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Comparison the Effect of the Fatigue of Body and Lower Limbs on the Performance and Risk Factors of Lower Limbs In the Women Novice Athletes

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ABSTRACT

The fatigue defined as lack ability of a person to produce required power or the inability to maintain and duration the generated power for doing targeted activity. The effect of fatigue in creating sport injuries and consequently treatment costs, staying away from sport as well as reducing the quality of athletic performance is evidence for everyone. Research that has been done in the field of fatigue have had an overall overview of this issue. The objective of this research was doing a comparison the effect of body and lower limbs fatigue on the performance and risk factors of lower limbs in the women novice athletes. In this study, 45 novice female athletes were selected as available. A pre-test including functional tests and the test of landing error without applying body fatigue protocol And lower limbs were done from the subjects and after a day resting in the second day after applying ABT fatigue protocol in the body fatigue group and Bosko fatigue protocol in the lower limbs group the functional tests and landing error was done. Kolmogorov-Smirnov, ANOVA and Kruskal-Wallis tests in the 0.05 significance used for data statistical analysis. Results indicated that the fatigue of body and lower limbs leads to increase significance and risky factors of lower limbs injuries and reducing significance of dynamic balance in all directions. Also there was not observed a meaningful difference between average changes in risk factors for lower extremity injuries, dynamic balance (in all directions) on invoice women of body fatigue group and lower limbs. The body and lower limbs fatigue leads to reduce dynamic balance and increasing risk factors of lower limbs.

Keywords: the fatigue of body and lower limbs, movement performance, risky factors and lower limbs injury

INTRODUCTION

Fatigue leads to reduce power generation, neuromuscular coordination, and precision motion control, Proprioception, joint stability, muscles co-contraction and increase reaction time which its main result is a significant reduction in muscle function [1]. In summary it can be expressed that the fatigue of central muscles without possibility of negative impact on neuromuscular coordination, precision motion control and stability proximal joint and transfer this effect on distal joints leads dysfunction during kinetic chain and finally this destructive effect in acts of core muscles and coordination of these muscles with the muscles of the lower limb leads constraints on functional movements [2]. The functional tests are used to evaluate the actual performance of individual ability which this functional ability can be as strength, endurance, speed, agility and flexibility [3]. Different studies suggested that a number of these tests are sensitive to the fatigue; therefore they are sufficient tests to investigate fatigue effects on the performance [4].

The fatigue defined as lack ability of a person to produce required power or the inability to maintain and duration the generated power to do targeted activity [5]. There are several factors that can affect a person's ability to maintain

or restore postural control that among them we can refer to damages of the nervous system, inefficient optic nerves, stress, vestibular mechanism and fatigue. To evaluate the effect of each of these factors on the control system of tools special tools and laboratory instruments are using [6].

Generally the muscle fatigue can be defined to reduce of muscles ability in generate favor power that occurs as a result of cut off the chain of events from the central nervous system to the muscle fibers. Fatigue classified to both local (environment) and public (central). Local fatigue occurs in the muscles and involves a certain group of muscles involved in moving which can lead to dysfunction incidence in the region of neuromuscular, mechanism of excitation-contraction, stimulated emission by the transverse tubules, release calcium and stimulating contraction components generates power [7]. However, the general fatigue related to upper part of the brain invokes alpha motor neurons and affects the whole body. In other words, in peripheral fatigue gesture commands does not change or even may increase but in the central fatigue, movement commands sent to the muscles are decreased, and thereby lead to reduced muscle tension or force is made the power of the muscle [8].

Neuromuscular joint control has an important role in maintaining stability and protect the body against damage.the neuromuscular fatigue can lead to dysfunction in this control and stability [9]. Hosseini Mehr et al(2010) in investigating College athletes stated that muscle fatigue can hinder postural control in dynamic mode this means that the effect of this variable in the postural control in the standing position is not significant compared to dynamic mode. Sadeghi et al, 2007 stated the dynamic balance reduction after fatigue.Several epidemiologic research shows that in the sport the most common time of the injury, is the end of the game when the athlete is exhausted [10]. McHugh et al stated that hip muscles to the exhausted of ankle muscles leads to more reduction in postural control in the standing state on one leg.It is believed that trunk muscles play an important role in the balance and by increasing the power of central of the body leads to improve in balance and control [11]. Surenkok (2008) observed the reduction in static and dynamic balance as a result of fatigue of extensor and flexor muscles [12]. Also Mcmullen et al (2011) indicated that the fatigue of the gluteus medius muscle as one of the central body stabilizer muscles leads to reduction of static and dynamic balance and as well as the quality of movment in the mens and women athlets [13]. Sheikh Hoseini et al (2013) suggested that increasing exercies of muscle endurance central is used to prevent reduction performance of lower lims derived from fatigue in the athletic programs because muscles that are able to tolerate long-term contractions are more resistant against to fatigue and have ability to support body in more longer time that this issue can maintain athletic performance in long-term activities. Damage caused by excessive fatigue and aditional load are very common and may become to chronic condition.for example the longer pains of quadriceps muscle tendon in patients that suffering from Good Schlatter disease to some extent be explained by fatigue of tandon connection.In addition a muscle that has endured great pressure and is exhausted, simply damaged that fatigue is a factor in causing of muscle rupture [14]. also inadequate exercise or incorrcet warm-up, muscle fatigue, previous injury and lack of proper rehabilitation, exposure to cold and exercise muscles that cause the lactic acid of the factors that lead to muscle rupture.In addition breakage derived from stress (stress Frakchr) that is called fatigue failure or weakness and insufficiency that caused as a result of the frequent pressure in the long time in the bone and probably inflammation of the zry bone is proceded to it [15,16]. Probably such damages that are due to corrosion or fatigue is not only to the size of the force, but it depends on the its frequency and duration.In addition individual characteristics such as body structure, age, level of training, previous damages, rehabilitation has improper interference.Given that in creating fructure stress and inflammation of the periosteum two principles of overload and fatigue are significant.And also the exhaustion of the factors involved in the occurrence of injury such as a muscle tear injury [17]. so considering fatigue is important in order to prevention of injury.In addition considering the severity and type of training, the level of physical fitness, proper warm-up before exercise, cool down after exercise, individual characteristics such as body structure, level of training, previous injury prevents the person from injury.Because good performance and strong muscles can reduce the pressure and the risk of bone derived from fatigue [18]. in addition the central body stabilizer muscles including of some trunk and thighs that are responsible for keep the stability and spine and pelvis and they are very important to transfer the energy from the trunk to the upper and lower limbs during exercise.Weakness or loss of the muscle coordination center of the body can lead to abnormal movement patterns, movement patterns compensatory damages variety of sports such as strain or hyperthyroidism.Fatigue is one of the factors that can lead to decreased coordination and muscle function.And since the central muscles of the body are essential to create a stable base of support to do appropriate body movements muscle fatigue may affect the performance of people especially athletes.And thus causing the damage caused by fatigue in people and athletes.In this regard ABT et al. investigated the effect of a fatigue protocol body on the mechanical pedalnig of 15 cyclist and concluded that core muscle fatigue leads to changes in pedaling mechanics and the lower body of the athlets which these changes can lead to knee injury [19]. In this study also this

protocol used in order to tiring the trunk the impact of fatigue on lower extremity injuries in female athletes to be checked.also in relation with lower extermity some Epidemiologic studies indicate that in the sport the most prevalent time of the injury is the end game when the athlete is exhausted such that 71percent of injuries is in the rubby sport in the second half of the match,47 percent is in the ice Hockey game and 48 percent of injuries in the last 5 minutes of a football injury in a third of each half, has been reported.Therefore, there is a possibility that the bulk of the damage caused by instability due to muscle fatigue of joint stability.As a result, this seems the tired people are at risk of articular damages due to decreased balance.Nowadays lower extremity injuries are the most common sports injuries that the injuries of joint of ankle highly prevalent between muscles of lower extermity so that 40 percent of all sports injuries are related to the ankle joint as well as 45% of ankle injuries occur during jump.The successful landing of the jump requires strength, balance and stability that is of the most important factors in preventing joint damage.Since muscle fatigue as one of the disruptive factors of neuromuscular control, by incidence of fatigue in the lower limb muscles and joints lower limbs such as the ankle and the changes that occur in muscle stability, the ability to produce muscle call for balance and stability Pschral reduced which can lead to instability and loss of balance while landing and the risk of injury [20].

There are some factors that we can say more after exercise fatigue in athletes can be identified as a risk factor.In the conducted studies so far factors such as the ability (and record) hopping, landing error system, balance etc. are presented as risk factors for injury.Given that the risk factors themselves can be a mechanism to lower body injury.more probably and according to suggestion of future studies the mechanism of injury appears in the latter stages of exercise.So it may be better the effect of fatigue on factors motor function and risk factors for injury to be investigated to determine which part of that fatigue can have a greater impact on vulnerable people.In this study Bosco testwas used to tiring the lower limbs thereby we brought the muscles to exhaustion then we measured the effects of fatigue on injury incidence and performance of the person by using landing error and functional tests.And since in recent researchs partially not investigated the injuries of lower extermities and reduction sport performance derived from body muscles fatigue it was necessary by using Frod test error and functional tests completely investigated in order to result can be prescribed exercise programs and competitions, etc.

MATERIALS AND METHODS

The study population consisted of novice women in Pakdasht city that did not perform professional sports. The statistical sample was 45 people of active women that did sport as professional in three groups:control group,the group of body fatigue and the group of lower extermities (in each group 15 people) were classified.The instruments consisted of 1. The questionnaire PAR-Q.2. Burke perceived exertion scale. 3. 4. written consent. ABT 5. trunk fatigue protocol performance test. 6. tests 7. Bosco. Fatigue tests of trunk and lower limbs 0.8. Test of lower extremity injuries.a pre-test that was include functional tests and the test of landing error without applying body fatigue protocol and lower extermities and after a day resting in the secind session after applying fatigue protocol ABT et al in the body fatigue group and Bosko fatigue protocol in the lower extermities group the tests of functunal and landing error was taken. Kolmogorov-Smirnov, ANOVA and Kruskal-Wallis test were used to data analysis in the 0.05 significance.

RESULTS

Table1: Describe the demographic variables

Groups	Variable	Minimum	Maximum	Average	SD
Lower Limbs Fatigue	Age(Year)	19	34	26.8	3.9
	Length(Cm)	152	173	164.2	5.7
	Weight(Kg)	48	98	65.9	13.1
	The Length of Feet	76	90	84.8	0.25
Body Fatigue	Age(Year)	22	35	28.8	3.9
	Height(Cm)	149	176	164	6.3
	Weight(Kg)	43	80	64.1	9.07
	Toe Length (Cm)	77	92	83.7	4.7
Control	Age(Year)	18	35	26	5
	Length(Cm)	147	178	163.1	7.7
	Weight(Kg)	48	78	60	9.1
	Toe Length (Cm)	76	94	85.2	4.8

In table 1idemographic characteristics of participants of the study including height(cm) and weight(kg),age (year) and the length of lower limbs of participants by using the smallest, largest, average, standard deviation fatigue in three groups of the lower limbs and trunk were described.

Results of the test indicated ANOVA.

- There is no significance difference between the mean of novice women age in three groups of lower limbs fatigue, body fatigue and control (F (41.2) =1.59, P=0.216). Thus, three groups based on age variables are homogeneous.
- There is no significance difference between the mean of novice women length in three groups of lower limbs fatigue, body fatigue and control. (F (39.2)=0.09, P=0.906) Thus, three groups based on age variables are homogeneous.
- There is no significance difference between the mean of novice women weight in three groups of lower limbs fatigue, body fatigue and control. (F(39.2)=1.05, P=0.359) Thus, three groups based on age variables are homogeneous.
- There is no significance difference between the mean of novice women feet length in three group of lower limbs fatigue, body fatigue and control. F (42.2) =439, P=0.648) Thus, three groups based on age variables are homogeneous.

Results of ANOVA in table 2 indicated that there is significance difference between the mean of risky factors of lower limbs injury of novice women in fatigue group of lower limbs (3.06),body (2.53) and control (-2.06) F (2،42) =19.6, P=0.000. So, to determine the source of the differences and the test was test hypotheses THE Tuky,s test was used.

Table 2: ANOVA results table

Source	SS	DF	MS	F	Sig
Intergroup	238.9	2	119.4	19.6	0.000
Intergroup	255.6	42	6.08		
Total	294.5	44			

The post hoc test showed that there is a significance relationship between the averages of risky factors of injuries of lower limbs in novice women of fatigue and control group (P=0.000). Therefore the null hypothesis rejected. in other words the fatigue of lower limbs leads to increase in risk factors of damage to the damage of novice lower limbs .

Also results of post hoc test showed that there is significance difference between the changes mean of risky factors injury to lower limbs of novice women in body fatigue (P=0.000). Therefore the null hypothesis rejected. in other words body fatigue leads to increase risky factors of damage to lower limbs of novice women.

Also results of post hoc test showed that there is no significance difference between the mean changes of risky factors of lower limbs of novice women in fatigue group and lower limbs (P=0.825), therefore the null hypothesis is rejected.

DISCUSSION AND CONCLUSION

According to mentioned definitions provided from internal and external risky factors, the approach of present study was to investigate internal risky factors. Research's has shown that damage on soft tissues such as ligaments occur in less than 100 milliseconds. While reflex muscle activation occurs about 128 milliseconds. These results indicate that ligament injuries such as ACL occurs much faster than reflex response for prevention. This initial muscle activities may improves through the muscle spindle reflex and by quickly identification reduces unexpected disturbances of ligament injury risks. Hence muscle activity and muscle readiness to deal with the escalation of damage or prevent is very important. Muscle prepared to deal with the injury in muscle activation changes and feed forward planning by integrating tensile neuromuscular reflexes, muscle elasticity and Golgi tendon organs lies. Lower limb muscle readiness to reduce ground reaction force, reduce hip abduction and adduction torque thigh during landing and reduce the occurrence of serious damage to the joints of the lower limbs. Obviously as having a fitness necessary to prevent risk factors such as excessive valgus knee during the landing, lower extremity muscle fatigue and lack of efficiency is also a risk factor for injury. In this sense, the fatigue associated with decreased

proprioception and increases the reflex response time [21]. In the present study may also cause muscle fatigue and muscle dysfunction of the lower limbs and causes inefficiencies landing error test is necessary. The central region stable, effective transmission of power from the Earth to facilitate the movements of the limbs or torque. Strong and stable body a solid foundation for the torque created by the limbs provides. Core pilgrimage center chain, most motor sports activities. Power control increases balance and movement core, upper and lower extremity kinetic chain performance. Activation of muscle coordination is very important for the stability and efficiency that this control requires strength, balance and the moving of central body. The previous studies pre activating the muscles of the lower limbs and trunk muscles prior to contact with the ground during the jump and landing movements, Neuromuscular coordination trunk and lower limbs have a great effect in performance activities such as recruitment, avoid falling trunk, power generation and control jump. Aida et al (2011) indicated increase in the external oblique muscle activity, rectus abdominals and intermediate twin before contact with the ground during landing and stated that these muscles are activated for prepare to landing injury with increasing hardiness and the stress internal abdomen [22]. As a predictor of postural control act recruitment. Reduce the muscle forces in the core reduces the overall power generation in the upper and lower limbs and the week central muscles cause interruptions in energy transmission, which leads to reduced exercise performance. In the present study may also cause muscle fatigue and muscle dysfunction causes inefficiencies landing error test is necessary. In the literature review, no study to compare trunk and lower limb fatigue was not found to influence risk factors for lower extremity. According to the results of this study, risk factors had a significant effect on the fatigue of lower limbs and trunk as well as fatigue. Since this effect was almost equally (in the 0.01 level) thus it is evident that it seems that the fatigue of trunk and lower limbs, lower limbs there is no difference in influencing the risk factors. Results of present study is consistent with Cortes et al studies (2013), Paterno et al (2004) and Gheidi et al (2014) but it is inconsistent with results of heather et al (2009).

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