



EFFECT OF PLYOMETRIC EXERCISE TRAINING ON VERTICAL JUMP HEIGHT BETWEEN GROUND AND SAND SURFACE IN MALE VOLLEYBALL PLAYERS

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ABSTRACT

Sport training in volleyball players should also focus on vertical jump height in consistent with demand of the sport. Since plyometrics training improves vertical jump height, it can be useful training strategy to improve the performance of volleyball players. The aim of the study is to compare the effects of Plyometric exercise training on ground versus plyometric exercise training on sand on vertical jump height in male volleyball players. Convenience samples of thirty professional volleyball players in the age of 18-25 were recruited. Intervention using plyometric training on ground and sand protocol was administered on the volley ball players. The outcome measures were assessed before the intervention and end of the first and second week. The study concludes that plyometric training on sand as a useful training strategy to improve vertical jump height in volley ball players than plyometric training on ground.

KEYWORDS: *plyometric, stretching, vertical jump height, sand, ground.*



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INTRODUCTION

Volleyball is a very demanding and challenging game which requires sustenance of maximum performance throughout the game. Jumping is a major part of the of the volleyball game. The higher a volleyball player jumps the better. They jump many times throughout a match, which means that they must be strong and conditioned enough to do so. In a 3-set match, the athletes can jump anywhere from 36 to 105 times (Black, 1995). This causes lot of impact on their lower body muscles and joint.¹ The sports training principle emphasizes that the muscle adaptations are very specific to the nature and type of exercises performed; intensity of exercises in which those exercise performed; the overload principle specifies that muscle power increases proportionally equal to the load with which it is trained.² The term Plyometrics can be used to describe any exercise that allows the athletes to take advantage of the stretch-shortening cycle to produce an explosive movement.^{1,3} Plyometrics training is one such training strategy to improve the performance of the volleyball players. This training gives the basic needs of agility and power; which in turn increases the maximum muscle strength and speed of movement. The training also includes stretching cycle as warm up and cool down sessions.⁴ Several physiological adaptations were reported following plyometrics training like muscle hypertrophy results in increasing of muscle strength; increase in synchronous motor neuronal pool firing due to activation of stretch reflex which increases muscle power; increase in ventilation and stroke volume and in increase in bone mass due to rapid mechanical loading.^{1,3,5} The sand makes your muscles work harder to get any higher limits on your jump. Plyometric exercise training on sand is more a muscle centric method of developing your vertical jump height. Jumping on sand causes a lower reuse of elastic energy and energy loss due to feet slipping during the concentric action.² This might induce different training effects compared to training on a firm surface. On the other

hand, the lower stress on the musculoskeletal system may decrease the risk of injuries and the overall physical strain of training sessions. The best way to use it is to focus on the joint friendly characteristics of the sand to train in a ballistic loaded manner. So the main purpose of the study is to compare the effects of plyometric exercise training on ground versus plyometric exercise training on sand on vertical jump height in male volleyball players.

METHODOLOGY

The Study design was Experimental design and convenient sampling method was used. 30 male national level volley ball players in the age group of 18-25 yrs were studied for period of 2 weeks in SRM University. These players were off season players who never underwent any plyometric program earlier. Recent history of fractures, spine injuries, low extremity injuries, acute inflammatory condition in upper limb and nerve entrapment were excluded from study. The outcome variable measured were vertical jump height using a inch tape. Pre and post test measurements were taken for vertical jump height by block jump. Volley ball players were divided randomly in two equal groups Group-A (n=15) and Group-B (n=15). Group-A went for plyometric exercise training on ground and Group-B went for plyometric exercise training on sand. Prior to the recruitment and training, proper explanation on the type of training, duration, advantages and risks were explained to the players and informed consent for participation was sought. The intervention included warm up (stretching) - plyometrics – cool down (stretching) for three alternate days per week for two continuous weeks. The stretches were performed for ten minutes before and after the plyometrics and the plyometrics session was done for 30 minutes for each of the session. The summary of the intervention protocol are presented in Table I. Data analyses were done with paired 't' test to evaluate the statistical difference between the pretest and posttest measures

Table 1
Plyometric exercise protocol.

WEEKS	EXERCISES	SETS x REPETITIONS	REST INTERVAL
1	1. Ankle hops	2 x 10	2 minutes
	2. Front cone hops	2 x 10	2 minutes
	3. Standing long jumps	2 x 10	2 minutes
	4. Diagonal cone hops	2 x 10	2 minutes
2	1. Ankle hops	3 x 10	2-3 minutes
	2. Front cone hops	3 x 10	2-3 minutes
	3. Standing long jumps	3 x 10	2-3 minutes
	4. Diagonal cone hops	3 x 10	2-3 minutes



Figure 1
Ankle hops



Figure 2
Front cone hops



Figure 3
Standing Long jumps



Figure 4
Diagonal cone hopes

RESULTS

The study group consisted of 30 male volleyball players and randomly divided in to two groups. The measures of outcome variable were assessed before the intervention and end of second week.

Table 2
GROUP A
Plyometric training on ground – Pre and post test

	Mean	N	S.D	Std.err	Sig
Pre test	70.13	15	4.88	1.26	.000
Post test	71.13	15	4.86	1.25	

Graph 1
GROUP A
Plyometric training on ground – Pre and posttest

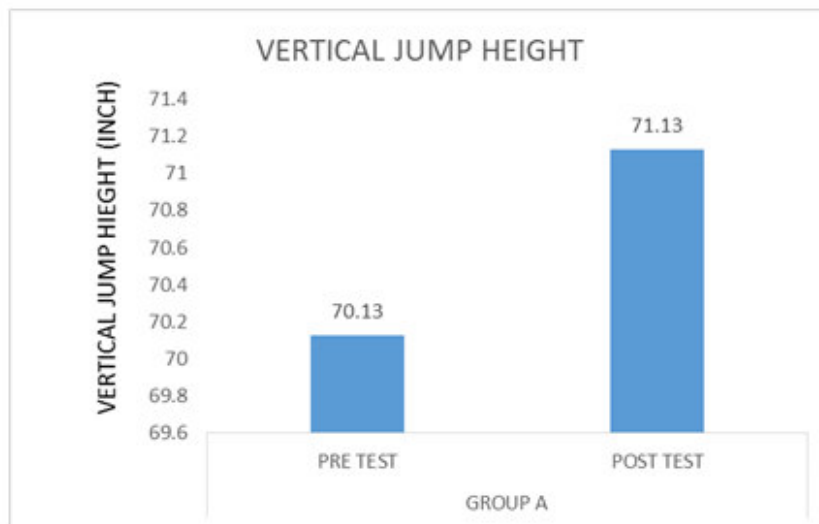


Table 3
GROUP B
Plyometric training on sand – Pre and post test

	Mean	N	S.D	Std.err	Sig
Pre test	65.40	15	6.19	1.60	.000
Post test	67.65	15	5.85	1.50	

Graph 2
GROUP B
Plyometric training on sand – Pre and post test

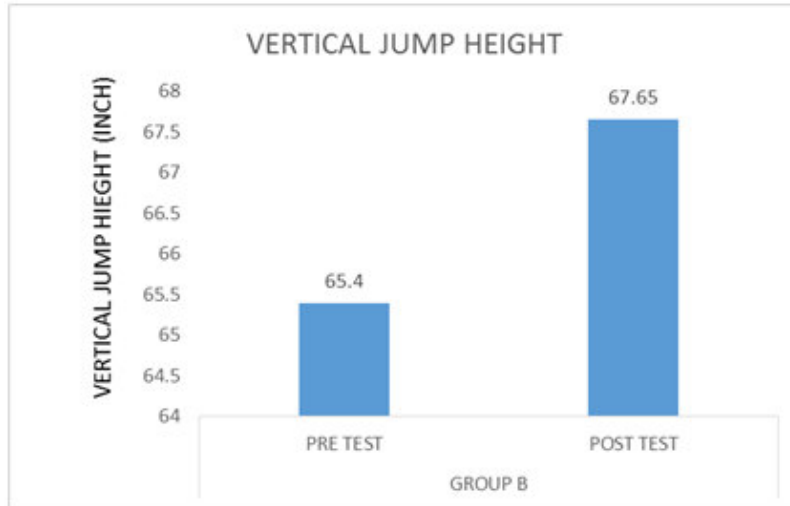
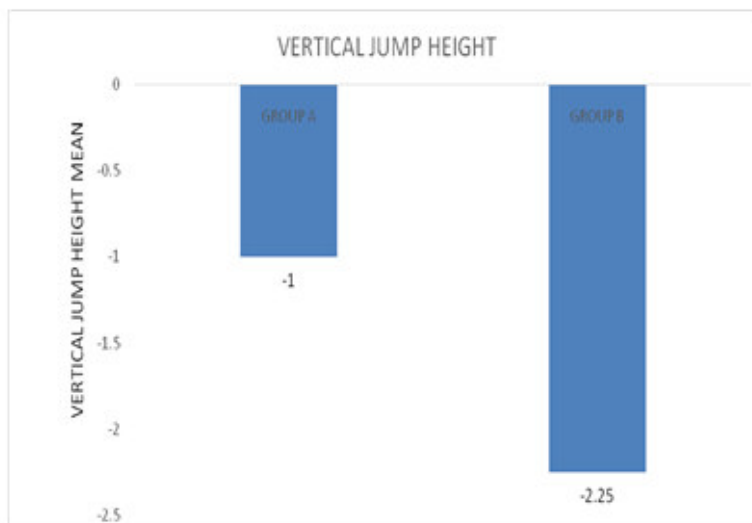


Table 4
Comparing the post test of group A and group B

	Mean	S.D	Std.err	T value	Sig
Group A	-1.00	.69869	.180	-5.554	.000
Group B	-2.25	1.40909	.363	-6.193	

Graph 3
Difference between post test of group A and group B



DISCUSSION

This study aimed at comparing the effects of plyometric training on sand vs ground over the vertical jump height among volleyball players. Athletes from various sports activities use Plyometric training to enhance their performance. So far only few research has been done over the area on which it is trained, Different trainers adapt the base of training according to their experience, So this study was done to provide a evidence based training for the better performance of the players. With the speed movements and unexpected quick turns, the volley ball players need to be trained to produce an explosive strength that is very necessary for a power packed performance. In this type of play lots of

movements are muscle stretching followed by muscle shortening which is the base of Plyometric training also. In this study about 30 male volley ball players were recruited and 15 underwent Plyometric training in sand and the other 15 underwent plyometric training in ground for a period of two weeks. The players in our study were followed up for two weeks duration and were monitored for any injuries during the total duration of training sessions. No injuries were reported. The stretching protocol adopted in our study has helped them to prevent injuries associated with short term Plyometrics training.

The results of this study says that there was a significant improvement post Plyometric training on ground for a

period of two weeks ($p < 0.05$). This can be explained by the fact that Plyometrics Improves the muscle ability to shorten after a stretch. These training make muscles to contract rapidly and explosively. This goes in hand with Fred Wilt (1975) who concluded that plyometrics produce "an overload of isometric-type muscle action which invokes the stretch reflex in muscles." This study shows that there was a significant improvement post Plyometric training on sand for a period of two weeks ($p < 0.05$). This can be explained by the fact that Sand training is a gentle on the joints but harmful on the muscles way of improving the vertical jump. The softness of the sand, like the trampoline mat, absorbs and disperses the downward force which takes away any plyometric advantages of the stretch shorten cycle. The sand also makes muscles work that much harder to actually get any height on the jump.² This goes in hand with FM Impellizzeri (2008) who concluded that plyometric training on sand "improved both jumping and sprinting ability and induced less muscle soreness". This study declares that sand plyometric training scores a better significant results in vertical jump height than ground Plyometric training for a period of two weeks. The players who underwent plyometrics on sand reported better stability while jumping on sand during the last session as compared to the initial sessions. The players undergoing plyometric training on sand reported that they had more landing balance and that landing was more comfortable during the volleyball practice sessions, following the training program. This goes in hand with Rajkumar sharma (2013) who concluded that the six week sand training program "increases the explosive type strength of the leg muscles, which in turn leads to an increase in the vertical jump height, spike

and the long jump". Both the groups reported an increase in their vertical jump following the training sessions. The group that underwent plyometrics on sand showed better improvement as compared to the group that underwent plyometrics on ground. This study proves that short term two weeks plyometrics training program combined with dynamic stretching program shows statistically significant improvements in vertical jump height. This study also shows statistically significant improvements in vertical jump height in volleyball players. The two-week sand training program have an effect on the statistically relevant increase in the explosive type strength of the leg muscles, which in turn leads to an increase in the vertical jump.² These results demonstrate that sand training can be used in sports to improve the vertical jump such as volleyball, high jump in athletics, and basketball etc. The athletes who trained on sand showed a greater average improvement in their vertical jump height than those athletes who trained on grass. This type of training is more a muscle centric method of developing the vertical jump.

CONCLUSION

The short term two weeks plyometrics training program on sand shows statistically significant improvements than plyometrics training program on ground in vertical jump height in male volley ball players.

CONFLICT OF INTEREST

Conflict of interest declared none.

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