciences, University of Samarra. Penelitian ini menggunakan desain deskriptif dengan pendekatan korelasional. Seluruh subjek dievaluasi menggunakan Torrance Brain Dominance Scale untuk mengklasifikasikan mereka ke dalam tiga kategori, yaitu dominasi otak kanan (22 mahasiswa), dominasi otak kiri (19 mahasiswa), dan dominasi otak terpadu atau gabungan (18 mahasiswa). Kemampuan berpikir lateral diukur menggunakan Lateral Thinking Scale yang dikembangkan oleh Al-Qazwini. Selain itu, peneliti menggunakan empat tes performa yang telah dikembangkan dan dinormakan pada sampel yang sama untuk mengukur keterampilan. Hasil penelitian menunjukkan adanya hubungan negatif (berbanding terbalik) yang signifikan antara kemampuan berpikir lateral dan performa keterampilan akhir pada semua pola dominasi otak. Kelompok dengan dominasi otak terpadu menunjukkan performa terbaik, dengan rata-rata skor berpikir lateral sebesar 16,4 dan waktu performa rata-rata 59,8 detik. Kelompok ini juga memiliki koefisien korelasi negatif terbesar ($r = -0,63$; $p = 0,006$). Sebaliknya, kelompok dominasi otak kiri menunjukkan koefisien korelasi terendah ($r = -0,38$). Berdasarkan temuan tersebut, dapat disimpulkan bahwa dominasi otak terpadu memberikan keunggulan dalam memproses keterampilan yang kompleks. Keunggulan ini tercermin dalam kecepatan respons yang lebih baik, tingkat akurasi yang lebih tinggi, serta kemampuan mengeksekusi inovasi secara lebih efektif dalam kondisi pengujian, sebagai hasil dari integrasi fungsi otak kiri dan kanan.

Kata Kunci: Dominasi Otak; Berpikir Lateral; Performa Keterampilan Kompleks; Sepak Bola; Fungsi Kognitif

INTRODUCTION

Athletic endeavours rely heavily on cognitive function and cognition has become one of the most significant foundations of elite sports within modern day football. Previously, the requirements to achieve excellence in football were simply physical or technical however today where specialised tertiary participants have academic studies in combination with practical applications through physical activity, it is no longer sufficient to just have physical/technical capabilities to be successful. The rapid change within player strategy and increased complexity of competition have forced student athletes to develop enhanced cognitive functioning that allows them to efficiently process very large amounts of incoming information with a high degree of accuracy.

Within this environment, lateral thinking is one of the higher order cognitive processes used to devise new innovative solutions to problems experienced during play by allowing students to think outside the box. Students can achieve this by restructuring their interpretation of stimuli and getting rid of "stored" motor patterns that are no longer applicable or effective in ever changing situations (De Bono, 1970).

The brain's hemispheres are often called brain dominance, and this term has come to represent the different abilities in each hemisphere of the brain. When using these different abilities to process things in an educational setting, it's common for students to show brain dominance by using predominantly one side of their brain more than the other to perform an educational task (Hughes & Williams). For example, students with a left-brained dominant course of action tend to process logically and analytically, along with having the ability to attend to and process sequentially, whereas students with a

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right-brained dominant course of action tend to process globally, intuitively, and creatively while performing an educational task. However, what presents a difficult hurdle for a player within the game of football is the conception of an integrated pattern; an integrated pattern represents the ability to have the two hemispheres of the brain functioning in an optimal state of coordination (functional balance) and to combine the analytical and creative abilities of the student in less than a second (Sperry, 1968).

In the university setting, learning patterns whether right-brain, left-brain or integrated have a direct impact on how students process information, learn and behave under the stress of testing/competitions. There is an evident connection between cognitive patterns and skill dimension when evaluating complex skill performance of students enrolled in collegiate physical education programs. Here, skill represents more than a single motor unit, but rather a series of sequential responses requiring both precise timing and execution that relate to fast cognitive processing. As stated by Schmidt & Wrisberg (2008), "the ongoing development of motor performance in learners is primarily a function of motor programs in memory that are retrieved and modified at a rapid pace in response to the demands of the situation." Therefore, lateral thinking contributes significantly to the quality of that type of performance through providing students with cognitive flexibility for relating fundamental skills with the demands placed upon them in the unpredictable tactical situation.

Several studies have been conducted on the relationships between brain dominance and lateral thinking, and their influence on complex skill acquisition in sports. However, this area of research is limited, particularly among student samples, who represent future elites in sports. By understanding this relationship, coaches and academics can identify students based on cognitive style and provide guidance with respect to their perceptual abilities within a specific playing position. Additionally, it will aid in designing exercises that simulate "real world" game scenarios and stimulate the neural pathways of creative thought (Memmert & Roca, 2019). Failure to consider a student's brain dominance may result in a loss of creative thought due to placement in a traditional approach (Williams & Ford, 2009).

This research aims to determine how brain dominance impacts lateral thinking and complex skill execution (in terms of legues) among university football students. This will create a theoretical basis to link neuropsychological functions with field performance, as Davids et al. (2008) states that athletic excellence comes from the complete coordination of the nervous system and motor system. Accurate results in this area have the potential to increase the effectiveness of education and training processes and promote new avenues for scientific talent identification in athletics (Raab, 2003).

METHOD

Research Design

In the descriptive research methods chosen by the researcher a correlational approach was deemed appropriate; since the research objectives define the type of relationship and degree of lateral thinking patterns per brain dominance type and the extent of complex skill production for the participants of this study sample, this method allowed the researcher to examine phenomena in their natural state in the field, without intervention or manipulation by the researcher(s), through an examination of

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correlational relationships between variables in the study, allowing for statistically valid conclusions that accurately reflect the true nature of the sample population.

Participants

The sample population under study is Third Year Students at the Department of Physical Education and Sports Sciences of the University of Samarra in Iraq, a group consisting of 73 male and female students. The researcher used a non-probability sampling method (total enumeration) to provide an accurate representation of the sample group in relation to their respective original populations.

The final sample included 59 participants (80.82% of the overall population), after removing five females because they did not fit into any categories related to skills that were targeted for this study; five males who participated in the pilot study but were excluded from the sample; and four females who were absent during the experimental phases of the study.

Three categories were formed to classify all of the participants by their score on the Brain Dominance Patterns Scale. The groups were right dominant 22 students, left dominant 19 students and integrated dominant 18 students. By classifying participants in this way, valid scientific comparisons between their dominance patterns, and study variable relationships, were possible.

Research Instruments

Lateral Thinking Scale

Al-Qazwini's Lateral Thinking Scale was chosen to measure Lateral Thinking by the researcher due to its high appropriateness for the local environment and university population characteristics.

To enhance the validity procedures, the scale was presented to seven experts and specialists to verify the efficiency of the items in measuring the targeted cognitive abilities.

The final version of the Scale contains 20 puzzles that challenge individuals to think creatively to arrive at solutions. Each of the puzzles was scored using a binary system (one point for a correct answer; no points for incorrect answers or lack of an answer) as determined using the standard answers provided for each of the puzzles by the researcher.

Thus, the total score for an individual will be determined by adding up the scores from all items; therefore, there will be a scale from 0 - 20, which provides objective and quantitative data regarding how successfully a student is able to use lateral thinking skills across multiple complex cognitive tasks.

Brain Dominance Scale

The researcher used the Torrance Brain Dominance Scale (SOLAT), which was adapted and standardized to fit the local context using statistical analysis by (Abdul-Hussein in 2014), to assess the cognitive and tactical classifications of the research participants. The final version of the instrument is comprised of 28 questions; each question consists of two choices (A & B) that indicate the distinctive functional attributes of each hemisphere of the brain. The left-brain characteristics, represented by choice A, indicate the logical and analytical aspects of brain function while the right-brain characteristics, represented by choice B, indicate the intuitive and creative aspects of brain function.

The scoring system is set up to tally how often students respond based on which hemisphere has the most responses; therefore, the dominant pattern will be the one with the most responses. When a student has a higher number of responses from either the right or left hemisphere than from the other, that student is classified as right or left dominant. The integrated pattern, on the other hand, will be indicated by the convergence of the total scores for both hemispheres, showing that the student has reached a state of functional balance and is able to integrate/hear sound(s) from both hemispheres simultaneously.

The researcher used this device to statistically group the samples into three qualitative groups so that a strong basis was available for investigating the relationship between these patterns and the variables lateral thinking and performing complex skills in soccer.

Complex Skill Performance Test in Football

Due to the absence of tests which can assess several skills at once in a manner compatible with the objectives of my study and to measure the performance of participants in the research sample in complex skill-based play in football, I used Al-Hayali's (2016) four complex skill-based play performance tests.

The objective of these tests is to evaluate technical efficiency through testing skill-based performance in combination through a continuous motor sequence; dribbling, passing, controlling a ball, and shooting from various angles at the same time. The tests were developed because of an extensive review of demonstrated success in skill-based training methodologies (Abu Ubaidah, 2015; Al- Douri, 2014).

The description for each of the four activities will highlight a particular technical and tactical element aspect. The activities will include zigzag dribbling around cones at various distances; passing the ball toward 2 separated goals in the same plane or toward a large circle and a small circle that overlap; receiving and controlling a ball while moving; and finishing off the attack by shooting the ball toward either a standard-sized goal or a small goal.

The new system will provide an integrated way to evaluate how well a student can perform motor-related physical skills and how quickly they can do it when faced with high levels of neuromotor coordination and high speeds of reaction time to stimuli.

To confirm that accurate results representing the reality of the study sample can be obtained, the researcher verified all scientific foundations (validity, reliability, and objectivity) of the tools used in the study.

In respect to establishing Both Content Validity and Face Validity, experts (7) and specialists subjected the Brain Dominance Scale; Lateral Thinking Scale; Two or More Complex Skill Performance Tests were utilized as measures of the participants for this study. The specialists affirmed each of the relevant measures as being appropriate to the nature and intended purpose of this research study; and therefore, meet Content and Face validity criteria.

To assess the reliability of the assessments, a pilot study was conducted with five students who were not part of the actual data set for the main research. To determine reliability coefficients, the test-retest method was used. The four assessments used to measure performance on complex skills, were included in Al-Hayali's (2016) research and exhibited high-reliability coefficients of between 0.91-0.95, respectively, according to the ratings determined via this method.

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The reliability coefficient for the Lateral Thinking Scale (Al-Qazwini, 2013) was calculated using the same method as presented above had a reliability of 0.85 whereas for the Torrance Brain Dominance Scale standardised by Abdul-Hussein (2014) the reliability coefficient was equal to 0.84. These values indicate that both instruments are highly stable and reliable over time.

All the instruments exhibited superior objectivity, demonstrating neutrality and independence from subjective judgment. All cognitive tests used standardized scoring keys and printed answer sheets and had no possibility for bias. Of the four field-based skill tests, all have exact quantitative measures for, for example, timing using a stopwatch, and explicit criteria for assigning accuracy scores (0, 1, 2, 3, 4) based on the successful targeting of passing/shooting areas or the efficiency of ball control.

These scientific foundations provided an accurate and highly predictive set of measurement tools used by researchers. This will ensure that researchers obtain scientifically valid results from students at the U. of Samarra in both the academic and practical arena.

Procedures

The researcher began performing the field procedures by completing a pilot study on Monday & Tuesday, Dec 1-2 2025, with five students from the original experimental population but not from the sample that was actually used; to address the clarity of the instructions for the lateral thinking scales; to ensure that the distances and equipment used in the four complex skill performance tests were appropriate; to determine the scientific basis of these conditions so that the resultant output data would be valid and reliable.

Once the methodological procedures had been confirmed to be sound, the researcher moved forward with conducting the experiment, which took place on the final research sample of 59 students. On Thursday, December 4th, 2025, students completed the Torrance Brain Dominance Scale; their results were input into a statistical program to determine if each student fell into one of three categories: (1) Right Dominance (22 students), (2) Left Dominance (19 students), and (3) Integrated Dominance (18 students). Immediately after completing the Torrance Brain Dominance Scale, students completed the Lateral Thinking Scale developed by Al Qazwini (2013).

Given the physical and technical requirements associated with performing these complex skill performance tests, these tests were conducted in the field over 3 days (Sunday, Monday and Tuesday) in succession or consecutively, to promote performance stability (consistency) and to prevent physical fatigue. For all three groups of participants, the integrated skill requirements (i.e., dribbling, passing, ball control, and shooting per approved technical specifications) were completed as follows: Group 1 completed their integrated skill tasks on Sunday (7 December 2025), Group 2 completed their integrated skill tasks on Monday (8 December 2025), and Group 3 completed their integrated skill tasks on Tuesday (9 December 2025).

The researchers had previously established accuracy values for performance by using an accurate time piece (i.e., the stopwatch) to track how long it took to complete an individual task; additionally, they established accuracy values for the tasks by counting the number of times individuals hit their designated target (i.e., the points within the area of the target). After the data was collected, it was reviewed and organized by the researcher and prepared for statistical analysis using the Statistical Package for

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the Social Sciences (SPSS) to determine whether there was a relationship between lateral thinking, as defined by brain hemisphere dominance, and the ability to perform complex skills in football.

Data Analysis

The researcher employed the Statistical Package for the Social Sciences (SPSS v26) as the primary analytical software to process and convert the raw data to scientific indicators, indicating the relationships between the variables present in the research study.

The analysis started by calculating descriptive statistics. The means and standard deviations provided a way of describing the participants' level of lateral thinking and their skill performance. Skewness coefficients were also used to assess the normality of the data sample, ensuring the statistical results would be valid and accurate.

The Pearson correlation coefficient was the statistical method to determine the correlation between lateral thinking scores and the four testing conditions, so Pearson's r was gathered from a correlation table. Likewise, in the pilot study, an Independent Sample t -test was used to establish reliability on the performance tests.

RESEARCH RESULTS

The data analysis revealed significant relationships between brain dominance patterns, lateral thinking abilities, and complex skill performance among football students. Descriptive statistics and correlation analyses were conducted to examine these relationships.

Table 1. Descriptive Statistics of Lateral Thinking and Complex Motor Performance According to Brain Dominance Pattern

Brain Pattern	Variable	Mean	Standard Deviation
Right Pattern	Lateral Thinking (Score)	13.5	1.2
	Complex Motor Performance (sec)	66.9	2.8
Left Pattern	Lateral Thinking (Score)	11.0	0.9
	Complex Motor Performance (sec)	62.3	2.5
Integrated Pattern	Lateral Thinking (Score)	16.4	1.1
	Complex Motor Performance (sec)	59.8	2.1

Based on Table 1 Descriptive statistics of lateral thinking and complex motor performance according to brain dominance pattern, in the right pattern group, lateral thinking values were obtained with a mean of 13.5 and standard deviation of 1.2, as well as complex motor performance with a mean of 66.9 and a standard deviation of 2.8.

In the left pattern group, the lateral thinking value had a mean of 11.0 with a standard deviation of 0.9, while complex motor performance had a mean of 62.3 with a standard deviation of 2.5. Meanwhile, in the integrated pattern group, the lateral thinking value had a mean of 16.4 with a standard deviation of 1.1, and complex motor performance with a mean of 59.8 and a standard deviation of 2.1.

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Table 2. Correlation Coefficients Between Lateral Thinking and Complex Motor Performance According to Brain Dominance Patterns

Brain Pattern	Sample Size	Correlation Coefficient ^o	Significance Level (Sig)	Type of Relationship
Right Pattern	22	-0.46	0.031	Moderate negative correlation
Left Pattern	19	-0.38	0.048	Weak negative correlation
Integrated Pattern	18	-0.63	0.006	Strong negative correlation

Based on Table 2 Correlation coefficients between lateral thinking and complex motor performance according to brain dominance patterns, in the right pattern group with a sample number of 22, a correlation coefficient of -0.46 was obtained with a significance value of 0.031 which indicates a moderate negative relationship.

In the left pattern group with a total of 19 samples, a correlation coefficient of -0.38 with a significance value of 0.048 was obtained which showed a weak negative relationship. Meanwhile, in the integrated pattern group with a total of 18 samples, a correlation coefficient of -0.63 with a significance value of 0.006 was obtained which showed a strong negative relationship.

Table 3. Pearson Correlation Matrix Between Lateral Thinking and Complex Motor Performance for the Right-Brain Pattern

Variable	Lateral Thinking	Complex Motor Performance
Lateral Thinking	1	-0.46*
Complex Motor Performance	-0.46*	1

Based on Table 3 of the Pearson Correlation Matrix Between Lateral Thinking and Complex Motor Performance for the Right-Brain Pattern, the correlation value between lateral thinking and complex motor performance is -0.46 which is marked with an asterisk (*). The value shows a negative relationship between the two variables, where the same correlation value is also symmetrically visible on the matrix

Table 4. Pearson Correlation Matrix Between Lateral Thinking and Complex Motor Performance for the Left-Brain Pattern

Variable	Lateral Thinking	Complex Motor Performance
Lateral Thinking	1	-0.38*
Complex Motor Performance	-0.38*	1

Based on Table 4 of the Pearson Correlation Matrix Between Lateral Thinking and Complex Motor Performance for the Left-Brain Pattern, the correlation value between lateral thinking and complex motor performance is -0.38 which is marked with an asterisk (*). The value shows a negative relationship between the two variables, which is also displayed symmetrically in the correlation matrix.

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Table 5. Pearson Correlation Matrix Between Lateral Thinking and Complex Motor Performance for the Integrated Brain Pattern

Variable	Lateral Thinking	Complex Motor Performance
Lateral Thinking	1	-0.63*
Complex Motor Performance	-0.63*	1

Based on Table 5 of the Pearson Correlation Matrix Between Lateral Thinking and Complex Motor Performance for the Integrated Brain Pattern, the correlation value between lateral thinking and complex motor performance is -0.63 which is marked with an asterisk (*). The value shows a negative relationship between the two variables, which is also displayed symmetrically in the correlation matrix.

DISCUSSION

An analysis of the data from the tables indicates there is a statistically significant relationship between the cognitive aspect represented by lateral thinking and the patterns of brain dominance regarding overall performance of complex skills in the sport of football within the research sample. This becomes apparent when comparing those who demonstrate an integrated dominance pattern with a mean score of 16.4 on the lateral thinking test and a mean time of 59.8 sec for performance on the field; this indicates a condition of functional harmony between both hemispheres of the brain. Serrien et al. (2006) state that the dynamic relationship between the hemispheres produces enhanced sensorimotor processing abilities when performing complex tasks that require both logical and intuitively creative thinker integration.

When students had an integrated pattern of functional integration, they had the strongest correlation ($r = -0.63$); this indicates a strong relationship: as the student's ability to think laterally (i.e., through functioning integration) increased, their performance time decreased; therefore, indicating greater speed and accuracy in executing skills on the field. This supports the view of Memmert and Roth (2007) that creativity in sport largely originates from divergent thinking (i.e., lateral thinking). It is through lateral thinking that athletes read the field and make unexpected skill-related decisions; thus, producing high-quality results in skill tests requiring a complex response.

Moreover, executive functions of the brain need to work together to process sophisticated tasks associated with skill development. According to Jacobson and Matthaeus (2014), persons with flexibility in their executive function abilities are better able to connect many either connected or disassociated technical skill types within a shorter duration of time. Thus, explaining the reason for the integrated pattern recorded an overall low performance time, as they exhibited an ability of their integrated brain to lower the cognitive draw in terms of dribbling, passing and shooting during the transition time between skill execution.

Those who exhibit a right-brained dominance show a moderately negative correlation between their right-brained dominant capabilities ($r = -0.46$) and their left hemispheric skills. These individuals are imaginative and creative but typically lack procedural accuracy associated with their left hemispheres. As Loffing et al. (2016) demonstrated, those with right-brain dominance gain the benefit of having superior distance and angle perception, which could improve passing and shooting accuracy for

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players. However, if the player is not fully coordinated between the left and right hemispheres (i.e., the left hemisphere is responsible for logical sequencing), the player's performance will vary in terms of that player's overall performance time when compared to the player who is fully coordinated between the two hemispheres (i.e., integrated). Memmert and Roth (2007) also note that a player with an extensive amount or a high level of cognitive control will be able to regulate his/her/its creative output; thus, the existence of minor technical errors in a player's creative output will diminish the quality of that player's creativity.

Compared to a right-hemisphere dominant individual, a left-hemisphere dominant individual (with respect to lateral thinking) displayed the least relationship with lateral thinking ($r = -0.38$). While they have accuracy in executing tasks, left hemisphere dominant individuals generally do not perform well in complex situations requiring both speed of thought and unconventional problem-solving abilities. Voss et al. (2010) proposed that to be an advanced level athlete you must move from a linear processing style (typical of the left hemisphere) to one which is more holistic. This helps explain why left-hemisphere dominant individuals record the lowest score for lateral thinking (11.0) and still have the highest mean time to complete a task (62.3 seconds). Left-hemisphere dominant students may excel in isolated technical skills; however, when you combine these skills into a more complicated test, there is a greater amount of cognitive load, resulting in slower execution time due to lower performance tempo, and/or accuracy errors.

The four tests of performance that we utilized to measure how well an individual performs the overall complexity of spade skills (dribbling, ball control, passing and shooting) place two types of demands on performing them (physical and cognitive). Wulf and Shea (2002) suggested that the complex learning process for skills involves dividing and allocating attention throughout each of the components of the skill on the part of the learner. Those learners who possess sufficient lateral processing ability can distribute their attention in such a way as to view the entire skill as an integrated whole rather than view the different parts of the skill separately. This can reduce the amount of time needed to process motoric behaviours that follow each other.

The integrated dominance pattern demonstrates a significant correlation between high-quality performance and what is popularly referred to as motor intelligence; however, it has been established that there is more than simple repetition of movement involved in producing high-quality performance, but rather a cognitive activity as well. Furthermore, research by Nielsen, Okuoka & Lindgren (2013) concluded that when individuals are performing tasks requiring high levels of coordination, their ability to communicate effectively through the Corpus Callosum increases in efficiency. Additionally, the negative correlation found ($r = -0.63$) between individuals demonstrating integrated dominance provides support for this claim, as these individuals can use both creative thinking as evidenced by generating innovative ideas (lateral thinking) and executing their ideas accurately using motor skills simultaneously while performing physical professions. Conversely, individuals demonstrating left-dominant (LD) patterns are still restricted to following traditional procedures, whereas individuals demonstrating right-dominant (RD) patterns may have an impulse to express ideas creatively without adherence to strict accuracy. Thus, brain integration can play a critical

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role in attaining excellence in the field of graduate physical education and sports sciences.

CONCLUSIONS AND RECOMMENDATIONS

The findings from the study showed significant differences in the amount of complex skill performance and lateral thinking of the participants based on different brain dominance patterns of the students. Those students with an integrated dominance pattern exhibited the highest levels of lateral thinking and were able to consistently demonstrate increased efficiency performing complex motor skills when compared to either the right or left dominated students. The right-dominated students initially demonstrated moderate level performance whereas left dominated students were significantly lower in both lateral thinking and ability to perform complex skills.

Additionally, results about lateral thought processes showed that there may be an inverse relationship between lateral thinking and completing a challenging skill correctly, in which greater degrees of lateral thought led to less time taken completing the task, as well as an increase in the ability to perform complex motor-related tasks proficiently.

Based on the results of this study, it is recommended that programmes help develop lateral thinking skills among Physical Education students by using innovative teaching and training methods that encourage creativity, enhance brain and body coordination and enhance performance and learning quality in sports.

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