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## Effect of left, right and integrated hemispheric dominance on performance of female gymnasts

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**Abstract**

The present study was conducted to compare overall performance of artistic female gymnasts on the basis of their hemispheric preference. To conduct the study, 50 female gymnasts (Ave. age 21.34 yrs) who took part in inter-university artistic gymnastics competition were selected as sample through convenience sampling method. Brain Hemisphere Domination Test (B.H.D.T.) prepared by Agashe and Helode (2007) was used to assess left, right and integrated brain hemisphere dominance of selected female gymnasts. To assess performance of female gymnasts, scores on floor exercise, vaulting table, uneven bars and balance beam events were summed up and used as performance scores of female gymnasts. Results reveal no statistically significant impact of brain hemisphere domination on performance of female gymnasts although it was observed that female gymnasts with right brain hemisphere dominance performed better collectively on all the apparatus as compared to selected female gymnasts with left and integrated brain hemisphere dominance. It was concluded that brain hemisphere dominance can predict performance of female gymnasts but to a certain extent.

**Keywords:** Brain hemisphere domination, artistic gymnastics, performance

### 1. Introduction

It is scientifically established fact that the brain is split into two roughly similar hemispheres, separated by the deep longitudinal fissure. It has also been propagated in neurological theories that left hemisphere controls the movement on the right side of the body, and the right hemisphere controls the movement of left side of the body. The left and right brain hemispheres of the body although look alike but there are certain functional difference between the two. The speech production and language comprehension are usually located in the left hemisphere of the brain whereas mathematical, analytical and logical processing are carried out in the left hemisphere, while spatial recognition, face recognition, sense perception, emotion processing and artistic functions occurs in the right brain hemisphere. Sometimes none of the two brain hemispheres are dominant.

It has been point of discussion among scientists of allied fields regarding the effect of hemispheric dominance on various factors such as psychomotor ability, cognition, learning etc. In the field of sports, literature on sports performance of left and right handed players are available. Researchers like Porozovs *et al.* (2011) [1], Harung *et al.* (2011) [2], Baker and Schorer (2013) [3], Sorokowski (2014) [4] compared winning or loosing percentage, motor control, psycho motor abilities, visuo motor abilities of left and right handed players. It is noticeable that the results regarding the effect of brain hemisphere dominance on sports performance are somewhat contradictory and expressed in terms of negative frequency and innate superiority hypothesis. It is also discernable that performance of sportspersons has not been assessed in the light of left, right and integrated brain hemisphere dominance.

One such sport where brain hemisphere dominance may play an important role is artistic gymnastics in which fine motor skill and visuo spatial ability determine the routines performed by the gymnasts. Researchers in the field of gymnastics are far and wide in terms of ascertaining the effect of psychomotor abilities, physiological aspects, psychological factors such as mental tension, personality etc. on overall gymnastic performance or on certain apparatus (Langlainis (1997) [5], Veliekoviae (1999) [6], Tsopani *et al.* (2011) [7], Maleki *et al.* (2014) [8], Dudhale and Bhate (2015) [9]) but so far performance of female artistic gymnasts has not been assessed in the light of their brain hemisphere dominance i.e. left, right and integrated

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brain hemisphere dominance, hence the present study was planned.

### Objectives

The major objective of the present study is to find out the effect of brain hemisphere domination on performance of female artistic gymnasts.

### Hypothesis

Significant differences will be observed in performance of female artistic gymnasts with right, left and integrated brain hemisphere dominance.

### Methodology

The following methodological steps were taken in order to conduct the present study.

### Sample

To conduct the study, 50 female gymnasts (Ave. age 21.34 yrs) who took part in inter-university artistic gymnastics competition were selected as sample through convenience sampling method.

### Tools

To assess hemispheric preference of selected subjects, Brain Hemisphere Dominance Test (B.H.D.T.) prepared by Agashe and Helode (2007) [10] was used. It consists of 12 multiple choice questions. This test is highly reliable and valid.

To assess performance of gymnasts, scores obtained by female gymnast on floor exercise, vaulting table, uneven bars and balance beam apparatus were summed up and used as performance scores of female gymnasts.

### Procedure

In order to conduct the study, 50 female gymnasts who participated in inter-university artistic gymnastic competition were selected through convenience sampling method. Written consent was taken from each select gymnast to participate in present study. To assess hemispheric preference, Brain Hemisphere Domination Test prepared and standardized by Agashe and Helode (2007) were administered to each selected subject as per their convenience and availability. Author's manual was followed to assess hemispheric preferences of selected subjects. To find out hemispheric preference i.e. left, right and integrated brain hemisphere dominance, the obtained scores on BHDT scores are divided by 12. Percentile norms for these scores were calculated. Subjects whose scores fall below 25th percentile were considered to have left dominant brain hemisphere while subjects whose scores fall above 75th percentile were considered to have right dominant brain hemisphere. The subjects whose scores lie between 25th and 75th percentile were considered as exhibiting integrated brain hemisphere dominance. In this way hemispheric preference of each subject was identified. The scores obtained by gymnast on floor exercise, vaulting table, uneven bars and balance beam apparatus events were recorded from official scorebook and added. These final scores was considered as overall performance of female gymnasts. To compare performance of female gymnasts on the basis of brain hemisphere domination, one way ANOVA was used. The results are presented in table 1 and 1(a) respectively.

## Analysis and Interpretation of Data

**Table 1:** Descriptive Statistics (Mean and S.D.) of Performance in a Group of Female Artistic Gymnast on the Basis of Brain Hemisphere Domination

Groups	N	Mean	S.D.
Left Brain Hemisphere Domination	11	14.69	7.81
Right Brain Hemisphere Domination	12	17.17	11.90
Integrated Hemisphere Domination	27	14.05	12.06

**Table 1(a):** ANOVA Summary

Source	df	Sum of Squares	Mean Squares	F	Sig.
Between Groups	02	81.790	40.895	0.32	NS
Within Groups	47	5956.757	126.740		
Total	49	6038.547			

Results obtained through One Way ANOVA clearly suggesting that overall performance of female gymnasts did not differ significantly on the basis of their brain hemisphere domination. Although overall mean scores of female gymnasts with right brain hemisphere domination (M=17.17) was higher than that of female gymnasts with left (M=14.69) and integrated brain hemisphere domination (M=14.05), the F ratio 0.32, which is statistically insignificant, did not support this finding statistically.

### Result and Discussion

Although the result indicate non-significant difference in performance of female artistic gymnasts with left, right and integrated brain hemisphere dominance but the statistical figures clearly shows a trend that female gymnasts with right brain hemisphere dominance performed better collectively on all apparatus as compared to female gymnasts with left and integrated brain hemisphere dominance. It may be due to the fact that people with right brain hemispheric preference have superior neuropsychological characteristics as well as spatiotemporal visual perceptions because these areas are located in right brain hemisphere (Heilman & Van Den Abell, 1980) [11]. Hence the slight advantage in favour of female gymnasts with right brain hemisphere domination is justified.

### Conclusion

On the basis of results and associated discussion, it was concluded that female gymnast with right brain hemisphere dominance enjoy superiority over their counterparts with left and integrated brain hemisphere dominance in terms of performance but it could not be conclusive because of non-significant statistical values.

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