

Effect of Counter Movement Jump Training on Vertical Jump Performance among Kabaddi Players

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Abstract: Background: Kabaddi players need to possess exceptional physical stamina, agility, individual proficiency, neuromuscular coordination, rapid reflexes, intelligence, mental fortitude, and presence of mind. The countermovement jump training is a straightforward, practical, valid, and repeatable of lower-body muscle strength. Vertical jumping is a difficult human movement that necessitates a high level of motor coordination between the upper and lower body segments. Method: 39 kabaddi players were selected on basis of inclusion and exclusion criteria and receive counter movement jump (CMJ) training session for 6 weeks 3 sessions per week, along with 10 minutes warm-up exercise before training and 10 minutes cool-down period after training. Pre and post measurement of vertical jump test were taken. Result: within group comparison of pre and post treatment and shows there was significant improvement in vertical jump test ($P < 0.05$). Conclusion: the counter movement jump training is improving vertical jump performance in kabaddi players.

Keywords: KABADDI, CMJ, power, verticle jump test

1. Introduction

Kabaddi is the ancient outdoor game played in India. It is the high intensity intermittent type of sport which requires a well-built physique. It involves rapid and forceful movements of the body during playing.^[1-3]

Kabaddi, players need to possess exceptional physical stamina, agility, individual proficiency, neuromuscular coordination, rapid reflexes, intelligence, mental fortitude, and presence of mind.^[4] for fast direction changes while maintaining or controlling body position throughout the course of a series of motions is known as agility.^[5]

Countermovement jumps exercises are one of the many exercises that may be used to increase the muscle's explosive power.^[6] Lower body plyometric training, which includes different types of jumps such counter movement jumps (CMJ), the drop jump, squat jump, hopping, alternate-leg.^[7] The counter movement jump training is the gold standard equipment for measuring lower limb muscular strength with a high level of precision.^[8]

To evaluate vertical jump ability, a variety of techniques are utilized. According to various authors, vertical jump performance is very helpful in analyzing performance parameters that matter in a number of sports. kabaddi players can benefit from having strong upper bodies, quick feet, and the ability to change directions.^[9,10,11]

There is a scarcity of literature regarding effectiveness of counter movement jump training among kabaddi players. So, the purpose of the study was to improve lower limb muscle

power in the kabaddi players with counter movement jump training.

2. Materials & Methodology

Study Site: Vadodara

Study Design: Intervantional study

Study Population: Kabaddi players

Inclusion Criteria:

- Healthy individuals with age group between 18 to 35
- Male kabaddi players
- Active participants playing kabaddi at least 3 days in a week.
- Willing to participate in the study

Exclusion Criteria:

- Any recent musculo skeletal injury.
- Any history of fracture or surgery.
- Known case of cardio-pulmonary condition

Sample Size: The calculated sample size is 39.

Method: 39 kabaddi players were selected on basis of inclusion and exclusion criteria. Written inform consent were taken from players. All the players were receiving counter movement jump training session for 6 weeks 3 sessions per week, along with 10 minutes warm-up exercise before training and 10 minutes cool down period after training. Baseline data were collected as pre and post measurement of vertical jump test.

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Warm-up exercise protocol:^[6]

Players were receive jogging exercise for 5 minutes and

stretching exercise protocol for 5 minutes as Warm-up exercise before counter movement jump training.

Counter movement jump training protocol:^[6,12]

Counter movement jump training Exercise	Duration
<ul style="list-style-type: none"> • Squat jump, • Jumping rope, • Singleleg Bound, • Hopover drill, • Lunges, • Repeat jumping, • Frog hopes, • Squatblock jumps 	4 sets of 5 repetitions with 30 seconds rest were given between each set per session.



Figure 1: Squat block jump

Cooldown Exercise Protocol:^[6]

Cool down exercise	Duration
Static stretching exercise	10 minutes

Outcome Measures:

Vertical jump test:^[29,30]

This test was used to know the lower limb power. It Was measured using chalk on finger method. Three jumps were carried out with 30 sec. recovery between trial and average of it was used. The participants were stand straight besides high wall and raise their handup. To measure the standing reach, they were touching the wall as high as they can with their fingertip using chalk, they were making a point over there. Then they were jump as high as they can from flat footed position and will again mark the point using a chalk. The distance between 1st mark and 2nd mark was measured using measuring tape.

Table 2: Age Distribution

Age (Years)	Frequency	Percentage	Cumulative Percentage
18-19	7	17.95	17.95
20-21	13	33.33	51.29
22-23	9	23.07	74.36
24-25	8	20.51	94.87
26-27	2	5.12	100
TOTAL	39		

Table 3: Intragroup comparison

Parameters	Pre-Treatment		Post-Treatment		t-Value	P Value	Results
	Mean	SD	Mean	SD			
Vertical Jump Test	28.92	5.85	32.52	6.06	-7.773	0.000	S

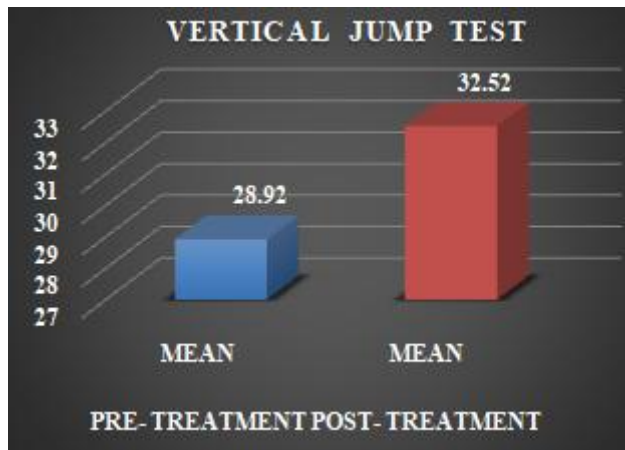
3. Statistical Analysis & Result

Data was entered in excel sheet and analysis was done using SPSS software 20.0.1.1 and Microsoft excel 2007. Pre and post data analyze using paired –t test.

Table 1: Baseline Data of Participants

Categories	Mean	SD
Age (years)	21.53	2.23
Height (cm)	171.69	4.04
Weight (kg)	65.94	6.95
BMI (kg/m ²)	22.36	2.17

[Interpretation]: Paired t-test was used for within group comparison for pre and post treatment and shown in above table 3. for Counter movement jump training there was significant improvement in vertical jump test(t=-7.773, P= 0.000).



Graph 1: Mean value of vertical jump test intergroup

4. Discussion

Kabaddi is the high intensity intermittent type of sport which requires a well-built physique in order to complete the game 40 min to 45 min of competitive game and to achieve success. It involves rapid and forceful movements of the body during playing, injuries are inevitable.^[13] It requires offensive and defensive skills which makes the players prone to many types of sports-related injuries.^[14]

Agility helps to coordinate several components such as to act and react quickly, accelerate and decelerate, move in proper direction, and to maintain the change direction balance and postural control as rapidly as possible. Plyometric training is a method to improve leg muscle power which includes various types of jumps like counter movement jumps (CMJ), the drop jump, squat jump, hopping, alternate-leg bounding and stretch-shortening cycle. This study was designed to see the effect of counter movement jump training on vertical jump performance among kabaddi players. Total 39 kabaddi players (Age-18-35) recruited for this study.

Participants had to perform counter movement jump training exercise over the duration of 18 training sessions, 3 per week, with rest of at least 48 hours. Four set of 5 repetitions with 30 seconds rest between each set per session. CMJ training is given with 10 minutes warm-up exercise before training and 10 minutes cool-down exercise after training. There are eight different type of exercise such as squat jump, jumping ropes, single-leg bound, hop-over drill, lunges, repeat jumping, frog hops, and squat block jump, which is used as counter movement jump training.

Baseline characteristics of kabaddi players, the mean and standard deviation of age was 21.53 ± 2.23 years; height was 171.69 ± 4.04 cm; weight was 65.94 ± 6.95 kg and BMI were 22.36 ± 2.17 kg/m². In present study age distribution of kabaddi player for 18-19 years was 18%, 20-21 years was 33%, 22-23 years was 23%, 24-25 years was 21% and 26-27 years was 5%, which shows more participants group was between 20-25 years of age. The result of the present study supports alternative hypothesis which states that there is significant difference in vertical jump test ($t=-7.773$, $P=0.000$) after CMJ training in kabaddi players.

As mention earlier jump performance can be improved by both peripheral and central adaptations. The increase in

jumping ability post training could be because of the neural and muscular adaptations. According to previous studies, neuromuscular factors such as increasing degree of muscular co-ordination, increasing inhibition of antagonist muscles and activation and co-contraction of synergists and motor unit functioning have showed to be important factors for increment in leg muscle power and performance following plyometric training.^[14]

The CMJ largely depended on the contractile abilities and characteristics of muscles directly involved in the movement structure and on the reflex mechanisms that influenced the pre-activation,^[15] which generated a sub-substantial amount of elastic energy in the working muscles. This was established by Bobbert,^[16] Gollhofer and Kyro-lainen,^[17] Kubo et al.,^[18] Liu et al.,^[19] and Coh.^[20] During the CMJ, the concentric forces that acted on the ankle, knee, and hip joints needed to initially be higher compared with the initial force necessary for the SJ execution. According to Hasson et al.,^[21] the maximal height attained in vertical jumps was heavily influenced by the execution of a large counter movement before the upward motion. This movement was highly related to the maximum positive power and maximum force.^[22] Zubac et al., Hammami et al., Arabtazi et al., and Adibpour et al. also showed an increased jump height of 11.4%, 14.0 %, 14.6%, and 18.8%, respectively after 8-week training. Therefore, the training program used in this study showed a better effect on the CMJ height in a shorter training period, which could be due to designed plyometric exercises, training intensity, demographics of participants, and sports background of the subjects. However, the increased jump height in this study was in contrast with the outcome of the review conducted by Oxfeldt et al., who showed improvement in the CMJ height after increasing the training sessions.^[23] Rubley et al. showed an increase of the CMJ height of about 13% after seven weeks of low-impact plyometric training, but their results were not significantly different from pre-training.^[24] Hip and knee extension velocities at take-off are also crucial parameters of CMJ that are significantly increased after PT. Balster et al. indicated that an increase in hip and knee angular velocities at take-off would improve the jump height.^[25, 26]

Since the participants were more familiar with the CMJ, it is conceivable that they had deficits in motor coordination. Thus, a larger percentage of muscle volume would have been active and loaded in the post intervention. This reasoning would argue for larger peripheral adaptations in the Counter movement jump training. Alberto Sánchez-Sixto et al. concluded in their study that a larger countermovement induced an increase in the net vertical impulse, leading to a higher jump height.^[27] Pavana and R. Prajapati also supported that DJ and CMJ plyometric are worthwhile training activities for improving leg muscle power in young athletes.^[6] Arumugam S. and Venkatesh P. also concluded in their study there was significant improvement on vertical jump ability due to the effect of counter movement vertical jump ability training among volleyball players.^[12] Poli Borah and AS Sajwan found in their study that eight weeks of plyometric training significantly improved the variable height, take-off force and maximum concentric power.^[28]

5. Conclusion

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The present study concluded that, the counter movement jump training is improving vertical jump performance in kabaddi players.

6. Limitation

Sample size was less, and hence, couldn't not improve major population of kabaddi. Female participants were not included.

7. Future Scope

The present study acknowledged that future studies will require for better understanding of the effect of counter movement jump training on vertical jump performance among kabaddi players. Large sample size and long-term follow-up may give a more précised results for efficacy of the intervention protocol. Apply counter movement jump training to improve vertical jump performance in other sports.

Clinical Implication

Use of counter movement jump training as strength training on regular basis which would help to improve vertical jump height.

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