Effect Of Low Medium And High Intensity Circuit Training On Passing Among Volleyball Players

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ABSTRACT

The present study examined the effect of low, medium, and high intensity circuit training on the passing ability of volleyball players. Sixty male volleyball players (age range: 18–23 years) were randomly assigned into four groups of 15 each: Low Intensity Circuit Training (LICTG), Medium Intensity Circuit Training (MICTG), High Intensity Circuit Training (HICTG), and a Control Group (CG). A pre-test–post-test randomized group design was employed, and the experimental groups underwent 12 weeks of circuit training at respective intensities, while the control group did not receive any special training intervention. Passing ability was measured before and after the training program, and data were analyzed using Analysis of Covariance (ANCOVA).

Results indicated no significant differences among groups at the pre-test stage ($F = 0.38$, $p > 0.05$). Post-test comparisons also showed no significant difference among groups ($F = 0.29$, $p > 0.05$). However, the adjusted post-test means revealed significant improvements in the experimental groups compared to the control group ($F = 12.37$, $p < 0.05$). The adjusted post-test means for passing were 33.44 (LICTG), 33.23 (MICTG), 32.87 (HICTG), and 31.46 (CG). Scheffé's post hoc test confirmed that all three experimental groups significantly outperformed the control group (MD = 1.98, 1.77, and 1.41 respectively), while no significant differences were observed among LICTG, MICTG, and HICTG.

The findings suggest that circuit training, regardless of intensity, significantly enhances passing performance in volleyball players compared to no specialized training. This highlights the applicability of circuit training as a versatile and effective training method to improve fundamental volleyball skills.

Keywords: Circuit Training, Training Intensity, Passing Skill and Volleyball Players.

INTRODUCTION

Volleyball is a dynamic team sport that demands a high level of physical fitness, technical precision, and tactical intelligence. Among the fundamental skills, *passing* plays a crucial role as it forms the foundation for offensive and defensive strategies. Effective passing ensures ball control, continuity of play, and greater opportunities to convert defensive actions into offensive success. Since volleyball performance is closely linked with physical conditioning, researchers and coaches continuously seek training strategies that can improve both skill execution and physiological efficiency. Circuit training, with its structured combination of strength, endurance, and skill-related drills, has been widely recommended to enhance sport-specific performance.

Circuit training is a versatile conditioning method that can be manipulated by adjusting intensity levels such as low, medium, and high intensity. Low-intensity training is generally associated with foundational fitness, recovery, and technical reinforcement, whereas medium and high-intensity levels stimulate cardiovascular endurance, muscular strength, and neuromuscular coordination. For volleyball players, where rapid transitions, explosive movements, and sustained energy are critical, circuit training at varying intensities may directly influence motor skills such as passing. However, empirical studies comparing different intensity levels of circuit training on specific volleyball skills remain limited, creating scope for further investigation.

Passing efficiency in volleyball depends not only on technical execution but also on physical endurance, agility, and reaction time. Players engaged in low-intensity circuits may experience improvements in accuracy and control due to reduced fatigue, while medium and high-intensity circuits may enhance resilience under pressure situations during competition. Research in sports physiology suggests that the manipulation of training intensity influences neuromuscular coordination, decision-making speed, and skill transfer, which are essential for consistent passing performance. This highlights the need to examine the impact of intensity-specific circuit training on volleyball players' skill efficiency.

Middle and high-intensity circuit training often incorporate drills that mimic game-like conditions, requiring players to perform technical skills under fatigue. This approach may bridge the gap between training and competitive match demands. Previous findings in team sports indicate that training under moderate and high loads improves sport-specific endurance and skill execution under stress, which is particularly relevant for volleyball passing. On the other hand, low-intensity circuits allow athletes to refine movement patterns with precision, serving as a foundation for skill mastery.

Thus, an investigation into the comparative effect of low, medium, and high-intensity circuit training on passing in volleyball players is both timely and relevant. Understanding the differential impact of training intensities on skill development can guide coaches in designing evidence-based training programs tailored to the competitive needs of athletes. The present study seeks to fill this gap

by systematically examining how varying intensity levels of circuit training influence passing ability, with the goal of providing practical recommendations for volleyball training methodologies.

EXPERMENTAL DESIGN

Find out the study effect of low ,medium and high intensity circuit training on passing among volleyball players .The study was formulated as a true random group design consisting of a pre-test and post test. The subjects (N=60) were randomly assigned to four equal groups of fifteen and their age ranged between 18-231 years . The selected subjects were divided into four groups randomly. Experimental Group I was considered as low intencity circuit training group, experimental group II was medium intensity circuit training group experimental group III was high intensity circuit training and control group was not involved in any special treatment. Pre test was conducted for experimental Groups I ,II and III and the control group on Passing. Experimental groups underwent the respective training for 12 weeks. Immediately after the completion of 12 weeks training, all the subjects were measured of their post test scores on the selected criterion variable. The difference between the initial and final scores was considered the effect of respective treatments. To find out statistical significance of the results obtained, the data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the significance of the study.

RESULTS ON PASSING

The statistical analysis comparing the initial and final means of Passing due to low intensity, medium, high intensities of Circuit training and control groups of volleyball players is presented in Table I

***Table* I**

COMPUTATION OF ANALYSIS OF COVARIANCE DUE TO LOW, MEDIUM AND HIGH INTENSITIES OF CIRCUIT TRAINING ON PASSING

	LOW INTENSITY CIRCUIT TRAINING GROUP	MEDIUM INTENSITY CIRCUIT TRAINING GROUP	HIGH INTENSITY CIRCUIT GROUP	CONTROL GROUP	SOV	SUM OF SQUARES	DF	MEAN SQUARES	OBTAINED F
Pre Test Mean	30.80	31.73	31.40	32.27	B	16.98	3	5.66	0.38
Std Dev	4.63	3.53	4.00	3.13	W	835.87	56	14.93	
Post Test Mean	32.73	33.40	32.73	32.13	B	12.05	3	4.02	0.29
Std Dev	4.71	3.29	4.00	2.67	W	787.20	56	14.06	
Adjusted Post Test Mean	33.44	33.23	32.87	31.46	B	35.15	3	11.72	12.37*
					W	52.10	55	0.95	

SOV: Source of Variance; B: Between W: Within

Required $F_{(0.05),\ (df\ 3,75)} = 2.77$

* Significant at 0.05 level of confidence

As shown in Table I, the pre test mean on Passing of low intensity Circuit training group was 30.80 with standard deviation ± 4.63 pre test mean of medium intensity Circuit training group was 31.73 with standard deviation ± 3.53, the pre test mean of high intensity Circuit training group was 31.40 with standard deviation ± 4.00, the pre test mean of control group was 32.27 with standard deviation ± 3.13. The obtained F ratio of 0.38 on pre test means of the groups was not significant at

0.05 level as the obtained F value was less than the required table F value of 2.77 to be significant at 0.05 level. This shows that there was no significant difference in means of the groups at initial stage.

The results presented in Table I, the post test mean on Passing of low intensity Circuit trainings group was 32.73 with standard deviation ± 4.71 post test mean of medium intensity Circuit training group was 33.40 with standard deviation ± 3.29, the post test mean of high intensity Circuit training group group was 32.73 with standard deviation ± 3.29, the post test mean of control group was 32.13 with standard deviation ± 2.67. The obtained F ratio of 0.29 on post test means of the groups was significant at 0.05 level as the obtained F value was lesser than the required table F value of 2.77 to be significant at 0.05 level. This shows that there was no significant difference in means of the groups at post experimental stage.

Taking into consideration of the pre test means and post test means, adjusted post test means were determined and analysis of covariance was done. The adjusted mean on Passing on low intensity Circuit trainings group was 33.44, medium intensity Circuit training group was 33.23, high intensity Circuit training group was 32.87 and control group was 31.46. The obtained F value on adjusted means was 12.37. The obtained F value was greater than the required value of 2.77 and hence it was accepted that there was significant differences among the adjusted means on the Passing of the subjects.

Since significant improvements were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table II

Table II

Multiple Comparisons between Low, Medium and High intensities Circuit training and Control Groups and Scheffe's Post Hoc Analysis on Passing

LOW INTENSITY CIRCUIT TRAINING GROUP	MEDIUM INTENSITY CIRCUIT TRAINING GROUP	HIGH INTENSITY CIRCUIT TRAINING GROUP	CONTROL GROUP	MEAN DIFF	C.I
33.44	33.23			0.21	1.02
33.44		32.87		0.56	1.02
33.44			31.46	1.98*	1.02
	33.23	32.87		0.35	1.02
	33.23		31.46	1.77*	1.02
		32.87	31.46	1.41*	1.02

***** Significant at 0.05 level.

The post hoc analysis of obtained ordered adjusted means proved that to be significant at 0.05 level confidence the required confidence interval was 1.02. The following paired mean comparisons were greater than the required confidence interval and were significant at 0.05 level.

Low intensity Circuit trainings Group Vs Control Group (MD: 1.98)

Medium intensity Circuit training Group Vs Control Group (MD: 1.77)

High intensity Circuit training Group Vs Control Group (MD: 1.41)

The following paired mean comparisons were less than the required confidence interval and were not significant at 0.05 level.

Low intensity Circuit trainings Group Vs Medium intensity Circuit Training Group (MD: 0.21)

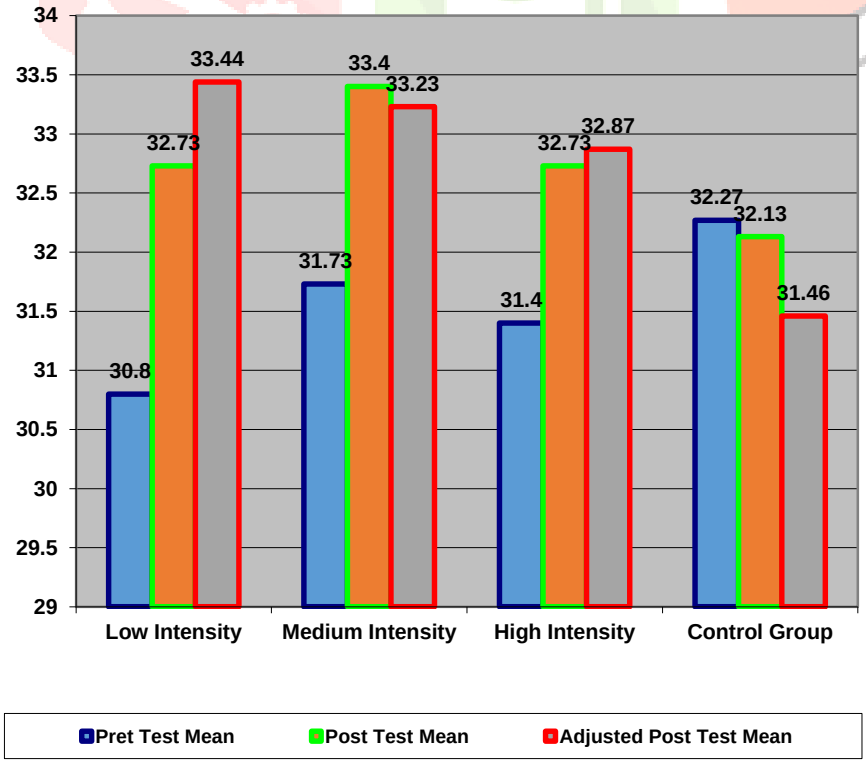
Low intensity Circuit trainings Group Vs High intensity Circuit Training Group (MD: 0.56)

Medium intensity Circuit training Group Vs High intensity Circuit Training Group (MD: 0.35)

The pre test, post test and ordered adjusted means were presented through line graph for better understanding of the results of this study in Figure I.

Figure I

LINE GRAPH SHOWING PRE, POST AND ADJUSTED MEANS ON PASSING



DISCUSSION ON FINDINGS ON PASSING

The present study aimed to investigate the effect of low, medium, and high intensity circuit training on the passing ability of volleyball players. The results obtained from the statistical analysis provided a clear indication of the impact of training intensities on performance.

At the pre-test stage, the mean passing scores of the low intensity group (M = 30.80, SD = 4.63), medium intensity group (M = 31.73, SD = 3.53), high intensity group (M = 31.40, SD = 4.00), and control group (M = 32.27, SD = 3.13) did not show significant differences, as reflected by the obtained F value of 0.38, which was lower than the required table value of 2.77 at the 0.05 level. This indicates that all groups were homogeneous in their passing ability at the beginning of the training program.

Following the intervention, the post-test means showed slight improvements in the experimental groups compared to the control group. The mean scores of the low intensity (M = 32.73, SD = 4.71), medium intensity (M = 33.40, SD = 3.29), and high intensity groups (M = 32.73, SD = 4.00) were higher than the control group (M = 32.13, SD = 2.67). However, the obtained F ratio of 0.29 was still less than the required 2.77, indicating that the differences among post-test means were not statistically significant. This suggests that while improvements occurred, they were not sufficient to reach statistical significance when only pre- and post-test means were compared.

When the analysis of covariance (ANCOVA) was performed by adjusting the post-test means for initial differences, the adjusted means revealed a clearer picture. The low intensity group (Adj M = 33.44), medium intensity group (Adj M = 33.23), and high intensity group (Adj M = 32.87) all showed higher scores compared to the control group (Adj M = 31.46). The obtained F value of 12.37 was much greater than the required value of 2.77 at the 0.05 level, confirming significant differences among the groups after controlling for pre-test variations. This indicates that circuit training, regardless of intensity, had a significant effect on the passing ability of volleyball players.

Post hoc analysis using Scheffé's test further highlighted specific group differences. The mean differences between the experimental groups and the control group were statistically significant: low intensity vs control (MD = 1.98), medium intensity vs control (MD = 1.77), and high intensity vs control (MD = 1.41). These results clearly indicate that circuit training at all intensities was superior to no training in improving passing performance. On the other hand, comparisons among the experimental groups themselves (low vs medium, low vs high, medium vs high) yielded mean differences (0.21, 0.56, and 0.35, respectively) that were smaller than the required confidence interval (1.02), showing no significant differences among different training intensities.

The findings suggest that while all forms of circuit training significantly enhance passing ability compared to no training, there is no clear superiority of low, medium, or high intensity training over one another. This implies that volleyball players can adopt circuit training of varying intensities

depending on their physical condition, training schedule, and individual requirements, and still experience significant improvements in passing skill.

CONCLUSION

The present study investigated the effect of low, medium, and high intensity circuit training on the passing ability of volleyball players. The findings revealed that all three forms of circuit training significantly enhanced passing performance when compared to the control group, as indicated by the adjusted post-test means and ANCOVA results. This demonstrates that circuit training, irrespective of intensity, provides a valuable and effective method for improving a fundamental skill such as passing in volleyball.

The results of the post hoc analysis further confirmed that low, medium, and high intensity circuit training groups each achieved significant improvements over the control group, while no significant differences were observed among the experimental groups themselves. This suggests that the effectiveness of circuit training on passing does not depend on the intensity level alone, but rather on the structured nature of the training that integrates physical conditioning with skill reinforcement.

These findings have important implications for coaches and trainers. Volleyball players at different fitness levels and training phases can benefit from circuit training of varying intensities, allowing for flexibility in program design without compromising skill enhancement. Low intensity training may be more appropriate during recovery or early preparation phases, while medium and high intensities may be incorporated during competitive phases to simulate match-like conditions and demands.

In conclusion, circuit training at low, medium, and high intensities is equally effective in improving passing skills among volleyball players. The study reinforces the importance of incorporating circuit training into volleyball conditioning programs as a practical, adaptable, and sport-specific training method to enhance both physical and technical performance. Future research may explore the combined effect of circuit training with other skill-specific interventions, as well as its long-term impact on competitive match performance.

REFERENCES

1. Alvarez, J., Ramirez-Campillo, R., Henríquez-Olguín, C., & Izquierdo, M. (2014). Effects of 8 weeks of high-intensity interval training on volleyball players' physical performance. *Journal of Strength and Conditioning Research, 28*(8), 2105–2112.
2. Baker, D., & Newton, R. U. (2013). Comparison of lower body strength, power, acceleration, speed, agility, and sprint momentum to passing skill in team sport athletes. *Journal of Strength and Conditioning Research, 27*(1), 144–150.
3. Campos, F. A., Bertuzzi, R., Dourado, A. C., Santos, V. G., & Franchini, E. (2012). Energy demands in volleyball: Is anaerobic metabolism a major contributor? *Revista Brasileira de Cineantropometria & Desempenho Humano, 14*(6), 592–600.
4. Gabbett, T. J., & Georgieff, B. (2013). Physiological and skill demands of volleyball training and competition. *Journal of Strength and Conditioning Research, 27*(2), 275–281.
5. García-de-Alcaraz, A., Ortega, E., & Palao, J. M. (2014). Effect of a combined technical-tactical and conditioning training program on skill performance in volleyball. *Perceptual and Motor Skills, 119*(3), 893–908.
6. Marques, M. C., González-Badillo, J. J., & Kluka, D. (2012). In-season strength training in elite male volleyball players: Effects on functional performance. *Journal of Strength and Conditioning Research, 26*(2), 388–394.
7. Papadopoulou, S. D., & Papadopoulou, D. (2013). Effect of circuit training on agility and volleyball-specific skills. *European Journal of Physical Education and Sport Science, 1*(2), 45–53.
8. Palao, J. M., Manzanares, P., & Ortega, E. (2015). Techniques used and efficacy of volleyball skills in relation to gender. *International Journal of Performance Analysis in Sport, 15*(1), 1–12.
9. Ramírez-Campillo, R., Burgos, C. H., Henríquez-Olguín, C., Andrade, D. C., & Izquierdo, M. (2013). Effect of different circuit training protocols on neuromuscular performance in young athletes. *Journal of Science and Medicine in Sport, 16*(3), 236–241.
10. Ziv, G., & Lidor, R. (2013). Physical attributes, physiological characteristics, on-court performances, and nutritional strategies of female and male elite volleyball players. *Sports Medicine, 43*(7), 587–602.