



HEART RATE VARIABILITY OF VOLLEYBALL AND BASKETBALL PLAYERS

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ABSTRACT

The purpose of the present study is to compare the Heart Rate Variability (HRV) of volleyball and basketball players in order to assess the functional process of autonomic nervous system of volleyball and basketball players. As we all know, the balance between the sympathetic nervous system (SNS) and parasympathetic nervous system (PSNS) is important and well coordinated in order to maintain and enhancement of high level of performance and fitness. Therefore, it was thought to assess the stress level and recovery process (indicates the fitness level) in terms of HRV of the players objectively. The study was conducted on 60 male subjects, i.e., 30 volleyball players and 30 basketball players at the age limit 20-25 years. Purposive sampling technique was used for the selection of the subjects and descriptive research method was applied to find out the result. In this study, a Biopic instrument was used to measure the HRV of the players and then further HRV of both groups were compared at Kaivaladhama yoga research institute, Lonavla where all the subjects were taken for the measurement of HRV. Independent t-test was used to analyze and interpretation of the data properly and systematically. After find out the value of each and every subjects, it is found that basketball players have more HRV indicates better cardiac health and high level of fitness of basketball players than volleyball players.

Keywords: Heart rate variability, volleyball, basketball, players and Biopac.

INTRODUCTION

We know, “the human heart is a bio-electrical pump beating at an ever changing rate: it is not like a clock that beats at a steady, unchanging rate. This variability in heart rate is an adaptive quality in a healthy body.” Heart rate variability is simply the time difference between each successive heart beat, otherwise known as the R-R interval or the inter-beat interval and is measured in millisecond (ms).

Measuring HRV (Heart Rate Variability), though long used in hospitals for treating heart patients, is a relatively new biofeedback concept for athletes. Soviet Union sports scientists started keeping track of their elite athletes’ heart rate variability in 70s. In the past decade, college sports team and the world class athletes have been increasingly using HRV to monitor fatigue and recovery from work outs.

Firstly, and this is important to remember, the variability in your heart rate (i.e. HRV) provides critical information about the function of your autonomic nervous system (ANS), and it is also the most reliable measurement of ANS function. An increase in HRV represents a positive adaptation/better recovery status, whilst a reduction in HRV reflects stress and a worse recovery status. Having said that, it is important to note that higher is not always better, and lower is not always worse – but that is beyond the scope of this article. But as a golden rule of thumb, the higher the athletes HRV, the fitter/better recovered they are and vice versa.



The ANS is comprised of two branches, these are the sympathetic nervous system (SNS) and the parasympathetic nervous system (PSNS). The easiest way to distinguish the differences between these two branches is to associate “fight or flight” responses with the SNS, and “rest and digest” responses with PSNS. So, the SNS is responsible for “exciting” the body in stressful environments (e.g. competition) and does so by stimulating the responses. For example, one of which is by stimulating the secretion of adrenaline and nor adrenaline, otherwise known as epinephrine and nor epinephrine, these hormones prepare the body for stress. More relevantly, the SNS also increases heart rate, force of contraction, and blood pressure, leading to an increased blood flow to the muscles. Therefore, anytime you or your athlete has felt an “adrenaline rush” before a competition, this is essentially your SNS being stimulated and preparing you for competition. On the flipside, the PSNS does the complete opposite and is responsible for reducing heart rate and blood pressure in the absence of stress. Essentially, the PSNS helps facilitate recovery after a stressful event (e.g. competition) by counteracting the effects of the SNS. Put simply then, the SNS increases heart rate and blood flow to the muscles, whilst the PSNS reduces heart rate and peripheral blood flow – in effect, they counteract one another. However, both are essential for performance and recovery. The SNS stimulates the body for the stressors experienced during performance, and the PSNS is vital for recovery and regeneration. It is believed that an “imbalance” between the SNS and PSNS can lead to reductions in athletic performance, and in more extreme cases, lead to overtraining. To add to this, HRV is also affected by mental and chemical stress as well as physical stress. For example, mental stressors such as job/work-

related stress, making complex decisions, public speaking tasks, and performing tests/exams have all been shown to significantly reduce HRV. In fact, one study reported that athletes experiencing high levels of stress make smaller strength gains than those with lower stress levels. In addition, chemical stressors such as alcohol have been repeatedly shown to reduce HRV. As HRV can accurately measure ANS function (balance between SNS and PSNS) and can do so in a non-invasive manner, it is commonly used by exercise scientists to monitor systemic fatigue and recovery. Having the ability to monitor an athlete’s systemic recovery status, of course, has its “pro’s” and “con’s”. The “pro’s” mean the coach can identify the athlete’s recovery status on a comprehensive scale which includes physical, mental, and chemical stress; other than wearable technology (GPS) which only displays physical/external stress. Whilst the “con’s” mean that the coach cannot be exact with which one of those stressors (physical, mental, or chemical) is causing the highest amount of stress to the athlete – but perhaps this is where the coach-athlete interaction and the wellness questionnaires play their part. Therefore, HRV is considered as a tool to monitor overtraining. Heart Rate Variability is a relatively new method for assessing the effects of stress on the body. High HRV indicates good health, high level of physical fitness and less stress & tension whereas low HRV is linked to stress, fatigue and even burn out. It is interesting to see the fitness level of the elite runners who are under intense training program and yoga practitioners who are regularly engaged in yogic activities and meditation. Therefore, it was thought to assess physical fitness as well as mental fitness in terms of HRV of different athletes objectively.



METHODOLOGY

30 male volleyball players and 30 basketball players who were under regular practice and have played minimum at inter-university level and above were selected from different institutions of Pune city by purposive sampling technique. In this study, a descriptive research has been conducted, where a method of comparative research has been adopted. 60 male subjects were taken by purposive sampling technique from Pune city who have participated at inter-university and national level. All the selected players were taken to Kaivaladhama yoga research institute, Lonavla for further measurement of HRV where the required instrument is available. Before implementation of the test, all the instructions were given and doubts were clarified. The researcher with the help of an expert recorded the reading of every subject.

Variables and tools to be used. The variable of the study is heart rate variability in which high frequency and low frequency parameters are taken and BIOPAC is an instrument that was used to conduct this study. Instrument's reliability =0.98 and validity =0.95. The data was primarily processed by using descriptive statistics. Further, independent t-test was used to compare the HRV of volleyball and basketball players.

RESULTS

The result of the HRV of volleyball and basketball players was compared and the difference of HRV has been interpreted systematically and critically.

Table I
COMPARISON AMONG VOLLEYBALL AND BASKETBALL PLAYERS RELATED TO THEIR HEART RATE VARIABILITY (HRV)

Groups	Mean	SD	Standard Error of Means	df	t-value
Basketball Players	1.73	0.423	0.03	58	12.372*
Volleyball Players	0.74	0.102			

Tabulated t (58) =2.002

The result as presented on Table 1 revealed that HRV mean value of basketball players was 1.73 Hertz (Hz). HRV mean value of volleyball players was 0.74 Hertz. The SD of HRV of basketball and volleyball players=0.36 Hertz. HRV value of t-test of basketball and volleyball players= 12.372 Hertz.

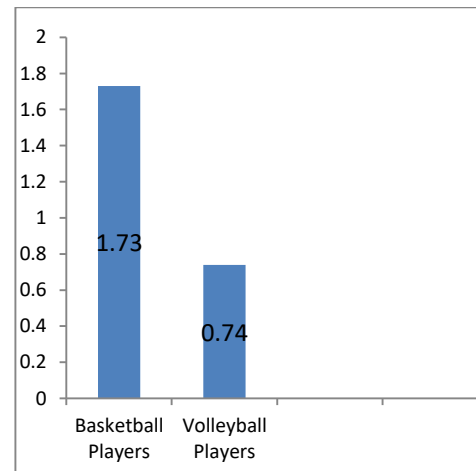


Fig. No 1: Graphical representations of HRV mean difference between basketball and volleyball players.

DISCUSSION OF FINDINGS

The statistical findings in the Table shows that the calculated t-value is 12.372 is greater than the tabulated value 2.002, hence there is some



significance difference in the HRV between volleyball players and basketball players and it is found in the result that the basketball players have more HRV than the volleyball players. It means the basketball players have faster and higher level of recovery after a stressful competition or training indicates high level of fitness than volleyball players at any competition or any work.

CONCLUSION

There was a significance difference in HRV between volleyball and basketball players. The HRV of the basketball players was higher than volleyball players. It means higher HRV correlates with low level of stress and high level of fitness and good health. Therefore, the balance between fatigue and recovery among volleyball players seems to be poorer than basketball players.

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