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Vishal Kumar
D.P.E, G.M.M.S, Pocket – 10,
Mani Majra, Chandigarh, India.

Correspondence
Vishal Kumar
D.P.E, G.M.M.S, Pocket – 10,
Mani Majra, Chandigarh, India.

Impact of sand running for developing endurance among athletes

Vishal Kumar

Abstract
The aim of the current study was to consider the impact of sand running for developing endurance among athletes. 30 Male athletes between the age group of 19 to 24 years (15 Experimental Group and 15 Control Group) were taken for the study. The Six Weeks endurance training program for experimental group were given which includes more sand running on alternate days and controlled group was given general training of athletics. The Pre Test and Post Test were conducted through Cooper Test for both groups to evaluate the impact of sand running. This study shows that the sand running has increase the endurance among the Experimental group along with Physiological capacity of the athletes. It is recommended that sand running is good for the endurance development of athletes.

Keywords: Sand Running, Endurance, Cooper Test.

Introduction

Endurance (also related to sufferance, resilience, constitution, fortitude, and hardiness) is the ability of an organism to exert itself and remain active for a long period of time, as well as its ability to resist, withstand, recover from, and have immunity to trauma, wounds, or fatigue. It is usually used in aerobic or anaerobic exercise. The definition of 'long' varies according to the type of exertion – minutes for high intensity anaerobic exercise, hours or days for low intensity aerobic exercise. Training for endurance can have a negative impact on the ability to exert strength unless an individual also undertakes resistance training to counteract this effect.

When a person is able to accomplish or withstand a higher amount of effort than their original capabilities their endurance is increasing which to many personnel indicates progress. In looking to improve one's endurance they may slowly increase the amount of repetitions or time spent, if higher repetitions are taken rapidly muscle strength improves while less endurance is gained. Increasing endurance has been proven to release endorphins resulting in a positive mind. The act of gaining endurance through physical activity has been shown to decrease anxiety, depression, and stress, or any chronic disease in total. Although a greater endurance can assist the cardiovascular system it does not imply that any cardiovascular disease can be guaranteed to improve. "The major metabolic consequences of the adaptations of muscle to endurance exercise are a slower utilization of muscle glycogen and blood glucose, a greater reliance on fat oxidation, and less lactate production during exercise of a given intensity."

Endurance training is essential for a variety of endurance sports. A notable example is distance running events (800 meters upwards to marathon and ultra-marathon) with the required degree of endurance training increasing with race distance. Two other popular examples are cycling (particularly road cycling) and competitive swimming. These three endurance are combined in triathlon. Other endurance sports for which extensive amounts of endurance trained include rowing and cross country skiing. Athletes can also undergo endurance training when their sport may not necessarily be an endurance sport in the whole sense but may still demand some endurance. For instance aerobic endurance is necessary (to varying extents) in racket sports, football, rugby, martial arts, basketball and cricket. Endurance exercise tends to be popular with non-athletes for the purpose of increasing general fitness or burning more calories to increase weight loss potential.

Long-term endurance training induces many physiological adaptations both centrally and peripherally mediated. Central cardiovascular adaptations include decreased heart rate, increased stroke volume of the heart, increased blood plasma, without any major changes in red blood cell count, which reduces blood viscosity and increased cardiac output as well as total mitochondrial volume in the muscle fibers used in the training (i.e. the thigh muscles in runners will have more mitochondria than the thigh muscles of swimmers). Mitochondria increase in both number and size and there are similar increases in myoglobin and oxidative enzymes. Adaptations of the peripheral include capillarization that is an increase in the surface area that both the venous and arterial capillaries supply. This also allows for increased heat dissipation during strenuous exercise. The muscles heighten their glycogen and fat storing capabilities in endurance athletes in order to increase the length in time in which they can perform work. Endurance training primarily work the slow twitch (type 1) fibers and develop such fibers in their efficiency and resistance to fatigue. Catabolism also improves increasing the athlete's capacity to use fat and glycogen stores as an energy source. These metabolic processes are known as glycogenolysis, glycolysis and lipolysis. There is higher efficiency in oxygen transport and distribution. In recent years it has been recognized that oxidative enzymes such as succinate dehydrogenase (SDH) that enable mitochondria to break down nutrients to form ATP increase by 2.5 times in well trained endurance athletes In addition to SDH, myoglobin increases by 75-80% in well trained endurance athletes.

The potential for negative health effects from long-term, high-volume endurance training have begun to emerge in the scientific literature in recent years. The known risks are primarily associated with training for and participation in extreme endurance events, and affect the cardiovascular system through adverse structural remodeling of the heart and the associated arteries, with heart-rhythm abnormalities perhaps being the most common resulting symptom.

The heart rate monitor is one of the relatively easy methods to assess fitness in endurance athletes. By comparing heart rate over time fitness gains can be observed when the heart rate decreases for running or cycling at a given speed. In cycling the effect of wind on the cyclists speed is difficult to subtract out and so many cyclists now use power meters built into their bicycles. The power meter allows the athlete to actually measure power output over a set duration or course and allows direct comparison of fitness progression. In the 2008 Olympics Michael Phelps was aided by repeated lactate threshold measurement. This allowed his coaches to fine tune his training program so that he could recover between swim events that were sometimes several minutes apart. Much similar to blood glucose for diabetes, lower priced lactate measurement devices are now available but in general the lactate measurement approach is still the domain of the professional coach and elite athlete.

The characteristics of a sand training surface and a grass training surface are quite different. For the athlete there are distinct physiological as well as biomechanical differences when performing on one or the other. This study was performed to determine the effects of each surface on soccer players.

The participants of the study were ten elite athletes - eight male and two female. The athletes were required to complete five separate testing sessions, which included three performance trials and two training sessions (one on sand, one on grass). The training session used was designed to mimic the movement patterns that are most common to team sports, including acceleration, agility, and common game simulation drills. The sand training session was conducted on soft, dry beach sand on a level area of beach removed from the water's edge. The grass session was conducted on a well-maintained sporting ground of Kikuyu grass. Athletes were barefoot during the sand trial, compared to the grass trial where they wore shoes. The same training session was completed on both sand and grass surfaces, and 24 hours later, each session was proceeded by a performance trial consisting of vertical jump, repeated sprint ability test, and a 3 kilometer running time trial. These measures were then compared to baseline measures acquired prior to the study.

Both physiological and perceptual variables such as blood lactate, heart rate, and ratings of perceived exertion were measured during each session. Additionally, throughout the 24 hour post-exercise period, measures such as muscle damage, inflammation, and hemolysis (the breakdown of red blood cells) were measured. GPS units were used to monitor sport-specific conditioning sessions, and distance and speed were calculated from the data collected on the units. Blood samples were taken pre-, post-, and 24 hours after exercise.

The results of the research showed a significantly higher heart rate and rating of perceived exertion in the sand training sessions**.** There were no differences in 24-hour post-exercise performance, no indications of muscle damage, and rates of inflammation and hemolysis were similar between each surface. These results suggest that performing a sport-specific conditioning session on sand as opposed to grass can result in a greater physiological response, without inflicting any additional damage to next day performance.

Based on this research, athletes can use sand surfaces to improve performance without worrying about recovery or performance issues**.** Sand training requires less stability and energy returned during exercise, which results in a greater workload for the muscles to achieve the same output. The fact that it won't affect recovery is promising, since it can be an effective training method.

Sand running offers the following benefits.

a) Helps develop power and muscle elasticity.
b) Improves stride frequency and length.
c) Promotes strength endurance.
d) Develop maximum speed and strength
e) Improves lactate tolerance

Method

The subjects for this study is 30 college level Male athletes of Kerala University between the age group of 19 to 24 years (15 Experimental Group and 15 Control Group) were taken for the study. Cooper's 12 Min Test is used for collection of Data.

Procedure of data Collection

The 12 Min Cooper Test were used for Pre Test for Experimental Group and Controlled Group and results was recorded. The six weeks training were given to Experimental Group which consists of Sand Running Sessions on alternate days. The Sand Running Sessions includes Short Sand Sprints, Continuous Running in Sand and Sand Hills were given training to experimental group. The controlled group was given the general training. After Six weeks Training the Post Test were conducted experimental group and controlled group. The athletes generally hail from different socio-economic status, different dietary habits, mode of living etc. certain factors like daily routine, life style and food habits which would have an effect on the performance of both groups could not be controlled.

Result and Discussion

12m Run/Walk test was used to assess cardio respiratory endurance before and after both of the experimental conditions. Items on this time are weighted such that a decrease in score is indicative of increase in fitness level in cardio respiratory endurance.

Table 1: Descriptive statistics of different groups measured in post-testing (Cooper Test 12m R/W)

Group	N	Mean	S.D
Control Group	15	3598.57	187.37
Experimental Group	15	3731.36	144.82
Total	30	3664.96	166.09

Table 1 shows the values of mean and standard deviation for the data on 12m R/W between the control and experimental groups during post-testing. The control group mean was 3598.57 (SD = 187.37) and the experimental group mean was 3731.36 (SD = 144.82).

Table 2: Pair wise comparisons on Cooper Test 12m R/W

(A) Group	(B) Group	Mean Diff. (A-B)	Std. Error	Sig*
Control Group	Experimental Group	-132,79	42.55	0.023
Experimental Group	Control Group	132.79	42.55	0.023

Table 2 shows the pair wise comparisons of 12m run/walk among both groups. The control group showed a MD = -132.79 and p = 0.023. The experimental group showed a MD = 132.79 and p = 0.023.

Conclusion

Sand Running results in the calf muscles learning to contract more quickly and thereby generating work at a higher rate, they become more powerful. The calf muscles achieves this by recruiting more muscle fibres, around two or three times as many when compared to running on the flat. Sand Running is recommended for endurance athletes more in off season and less in season.

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