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THE EFFECT OF SIX WEEKS COMBINED BALANCE AND PLYOMETRIC TRAINING ON CHANGE OF DIRECTION PERFORMANCE OF COLLEGE LEVEL MALE BALL BADMINTON PLAYERS

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ABSTRACT

The aim of present study was the effects of six-week combined balance and plyometric training on change of direction performance of college level male ball badminton players were studied. The subjects for this study were confined from SRM Group of Institutions, Tamil Nadu, India. Their ages ranged from 18 to 25 years. 30 state level players were selected and fifteen for balance-plyometric group (BP = 15) and fifteen for plyometric group (PL = 15). The BP group performed balance combined with plyometric training three days a week for six week, while the PL group undertook only plyometric training three days a week during the same period. Both groups were given the same training. All participants were tested to assess the agility pretest and posttest after the training period through Southeast Missouri (SEMO) test for agility, 5-0-5 change of direction (COD) test, and balance asses through Y balance test. The mean (M) and the standard deviation (SD) of the collected data were computed. To find out the significance of difference between the two means, the 't' ratio was determined. The level of significance was fixed at 0.05 level of confidence. Result of the study indicated that the six week of the combined balance and plyometric training on change of direction (COD) performance have shown improvements on the subjects. The pre-test and post-test comparisons in respect of agility, COD test, and balance due to the training the better performance observed at post-test compared with a pre-test for the BP group and PL group, and the BP group improvement was higher than the PL group variables were positive and significant at 0.05 level of significance, except the PL group left leg balance it was not significant at 0.05 level of significance. The changes in agility, COD and balance the magnitude of the with-group improvement for BP was higher than that of PL.

KEYWORDS

Ball Badminton, Balance training, Plyometric training, Agility, Change of Direction

INTRODUCTION

Ball badminton is a fast reaction and racket game like badminton but the ball is made up of woolen and looks like a tennis ball. Reaction time is a simply means how fast an athlete is able to respond to stimulus. The ball badminton players may be required more motor fitness like reaction time, leg strength, flexibility, agility, and balancing abilities to become better performers. A previous study showed that among all physical capacities, the COD performance served as the best physical predictor of badminton excellence (1) so that ball badminton players maximize such ability to enhance on court performance. Until now, several tests for COD ability have been widely used for assessment, such as the Hexagon test, the 5-0-5 COD test, and the Modified SEMO test, and they were verified as representative methods to determine on-court performance of players (2, 3, 4). In the training programs, the traditional resistance training has been used to improve the power and COD ability (5). However, recent studies have revealed that plyometric training and combined plyometric and resistance training presented greater efficiency in improving power and COD abilities (6,7,8). The actual mechanism of plyometric exercise is a lengthening (eccentric contraction) of the muscle-tendon unit followed directly by a shortening or concentric contraction, otherwise termed as a stretch-shortening cycle (SSC) (9). In practice, it consists of exercises related to jumping, hopping, and skipping with multi-joint actions on stable or unstable surfaces (10,11). While numerous studies have proved that plyometric training could be applied to improve the COD ability in players in racket sports like tennis, badminton (12,13), few attempts have been made for badminton(14). Therefore, the effect of plyometric training on the COD ability of ball badminton players remains to be unveiled. The previous finding has evidenced the importance of balance for the COD performance in that it helps players control the center of gravity (COG) during the accelerations and decelerations phase (15). For ball badminton players, balance also plays an important role in addressing issues of controlled COG and other situations challenging their balance, such as twisting movements during jump smash and offensive and defensive plays. It is logical to undertake balance training to improve movement performance in ball badminton, particularly COD performance. Previous studies have explored the effect of combined plyometric and balance training on professional female basketball athletes and young soccer players. The results showed that such a combined program could produce greater performance improvements in balance, power, and COD, as opposed to the single plyometric intervention. However, it was suggested that immaturity or a lack of optimal balance capabilities might compromise the plyometric training adaptations (16). Despite a growing body of literature on combined training in other sport modalities and athletes, therefore, it is unclear whether combined training could lead to greater improvement of COD ability in ball badminton players, or to mention the generalizability of results and practical recommendations from other studies. In order to explore refined fitness programing, the current study was aimed to investigate the effect of six week combined balance training and plyometric training on COD performance in college level ball badminton male players. We hypothesized that the combined training protocol would further increase the COD and balance performance in ball badminton players when compared with plyometric training alone.

METHODOLOGY

The study was conducted on 30 numbers college male ball badminton players. All subjects were fully informed of the risks and discomfort associated with the investigation before accepting their willingness to act as subjects. Subjects were randomly selected into two group of 15 subjects each. 15 for balance-plyometric group (BP = 15) and 15 for plyometric group (PL = 15). The BP group performed balance combined with plyometric training three days a week for six week, while the PL group undertook only plyometric training three days a week during the same period. All experimental training programs were conducted along with a weekly technical training routine. Participants from the BP and PL groups followed a balance combined with a plyometric training program (40min of plyometrics and 20min of balance training) three times per week. In order to control the 20-min balance training protocol, the PL group was required to perform the same drills as the BP group. However, unlike the latter that undertook all the exercises under unstable conditions (i.e., BOSU ball, Swiss ball, and Balance pad), they practiced on the floor. A detailed description of balance and plyometric training protocols and biweekly progression are presented in **Tables 1, 2.** During each session, players received consistent instructions from the invigilator on proper techniques for agility drills, balance exercises, plyometric exercises (17).

Table – I,
The balance training program for balance-plyometric (BP) (combined training) group

Exercises	1–2 weeks	3–4 weeks	5–6 weeks
Stand on the balance board exercise	Static standing on the board with two legs (3 sets: 30 s/set)	Static standing on the board with two legs and eyes closed (3 sets: 30 s/set)	Squat on the plate with eyes closed (3 sets: 10 reps/set)
Supine straight leg bridge on Swiss Ball	Isometric supine straight leg bridge on Swiss Ball (3 sets: 30 s/set)	Isometric supine single-leg bending bridge on Swiss Ball (3 sets: 30 s/set)	Dynamic supine single-leg bending bridge on Swiss (3 sets: 10 reps/set)

Side-plank with inflated balance disc	Side-plank with inflated balance disc with elbow (3 sets: 30 s/set)	Side-plank with inflated balance disc and the non-supporting leg stretches backward (3 sets: 10 reps/set)	Side-plank with inflated balance disc and the non-supporting leg stretches backward with elastic band (3 sets: 10 reps/set)
Lunge squat on gym ball	Lunge squat on gym ball (3 sets: 10 reps/leg/set)	Lunge squat on gym ball and inflated balance disc (3 sets: 10 reps/leg/set)	Lunge squat on gym ball and inflated balance disc with 5 kg dumbbells (3 sets: 10 reps/leg/set)
Balance-pad exercise	Single-leg squat with balance-pad (3 sets: 10 reps/leg/set)	Single-leg standing with balance-pad and the non-supporting leg stretches backward (3 sets: 12 reps/leg/sets)	Single-leg support with balance-pad elite and the non-supporting leg stretches backward with elastic band (3 sets: 12 reps/leg/sets)
Rest	Between exercise: 60 s Between sets: 3 min		

Table - II,
The plyometric training program for BP and plyometric (PL) training group

Exercises	1–2 weeks	3–4 weeks	5–6 weeks
Front barrier jump (6 hurdles)	Double-leg front barrier jump (15 cm) (3 sets: 10 reps/set)	Single-leg front barrier jump (15 cm) (3 sets: 5 reps/leg/set)	Single-leg front barrier jump (30 cm) (4 sets: 5 reps/leg/set)
Lateral high-knees with hurdles	4-hurdle (15 cm) (3 sets: 2 reps/set)	6-hurdle (30 cm) (3 sets: 4 reps/set)	6-hurdle (30 cm) (3 sets: 6 reps/set)
Lateral barrier jump	Double-leg jump (15 cm) (3 sets: 10 reps/set)	Double-leg jump (30 cm) (3 sets: 12 reps/set)	Single-leg jump (30 cm) (3 sets: 15 reps/leg/set)
Depth jump	Jump with 20 cm box (3 sets: 8 reps/set)	Jump with 30 cm box (3 sets: 8 reps/set)	Jump with 40 cm box (3 sets: 8 reps/set)
Multi-direction jumps with hurdles	Triangle jump with double-leg (3 hurdles) (3 sets: 6*3 reps/set)	Square jump with single-leg (4 hurdles) (3 sets: 8*3 reps/set)	Hexagon jump with single-leg (6 hurdles) (3 sets: 12*3 reps/set)
Rest	Between exercise: 60 s Between sets: 3 min		

Table – III
Type of variables, test and unit of measurements

S. No.	Variables	Test	Unit of Measurements
1.	Agility	SEMO Agility test	Seconds
2.	COD	5-0-5 COD test	Seconds
3.	Balance	Y Balance Test	Composite score

STATISTICAL ANALYSIS:

Test scores were subjected to statistical analysis. Indices like means and standard deviations were computed for the three variables: (a) agility, (b) COD, and (c) balance. To find out significance of the difference or the change that occurred between pre-and-post tests, 't' test was applied.

RESULTS OF THE STUDY

Table - IV
Mean, SD scores and Result of the test of significance ('t') in respect of agility, COD, and balance variables of BP and PL groups

Variables	Groups	Pre-Test		Post-Test		't'
		Mean	SD	Mean	SD	
Agility	BP	14.42	0.834	13.98	0.814	11.78*
	PL	14.53	0.843	14.41	0.765	5.85*
COD	BP	4.06	0.187	3.80	0.185	7.78*
	PL	4.08	0.182	3.88	0.191	6.72*
Balance Right Leg	BP	88.60	3.98	93.65	3.51	30.98*
	PL	88.73	3.91	88.28	3.99	5.41*
Balance Left Leg	BP	86.96	2.86	92.17	2.41	31.13*
	PL	86.89	2.99	87.29	2.93	1.84

*significant at 0.05 level of significance with 14 degrees of freedom (2.145)

Table - IV indicates significant differences between pretest and posttest of the Balance Plyometric training group (BP) and Plyometric Training group (PL) on the variables namely agility, COD and Balance except PL left leg. The agility of BP and PL group the obtained 't' value was 11.78, 5.85, respectively and found to be greater than the required 't' value 2.145 and significant at 0.05 level of significance with 14 degrees of freedom. The COD of BP and PL group the obtained 't' value was 7.78, 6.72, respectively and found to be greater than the required 't' value 2.145 and significant at 0.05 level of significance with 14 degrees of freedom. The balance right leg of the BP and PL group the obtained 't' value was 30.98, 5.41, respectively and found to be greater than the required 't' value 2.145 and significant at 0.05 level of significance with 14 degrees of freedom. Also the BP group was grater then and higher magnitude of value in results of PL group. The balance left leg of the BP group the obtained 't' value was 31.13, and found to be greater than the required 't' value 2.145 and significant at 0.05 level of significance with 14 degrees of freedom. The balance left leg of the PL group the obtained 't' value was 1.84, and found to be lesser than the required 't' value 2.145 and not significant at 0.05 level of significance with 14 degrees of freedom. Also the BP group was grater then and higher magnitude of value in results of PL group.

DISCUSSION ON FINDINGS

The six week of the combined balance and plyometric training on change of direction (COD) performance have shown improvements on the subjects. Based on the results, we found the combined protocol to be more effective in improving agility, COD test, and balance of ball badminton plyers. As agility, COD ability, and balance, are valid indicators of the movement performance of badminton players (18), the current findings was help to enhance the ball badminton specific strength and conditioning routines and improve the on-field performance. Findings of the study that the six weeks of BP training induced better adaptations in agility, COD, and balance, performances. As the well-developed agility, COD ability requires not only strong lower limb power to move quickly, but also a good balance to control body posture and to overcome the inertia caused by decelerations and breakings, adding an extra balance training indeed played an important role in boosting such performance (19). The rapid CODs, consecutive jumps, lunges, and multiple accelerations and decelerations and possessing decent COD is the key to applying the most efficient footwork into reaching the correct places and hitting the shuttlecock (20). As previously revealed that the most frequent moving patterns during badminton matches were forward-backward movements, lateral movements, and CODs, results of the agility, and the COD test would be a performance indicator of on-court COD of a player (21). Meanwhile, although sufficient investigations have already evidenced positive adaptations in the agility, COD ability of athletes after plyometric training (6), the current study provided the findings that a combined training could greater improvement, which is in consensus with findings of when applying similar training methodology to female basketball players (16). The results further revealed a significant increase in the Balance performance for the BP group and PL group. It could be inferred from this result that ball badminton agility, COD ability has been improved after plyometric training, but not as much as a combined training protocol, which is consistent with the previous research where significant adaptations were reported in female basketball players and ordinary adolescents after combined training (16,22). A potential reason could be that balance training enhanced the body control of players and finally reduced the time spent on the landing during jumps. It is also possible that balance training could be beneficial for the power improvement of the lower limbs. A study found an increase in vertical jumping after 5-week balance training, which helped decrease the COG, allowing athletes to land more consistently with optimal vertical jump angles (23). Lower limb reactive strength and posture control are important factors affecting quick COD of athletes, body stability as well as effective prevention of injuries (24). Due to the training the better performance observed at agility, COD and balance on BP and PL group except the PL group left leg balance it was not show any significant improvement. The changes in agility, COD and balance the magnitude of the with-group improvement for BP was higher than that of PL. Finally, coaches and researchers are suggested to investigate whether incorporating reaction training drills to combined training programme could further

improve ball badminton on-court COD performance. Despite the new information about the effect of combined training on ball badminton COD ability, many limitations need to be acknowledged. Due to the fact that most college level ball badminton male players usually have fixed match and training planning that are not possible to be alternated, the study could only include a comparatively small sample size. It should be noted that an experiment period of 6 weeks was chosen in order to verify that a shorter intervention than the commonly used 12 weeks to induce favorable adaptation, as the experiment schedule had to be acceptable for both the coaches and players.

CONCLUSIONS

In summary, the six week training intervention for college level ball badminton male players showed that combined training (BP) induced an overall better performance for the agility, the COD, and the balance than plyometric training (PL). Moreover, considering the completion of balance training is relatively time-efficient, it is suggested that adding such exercises would allow optimal training adaptation for ball badminton players.

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