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Effect of Plyometric Training on Physiological Variables Among Visually Impaired Goalball Players

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ABSTRACT

Background: Goalball is a Paralympic sport specifically designed for individuals with visual impairment and requires considerable physiological fitness and cardiovascular efficiency for successful performance. Plyometric training has been widely recognized as an effective training method for improving athletic and physiological performance. However, limited research has been conducted among visually impaired Goalball players.

Purpose: The purpose of the study was to examine the effect of plyometric training on selected physiological variables among visually impaired male Goalball players.

Methodology: A total of sixteen visually impaired male Goalball players were selected as subjects and randomly divided into two groups namely the experimental group (n=8) and the control group (n=8). The experimental group underwent a systematic plyometric training programme for a specified duration, while the control group continued their regular routine activities. The selected physiological variables were VO_2 Max and Resting Heart Rate. Pre-test and post-test measurements were collected using standardized testing procedures. The collected data were analyzed using Analysis of Covariance (ANCOVA).

Results: The results of the study revealed significant improvements in VO_2 Max and Resting Heart Rate among the subjects in the experimental group compared to the control group. The findings indicate that plyometric training positively enhanced aerobic capacity, cardiovascular efficiency, and physiological fitness among visually impaired Goalball players.

Conclusion: The study concluded that plyometric training is an effective training method for improving selected physiological variables among visually impaired Goalball players. The findings emphasize the importance of incorporating plyometric exercises into adapted sports training programmes to improve physiological performance and athletic efficiency among visually impaired athletes.

Keywords: Plyometric Training, Physiological Variables, VO_2 Max, Resting Heart Rate, Goalball, Visually Impaired Athletes.

INTRODUCTION

Goalball is a Paralympic team sport specifically designed for individuals with visual impairment and is

played between two teams consisting of three players each. The game requires athletes to rely primarily on auditory, tactile, and spatial awareness to identify the movement and direction of the ball during competition. Due to its unique sensory and motor demands, Goalball provides an important opportunity for visually impaired individuals to participate in organized sports and physical activity (Smith, 2025). The sport involves repeated offensive and defensive movements such as throwing, blocking, diving, passing, and rapid positional changes, which place considerable physiological demands on the players (Eugeniusz et al., 2012).

Previous studies have examined various physical and physiological characteristics of Goalball athletes including aerobic and anaerobic parameters, motor fitness, body composition, technical performance, and physiological responses during the game (Goulart-Siqueira et al., 2018; Alves et al., 2018). Research findings have shown that aerobic fitness and physiological efficiency play an important role in enhancing technical and tactical performance among elite Goalball players (Alves et al., 2018). Similarly, relationships between field test performances and physical fitness components have also been identified among elite athletes participating in Goalball competitions (Goulart-Siqueira et al., 2018). However, limited studies have investigated the effects of systematic training interventions on physiological variables among visually impaired Goalball players.

Plyometric training is widely recognized as an effective training method for improving muscular power, neuromuscular coordination, cardiovascular efficiency, and overall athletic performance. It consists of explosive exercises utilizing the stretch-shortening cycle mechanism to produce maximum force within a short period of time. Previous studies have demonstrated that plyometric training positively influences both physical and physiological parameters among athletes (Sarachandra & Reddy, 2019). Singh et al. (2024) reported that plyometric exercises significantly improve physiological parameters and contribute to enhanced sports performance among football players. Similarly, Andrade et al. (2018) observed improvements in explosive and endurance performance following plyometric training interventions.

Among the various physiological variables associated with athletic performance, VO_2 Max and Resting Heart Rate are considered important indicators of cardiovascular fitness and aerobic efficiency. VO_2 Max reflects the maximum amount of oxygen utilized by the body during intense physical activity, while Resting Heart Rate indicates the efficiency of cardiac functioning and physiological adaptation to training. Studies have shown that structured training programmes can improve aerobic capacity and heart rate recovery among athletes (Subekti et al., 2022). Improved cardiovascular efficiency and recovery ability are essential for Goalball players because of the repeated high-intensity efforts performed during the game.

Despite the increasing popularity of Goalball and the growing application of scientific training methods in adapted sports, very limited research has focused on the effects of plyometric training on physiological variables among visually impaired Goalball players, particularly in the Indian context. Therefore, the present study aims to investigate the effect of plyometric training on selected physiological variables namely VO_2 Max and Resting Heart Rate among visually impaired Goalball players.

MATERIALS AND METHODS

Participants

In Coimbatore district, a total of 16 visually impaired males aged 17 to 25 years volunteered for the study. The subjects were divided into two groups: the experimental group, comprising 8 goalball players

undergoing a 6-week training program, and the control group, consisting of 8 nonactive individuals who had not engaged in any sports activity previously. All participants had no other known disorders besides visual impairment.

Measurements

Pre-tests were conducted to establish baseline measures of physiological variables (VO_2 Max and Resting Heart Rate) for all participants. The experimental group underwent a plyometric training program specifically designed for visually impaired goalball players, while the control group maintained their regular training routine. The plyometric training likely included exercises such as depth jumps, bounding, and box jumps, focusing on lower body muscles. After a specified training period, post-tests were administered to assess changes in motor fitness and performance variables for both groups. Statistical analysis using Analysis of Covariance was employed to compare post-test scores, controlling for baseline differences.

RESULTS

The statistical analysis presented in Table I compares the initial and final means of motor fitness (speed and explosive power) and performance variables (overall playing ability) resulting from plyometric training on goalball players.

Table – 1

ANCOVA between Experimental group and control group on vo2 max and resting heart rate among visually impaired goalball players

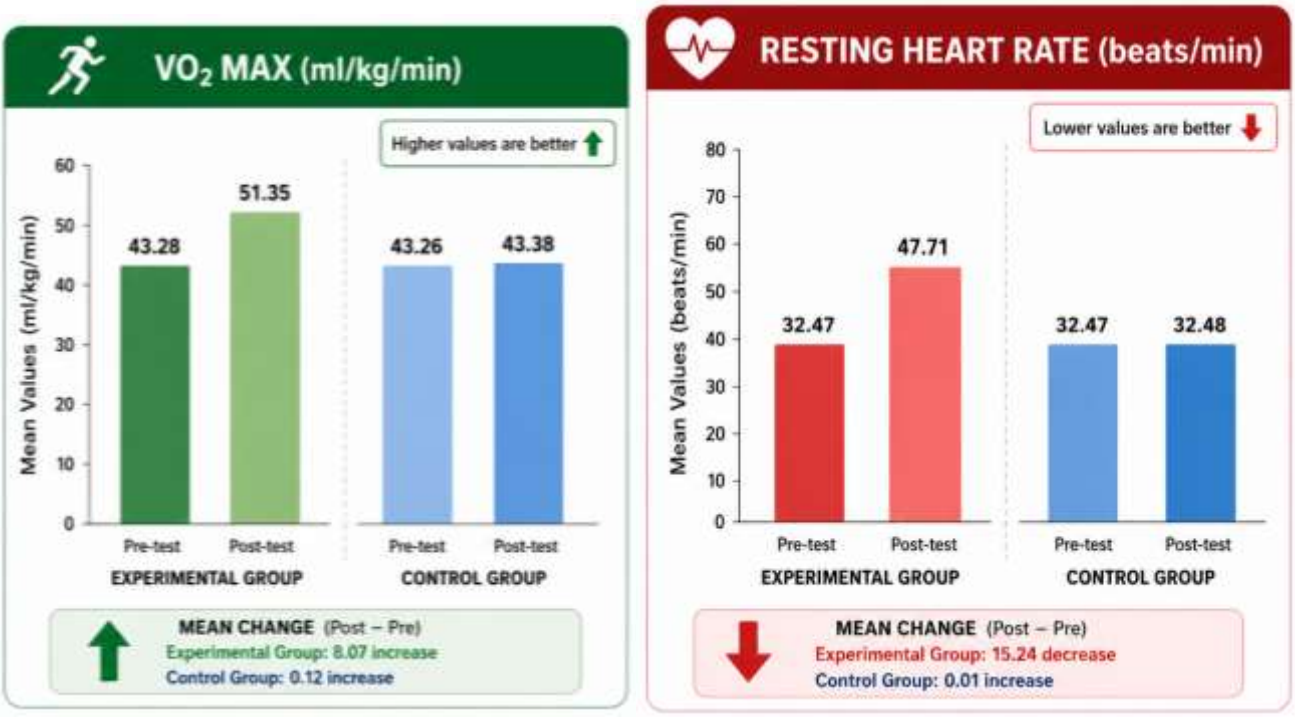
VARIABLES NAME	GROUP NAME	EG	CG	'F' Ratio
RESTING HEART RATE	Pre-test Mean ± S.D	70.47 ± 0.10	70.50 ± 0.08	0.61
	Post-test Mean ± S.D	63.96 ± 2.07	70.50 ± 0.13	79.63*
	Adj.Post-test Mean ± S.D	64.15	70.31	71.50*
VO2 MAX	Pre-test Mean ± S.D	32.47 ± 1.60	32.37 ± 0.22	0.14
	Post-test Mean ± S.D	47.71 ± 4.48	32.48 ± 1.61	81.83*
	Adj.Post-test Mean ± S.D	47.69	32.50	86.47*

** Significant at 0.05 level.

The table revealed that the obtained 'F' values of Vo2 max and resting pulse rate was found to be significant at 0.05 level with the tabulated value of 4.6 required to be significant at 0.05 level. The same table indicated that there was a significant difference in adjusted means of speed, explosive power and overall playing ability of goalball players between experimental group and control group. In case of physiological variables results between pre and posttest has been found significantly higher in experimental group in comparison to control group.

Figure I

Figure shows the Mean score of motor fitness and performance variables of both experimental and control group



DISCUSSION ON FINDINGS

The findings of the present study showed that plyometric training improved the selected physiological variables among visually impaired Goalball players. The results revealed improvements in VO_2 Max and Resting Heart Rate after the training programme. The increase in VO_2 Max indicates better aerobic fitness and improved oxygen utilization during physical activity, while the improvement in Resting Heart Rate reflects better cardiovascular efficiency and heart functioning. These improvements may be due to the explosive and repeated movements involved in plyometric exercises, which help to improve both muscular and cardiovascular performance.

The findings of the present study are supported by previous research studies. Sarachandra and Reddy (2019) reported that plyometric training positively improved physical and physiological variables among volleyball players. Similarly, Singh et al. (2024) explained that plyometric exercises improve physiological parameters and overall sports performance. Andrade et al. (2018) also found that plyometric training improved endurance and athletic performance among trained athletes. In addition, Subekti et al. (2022) observed improvements in VO_2 Max capacity and heart rate recovery after structured training programmes.

CONCLUSION

The present study concludes that plyometric training has a positive effect on selected physiological variables among visually impaired Goalball players. The training programme significantly improved VO_2 Max and Resting Heart Rate, indicating better aerobic fitness and cardiovascular efficiency among the participants. The findings suggest that plyometric exercises are effective in enhancing physiological performance and overall fitness required for Goalball. Therefore, plyometric training can be included as

an important part of training programmes for visually impaired Goalball players to improve their athletic performance and physical fitness.

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