

Relationship Between Testosterone And Territoriality: Home Advantage

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Abstract

The Home Advantage is a vigorous marvel that happens in the territory of beginner and professional sports. The main objective of this study was to check the testosterone levels (ng/mL) and territoriality score of younger than 23 years inter-university male volleyball players at home and opponent home ground. A total number of Ninety-six male volleyball players were selected for this study. To check the testosterone level of players' pretest-posttest analysis was done 60 minutes before the start of a match and 15 minutes after the finish of the match. A survey response on the territoriality factor was also taken 40 minutes after the match. Pared sample "t" was used to find the mean difference in testosterone and territoriality factor at home and away from home ground. Researchers found a significant difference (Sig.<0.0001) from pre-test to post-test results of players before and after the competition when there was seen a reduction in the testosterone level (ng/ml) of players by 8% at home ground and 11% on away ground whereas a 6% decline observed in territoriality at opponents ground. The results of the present study were found that playing at home ground cause a less reduction in serum-free testosterone level due to an increased level of territoriality score of players. Home advantage plays a role to increase the level of assertive behavior of players when they are performing at their home ground.

Introduction

Testosterone is an essential steroid hormone, it is serving anabolic capacities, for example, support and development of muscle and bone tissue (Herbst and Bhasin, 2004). Steroid hormones are natural controllers of physiological procedures (Park et al., 2016). In human males, testosterone is the essential circling androgen (Evans et al., 2008). The method of check the circulating levels of testosterone hormone than compare and observed behaviors is simple and cheap as compared to other methods (Durdiaková et al., 2013). Through saliva, bioavailable testosterone can be checked (just as in blood), and this method of measuring the free testosterone level can be held without laboratory setting in different sets (for example kids, athletes, and so on.) with essential training and territorial behavior (Hayes et al., 2016).

The volleyball game can be categorized as a coordinated playing activity that comprises six components: service, reception, pass, attack, block, and defense (Zetou et al., 2006). Ball games require extensive ability including physical, technical, mental and strategic abilities (Gaurav et al., 2010). Among them, the physical capabilities of players bring to bear remarkable impacts on the expertise of the players themselves and the strategies of the team (Taware et al., 2013). In this manner, players must have the physical capabilities to satisfy the need of the game. Volleyball is one of the most prominently played games all over the world (Sattler et al., 2012).

The home advantage is a vigorous marvel that happens in the territory of beginner and professional sport (Carré et al., 2006). Significantly, the winning ratio of Athletic teams is higher in their home venue than the opponent venue (Carron et al., 2005). The strong relationship between home performance and steroid testosterone had been demonstrated by the different studies, which related to activation and aggressiveness, cardiovascular productivity, quicker reaction time and predominance, all of these factors would be connected with better performance of the players (Cristiano et al., 2015). For home advantage, the usual explanation has considered home crowd support, referee's biases, especially by the home team; venue familiarity and experienced by the away team; travel, dispersion and fatigue (Morley and Thomas, 2005). One more factor may be physiological and identified with the perception of territoriality (Maruska and Fernald, 2010). In animals, regional practices are normal, and it has been set up that the securing and protection of regions (particularly by males) is in any event somewhat mediated by surges in testosterone (Landys et al., 2010).

Aggression has been ritualized as sport and competition in human societies and higher testosterone levels have been related to dangers/threats, fights, and attacks in male judo contenders and with proficient basketballers' commitments to the game result, estimated by the score/time playing proportion (Neave and Wolfson, 2003). Increasing the level of testosterone has likewise been accounted for in winning tennis

players, even though the bearing of causality remains hazy. As far as territoriality, proof exists from no donning contexts that human is progressively predominant and activated inside a region defined as their own (Morgan, 2004).

A few types of research have indicated increased aggression and excitement at home venues with regards to ice hockey and rugby, not many kinds of research have surveyed interfaces between observed the home advantage in sport and territoriality (Arruda et al., 2014; Cunniffe et al., 2015; Gray et al., 2017). To male students who are involved in decision-making tasks, act more self-assuredly and show control behavior when the meetings take place in their rooms, even when they lack the personality trait of dominance (Neave and Wolfson, 2003). If testosterone levels are to be sure connected with confidence and predominance, and if people additionally fight more diligently to defend their home ground/territory, the testosterone level of players might differ in sports competitors when they playing at home venue and away venue (Neave and Wolfson, 2003). The present study aimed to investigate the variation in male volleyball university players' testosterone levels according to their match venue.

As humans additionally show territoriality, could home advantage be incompletely clarified by a surge in testosterone before safeguarding one's home territory? Two studies have shown that footballers had a testosterone surge before playing at the home ground as compared to training sessions or an away game; this home advantage is especially evident in a team playing against a severe or tough team. The sample of Wolfson and Neave's (2003) study was the under-19 squad of a UK Premiership team. An hour before the training session, two home games and two away games, they took the salivation test of all the players. The players played matches with two separate opposition teams; one was tough and the other was the moderate team. They played each team once at home ground and other at away ground. The players' testosterone levels were normal before the training session and away matches according to the average testosterone level of males. However, the testosterone level of players was 40% higher before the match played against the moderate team and 67% higher before the match played against the tough team. While they found there was a big variation in the testosterone level of goalkeepers, says Wolfson (2003). "In training, all players had the lowest level of testosterone but before the home ground match, they had the highest level of testosterone. During the game, it looked like players felt the burden of responsibility." All factors like crowd support, familiarity with the ground and referee's biases have been put forward as explanations. "But none of them have been found to have any effect on their own," says Wolfson (2004).

Considering all the above literature, the main objective of this study was to check the hormonal secretion values and territoriality score of a player when he plays his home ground and at the opponent's home ground, secondly, to determine the positive relationship between testosterone and territoriality factor and their effect on player's behavior.

Methods and Procedures

Population of the study

Volleyball players from different universities in Lahore city who have also participated in the Higher Education Commission (HEC) intervarsity sports competition 2017-18, were recruited for the study. These were professionally trained players representing their universities in competitions on different playing venues. There was a total of eight universities from both public and private sectors which participated in HEC inter-university sports competitions. The following were the universities from whom male volleyball players were taken as a sample;

Table 1

List of universities situated in Lahore and participated in HEC sports Inter-university Competition

Sr.	University	Sector
1	University of the Punjab	Public
2	Government College University	Public
3	University of Management and Technology	Private
4	Lahore University of Management Sciences	Private
5	University of Veterinary & Animal Sciences	Public
6	Minhaj University Lahore	Private
7	Lahore Leads University	Private
8	Superior University Lahore	Private

Sampling

Census sampling was done to choose the participants from only those universities which were situated in Lahore City and whose volleyball teams participated in HEC inter-university sports competitions during 2017-18, teams from eight universities (from public and from private) fulfilled the above-mentioned inclusion criteria, hence, registered for the study. As per game rules, there are twelve players in a team, six players playing on one side of the volleyball court in a match. In this regard, researchers selected all the players from all eight

(08) universities as participants of the study (n= 96). Participants were guided about competitions at different venues. Permission from all participants was obtained to participate in this study on a consent form.

Research Design

In this study, pre-test, and post-test experimental research design was used to analyze the hormonal responses of players through blood sampling. Survey response was taken from players on the territoriality factor to know the opinion about their aggressive behavior.

The procedure of the Study

After the identification of potential participants of the study, permission was obtained from all directors of sports of allocated universities to get access to their volleyball team players. Objectives and significance of the study were discussed with players by visiting all universities on the stipulated date and time. Written consent was obtained from all of the players of volleyball teams through a consent form. To fulfill the objectives of the study, we organized the schedule of matches in such a way that every team would play one match on the home ground and one match on the opponent's home ground with the same team.

Blood Sampling Procedure

A blood sampling practice was conducted in the dressing room of players before the commencement of the match. A professionally trained registered medical practitioner from a patent pathology laboratory drew the blood sample 60 minutes before match as a pre-test sample. Then players moved to the court for the match and fifteen minutes after the match again medical staff took a blood sample for a post-test sample. Blood samples were sent to the research laboratory and processed for serum/plasma separation and storage at -8°C for later use in hormonal analyses. The same practice was repeated in all eight volleyball matches.

The procedure of Territoriality Factor's Assessment

The survey response of players on territoriality factor was taken 40 minutes after the match on home and away grounds through a self-developed questionnaire, which was contained 10 statements, rating on five point-point Likert Scale (1=Never; 2=Seldom; 3=Sometimes; 4= Often; 5= Always).

Statistical Analysis

Results were analyzed, statistically by paired sample "t" test (Carré *et al.*, 2006), to work out the significant variations amongst the parameter of the study, in comparable groups. Secondly, descriptive statistics were applied to measure the territoriality factor of the competition playing venue.

Table 1. Average levels of Testosterone (ng/mL) on home and opponent's home ground

Volleyball n=96	#	Playing Venue	Test type	Testosterone level (ng/mL) Mean \pm SEM	%age Difference	P-value
	a	Home	Pre Post	05.71 \pm 0.22 05.26 \pm 0.16	8 \downarrow ***	< 0.0001
	b	Away	Pre Post	04.95 \pm 0.17 04.39 \pm 0.11	11 \downarrow ***	< 0.0001

***indicate significance at $P < 0.001$

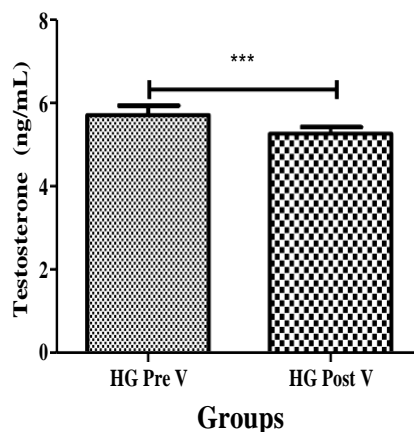


Fig. 1 (a): Average Level of Testosterone (ng/mL) in HG Pre V vs HG Post V analysis

HG Pre V: Home Ground Pre-test Volleyball

HG Post V: Home Ground Post-test Volleyball

***Significance at $P < 0.001$.

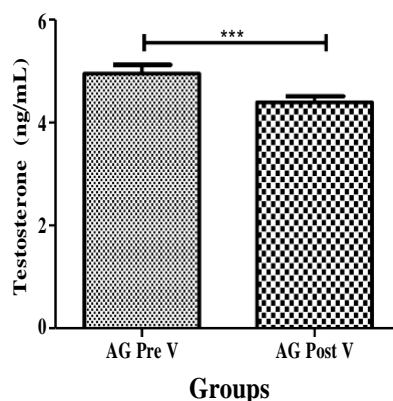


Fig. 1 (b): Average Level of Testosterone (ng/mL) in AG Pre V vs AG Post V analysis

AG Pre V: Away Ground Pre-test Volleyball

AG Post V: Away Ground Post-test Volleyball

***Significance at $P < 0.001$.

Territoriality Score

Table 2: Territoriality Score of Volleyball Players

Venue factors	Venue	N	Mean \pm SEM	P-value
Territoriality	Home Ground	96	3.72 \pm 0.07	0.015*
	Away Ground		3.49 \pm 0.05	

** $P < 0.01$ is considered as significant variation

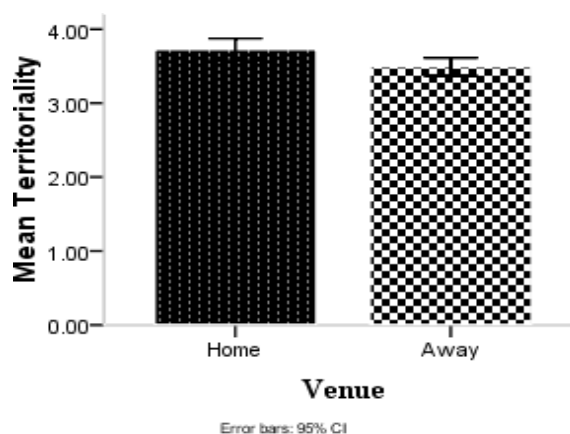


Fig. 2 Territoriality Score of Volleyball Players

* $P < 0.05$ is considered a significant variation

Discussion and Conclusion

Researchers found a significant distinction (Sig.0.0001) from pre-test to post-test results of players before and after the competition when as there was a mild reduction in the mean serum free testosterone level (ng/mL) of players in pre-test at the home venue which is 05.71 ± 0.22 ng/mL as compared to post-test which was 05.26 ± 0.16 ng/mL with %age mean the distinction of 8%. While the other side, there was a remarkable reduction in sans serum free testosterone level from pre-test value for example $04.95 \pm .017$ ng/mL to serum-free testosterone level in post-test which was 04.39 ± 0.11 ng/mL with a mean %age variance of 11%.

The obtained values of the current study suggest that there is a significant difference between the territoriality factor on home and the opponent's home ground. The average score of territoriality on home ground was 3.72 ± 0.07 , which decreased by 6% on away ground, which was estimated at 3.49 ± 0.05 . The elevated score of

territoriality on the home ground reflects that players feel comfortable and aggressive due to the increased value of testosterone on home ground and perform better on account of the effects of territoriality.

Different studies have shown solid connections between players' performances at home venue and the steroid testosterone, which has been related to stimulation and confidence, quicker response time, cardiovascular proficiency, territorial behavior and predominance (Fothergill et al. 2017; Guinote, 2017), which would all be concerned with better performance.

It has been reported earlier that in case of favorable conditions which may be in the form of home venue, well-balanced mental state, or other atmospheric conditions, the player's testosterone concentration becomes elevated as compared to an ordinary person. Various studies have found a significant difference in earlier and later conditions of testosterone concentration of the players who compete in the form of a team at their home venue (Fothergill et al., 2017; de Arruda et al., 2018). They observed that playing at the home venue in the presence of supporting spectators, aggressive behavior causes the elevation of salivary testosterone concentration in the pre-match state (de Arruda et al., 2018).

In elite sports, player's salivary T concentration has been found fluctuating in the same manner at their home ground as in amateur. The probability of the occurrence of such changes is due to directly proportional relationship status threats and social dominance (Mehta and Josephs, 2010). The findings of the present study are reinforcing the hypothesis of direct relation in the form of association between testosterone role in gaining and maintaining social status and social seeking attitude with aggressive mood (Mehta and Josephs, 2010).

Geniole et al. (2017) presented a model, in which he tried to explain how competition influences the behavior of the endocrine system. According to the biosocial model of status, the players who experience victory, their changing testosterone level apparently, becomes helpful for their preparation for dominant encounters in the future. Whereas, the defeated players of the same competition possess lower testosterone and express recessive behavior with a reduction in future encounters (Fothergill et al., 2017). It is not only the testosterone level that is affected by a competitive drive and causes improvement in performance but the testosterone level of playing sports person gets subsequently influenced by the performance outcomes (Eisenegger et al., 2011; Romero-Maetinez et al., 2013; Casto and Edwards, 2016).

Territoriality is a predominant phenomenon among numerous animal species, where they show agonistic practices and assault with bigger vigor while safeguarding their indigenous domain (Carré et al., 2006). A few types of research have indicated that "home advantage" is an animal behavior where, they show defensive acts to claim their area (Neave and Wolfson, 2003).

Though, a few types of research have indicated expanded hostility and excitement at home stations with regards to ice hockey (Polman et al., 2007) and in Rugby (Cunniffe et al., 2015). Only a few investigators have established links between apparent territoriality and the local benefits in games. Testosterone productions are surely connected with the strength of the individual, hence, contributing to elevated enthusiasm to safeguard their perceived home region. There might be changes in testosterone production in players when playing at their local station or away grounds.

5. Practical Implication and Future Recommendations

- This study will help players, officials, and coaches to manage/optimize aggression of players at home and away playing areas due to which players can perform at a better level.
- This study can be done on a larger population to generalize it.
- This study can be done on some other sports to increase its validity.
- This study can be done on female athletes due to the difference in their testosterone level in comparison to male athletes.
- This study can be done to measure other psychological parameters like anxiety, arousal, stress, etc. to increase invalidity for the measuring parameter of serum-free testosterone level.
- This study can be done on strength sports athletes due to the difference in their testosterone level in comparison to endurance athletes.

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