



Comparative Effect of Early and Late Preparatory Phase Training on Selected Motor Fitness, Physiological, and Handball Skill Performance Variables

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Abstract:

Handball is a fast-paced and physically demanding team sport that requires athletes to possess a high level of motor fitness, physiological efficiency, and technical proficiency. Success in handball depends not only on the players' technical abilities but also on the systematic planning and implementation of training during different phases of the annual training cycle. Among these, the early and late preparatory phases play a crucial role in developing the physical and physiological capacities necessary for achieving optimal competitive performance. Although both phases are essential components of sports training, limited empirical evidence is available regarding their comparative influence on the performance characteristics of intercollegiate handball players. Therefore, the present investigation was undertaken to compare the effects of early and late preparatory phase training on selected motor fitness, physiological, and handball skill performance variables.

The study adopted an experimental research design involving 90 male intercollegiate handball players aged 18 to 25 years, selected from affiliated colleges of Andhra University, Visakhapatnam, Andhra Pradesh, India. The participants were selected through appropriate sampling procedures and were randomly assigned into three equal groups consisting of 30 players each: an Early Preparatory Phase Training Group, a Late Preparatory Phase Training Group, and a Control Group. The experimental groups underwent structured training programmes designed according to the objectives and workload characteristics of their respective preparatory phases, while the control group continued its routine physical activities without participating in the specialized training programme. The duration of the experimental training programme was twelve weeks.

The selected motor fitness variables included speed, agility, explosive power, muscular endurance, and coordination. The physiological variables comprised resting heart rate, vital capacity, and aerobic capacity, while handball skill performance was evaluated through standardized tests of passing accuracy, dribbling ability, shooting accuracy, and defensive movement. Pre-test and post-test data were collected using standardized testing procedures to ensure objectivity and reliability.

The collected data were analyzed using appropriate descriptive and inferential statistical techniques. Mean and standard deviation were computed to describe the performance of the participants, while Analysis of Covariance (ANCOVA) was employed to determine the significance of differences among the groups after adjusting for pre-test scores. Whenever significant differences were observed, Scheffé's Post Hoc Test was applied to identify the specific group differences. The level of significance was fixed at 0.05.

It was hypothesized that both early and late preparatory phase training programmes would produce significant improvements in the selected motor fitness, physiological, and handball skill performance variables compared with the control group. It was further expected that the nature and magnitude of improvement would vary between the two experimental groups because each preparatory phase emphasizes different

training objectives, exercise intensity, and physiological adaptations. The findings of the study are expected to provide valuable scientific evidence for coaches, physical education teachers, sports scientists, and strength and conditioning professionals in designing phase-specific training programmes for handball players. The study may also contribute to the existing literature on sports training methodology by offering practical insights into the effective planning of preparatory phase training for improving competitive performance among university-level handball players.

Keywords: Early Preparatory Phase, Late Preparatory Phase, Handball, Motor Fitness, Physiological Variables, Skill Performance, Intercollegiate Players, Andhra University, Experimental Study

1. Introduction

Handball is one of the exciting and physically tough team sports played around the world. It is known for changes between attacking and defending, lots of moving in different directions, big jumps, fast running, good passing, strong shooting, and smart defense. The modern version of the game needs players to have not only good skills but also very good physical fitness and how well their bodies work together to handle the challenges of playing. As handball gets faster and harder, making training plans has become a key part of getting ready for competition.

The performance of a handball player is affected by a mix of movement skills, how the body works, and the skills needed to play. Movement skills include speed, how well you can change direction, how strong your muscles are, how powerful you can jump, and how well you can move together. How long you can keep going helps players do the things they need to do in a game. Also, how well the body works, like how you can keep going without getting tired, how well your heart and lungs work, and how your body uses oxygen, helps players stay good all through a match. Along with these, the skills of passing, moving the ball, shooting, and defending decide how well a player plays in a game. So making sure all these parts grow together is very important for doing well in handball.

In sports training, the starting part of the year is the base of the training plan for an athlete. It is meant to build up the physical body, mind, and skill parts that are needed for playing. Coaches and people who study sports usually split this starting period into two times: the early part and the later part. Even though both times want to make players better, they are different in what they try to do, how hard the training is, how much is done, and how specific the training is.

The early part of the starting period focuses on building a base of fitness through general workouts. During this time, the main goal is to get stronger, be able to run, be more flexible, move better, and have more energy. The training starts slowly so players can get used to the work without getting hurt. This time helps players get ready for intense and specific training later in the season.

The later part of the starting period is when players move from training to training that is more like what they face in a game. The training gets harder. Looks more like what happens in a match. More focus is on speed, how well you can change direction, how powerful you can be, how well you can do bursts of energy, how quickly you can react, and more advanced handball skills through special exercises and team play. The goal of this time is to get players as ready as possible before the games start.

Even though both parts of the starting period are seen as important for training, it has not been studied enough how good each is at making players better at moving, how their bodies work, and their handball skills. Many training plans are made based on what coaches know from real research that shows what works best. So there is a need for experiments that look at how training in each part affects players.

This study looks at that by looking at how early and late parts of the starting period affect movement, body, and handball skills in 90 male players from colleges connected to Andhra University in Visakhapatnam, Andhra Pradesh,

India. The players are between 18 and 25 years old. They are split into a group that does training, a group that does late training, and a group that does no special training to see what works best in a fair test.

The results of this study are expected to help understand how training at different times affects players. It will also help coaches, teachers, people who help with fitness, and sports scientists make training plans. This study is also expected to help create training that is based on facts and makes players better at moving, how their bodies work, and their handball skills, which will improve the level of play for college players.

Statement of the Problem:

The purpose of this study was to investigate **“the comparative effect of early and late preparatory phase training on selected motor fitness, physiological, and handball skill performance variables”** among 90 male intercollegiate handball players aged 18–25 years from affiliated colleges of Andhra University, Visakhapatnam, Andhra Pradesh, India. The study aimed to determine the effectiveness of these two preparatory training phases in improving the selected performance variables and to identify which phase produces greater adaptations in physical fitness, physiological efficiency, and handball-specific skills. The findings are expected to provide scientific evidence for designing effective preparatory training programmes for university-level handball players.

Significance of the Study:

This study is important because it looks at how early and late training phases affect handball players. The study is about handball players. It will help us understand how different training phases impact their fitness and skills. The results of this study will help us learn more about how to train handball players.

This study will give coaches the information they need to plan training sessions for handball players. Coaches will know how to design training programmes that will help handball players get better at handball. Strength and conditioning specialists will also learn how to create training loads that're right for handball players.

The results of this study will be useful to education teachers and sports scientists. They will learn how to create training schedules for handball players. University sports administrators will also benefit from this study. Handball players will learn why they need to follow a training plan to play better and avoid getting hurt.

This study will also add to what we know about sports training. It will give us information about how early and late training phases work. This study will be a reference for people who want to study handball and other team sports. Handball is a team sport. This study will help us understand how to train handball players better.

Objectives of the Study:

The main goal of this study is to find out a few things.

1. We want to see how training during the part of the season affects the physical fitness of handball players at the college level.
2. We also want to see how training during the part of the season affects the physical fitness of handball players at the college level.
3. Then we will compare the two to see which type of training is better for handball players at the college level.
4. We are also curious about how early-season training affects the health of handball players at the college level.
5. We want to know how late-season training affects the physical health of handball players at the college level.
6. So we will compare the two to see which type of training is better for the health of handball players at the college level.
7. We need to find out if early-season training improves the skills of handball players at the college level.
8. We also need to find out if late-season training improves the skills of handball players at the college level.
9. Then we will compare the two to see which type of training is better for improving the skills of handball players at the college level.

10. The main thing we want to find out is which type of training is better overall for handball players at the college level so we can help them get better at handball and be healthier.

2. Methodology

Research Design:

This study used an experimental research design to see how early and late preparatory phase training affected motor fitness, physiological measures, and handball skill performance in intercollegiate handball players. The design allowed the researcher to compare two training programs and use a control group to get results.

The study looked at the effects of early and late preparatory phase training on handball players.

This was done by using an experimental research design with pre-test and post-test measures.

Selection of Subjects:

Ninety male intercollegiate handball players from Andhra University in Visakhapatnam, Andhra Pradesh, India were chosen for the study. These players were between 18 and 25 years old.

All the players had played in handball competitions before and were healthy enough to take part in the training program. The players were from colleges of Andhra University.

Sampling Technique:

The players were chosen using a random sampling technique that considered their experience, age, health, and how often they played handball. The players were then divided into three groups of 30 players each. This was done after they were selected.

Group I was the Early Preparatory Phase Training Group with 30 players.

Group II was the Late Preparatory Phase Training Group with 30 players.

Group III was the Control Group with 30 players.

Training Programme:

The training groups did preparatory phase training for 12 weeks with five sessions per week. Each session lasted 90 minutes and included warm-up, main training, and cool-down exercises. The Early Preparatory Phase Training Group did physical conditioning exercises. They also did endurance, muscular strength, flexibility, coordination, and basic technical skills exercises.

The Late Preparatory Phase Training Group did sport conditioning with a focus on speed, agility, explosive power, anaerobic endurance, tactical drills, and advanced handball skills. The Control Group kept doing their physical activities and handball practice without the special training program. The Control Group did not participate in the preparatory phase training program.

Criterion Variables:

Independent Variable:

Early Preparatory Phase Training and Late Preparatory Phase Training were the variables.

Early Preparatory Phase Training and Late Preparatory Phase Training were the factors in this study.

Dependent Variables:

There were three types of variables: Motor Fitness Variables, Physiological Variables, and Handball Skill Performance Variables.

The Motor Fitness Variables were:

- Speed
- Agility
- Explosive Power
- Muscular Endurance
- Coordination

The Physiological Variables were:

- Resting Heart Rate
- Vital Capacity
- Aerobic Capacity

The Handball Skill Performance Variables were:

- Passing Accuracy
- Dribbling Ability
- Shooting Accuracy
- Defensive Movement

Administration of Tests:

Standard tests were used to measure all the variables. The tests were done before and after the training program. After the training program. The same conditions and equipment were used for all the tests to ensure reliability and fairness. This was done to get results. The tests were administered in the same way throughout the study.

Table 4.1: Descriptive Statistics of Selected Motor Fitness Variables.

Variable	Group	Pre-Test Mean $\pm$ SD	Post- Test Mean $\pm$ SD	Adjusted Mean	ANCOV A F	p- value
Speed (sec)	Early Preparatory	7.52 $\pm$ 0.31	7.10 $\pm$ 0.27	7.08	18.74	0.001*
	Late Preparatory	7.50 $\pm$ 0.29	6.88 $\pm$ 0.25	6.86		
	Control	7.49 $\pm$ 0.30	7.46 $\pm$ 0.29	7.45		
Agility (sec)	Early Preparatory	10.81 $\pm$ 0.42	10.15 $\pm$ 0.38	10.12	21.63	0.001*
	Late Preparatory	10.80 $\pm$ 0.39	9.82 $\pm$ 0.34	9.8		
	Control	10.79 $\pm$ 0.40	10.74 $\pm$ 0.39	10.73		

Explosive Power (cm)	Early Preparatory	48.63 ± 3.11	53.82 ± 2.95	53.9	25.81	0.001*
	Late Preparatory	48.55 ± 3.08	56.91 ± 2.88	56.98		
	Control	48.60 ± 3.12	48.88 ± 3.04	48.9		
Muscular Endurance (reps)	Early Preparatory	32.44 ± 3.25	39.15 ± 3.12	39.28	19.34	0.001*
	Late Preparatory	32.61 ± 3.20	41.78 ± 3.05	41.91		
	Control	32.52 ± 3.18	32.90 ± 3.14	32.95		
Coordination (score)	Early Preparatory	14.35 ± 1.21	17.28 ± 1.16	17.35	16.92	0.001*
	Late Preparatory	14.41 ± 1.24	18.36 ± 1.10	18.42		
	Control	14.38 ± 1.20	14.52 ± 1.18	14.55		

Table Value ($F_{0.05, df = 2,86}$) = 3.10.

Table 2: Descriptive Statistics of Selected Physiological Variables.

Variable	Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Adjusted Mean	ANCOVA F	p-value
Resting Heart Rate (bpm)	Early	73.54 ± 2.81	70.46 ± 2.62	70.41	15.83	0.001*
	Late	73.49 ± 2.74	68.95 ± 2.55	68.9		
	Control	73.51 ± 2.78	73.20 ± 2.69	73.18		
Vital Capacity (L)	Early	3.95 ± 0.28	4.26 ± 0.24	4.28	17.54	0.001*
	Late	3.96 ± 0.27	4.45 ± 0.22	4.47		
	Control	3.94 ± 0.29	3.96 ± 0.28	3.97		

Aerobic Capacity (ml·kg ⁻¹ ·min ⁻¹)	Early	46.85 ± 2.10	50.94 ± 2.02	51.01	23.67	0.001*
	Late	46.92 ± 2.08	53.35 ± 1.96	53.41		
	Control	46.88 ± 2.12	47.05 ± 2.09	47.1		

Table Value ($F_{0.05, df = 2,86}$) = 3.10.

Table 3: Descriptive Statistics of Selected Handball Skill Performance Variables.

Variable	Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Adjusted Mean	ANCOVA F	p-value
Passing Accuracy (score)	Early	18.42 ± 2.14	23.84 ± 2.02	23.9	20.58	0.001*
	Late	18.38 ± 2.11	25.65 ± 1.94	25.71		
	Control	18.40 ± 2.12	18.71 ± 2.08	18.75		
Dribbling (sec)	Early	14.82 ± 0.71	13.91 ± 0.62	13.88	22.91	0.001*
	Late	14.80 ± 0.69	13.34 ± 0.59	13.3		
	Control	14.81 ± 0.70	14.76 ± 0.68	14.75		
Shooting Accuracy (score)	Early	16.55 ± 1.82	20.86 ± 1.71	20.91	24.73	0.001*
	Late	16.52 ± 1.80	22.75 ± 1.65	22.8		
	Control	16.54 ± 1.81	16.70 ± 1.78	16.72		
Defensive Movement (score)	Early	15.34 ± 1.63	19.44 ± 1.51	19.49	18.41	0.001*
	Late	15.31 ± 1.61	20.82 ± 1.45	20.87		
	Control	15.33 ± 1.62	15.50 ± 1.60	15.54		

Table Value ($F_{0.05, df = 2,86}$) = 3.10.

3. Discussion of Results

Selected Motor Fitness Variables:

Table 1 shows the statistics and Analysis of Covariance (ANCOVA) for the selected motor fitness variables of the three groups, which are the Early Preparatory Phase Training Group, the Late Preparatory Phase Training Group, and the Control Group. The pre-test mean scores showed that there were small differences among the three groups before the experiment started, which shows that the participants were similar at the beginning.

After the twelve-week program, both groups that had training showed improvements in all the motor fitness variables that were studied, such as speed, agility, explosive power, muscular endurance, and coordination. The Late Preparatory Phase Training Group had better results than the Early Preparatory Phase Training Group. The Control Group had little change, which might be because they did regular physical activities but were not part of the special training.

The ANCOVA results showed differences between the adjusted scores after the test. The F-ratios for all the motor fitness variables were higher than the values needed at the 0.05 level of significance. These results show that the training programs helped improve motor fitness for the handball players in college. The better results from the Late Preparatory Phase Training Group could be because of a focus on specific sport training, more intense workouts, exercises that build power, and movements that are like those in a real game. These activities match the movement needs of playing handball in a competition.

So it was decided that training in the preparatory phase was better than training in the early preparatory phase for improving selected motor fitness variables among intercollegiate handball players.

Selected Physiological Variables:

Table 2 shows the statistics and results for the variables of the three groups. At the beginning, the people in all groups were pretty similar when it came to their characteristics.

The results after the test showed that the people in the two training groups got better at resting heart rate, vital capacity, and aerobic capacity. The Late Preparatory Phase Training Group did better than the Early Preparatory Phase Training Group in terms of changes. The Control Group did not change much during the study.

The numbers we got from the analysis show that the improvements were real and not just luck. The training programmes actually worked. The people in the training groups had lower resting heart rates. Could breathe better, which means their hearts and lungs were working more efficiently. This is important for handball players because they need to be able to keep playing at a high level.

The Late Preparatory Phase Training Group did better because their training was harder. They did high-intensity exercises, practiced playing handball, and did sprint exercises. This kind of training makes the heart and lungs work harder.

So the results show that training during the preparatory phase is better than training during the early preparatory phase for handball players. The Late Preparatory Phase Training Group had more physiological changes than the Early Preparatory Phase Training Group.

Selected Handball Skill Performance Variables

Table 3 illustrates the descriptive statistics and ANCOVA results for the selected handball skill performance variables. The pre-test scores indicate that all three groups possessed similar levels of technical proficiency before the commencement of the experimental training programme.

At the conclusion of the twelve-week training period, both experimental groups showed substantial improvements in passing accuracy, dribbling ability, shooting accuracy, and defensive movement. Among the two experimental groups, the Late Preparatory Phase Training Group achieved higher adjusted post-test mean scores in all selected skill variables. The Control Group exhibited only slight improvements, which were insufficient to produce statistically significant differences.

The ANCOVA findings revealed that the obtained F-values were greater than the critical table value at the 0.05 level of significance, indicating significant differences among the three groups after controlling for pre-test variations. These findings confirm that systematic preparatory phase training contributes significantly to the development of handball-specific technical skills.

The greater improvements observed in the Late Preparatory Phase Training Group may be attributed to the incorporation of sport-specific drills, tactical practice, competitive situations, and high-speed skill execution, all of which closely replicate actual match conditions. Such training enhances technical efficiency, decision-making, coordination, and execution under game-like pressure.

Based on these findings, it may be concluded that late preparatory phase training is more effective than early preparatory phase training in improving selected handball skill performance variables among intercollegiate handball players.

4. Conclusion

The data were analyzed. It was decided that both the early training and the late training made a big difference in how well the handball players did in terms of their physical fitness, health, and handball skills. The difference was not the same for both groups.

The group that did the training did a lot better in things like speed, agility, and endurance. They also got better at passing, dribbling, and shooting. This shows that a training plan that is more intense and focused on the skills needed for handball is more effective.

The group that did the training also did better than the group that did not do any special training. This means that starting with some conditioning can help a lot. The group that just practiced normally did not get much better.

So the study says that having a training plan is very important for handball players. It is also important to have types of training at different times of the year. Late training is especially important to get the players ready for competition. These findings can help coaches and trainers make training plans for handball players at the university level.

The results of this study can help people who work with handball players to make training plans that are based on facts. This can help the players do better and be more successful. Handball players need to have a training plan to do well. Late training is very important for handball players. It helps them get ready for the games and do their best.

References

1. Baechle, T. R., & Earle, R. W. (2008). *Essentials of Strength Training and Conditioning* (3rd ed.). Human Kinetics.
2. Bompa, T. O., & Buzzichelli, C. (2019). *Periodization: Theory and Methodology of Training* (6th ed.). Human Kinetics.
3. Bompa, T. O., & Haff, G. G. (2009). *Periodization: Theory and Methodology of Training* (5th ed.). Human Kinetics.
4. Buchheit, M., & Laursen, P. B. (2013). High-intensity interval training, solutions to the programming puzzle. *Sports Medicine*, 43(5), 313–338.
5. Fleck, S. J., & Kraemer, W. J. (2014). *Designing Resistance Training Programs* (4th ed.). Human Kinetics.

6. Gambetta, V. (2007). *Athletic Development: The Art and Science of Functional Sports Conditioning*. Human Kinetics.
7. Helgerud, J., & Hoff, J. (2004). Endurance and strength training for soccer players: Physiological considerations. *Sports Medicine*, 34(3), 165–180.
8. Issurin, V. B. (2008). *Block Periodization: Breakthrough in Sport Training*. Ultimate Athlete Concepts.
9. Magill, R. A., & Anderson, D. (2017). *Motor Learning and Control: Concepts and Applications* (11th ed.). McGraw-Hill Education.
10. Manchado, C., Cortell-Tormo, J. M., & Tortosa-Martínez, J. (2018). Effects of two different training periodization models on physical and physiological aspects of elite female team handball players. *Journal of Strength and Conditioning Research*, 32(1), 280–287.
11. Platonov, V. N. (2015). *Sports Training Periodization: General Theory and Its Practical Application*. Olympic Literature.
12. Reilly, T., Bangsbo, J., & Franks, A. (2000). Anthropometric and physiological predispositions for elite soccer. *Journal of Sports Sciences*, 18(9), 669–683.
13. Sharkey, B. J., & Gaskill, S. E. (2013). *Fitness and Health* (7th ed.). Human Kinetics.
14. Tanner, R. K., & Gore, C. J. (2013). *Physiological Tests for Elite Athletes* (2nd ed.). Human Kinetics.
15. Wilmore, J. H., Costill, D. L., & Kenney, W. L. (2015). *Physiology of Sport and Exercise* (6th ed.). Human Kinetics.
16. Zatsiorsky, V. M., & Kraemer, W. J. (2006). *Science and Practice of Strength Training* (2nd ed.). Human Kinetics.
17. Zar, J. H. (2010). *Biostatistical Analysis* (5th ed.). Pearson Education.