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A STUDY ON RELATIONSHIP BETWEEN VITAMINE E SUPPLIMENTATION AND SOLE MORPHOLOGY WITH PERFORMANCE LEVEL OF FOOTBALL PLAYERS

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ABSTRACT

Football is the most popular sport in the world. Football needs high skilled coordination of different body parts, especially the lower extremities. The administration of Vitamin E, *in vivo*, might have similar effects on skeletal and cardiac muscles. From the findings of this study, it could be concluded that vitamin E supplementation can boost up the performance level of hill land football players but it could not possible to draw a conclusion with studying footprint parameters but can be predicted that sole morphology do have a relationship with goal scoring ability considering the impact of hitting the ball, the spin that to be delivered to the ball to move a particular trajectory and force generation at kicking all these are dependent on foot or sole morphology which needs detailed biomechanical analysis as well as EMG analysis. This study is the first to investigate several static footprint measurements in professional football players using AutoCAD software with their goal scoring ability.

KEY WORDS: Football player, Performances, Sole morphology, Vitamine

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INTRODUCTION

Football is the most popular sport in the world, with 265 million football player's worldwide. As it is a contact sport, there is a high risk of injury to the lower extremities[1]. The reported rates of injuries to the foot and ankle vary [2, 1]. Football needs a high skilled coordination of different body parts, especially the lower extremities[3]. Body proportions and size are the important factors for the sports performance. Especially, the feet of the football players are essential for their proper performances among other factors. Also, determination of foot morphology and shape will be helpful for designing footwear to enhance performance[4]. Indeed, sport specific foot morphology of athletes engaged in various sporting disciplines has been demonstrated recently[1] Vitamin E is a potential lipid soluble antioxidant has profound roles in amelioration of free radicals generated during endurance exercise. According to University of Illinois kinesiology and community health professor Kimberly Huey, past research has demonstrated that the antioxidant properties of Vitamin E may be associated with reduced expression of certain pro-inflammatory cytokines, in vitro, in various types of cells. The administration of Vitamin E, *in vivo*, might have similar effects on skeletal and cardiac muscles[5] Research study by Amelink *et al.,* 1991[5] had shown that Vitamin E deficiency enhances the susceptibility to exercise-induced muscle damage in male rats more than in female rats. This difference between the sexes is attributed to the protective effect of estradiol that remains operative in female rats when the vitamin E status is disturbed: male rats lack such hormonal protection. Research study has reported that a single bout of sub maximal treadmill running can result in a significant depletion of vitamin E in skeletal muscle. Therefore, in the present study an attempt has been made to observe the effect of vitamin E supplementation on development of anaerobic power, leg strength and oxygen uptake of football players as well as the effect of foot morphology of professional football players on their goal scoring capacity.

METHODS

The subject

The totals of twelve (12) male footballers were taken as the subject for the study all of them, twelve were from hill land. The age of the subjects ranged from 17-20 years. They were undergoing for a specific training programme throughout the year under the guidance of a qualified coach. The personal data of the subjects that is the name, age, height and weight were taken. Evion® 200 capsules were administered to the subjects to the experimental group everyday with taking consent from the subject and in consultation with the medical professional (dose was adopted as per Takanami et al., 2000)[6]. A total of 24 hrs time period was given for bioavailability and complete metabolism of the Vitamin E capsule after which the exercise was given.

Leg strength measurement

Leg dynamometer was used to measure the leg strength. The subject was stood on the dynamometer base, with feet parallel about 6 inches apart. The ankle joint was nearly opposite to the attachment of the dynamometer to its base. The subject stood with head erect, back straight, and chalked fingers extending down the thighs. Belt was used around the subject's hip to stabilize the bar, as the lifting force of the legs is much too great to be held by the hands, the subjects hold the center of the bar, palms down, at the level of pubic bone.The left end of the bar was attached with the belt.. the belt loop was attached to the left end of the bar. The belt was brought around the lower portion of the sacrum to the right end of the handle. The subject with head up and back straight, bends at the knees. The handle was hooked on to the chain, so that the subject knees were flexed between 115 and 125 degrees. Three trials were given and the highest score of reading was recorded in kgs.

Maximum exercise of O_2 uptake test

To determine and measure the exercise oxygen uptake from the basic equation of predicting

energy cost of Treadmill running of the subject. The maximum exercise of O_2 uptake, it mainly used for determination of maximum O_2 consumption during exercise. Before the test same protocols [4] was applied for examination of VO_2 ($mL.Kg^{-1}.min^{-1}$).The percentage grade of treadmill inclination was increased gradually transport the protocols. That any point it the subjects feels any discomfort the test was a stopped. The same procedure followed for post test. Equations: VO_2 ($mL.Kg^{-1}.min^{-1}$) =Resting component + Horizontal component+ Vertical component

VO_2=Resting VO_2 ($mL.Kg^{-1}.min^{-1}$) + [speed (m. min^{-1}) X 0.2 $mL.Kg^{-1}.min^{-1}$] + [%grade x speed (m. min^{-1}) X0.9mL. $Kg^{-1}.min^{-1}$]

For Running Oxygen cost of the horizontal component of movement equals to 0.2 mL. $Kg^{-1}.min^{-1}$ where as 0.9 $mL.Kg^{-1}.min^{-1}$ for the vertical component

Standing broad jump

To determine and measure the leg explosive strength of the subject, the subject stood with his feet a comfortable distance apart and his toes just behind the take of mark. Subject crouched, leaned forward, swing his arms backward and then jumped horizontally as far as possible, jumped from the both feet and landing on both feet. The best of three jumps were recorded to the nearest cms. The measurement was taken from the back take off mark to the nearest point where the subject touched the pit at the completion the jump. In this way all the score was recorded against each name**.**

Criterion measures

The McDonald soccer test was taken as the criteria for measuring the goal scoring ability of the football players. The goal scoring ability was correlated with the sole morphology of the subjects; measured anthropometric parameters include: - Chippaux-Smirak index, Staheli index, Arch length index, Footprint index, Truncated arch index, and Arch index were considered for the study.

Measured parameters

After recording the personal data, the subjects had gone through the McDonald soccer test to measure the goal scoring ability in football while sole morphology were measured for the present study. Sole morphology includes following components –

Sole morphology components: Measured Anthropometric Parameters

- ✓ Chippaux-Smirak index
- ✓ Staheli index
- ✓ Arch length index
- ✓ Footprint index
- ✓ Truncated arch index
- ✓ Arch index

Procedure for collecting the data

For collecting data the subjects were asked to assemble in the field. They were informed briefly about the purpose of the study and were requested to extend their co-operation.

McDonald soccer test

This test is designed to measure general soccer ability, though mainly trapping and passing skills, and is appropriate for most levels. A soccer ball is placed on a line, marked 9 feet from the wall. Another two soccer balls are left 9 feet behind the line in the centre of the test area. On the signal, “Go,” the player kicks the ball against the wall as many times as possible in 30 seconds. In the event of a wild kick, the player may either retrieve the original ball or use one of the two spare balls. (It is OK to use the hands to retrieve a ball). All kicks must perform from the ground behind restraining line. The test is repeated four times.

Scoring The number of kicks in each 30 second period is recorded, with the highest total being the score.

Statistical analysis

Analysis of covariance (ANCOVA) was used to determine the differences, among the adjusted post test means on selected criterion variables separately. The level of significance was fixed at 0.05 level of confidence to test the ‘F’ ratio obtained by analysis of covariance. Percentage changes in Mean value of each of the three parameters before and after test were measured.

All the statistical analysis was done by using MICROCAL ORIGIN PRO 7 version. Pearson's product moment correlation was done.

RESULTS

The mean and standard deviation (SD) of the personal data– age, height and weight of the hill and plain land football players were presented in Table 1. From the table 1, it was observed that mean age of Hill land football players were 18.42 with a variation of SD 0.79. The mean of age of both the groups were found same. It was observed that mean height of Hill land footballer players were 166.08 with a variation of SD 4.35.

On the other hand, it was observed that mean weight of Hill land footballer players were 59.58 with a variation of SD 1.11

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Table 1

Age (years), height (cm.), weight (kgs.) of hill land football players.

Parameters	Mean±SD
Age (years)	18.42±0.79
Height (cms)	166.08±4.35
Weight (kgs)	59.58±1.11

ANCOVA analysis (Table 2) shows that there is a significant difference in leg strength, explosive strength and exercise oxygen uptake between the control group and hill land football players.

Table 2

Analysis of Covariance and 'F' ratio for Leg strength, Exercise oxygen uptake and Explosive strength of control group and hill land football players.

Variable Name	Group Name	Control Group	Hill land football players	F ratio
Leg strength (in Kgs)	**Pre-test Mean ±S.D**	52.8± 1.08	66.4 ±1.15	1.935
	Post-test Mean ±SD	59.6± 1.7	58.1± 2.04	8.246*
	Adj Post test Mean ±S.D	59.2±1.12	65.2±2.84	17.754*
Exercise oxygen uptake ($mL.Kg^{-1}.min^{-1}$)	**Pre-test Mean ±S.D**	32.7±1.42	33.3±1.01	1.539
	Post-test Mean ±SD	32.2± 1.94	34.7± 2.21	5.64*
	Adj Post -test Mean ±S.D	33.15	35.002	12.86*
Explosive strength	**Pre-test Mean ±S.D**	3.22 ± 0.009	3.23 ± 0.07	0.697
	Post-test Mean ±SD	3.22 ± 0.06	3.24 ± 0.08	6.078*
	Adj Post -test Mean ±S.D	3.15± 0.004	3.30± 0.11	12.16*

****Significant at .05 level of confidence.***

Mc Donald soccer test data

From the table 3, it was observed that mean McDonald soccer test score (no.) of Hill land footballer players were 19.25 with a variation of SD 2.02. Various sole morphology indexes had been mentioned here.

Table 3

Mean and SD of McDonald soccer test (no.) and sole morphology of hill land football players

Groups	Mean±SD
McDonald soccer test	19.25±2.02
Chippaux-Smirak index	0.54±0.13
Staheli index	0.83±0.20
Arch length index	2.24±0.21
Footprint index	2.57±0.48
Truncated arch index	1.56±0.10
Arch index	0.28±0.03

Table 4 showed that the co relation between Chippaux-Smirak index and Mc Donald soccer test has high value of co relation therefore this particular anthropometric parameter do have positive significant relation with the goal scoring ability i.e. goal scoring ability depends upon the Chippaux-Smirak index. Table 4 also showed that co relation between Staheli index and Mc Donald soccer test i.e. goal scoring ability has much positive relationship with goal scoring ability. Therefore, these particular anthropometric parameters do have a significant relation with the goal scoring ability. It has been observed that the Co relation between arch length index and Mc Donald soccer test, i.e. goal scoring ability has a high positive relationship with goal scoring ability. Therefore this particular anthropometric parameter does have significant relation with the goal scoring ability (Table 4). It has been observed that co relation between foot print index and Mc Donald soccer test i.e. goal scoring ability has high positive relationship with goal scoring ability this particular anthropometric parameter do have significant relation with the goal scoring ability (Table 4). Table 4 showed that co relation between Truncated Arch index and Mc Donald soccer test i.e. goal scoring ability has high positive relationship with goal scoring ability. Therefore, this particular anthropometric parameter does have significant relation with the goal scoring ability. It has been observed that positive co relation exists between Arch index and Mc Donald soccer test but the r value is not very high i.e. goal scoring ability has very weak relationship this particular anthropometric parameter (Table 4).

Table 4

Co-relation between Chippaux-Smirak index, Staheli index, Arch length index, Footprint index, Truncated Arch Index and Arch Index with McDonald Soccer Test.

Mean±SD of Chippaux-Smirak index	Mean±SD of McDonald Soccer Test	r value
0.55±0.13	19.25±6.01	0.92 (p<0.001)
Mean±SD of Staheli index	Mean±SD of McDonald Soccer Test	r value
0.83±0.20	19.25±6.01	0.20 (p<0.5)
Mean±SD of Arch length index	Mean±SD of McDonald Soccer Test	r value
2.42±2.14	19.25±6.01	0.89 (p<0.001)
Mean±SD of Footprint index	Mean±SD of McDonald Soccer Test	r value
2.59±0.48	19.25±6.01	0.92 (p<0.001)
Mean±SD of Truncated Arch Index	Mean±SD of McDonald Soccer Test	r value
1.56±0.10	19.25±6.01	0.94 (p<0.001)
Mean±SD of Arch Index	Mean±SD of McDonald Soccer Test	r value
1.56±0.10	19.25±6.01	0.18 (p<0.5)

DISCUSSION

It has been widely reported that vitamin E shows numerous beneficial effects through and beyond its antioxidative properties; many studies related to vitamin E have been conducted originally from the point of view of its effects on physical performance. Recent studies have suggested that endurance exercise may promote free radical generation in the body, and vitamin E may play an important role in preventing the free radical damage associated with endurance exercise. However, it is proposed that as a result of exercise, vitamin E may be mobilised from store tissues and redistributed in the body to prevent oxidative damage. Research studies have already proved that vitamin E contributes to preventing exercise-induced lipid peroxidation. It has also observed that in case of strenuous endurance exercise enhancement in the production of oxidised low density lipoprotein (LDL) could be reduced by higher vitamin E status maintenance. [6] Supplementation with 100 to 200mg of vitamin E daily can be recommended for all endurance athletes to prevent exercise-induced oxidative damage and to reap the full health benefits of exercise. [6] In our studies we had observed that there is significant differences of all the parameters amongst the subjects of control, only treadmill exercise group, vitamin E and treadmill exercise and only vitamin E group[7]. Moreover whenever we have compared the percentage increment values of leg strength, explosive strength and exercise oxygen uptake of hill land football players with respect to controls we have found that all the parameters were increased after experimental time period in case of vitamin E supplementation. The possible explanation might be is that Vitamin E has profound effect in increasing muscle strength which can boost up the performance level of football players. It was reported that the role of Vitamin E towards improvement of performance is achieved by increasing low oxygen pressure tolerance, myocardial efficiency and peripheral capillary dilatation[8]. So, increment in exercise oxygen consumption in case of vitamin E supplementation group co-relates with this research studies and thus can increase the performance level of football players. Therefore, for the hill land football players Vitamin E supplementation could be a better device by which greater muscular strength and endurance can be achieved. Staheli et al. studied an arch index called the Staheli index in 441 subjects with a large range in age[9]. Cavanagh and Rodgers described the arch index and studied 107 subjects using an ink footprint method and measurements made with a plan meter[4]. Billis et al, 2007 studied the arch index using a similar method with weight-bearing footprints, except that they acquired the footprint with powder and then input the data to a computer using the AutoCAD software, as these authors did[10]. The results of all of these studies gave higher values than the results described in this research study. In 2004 and 2005 respectively, Urry and Wearing studied the arch index and identified statistically significant differences between some contact areas of the sole using ink footprints and electronic images obtained with pressure platforms (which might skew the results for small contact areas and cause inaccuracies)[11, 12]. Their values for the arch index obtained in their 2004 study, using both ink footprints and the pressure platform, were similar to the results obtained in this research, and the ink footprint results from 2005 were also similar to the results obtained in this study [11, 12]. Chu et al, 1995 and Wearing et al, 2005 studied the arch index with a foot pressure platform in small study groups and obtained results similar to these authors' results[11, 13]. Mathieson et al, 1999 studied the Chippaux–Smirak and Staheli indices using static footprints of the right feet of 20 volunteers[14]. This present study's results for the Chippaux–Smirak index for the right feet of both professional football players and results were co-related with the goal scoring ability. Shiang et al, 1998 studied all of the footprint parameters, as was done in this present study[15]. Their average results for the Chippaux–Smirak, arch length, and Staheli indices for both feet were higher than those for both feet in both

of this research study's groups. Although their average results for the arch angle of both feet were similar to this research's results for the control group, these results for professional football players were higher. For the footprint index, this research study's results for both feet for professional football players a high co relation was observed with goal scoring ability. For the truncated arch index, although this study's results for both feet of the professional football players were similar to that in their study as above. In general, many of these authors' results conflicted with those of other studies, although some were similar. Aydog et al, 2004 determined the Staheli index in Turkish junior-level basketball players using a pod scope and a video camera, but did not find any differences between groups[16]. This research study's results were smaller for both feet. Aydog et al, 2004 studied the same foot parameter using the same method in elite gymnasts and showed that the sole arch indices of the gymnasts were significantly lower than those of their controls[16]. By contrast, the present study found that these measurements were higher in both feet in football players and they have significant positive co relation with their goal scoring ability as obtained from McDonald soccer test. Aydog et al, 2004 studied the same foot parameter in football players, wrestlers, weightlifters, handball players, and gymnasts[17]. This present study's results for football players for both feet were higher than their results for gymnasts, similar to those of the handball players, and smaller than those for the other groups. The differences between these results and those of Aydog et al, 2004 could depend on the number of subjects in their study groups, as all of their groups were smaller[17]. The biomechanics of the various sports and training programmes could be another reason for such differences. Age might be a third reason for the differences, especially for their first study. In their third study, they also studied football players, but their study group was small, and it was not clear whether their subjects were professionals. The primarily extrinsic muscles, such as the posterior tibial, flexor hallucis longus, flexor digitorum longus, and abductor hallucis longus, and the intrinsic muscles of the foot are dynamic supporters of MLA and do not become active until walking. Most movements in football depend on the lower extremity muscles and, of course, on the foot. While kicking, the foot must be plantar flexed, and the extrinsic plantar flexor muscles of the foot are activated[18]. Consequently, prolonged activation of these muscles might cause lasting changes in the sole of the foot, which would be detected in the static footprint parameters. Although some of the parameters in the present study differed between the football players and the controls, these parameters do not reflect the same processes, as the arch angle, footprint index, and truncated arch index are directly proportional to the arch height, whereas the Chippaux–Smirak and Staheli indices are inversely proportional to the arch height. During specific movements in football, pressure on the different areas of the sole and resistance to this pressure could have different effects.

CONCLUSION

In the light of these findings, it could be concluded that vitamin E supplementation can boost up the performance level of hill land football players but it could not possible to draw a conclusion with studying footprint parameters but can be predicted that sole morphology do have a relationship with goal scoring ability considering the impact of hitting the ball, the spin that to be delivered to the ball to move a particular trajectory and force generation at kicking all these are dependent on foot or sole morphology which needs detailed biomechanical analysis as well as EMG analysis. This study is the first to investigate several static footprint measurements in professional football players using AutoCAD software with their goal scoring ability.

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