

# The effects of 30 hours sleep deprivation on basic football skills of soccer players

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## Annotation:

The aim of this study is to determine the effect of sleep deprivation on the passing and shooting skills of football players. To this end, 18 students of Sahand University, with age range 20 to 24 years performed basic soccer skills (shoot and pass) in the pre-test and post test stages. In this study to assess these skills, the test "Mor – Christian" has been used. In the first step, subjects conducted the shoot and pass test as pre-test after 8 hours sleep a night. 10 days later, to ensure the validity of tests and test results on the learning effect, subjects did the same test again after 8 hours sleep a night. In the third stage, 30 hours of sleep deprivation as an independent variable imposed on the subjects and then the test was repeated and experimental test results were compared as recorded using paired t-test. The findings showed that 30 hour sleep deprivation decreases passing and shooting skills implementation skills ( $p < 0.001$ ). Therefore, the findings showed that sleep deprivation can be a devastating effect on basic football skills.

**Мехрдад Хефзоллесан, Сохраб Гхалехгир, Насер Бехпоор. Эффекты 30-годинного позбавлення сну в зниженні базових футбольних умінь футболістів.** Мета цього дослідження – визначити ефект 30-годинного позбавлення сну в зниженні навиків передачі і удару м'ячем по воротах футболістами. 18 студентів Університету Саханд у віці 20-24 роки виконували основні футбольні навички (удар і передача) в попередньому тестуванні і повторній перевірці в різних фазах підготовки. У цьому вивченні, щоб оцінити ці навички, був використаний тест «Мор – Christian». На першому етапі, випробовувани виконували удар і передачу м'яча в тестуванні після 8-годинного сну вночі. Потім, 10 днів пізніше, щоб гарантувати валідність тестів і тестових випробувань в ефекті навчання, випробовуваних знов перевірили після 8-годинного сну вночі. На третьому етапі, після 30-годин позбавлення сну як незалежної змінної для випробовуваних, було проведено повторне тестування і експериментальні тестові випробування порівнювалися з отриманими раніше з використанням парного t-test. Отримані дані показали, що 30-годинне позбавлення сну погіршує навички передачі і удару у футболістів ( $p < 0.001$ ). Тому, отримані дані показали, що позбавлення сну може бути руйнівним ефектом для основних футбольних навиків.

**Мехрдад Хефзоллесан, Сохраб Гхалехгир, Насер Бехпоор. Эффекты 30-часового лишения сна в снижении базовых футбольных умений футболистов.** Цель этого исследования – определить эффект 30-часового лишения сна в снижении навыков принятия и удара мячом по воротам футболистами. 18 студентов Университета Саханд в возрасте 20-24 года выполняли основные футбольные навыки (удар и передача) в предварительном тестировании и повторной проверке в различных фазах подготовки. В этом изучении, чтобы оценить эти навыки, был использован тест «Мор – Christian». На первом этапе, испытуемые выполняли удар и передачу мяча в тестировании после 8-часового сна ночью. Затем, 10 днями позже, чтобы гарантировать валидность тестов и тестовых испытаний в эффекте обучения, испытуемых вновь проверили после 8-часового сна ночью. На третьей этапе, после 30-часов лишения сна как независимой переменной для испытуемых, было проведено повторное тестирование и экспериментальные тестовые испытания сравнивались с полученными ранее с использованием парного t-test. Полученные данные показали, что 30-часовое лишение сна ухудшает навыки передачи и удара у футболистов ( $p < 0.001$ ). Поэтому, полученные данные показали, что лишение сна может быть разрушительным эффектом для основных футбольных навыков.

## Keywords:

*sleep, deprivation, shooting, passing, skill, soccer.*

*сон, втрати, удари, передачі, навик, футбол.*

*сон, потери, удары, передачи, навык, футбол.*

## Introduction

Sleep is a complex combination of physiological and behavioral factors that is required for renewal of physical and mental powers in normal individuals and athletes (willy et al., 2008) However, sleep disorders may be observed in athletes who may participate in a competition with prescribed schedule, after a long trip, change in the environment, physical activity and anxiety (Bryant et al., 1992 Chen., 1991).

A study (2002) on more than one million men and women showed that the death risk of people sleeping over 8.5 hours or less than 3.5 hours a night, is 15 percent higher than those who averagely sleep seven hours a night (Williams et al., 2003). The sleep quality of athletes is important in such a way that sleeps disorders in athletes causes psychologically negative effects, increased heart rate, decreased peak oxygen consumption during physical activity performance, weak immune system, hormonal changes, etc (willy et al., 2008 Tulio et al., 2005 Selma et al., 2007). Another study revealed that the amount and state of night sleep can affect the individual level of cognitive function and activities (Silvia. 2006). Result of another study on the negative effects caused by sleep deprivation

suggests that sleeping less than 5-6 on the night can lead to dysfunction (Veasey et al., 2002). Athletes can be easily affected by anxiety, fatigue, exercise pressures, and especially long journeys and as a result, they will suffer from sleeplessness or insomnia. In sports psychology literature, experimental or quasi-experimental research about amount and state of sleep in athletes has been done very rarely. Usually athletes, coaches and sports psychologists have a lot of information about the many factors that can be effective on the performance. But the effect of sleep deprivation on athletic performance, often have been less studied. However, it was shown that when the sleep schedule changes, it indirectly affects on athletic performance. But the results of research done in this case has less integrity and often are contradictory (Angus et al., 1985 Bond et al., 1986 Hill. 1992 Holland., 1986 Johnson., 1982). For example, (Bond. 1986) demonstrated that sleep deprivation reduces maximum oxygen consumption, while Martin and Gdys (Hill., 1992) stated that there are no changes in VO<sub>2</sub> following sleep deprivation (Bryant et al., 1992). In addition, most previous studies have shown that heart rate at a given workload by sleep deprivation is not affected (Hill., 1992 Holland., 1986). (Bond. 1986) reported that heart rate

after sleep deprivation decreases. These differences can result from different research methods, including sleep deprivation period, measuring techniques and training methods, so the investigation can add some information about the effect of sleep on performance. Another test, on six patients, sleep deprivation did not show a significant effect on peak oxygen consumption, but the peak exercise heart rate was significantly reduced. These results suggest that sleep deprivation changes psychological responses to exercise of moderate to severe level (Hill. 1992). Chen (1991) examined 30 hour sleep deprivation effects on heart- breathing function at rest and exercise in 15 healthy male volunteers. Results showed a decrease in heart rate, catecholamine levels and blood PH at rest followed by 30 hours sleep deprivation; while the minute ventilation and CO<sub>2</sub> production increased ( $p < 0.05$ ). Maximum exercise performance by the maximum heart rate, peak minute ventilation, peak production of carbon dioxide and peak oxygen consumption assessed by the sleep deprivation has decreased. However, significant changes in endurance exercise, PH CO<sub>2</sub> and blood pressure during exercise was observed followed by sleep deprivation. Chen. 1991 concluded that 30 hours of sleep deprivation changed the heart- breathing function in relaxation and ability to exercise, but endurance training had not been affected. Pilcher and Huffcutt (1996), in several researches, studied the effect of complete sleep deprivation on some human functions such as mood and thought, rather than cognitive dimensions.

Habeek et al, (2002) showed sleep deprivation damages precision performance. Dongen von et al (2003) postulated that 4-6 hours of sleep deprivation reduces cognitive function. Scott et al (2006) examined the effect of sleep deprivation on cognitive and motion performance in their study of six persons deprived of sleep and concluded that 30 hours of sleep deprivation had significant effects on the reaction time at rest and during exercise and the reaction time with 26 Sleepless hours significantly increased (Waterhouse., 1998).

Since in many sports, motion skill performance is of great importance and very few researches had been done on the impact of sleep deprivation on the performed skill, it seems that the conducted study can partly fill the needs of coaches and athletes to control the effects of sleep deprivation in order to get the best results.

### **Materials and methods:**

The statistic samples of this research were 18 members of Sahand university football team with ages ranged between 20 and 24 and at least with 3 years experience in playing football. Samples were completely healthy. They didn't have any abuse such as smoking. They had regular sleep and wake program one month before the test. They didn't do any difficult physical activities 48 hours before the test. All of the samples (here means subject of the test) participated in this research as volunteer. Volunteers (subject) did the pass and shoot tests as a pretest after 8 hours sleep. 10 days later, to ensure the validity of the test, subjects run the tests as post-test again after 8 hours of night sleep. 10 days after this process and as the

third stage, the independent variable was applied upon subjects. After 36 hours of sleep deprivation, the subjects repeated the test again. The results were recorded as an experimental test. To measure the basic skills of football (pass and shoot), Mor Christine test was used. The aim was general evaluation of football. Validity of the test is 81 percent and the stability is reported 92 percent. In the pass test, a gate is made by putting two 18 inch cones, one yard (91.44 centimeter) away from each other and a horizontal rod or rope placed on them. Within 15 yards of the gate, two cones with 45 degrees angle and a cone with 90 degrees angle are placed (Fig-1). The subject sends 4 passes (total of 12 passes) from each of the three cones, placed 15 yards away, to the gate. For each correct pass, one point is given. The final score of the subject in the pass test is obtained according to the total score. In the shoot test, two vertical ropes with a distance of 4 feet from horizontal bars of the football gate are hanging from vertical masts and the gate space is divided into two significant areas. Each of these two significant areas is divided into two goals by two rings with a diameter of 4 feet. A line, 16 yards away from the line of the gate parallel to the gate line, is plotted as the location of shoot handling (Fig- 2). All of the subjects are asked to be located on the back of the marked line to shoot the ball anywhere they want. One should shoot 4 times from this point to left or right of any of the circles which are specified as purpose (total 16 shoots).

For statistic analysis from descriptive statistics, the resulted average and standard deviation were used and from inferential statistics for investigating the difference of pretest and post-test, significance level of 5% was used and SPSS statistic software and excel software were used for drawing charts .

### **Results:**

According to Table-I, average age of the samples (subjects) was  $21.56 \pm 1.23$  years old, average height was  $172.06 \pm 4.84$  centimeter and average weight was  $68.56 \pm 3.36$  kg.

The descriptive statistics results of the subject showed that the average score of pass test in pretest (before the sleep deprivation) was  $7.8333 \pm 1.6539$ ; in the control test before the sleep deprivation which was performed for the validity of test was  $7.8333 \pm 1.6539$ ; and in experimental post-test which was performed after applying 30 hours sleep deprivation, the average and standard of pass test was  $1.6450 \pm 5.000$ . The results (Table-II and Figure-3) also showed that the mean score of shoot test in pretest before the sleep deviation was  $57.8889 \pm 19.3479$ ; in control test before sleep deprivation, which was performed for validity of the test was  $57.833 \pm 19.749$ ; and in experimental post-test, which was performed after applying 30 hours sleep deviation, test score was  $34.444 \pm 11.1789$ . As the results show, by comparing the average scores which are obtained from pass and shoot test in pretest and experimental posttest, the lack of any difference between tests, statistically indicates the validity of the tests. According to Table 3 and comparing the results of the pre-test and post test of experimental passing skills, sleep deprivation

Table 1. Individual specifications

variable	number	Standard deviation	average
age (old)	18	1.23	21.56
weight(kg)	18	3.36	68.56
height(centimeter)	18	4.84	172.06
fat(percent)	18	2.27	13.46

Table 2. The descriptive statistic of pass and shoot test

Test	Number	Process	Standard deviation	Average
Pass	18	Pretest	1.5297	7.8889
	18	Posttest of control	1.6539	7.8333
	18	Experimental post test	1.6450	5.0000
Shoot	18	Pretest	19.3479	57.8889
	18	Posttest of control	19.1749	57.8333
	18	Experimental post test	11.1789	34.4444

Table 3. T test result in the pre-test and experimental post test of passing skill.

Significant level	Obs T	Standard deviation	average	
0.001	6.138	1.5297	7.8889	pre-test
		1.6450	5.0000	experimental post test

Table 4. T test result in the pre-test and experimental post test of shooting skill.

Significant level	Obs T	Standard deviation	average	
0.001	4.494	19.3479	57.8889	pre-test
		11.1789	34.4444	experimental post test

showed a significant effect on performance in the test subjects.

A difference observed in the average of the two tests (2.8889) is significant at 0.001. T of the Table in 0.001, with 17 degrees of freedom, is 3.965, which is obtained from the mean difference between the two stages of passing test 6.138. According to T being larger than T observed in Table by 0.001, one can conclude that sleep deprivation can significantly affect the pass performance in football. According to Table 4 and comparing the results of the pre-test and post test experimental skills, sleep deprivation represents a significant impact on shoot performance in the test subjects.

#### Conclusion:

Sleep deprivation is one of the problems that may occur in athletes caused by long trips (or any other cause) and their optimal athletic performance on race day or practice may be affected. Athletes for many reasons, including excitement, travel, change of habits, change of sleep time, malnutrition, etc are suffering from change in circadian rhythm and in some cases sleep deprivation. Study results showed that 30 hours sleep deprivation has a significant negative impact on performance of pass and shoot skills in football players. Limited studies in this area are mostly done on the impact of sleep deprivation on the

physiological and psychological factors. Scott et al (2006) in their study of six persons deprived of sleep and its effect on cognitive and motion performance concluded that 30 hours of sleep deprivation had significant effect on reaction time; Also 26 hours of sleep deprivation significantly increased the reaction time during exercise (Waterhouse., 1998). Flip et al (1993) in other research expressed that sleep deprivation range from 30 to 64 hours has a significant effect on the choice and simple reaction time. Thus, the results of the present study are consistent with the research. Review study of Haack and Mullington (2005) also showed that duration of sleep deprivation has an effect on performance however, less than 20 hours is not impressive and the effects of sleep deprivation usually show up in more than 30 hours of deprivation (willy et al., 2008 Van Helder., 1989). Considering that the basic skills of football (pass and shoot) are needed to be done accurately and quickly and also considering the results of research done regarding the significance of sleep deprivation on performance of skills, and confirmation of the effect of sleep deprivation, controlling the sleep before competitions and exercises becomes necessary to prevent loss of essential functions and soccer coaches persist on the importance of sleep to players and plan a full program on controlling their rest.

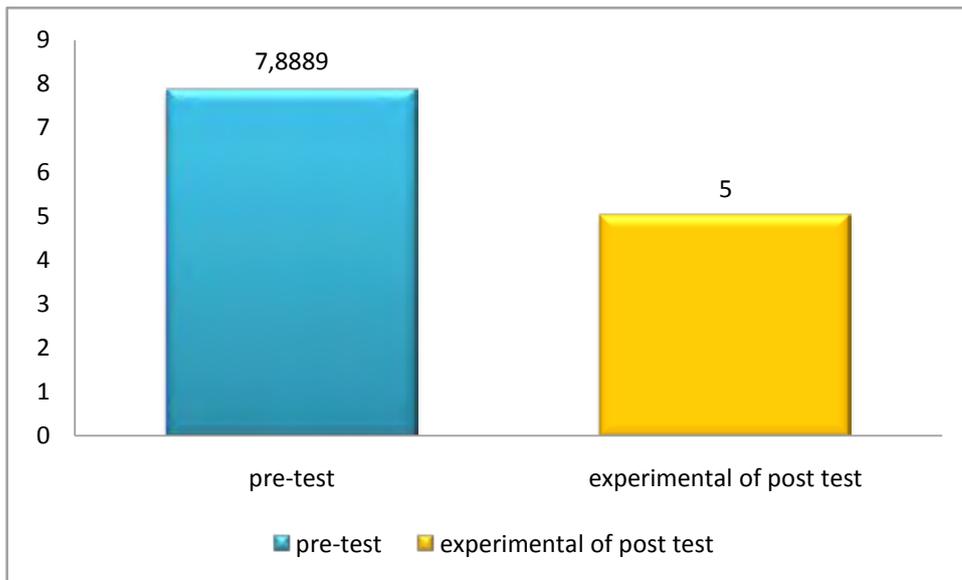


Diagram 1. Averages result of pre-test and experimental post test I of passing skill.

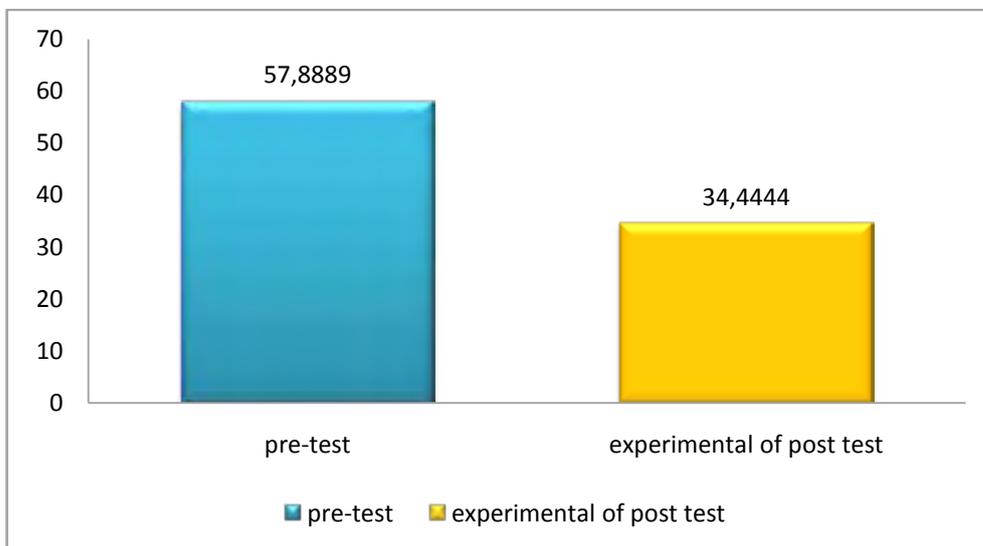


Diagram 2. Averages result of pre-test and experimental post test of shooting skill.

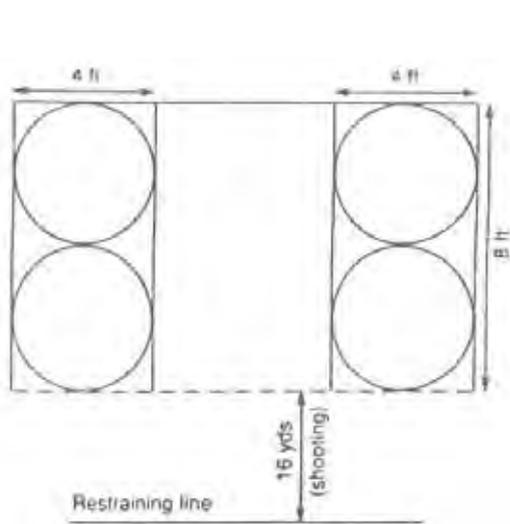


Fig. 1. Shooting test

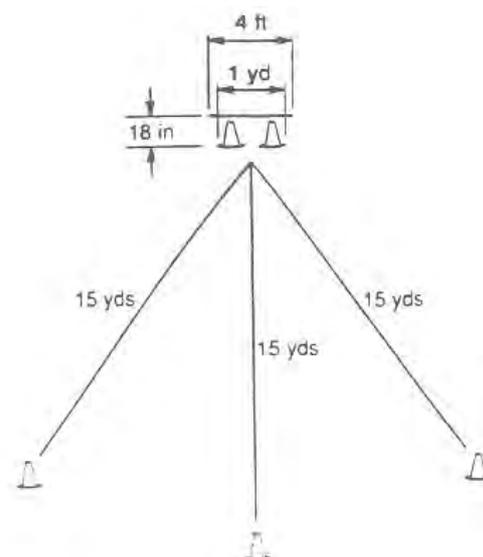


Fig. 2. Passing test

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