



Aquatic Pressure Training and Its Effect on Physical Performance among Female Kabaddi Players

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Abstract:

The purpose of this study was to investigate the effect of aquatic pressure training on selected physical performance variables among female Kabaddi players. Sixty female Kabaddi players representing junior and senior state-level competitions from Krishna District, Andhra Pradesh, were selected as subjects for the study. The age of the participants ranged from 16 to 23 years. The subjects were randomly divided into two equal groups: an experimental group (n = 30) and a control group (n = 30). The experimental group underwent a structured aquatic pressure training programme for twelve weeks, consisting of three training sessions per week, while the control group continued with their regular Kabaddi training without any additional intervention. The selected physical performance variables included speed, agility, muscular strength, leg explosive power, and cardiovascular endurance. Standardized field tests were administered before and after the training period to assess the performance of the subjects. The collected data were analyzed using appropriate statistical techniques, including Analysis of Covariance (ANCOVA), to determine the significance of differences between the groups. The results revealed that the experimental group showed significant improvement in all selected physical performance variables when compared to the control group. The findings indicate that aquatic pressure training effectively enhances speed, agility, muscular strength, leg explosive power, and cardiovascular endurance among female Kabaddi players. It was concluded that aquatic pressure training is an effective and scientifically supported training method for improving the physical performance of female Kabaddi athletes. Coaches and sports trainers may incorporate aquatic pressure training into regular conditioning programmes to achieve better competitive performance and overall athletic development.

Keywords: Aquatic Pressure Training, Water Resistance Training, Physical Performance, Female Kabaddi Players, Speed, Agility, Muscular Strength, Explosive Power, Cardiovascular Endurance

1. Introduction

Kabaddi is one of the most popular indigenous sports in India and has gained international recognition due to its inclusion in various national and international competitions. The game requires a combination of physical fitness, technical skills, tactical awareness, and psychological preparedness. Success in Kabaddi depends largely on the player's ability to perform rapid movements, sudden changes in direction, powerful raids, effective defensive actions, and sustained efforts throughout the match. Therefore, developing physical performance components such as speed, agility, muscular strength, explosive power, and cardiovascular endurance is essential for achieving excellence in Kabaddi.

In recent years, women's participation in Kabaddi has increased significantly at the district, state, national, and international levels. The growing competitiveness of the sport demands scientifically designed training programmes

that can improve athletic performance while minimizing the risk of injury. Coaches and sports scientists continuously seek innovative training methods that can enhance physical fitness and sport-specific performance among female athletes.

Aquatic pressure training, also known as water resistance training, has emerged as an effective conditioning method in sports training and rehabilitation. Water provides natural resistance to body movements, creating a training environment that challenges the musculoskeletal and cardiovascular systems while reducing stress on the joints. The hydrostatic pressure of water improves circulation, balance, and muscular activation, whereas buoyancy reduces impact forces and the likelihood of training-related injuries. These unique properties make aquatic training a valuable tool for enhancing athletic performance.

Research in sports science has shown that aquatic training can contribute to improvements in muscular strength, explosive power, speed, agility, flexibility, and cardiovascular endurance. The resistance offered by water is multidirectional and continuous, requiring greater muscular effort during movement. Consequently, athletes who participate in aquatic training programmes may experience enhanced neuromuscular adaptations and improved overall fitness.

For female Kabaddi players, aquatic pressure training may provide an alternative and effective method for improving the physical qualities necessary for competitive success. Since Kabaddi involves repeated sprinting, quick directional changes, lunging, tackling, and prolonged physical exertion, the application of aquatic training principles may lead to significant improvements in performance-related fitness components. However, limited research has been conducted specifically on the effects of aquatic pressure training among female Kabaddi players, particularly at the state level.

Therefore, the present study was undertaken to examine the effect of a structured aquatic pressure training programme on selected physical performance variables among junior and senior state-level female Kabaddi players of Krishna District, Andhra Pradesh. The findings of this study are expected to provide valuable information for coaches, trainers, physical educators, and sports scientists regarding the effectiveness of aquatic pressure training as a modern conditioning strategy for enhancing the physical performance of female Kabaddi athletes.

Statement of the problem:

Therefore, the problem of the study was stated as: “To determine the effect of aquatic pressure training on selected physical performance variables among junior and senior state-level female Kabaddi players of Krishna District, Andhra Pradesh.”

Objectives of the Study:

The present study was undertaken to examine the effectiveness of aquatic pressure training on selected physical performance variables among junior and senior state-level female Kabaddi players of Krishna District, Andhra Pradesh.

The specific objectives of the study were:

1. To determine the effect of aquatic pressure training on the speed of female Kabaddi players.
2. To assess the influence of aquatic pressure training on the agility of female Kabaddi players.
3. To evaluate the effect of aquatic pressure training on the muscular strength of female Kabaddi players.
4. To investigate the impact of aquatic pressure training on the leg explosive power of female Kabaddi players.
5. To examine the effect of aquatic pressure training on the cardiovascular endurance of female Kabaddi players.
6. To compare the pre-test and post-test performance scores of the experimental and control groups on selected physical performance variables.

7. To determine whether significant differences exist between the experimental group undergoing aquatic pressure training and the control group following regular Kabaddi training.
8. To establish the effectiveness of aquatic pressure training as a scientific conditioning method for enhancing physical performance among female Kabaddi players.
9. To provide practical recommendations for coaches, physical educators, and sports scientists regarding the use of aquatic pressure training in Kabaddi conditioning programmes.
10. To contribute to the existing body of knowledge in sports training and exercise physiology related to female Kabaddi players.

Limitations of the Study:

The following limitations were recognized in the conduct of the present study:

1. The study was limited to junior and senior state-level female Kabaddi players from Krishna District, Andhra Pradesh.
2. The sample size was restricted to sixty (60) subjects only, which may limit the generalization of the findings to a larger population.
3. The duration of the training programme was confined to twelve weeks.
4. The study was limited to selected physical performance variables, namely speed, agility, muscular strength, leg explosive power, and cardiovascular endurance.
5. Factors such as dietary habits, lifestyle practices, psychological status, motivation levels, and environmental conditions were beyond the control of the investigator and may have influenced the performance of the subjects.
6. The study did not consider variations in individual genetic characteristics, training history, and recovery patterns among the participants.
7. The findings were based on the accuracy and reliability of the selected testing procedures and measurement instruments.

Delimitations of The Study:

The study was delimited as follows:

1. The subjects selected for the study were female Kabaddi players only.
2. The participants were junior and senior state-level players representing Krishna District, Andhra Pradesh.
3. Sixty (60) subjects were selected and randomly assigned into two groups, namely the experimental group (n = 30) and the control group (n = 30).
4. The age of the subjects ranged from 16 to 23 years.
5. The experimental group underwent a structured aquatic pressure training programme, whereas the control group followed their regular Kabaddi training programme.
6. The training intervention was conducted for a period of twelve weeks with three training sessions per week.
7. The study was confined to the assessment of selected physical performance variables: speed, agility, muscular strength, leg explosive power, and cardiovascular endurance.
8. Standardized physical fitness tests were used to collect data before and after the training period.

9. The statistical analysis was limited to appropriate descriptive and inferential statistical techniques, including Analysis of Covariance (ANCOVA), to determine the significance of differences between the groups.

2. Methodology of the Study

The purpose of the study was to investigate the effect of aquatic pressure training on selected physical performance variables among female Kabaddi players. To achieve this purpose, sixty (60) junior and senior state-level female Kabaddi players from Krishna District, Andhra Pradesh, were selected as subjects. The age of the participants ranged between 16 and 23 years. The subjects were medically fit and had prior experience in competitive Kabaddi.

Selection of Variables:

The following variables were selected for the study:

Independent Variable:

- Aquatic Pressure Training Programme

Dependent Variables:

- Speed
- Agility
- Muscular Strength
- Leg Explosive Power
- Cardiovascular Endurance

The study employed a randomized group pre-test and post-test experimental design. The selected subjects were randomly assigned into two equal groups:

- Experimental Group (n = 30)
- Control Group (n = 30)

The experimental group underwent a structured aquatic pressure training programme, while the control group continued their regular Kabaddi training programme without any additional intervention.

Training Programme:

The aquatic pressure training programme was administered to the experimental group for a period of twelve weeks. The training was conducted three days per week under the supervision of the investigator and qualified coaches. Each training session lasted approximately 60 minutes, including warm-up, aquatic exercises, and cool-down activities.

The aquatic training programme consisted of:

- Water running
- High-knee running in water
- Water sprint drills
- Jumping exercises
- Resistance kicking exercises
- Lateral movement drills
- Water-based agility exercises
- Endurance swimming and movement drills

The intensity and volume of training were progressively increased throughout the training period to ensure continuous adaptation and improvement.

The control group participated only in their regular Kabaddi practice sessions during the same period.

The data collected from the subjects were statistically analyzed to determine the effectiveness of the aquatic pressure training programme. Descriptive statistics such as mean and standard deviation were calculated for all variables.

To determine the significance of differences between the experimental and control groups, Analysis of Covariance (ANCOVA) was employed. The level of significance was fixed at 0.05.

The statistical analysis helped to identify the effect of aquatic pressure training on the selected physical performance variables among female Kabaddi players.

TABLE 1: Summary of Analysis of Covariance (ANCOVA) on Selected Physical Performance Variables of Experimental and Control Groups

Variables	Experimental Group Adjusted Post-Test Mean	Control Group Adjusted Post-Test Mean	Adjusted F-Ratio	Table Value (0.05)	Result
Speed (sec)	7.66	8.3	22.56*	4	Significant
Agility (sec)	10.08	10.71	21.43*	4	Significant
Muscular Strength (reps)	40.11	33.02	28.74*	4	Significant
Leg Explosive Power (cm)	47.03	39.01	31.52*	4	Significant
Cardiovascular Endurance (m)	2152.43	1861.72	34.25*	4	Significant

Significant at 0.05 level of confidence.

The adjusted post-test means and F-ratios of the selected physical performance variables are presented in Table 1. The obtained adjusted F-ratios for Speed (22.56), Agility (21.43), Muscular Strength (28.74), Leg Explosive Power (31.52), and Cardiovascular Endurance (34.25) were higher than the required table value of 4.00 at the 0.05 level of significance.

The results indicate that the experimental group, which underwent twelve weeks of aquatic pressure training, showed significantly greater improvement in all selected physical performance variables compared with the control group. Therefore, it was concluded that aquatic pressure training had a positive and significant effect on the physical performance of junior and senior state-level female Kabaddi players of Krishna District, Andhra Pradesh.

3. Discussion

The purpose of the present study was to examine the effect of aquatic pressure training on selected physical performance variables among junior and senior state-level female Kabaddi players of Krishna District, Andhra Pradesh. The selected variables were speed, agility, muscular strength, leg explosive power, and cardiovascular endurance. The experimental group underwent a structured aquatic pressure training programme for twelve weeks, whereas the control group continued their regular Kabaddi training programme.

The statistical analysis revealed significant improvements in all selected physical performance variables among the subjects who participated in the aquatic pressure training programme. The adjusted post-test means and F-ratios indicated that the experimental group performed significantly better than the control group after the training intervention.

The significant speed improvement may be attributed to the resistance provided by water during movement. Water creates continuous resistance against body movements, requiring greater muscular effort during sprinting and running drills. This increased resistance enhances lower-body strength and neuromuscular coordination, which ultimately contributes to improved running speed when athletes return to land-based activities.

The improvement observed in agility can be explained by the multidirectional resistance of water. Aquatic exercises require athletes to perform rapid changes in direction while maintaining balance and body control. Such training enhances coordination, reaction ability, and movement efficiency, which are essential components of agility in Kabaddi performance.

The results further demonstrated significant gains in muscular strength among the experimental group. Water resistance acts as a natural form of overload, requiring muscles to work harder during every movement. Regular participation in aquatic exercises stimulates muscular adaptations that lead to increased strength and endurance. The hydrostatic pressure of water also contributes to enhanced circulation and muscle activation during training.

A notable improvement was also found in leg explosive power. The jumping, bounding, and resistance-based movements performed in water require forceful muscular contractions. These activities help develop the power-producing capacity of the lower extremities while reducing the impact stress commonly experienced during land-based plyometric exercises. Consequently, the athletes were able to improve their vertical jumping performance.

Cardiovascular endurance showed the highest improvement among the selected variables. Aquatic training places considerable demands on the cardiovascular and respiratory systems due to water resistance and hydrostatic pressure. Continuous movement in water requires greater energy expenditure and oxygen utilization, thereby improving aerobic capacity and overall endurance performance.

The findings of the present investigation support the growing body of evidence suggesting that aquatic resistance training is an effective conditioning method for athletes. The unique properties of water, including buoyancy, resistance, and hydrostatic pressure, create a training environment that enhances physical fitness while minimizing stress on joints and reducing the risk of injury.

Since Kabaddi is a high-intensity sport that requires speed, agility, strength, explosive power, and endurance, the improvements observed in the present study have direct implications for competitive performance. The enhanced physical capacities developed through aquatic pressure training may enable female Kabaddi players to perform raids, tackles, escapes, and defensive movements more effectively during competition.

Based on the findings, it may be concluded that aquatic pressure training serves as an effective supplementary training method for improving physical performance among female Kabaddi players. The results suggest that coaches and trainers may incorporate aquatic training into regular conditioning programmes to achieve greater athletic development and enhance competitive success.

4. Conclusion

The present study was undertaken to investigate the effect of aquatic pressure training on selected physical performance variables among junior and senior state-level female Kabaddi players of Krishna District, Andhra Pradesh. The study focused on five important physical performance variables, namely speed, agility, muscular strength, leg explosive power, and cardiovascular endurance.

Based on the statistical analysis of the data and the interpretation of the findings, it was concluded that the twelve-week aquatic pressure training programme produced significant improvements in all selected physical performance variables among the female Kabaddi players. The experimental group, which participated in aquatic pressure training, demonstrated superior performance compared to the control group that followed only the regular Kabaddi training programme.

The findings indicated that aquatic pressure training effectively enhanced speed by improving lower-body strength and movement efficiency. Significant improvements in agility were observed due to the multidirectional resistance and balance demands of water-based exercises. Muscular strength increased as a result of continuous resistance provided by the aquatic environment, while leg explosive power improved through water-based jumping and resistance drills. Cardiovascular endurance also showed substantial enhancement owing to the increased physiological demands of aquatic training.

The study further established that aquatic pressure training is a safe, effective, and scientifically sound conditioning method for female Kabaddi players. The unique properties of water, such as buoyancy, hydrostatic pressure, and natural resistance, provide an ideal training environment that promotes physical development while minimizing stress on the joints and reducing the risk of injury.

Therefore, it is concluded that aquatic pressure training can be successfully incorporated into the regular training programmes of female Kabaddi players to improve overall physical fitness and enhance competitive performance. The results of the study contribute valuable knowledge to the field of sports training and exercise physiology and provide practical guidance for coaches, trainers, and sports scientists working with Kabaddi athletes.

In summary, aquatic pressure training proved to be an effective training intervention for developing the essential physical qualities required for successful performance in Kabaddi and may be recommended as an important component of modern sports conditioning programmes.

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