



Original Article

Comparison the effect of different warm up methods on squash players function: A randomized crossover trial

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Abstract

Background: Warmup is a main section of each training program and is necessary for better performance and decrease chance of sport injuries. Many warmup methods used with athletes and their effects are challenge full. Squash players use different warmup methods like other athletes. Muscular power, anaerobic power and flexibility are important factors for performance of squash players. On the other hand, there are conflict in previous researches about the effect of different warmup methods on performance. Thus the propose of this study was evaluating the effect of static stretch, proprioceptive neuromuscular facilitation (PNF) and whole body vibration on muscular power, anaerobic power and flexibility of squash players.

Methods: Nine squash players randomly assigned in three groups and took three warmup methods on three weeks. Wash out period was one week. After each session, all variables were measured. One way ANOVA was used to detect differences between groups.

Results: We couldn't find any significant differences between groups in vertical jump, sit and reach and mean power tests.

Conclusion: It seems that there is not difference between the effect of whole body vibration, static stretch and PNF on our variables.

Keywords: Flexibility; Muscular power; Anaerobic power

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Introduction

Warmup has a great effect on physiological and psychological parameters and can improve athletes' performance. The aim of warmup in short term activities is increasing muscle temperature(1). Different variables effect warmup that included: time, intensity, program, time interval until main program, environment temperature,...(2). Static stretch is a effective method for increasing range of motion(3) and it seems that can improve performance(4). However other studies suggest that static stretching may negatively affect immediate performance(5) Kay et al. show decrease in muscle tendon stiffness after one bout static stretching(6) On the other hand some researchers show that long static stretch can damage muscle fibers(7). It seems that moderate stretch has not effect on lower body strength (8)vibration can be produced when a person stands on a vibration platform that generates vertical vibration at a frequency in the range 35-50 Hz. whole body vibration can enhance athletic performance . Dallas et al. Show that whole body vibration can enhance athletic performance can improve muscle power but didn't affect flexibility in gymnasts(9) It seems that whole-body vibration causes increasing in body temperature and activates muscles(10) and thus improves power and strength(2). Despite static stretch commonly uses by athletes, it seems that PNF is more effective for increasing ROM(6) There are several types of Proprioceptive Neuromuscular Facilitation (PNF) stretching. Each technique offers combination of isometric contraction and passive stretch. Some times PNF consisted of eccentric and concentric contraction and might provide dynamic stretch benefits (11). The purpose of the procedure in PNF stretching is to excitability of motor neuron pool by autogenic inhibition and reciprocal inhibition(12). Muscular power is a important factor for athletic performance(13) and is a powerful factor for squash players too. Thus use of proper warmup methods can be helpful for players. Wingate test is a common test for evaluation anaerobic performance. Ramirez et al. (2007) reported that stretch reduced peak power and mean power in Wingate test(8) . even with the inconsistency in warmup methods on performance, only two studies observed the effect of stretching on Wingate test(8). Because of the conflict in previous studies results' we decided to compare the effect of three warmup methods on some functional indicators, thus the aim of this study was evaluation the effect of warmup method on muscle power, anaerobic power and back muscles flexibility in amateur squash players.

Material and methods

Study design: this study was a semi experimental. Study design was cross over trial. Samples was all of Tehran squash team players. Subjects were 9 squash player women that randomly assigned in 3 groups. For this propose we used drawing method. Including criteria was: age (20-30) yrs., playing squash consequently in last year, and common health. We describe research aims and procedure before beginning for all of subjects. They attempted in laboratory in 3 sessions with one week interval.

Warmup protocols: Group’s warmup protocols show on table 1.

For warmup they had done 10 min general warmup protocols in each session that consist of running in treadmill with 50-60% HRR. PNF stretch protocol was contract-relax method. This method include a static stretching phase that flowed by intense isometric contraction (6). PNF increases ROM by increasing the length of muscle and neuromuscular efficiency and it can improve athletic performance when do before or after exercise(14). In our study subjects did PNF stretching that consist of 6 sec resistance against competitive partner and 14 sec rest that reputed for 5 times. For this propose subjects lay down in supine position with 90 flexion of knee joint, then the competitive partner push her leg toward chest and she resisted.

Static stretch protocol consisted of 45 sec stretch in hamstring muscle groups and 15 sec rest that repeated for 5 times. In this stretch subjects lay down in supine position and some one stretch’s their hamstring passively. Vibration group take vibration with 35 htz for 15 min.

All dependent variables measured immediately after each session.

Vertical jump test was used to evaluate muscular power. Anaerobic power was measured with Wingate test and sit and rich test was used to evaluate flexibility.

Table 1. Groups interventions in 3 weeks

	Group one	Group two	Group three
1st week	PNF	Static stretch	vibration
2nd week	vibration	PNF	Static stretch
3rd week	Static stretch	vibration	PNF

Results:

Kolmogorov–Smirnov test was used to test normality of our data. In order to evaluate equality of variance and ANOVA with tukey’s posthoc test were used to find differences between three groups.

Subjects’ demographic characteristics’ was shown in table2.

Table2. demographic characteristics’ of subjects

	mean	SD
Age(year)	25	1.4
Height(cm)	164.67	4.72
Weight(kg)	63.67	5.46
BMI(kg/m2)	23.51	2.16

Our statistical results show that there was not any significant difference between groups in vertical jump records (F=0.015, df=2, P=0.985). In sit and reach test differences bet ween groups was not significant (F=0.159, df=2, P= 0.854). Mean power results was not show any significant difference between groups too (F=1.603, df=2, P=0.222).(table 3)

Table 3. ANOVA results for all variables

	Sum of squares	df	F	pvalue
Vertical jump	1.301	2	0.015	0.985
Sit and reach	11.185	2	0.159	0.854
Mean power	18142.651	2	1.603	0.222

Discussion

Our results shown that there was not any significant differences between three types of warmup protocols on vertical jump, sit and reach and mean power outcomes. All stretching methods increasing ROM and other functional changes may be accrue due to different types of stretching (15)Alteration in muscle performance after static stretch is related to muscle tendon stiffness(16)

There is evidence that static stretch affect motor unit and increase motor unit compliance and subsequently decrease its stiffness. This may impairs performance because of decrease in elastic potentiation produced during stretch phase. On the other hand, greater motor unit compliance may affect the length-tension relationship in muscle(17).

whole body vibration activates alpha-moto neurons and initiates muscle contractions(9).One possible mechanism that explains whole body vibration of physical function may be that a chain of rapid muscle contractions during exercise can activate neuromuscular system in lower extremities. Another possible mechanism is increase in growth hormone due to whole body vibration, because it show that whole body vibration increase growth hormone immediately(18)

Two neuromuscular theories explain increasing ROM after contract-relax: autogenic inhibition and gate control. Autogenic inhibition occur during the contraction phase and increase activity of type Ib afferent of muscle fibers within Golgi tendons. Gate control theory suggests that an increased output from type III muscle afferents during the contraction phase could inhibit pain perception and thus increase ROM(6).

Declaration

Competing interests

There is no competing of interest to disclose.

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