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## Effect of deprivation of sleep on handball shooting accuracy

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### Abstract

Zenith athletic performance appears to be a role of three things: physical performance, balance diet, and sleep. The first two are widely understood as main pillars for achieving great performance but sleep plays an equally important role. Without sufficient sleep, effective recovery cannot take place which resultantly impacts an athlete's performance. In Handball shooting the ball hard is not enough to beat a good goalie; accuracy is essential. Shooting for the corners is one of the important principles of shooting. The accuracy is dependent on our brain functioning better brain functioning can be achieved through proper recovery and rest. The objective of the study is to find out how sleep deprivation will affect the shooting accuracy of handball players. For the purpose of the study, the sampling technique used was probability random sampling, where a total of 15 male handball players, from Lakshmibai National Institute of Physical Education, Gwalior selected (age group 18 yrs – 24 yrs). Mean & standard deviation (SD) of their age was  $20.64 \pm 0.92$  (yrs). The experiment was conducted for three days. The experimental group was first provided with complete 8 hour sleep and shooting accuracy test was conducted. The same experimental group after one day gap was deprived from one night sleep and then shooting accuracy test was conducted. The mean shooting accuracy score of Day one was (8.80) and the mean shooting accuracy score of Day three was (6.26) and the mean difference the Day one & Day three shooting accuracy was (2.54) & tested by 't' test. The significance difference exists between pre-test mean and post-test mean because calculated value 7.87 is greater than the tabulated value 2.14. Day two scores were found to be statistically significant at .05 level of confidence. On the basis of obtain data a complete sleep can play vital role in enhancing the accuracy of shooting ability of handball players.

**Keywords:** Sleep, accuracy, deprivation, handball, shooting

### Introduction

Sleep deprivation has traditionally been the major approach to illuminating the role of sleep in human functioning. This research has documented the detrimental consequences of sleep restriction and the sleep debt that subsequently accumulates on cognitive function, mood, daytime sleepiness, and traditional performance indices such as reaction time and learning and memory tasks. Several studies have also demonstrated the negative impact of sleep restriction on physical performance including weight-lifting, cardio-respiratory functioning, and psychomotor tasks that require accuracy and consistent performance. In general, our understanding of sleep via a sleep deprivation model has been fairly well documented and characterized

Sleep is the period that is popularly recognize as a time when the body restores itself, It is a recovery process for day time activity (Shapiro, 1981) <sup>[1]</sup>. Both athletes and coaches believe adequate sleep is essential for peak performance (Maougin, Shimon Rigaud, 1991) <sup>[2]</sup> and that performance may be compromised by circumstances that cause athletes to either rise very early or delay bedtime. Incidences such as recent time zone change, anxiety causing insomnia, or the start an event requiring early rising may compound the stress of physical work with partial sleep loss (Hill, Borden, Darnaby and Hendricks, 1994; Mougine *et al*, 1992; Mougine *et al* 1991; Shapiro, 1981) <sup>[2, 1]</sup>.

Unfortunately, few studies exist that define the effect of sleep (or sleep loss) on athletic performance (Shapiro, 1981) <sup>[1]</sup> or motor performance (Holland, 1968) <sup>[3]</sup>. Holland (1968) <sup>[3]</sup> showed one night of sleep loss had no significant effect upon the speed or accuracy with which a jump or manipulation tasks were performed, but work performance, measured by a cycle work test, showed a significant decrement.

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Peak athletic performance appears to be a function of three things: physical performance, adequate nutrition, and sleep. The first two of these appear to be common sense, perhaps the two things that come to mind when one thinks of an athlete achieving peak performance, but sleep plays an equally important role. Without adequate sleep, effective recovery cannot take place which resultantly impacts an athlete's performance. Current evidence recommends obtaining, on a regular basis, 7 or more hours of sleep per night to promote optimal health among adults aged 18 to 60 years. Obtaining at least eight hours is essential in preventing neurobehavioral deficits such as concentration difficulties, fatigue, emotional lability, irritability, and sleep and appetite disturbances. Sleep has been recognized as an essential component of preparation for, and in recovery from, high intensity training (Reilly & Edwards, 2007) [4]. Lack of sleep correlates with higher risk of injury (Shapiro, 1981) [1]. Teenage athletes who frequently attain at least eight hours per night are 68% less likely to injure themselves playing sports than those who do not regularly obtain eight hours each night.

Sleeping less than six hours per night is associated with fatigue-related injuries among youth soccer, basketball, football and running athletes (Luke *et al.*, 2011) [5]. Sleep promotes muscle recovery, which allows time for cell regeneration and repair in the body. Dr. Michael Landers found that sleep deprivation affects proprioception. People who do not obtain eight hours of sleep will have less balance, which could potentially become more susceptible to injury ("secret to teen athletes' success might be their sleep Healthy Living Dallas News," n.d.).

Some helpful tips for obtaining more sleep from the National Sleep Foundation include sticking to sleep routine, going to bed and waking up at the same time every single day, even on the weekend, as well as having a bedtime ritual that is relaxing. It is also suggested to avoid naps if one has trouble sleeping and to exercise daily. Ensure your mattress and pillow are also comfortable, as this could affect your sleep significantly ("Sleeping Tips & Tricks – National Sleep Foundation"). Always ensure you are obtaining at least seven to eight hours of sleep each night in order to allow efficient recovery to take place and to promote overall health. Most importantly, ensure that you are regarding sleep as an essential part of peak athletic performance. Adequate sleep can lead to improved reaction times (American Academy of Sleep Medicine, 2008, Shapiro, 1981) [1], reduced injury rates (Shapiro 1981, American Academy of Pediatrics, n.d., Luke *et al.*, 2011) [1, 5], potentially longer playing careers (American Academy of Sports Medicine, 2012), better accuracy and faster sprint times (Mah *et al.*, 2011, American Academy of Sleep Medicine, 2008) as well as fewer mental errors (Luke *et al.*, 2011, Shapiro, 1981, American Academy of Sleep Medicine, 2013) [1, 5].

Competitive team handball is an intermittent high intensity body-contact team sport that requires a combination of aerobic and anaerobic fitness to perform a sequence of well-coordinated activities (Chelly, 2011; Buchheit *et al.*, 2009; Buchheit and Leprette, 2009; Delamarche, 1987; Rannau, 2001) [6]. Team handball places a heavy emphasis on sprinting, running, jumping and throwing. Motor ability, sprinting, jumping, flexibility and throwing velocity represent physical activities that are considered as important aspects of the game and contribute to the high performance of the team (Zapartidis *et al.*, 2009) [7].

Passing and catching are the most important components of ball control in team handball. Offensive success revolves

around a team's ability to move the ball quickly and accurately from one player to another. Consistent, accurate passing ensures the paces and continuity of team play and keeps pressure on the defense by allowing each attacker the opportunity to be a scoring threat. There are four basic shots in team handball. The set shot is the most natural of all shooting actions and is simply the overhand pass thrown hard. The "jump shot" is the most used shot in team handball. Developing the ability to jump and shoot over the defence, as well as jumping inside the goal area, will make athletes more effective scoring threat. The "wing shot" is the jump shot performed at a difficult shooting angle. The "fall shot" is the basic technique of the circle runner. It allows receiving the ball on the 6 meter line and shooting without using three steps (Clanton & Dwight, 1997) [8].

Schmidt & Wrisberg (2004) [9] were expressed accuracy as the amount of variability or inconsistency of performer's movement end point in the target area.

Accuracy can be divided into three such as spatial accuracy, temporal accuracy and timing accuracy. Spatial accuracy required of aiming movements for which spatial position of the movement's end point is important to task performance. Speed or distance is decreased such as down the line serve in volleyball; dart throwing; target archery. Temporal accuracy required of rapid movements for which accuracy of the movement time is important to task performance; more commonly referred as timing accuracy. The last one is timing accuracy required of rapid movements and decreased movement time for also referred to as temporal accuracy such as tennis drive or badminton smash (Schmidt & Wrisberg, 2004; Kluka, 1999) [9].

**Fitts Law:** Fitts' law suggests that there is a trade of between speed and accuracy. When speed is emphasized, accuracy is reduced; when accuracy is emphasized, speed is reduced. If the goal of the movement involves primarily spatial accuracy such as throwing darts at a target, movement should be made more slowly to reduce spatial errors. If the movement goal primarily involves temporal accuracy such as when to swing the bat at the ball in cricket, increasing the speed of the movement will reduce errors in timing accuracy (Kluka, 1999) [10].

Shooting the ball hard is not enough to beat a good goalie; accuracy is essential. Shooting for the corners is one of the important principles of shooting. The high corner cobwebs are under the crossbar and inside the goalpost. The low cobwebs are where the goalpost meet the floor, above where the goalie's foot can extend and below where the goalie's hand can reach. The accuracy is dependent on our brain functioning better brain functioning can be achieved through proper recovery and rest. The objective of the study is to find out how sleep deprivation will affect the shooting accuracy of handball players. Independent variable: sleep. Dependent variable: Accuracy

### Selection of the Subjects

For the purpose of the study, the sampling technique used was probability random sampling, where a total of 15 male handball players, from Lakshmbai National Institute of Physical Education selected (age group 18 yrs – 24 yrs).

- Mean & standard deviation (SD) of their age was  $20.64 \pm 0.92$  (yrs).

### Procedure of Experiment

The experiment was conduct for three days. The experimental

group was first provided with complete 8 hour sleep (10:00 pm to 6:00 am) and shooting accuracy test was conducted where all 15 players were asked to jump shot from 9 metre line. For accuracy the players were asked to target the top right & left goal post cobwebs. 10 shots trail was given to each player where each goal scored is counted as 1 and not goal scored counted as 0.

The same experimental group after one day gap was deprived from one night sleep and then shooting accuracy test was

conducted where all 15 players were asked to jump shot from 9 metre line. For accuracy the players were asked to target the top right & left goal post cobwebs.

### Statistical Analysis

Provide sample t-test was applied to investigate shooting accuracy of subjects with level of significance was selected at 0.05.

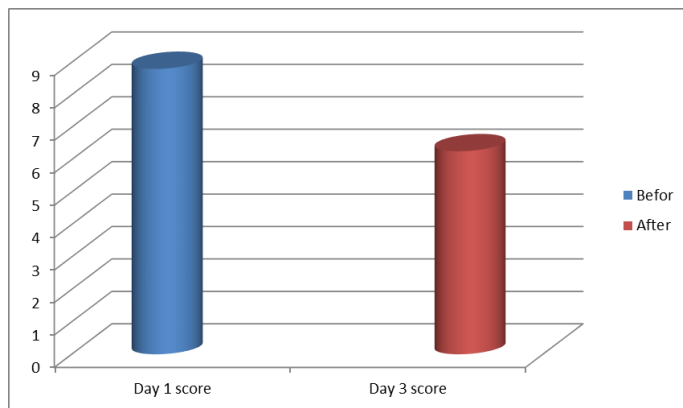
**Table 1:** Group means difference in performance of shooting efficiency in Handball players before and after deprivation of sleep.

Group	Number of subjects	Mean	Mean difference	Std. Deviation	t ratio
Day 1 (after complete sleep)	15	8.80	2.54	1.01	7.87
Day 3 (after incomplete sleep)	15	6.26		1.43	

\*Significant at 0.05 level, [Tabulated value = 2.14, df= 14]

The mean and standard deviation shooting scores of Day 1 and Day 3 at the experiment were (8.80±1.01) and (6.26±1.43).

The mean performance pre and post were 8.80 and 6.26 respectively at the conclusion of experiment thus, the performance on the Day 3 decrease as compare of Day 1 recorded data.



**Fig 1:** Difference between Day one shooting score mean and Day three shooting score mean of handball players before and after deprivation of sleep.

### Result

The score of shooting accuracy were taken before and at the end of the experiment. The mean score of Day one was (8.80) and the mean score of Day three was (6.26) and the mean difference the Day one & Day three was (2.54) & tested by 't' test. The significance difference exists between pre-test mean and post-test mean because calculated value 7.87 is greater than the tabulated value 2.14. Day two scores were found to be statistically significant at 0.05 level of confidence.

### Conclusion

On the basis of the result and findings within the limitation of the present study the significant difference were found before deprivation of sleep and after deprivation of sleep. Obtaining at least eight hours is essential in preventing neurobehavioral deficits such as concentration difficulties, fatigue, emotional liability, irritability, and sleep and appetite disturbances. Deprivation of sleep as per the preceding discussion significant difference was found and it is recommended that a complete sound sleep is requires for enhancing the accuracy for greater performances.

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