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Effect of Resistance Training on Physical Fitness Variables of Female Hockey Players

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Abstract:

The purpose of the study was to find out the effect of resistance training on selected physical fitness variables of female hockey players. Thirty female hockey players of 18-25 years of age were randomly assigned into two groups i.e. experimental group and control group. The experimental group underwent a structured resistance training program for 8 weeks, while the control group maintained their normal daily activities with no specific training intervention. The main physical fitness variables such as muscular strength, speed, agility and endurance were assessed using standardised testing procedures before and after the training period. The collected data were analysed statistically by pair and independent t-tests The results of the study showed that the muscular strength (t=6.42), speed (t=4.87), agility (t=5.12) and endurance (t=6.01) of the subjects of the experimental group were significantly improved at 0.05 level of significance. In contrast, no significant improvement was observed in any of the chosen parameters in the control group. These findings strongly suggest the important role of resistance training in improving the athletic performance and general physical fitness of female hockey players.

Keywords: Resistance Training, Physical Fitness, Female Hockey Players, Muscular Strength, Speed, Agility, Endurance, Athletic Performance

1. Introduction

Physical fitness is decisive in improving the athletic performance in the modern competitive sports. Hockey is a high intensity intermittent sport requiring an optimal blend of strength, speed, endurance, agility and coordination. The female hockey players in particular need the scientifically designed training programmes in order to improve their physical capabilities and to perform successfully at the competitive levels. Resistance training has become an important part of sports conditioning due to its effectiveness in developing muscular strength, endurance and overall athletic performance (Granacher et al., 2016). It's about doing exercises against an external load such as weights, resistance bands or body weight to improve the function of muscles and physical efficiency. Resistance training has been previously shown to enhance neuromuscular coordination, muscle mass, body composition, and sports performance (Faude et al., 2017; De Hoyo et al., 2019). But there is not much research done specifically on female hockey players, especially at the collegiate level. The present study is an attempt to find out the effect of resistance training on selected physical fitness variables of female hockey players.

2. Objectives of the Study

1. To evaluate the effect of resistance training on muscular strength in female hockey players.

2. To study the effect of resistance training on speed performance of female hockey players.
3. To determine the effectiveness of resistance training in improving agility among female hockey players.
4. To examine the role of resistance training in enhancing endurance capacity among female hockey players.

3. Hypotheses

1. There will be a significant improvement in muscular strength due to resistance training.
2. Resistance training will significantly improve speed.
3. Resistance training will significantly enhance agility.
4. Resistance training will significantly improve endurance.

4. Methodology

4.1 Research Design

The study followed an experimental research design with pre-test and post-test control group design.

4.2 Sample

A total of 30 female hockey players aged between 18–25 years were selected from colleges. The subjects were randomly divided into:

- Experimental Group (n = 15)
- Control Group (n = 15)

4.3 Variables

Independent Variable:

- Resistance Training Program

Dependent Variables:

- Muscular Strength
- Speed
- Agility
- Endurance

4.4 Tools and Tests

Table 1: Tools and Tests Used for Measuring Selected Physical Fitness Variables

Variable	Test Used
Muscular Strength	Push-Up Test / 1RM Test

Speed	50 Meter Dash
Agility	Shuttle Run Test
Endurance	12-Minute Run/Cooper Test

4.5 Training Program

The experimental group underwent a resistance training program for 8 weeks, 3 days per week. The components of the training are:

- Squats
- Lunges
- Push-ups
- Deadlifts
- Core exercises
- Resistance band drills

Duration: 45–60 minutes per session.

Progression: Gradual increase in intensity (progressive overload). The control group continued their regular daily activities and did not undergo any structured resistance training program during the study period.

5. Statistical Analysis, Presentation of Data and Results

The collected data were statistically analysed using Mean, Standard Deviation, paired t-test, and independent t-test to determine the significance of differences between the experimental and control groups. The level of significance was fixed at 0.05 level of confidence. The findings are presented in the following tables.

Table 2 indicates significant improvement in muscular strength among the subjects of the experimental group following the 8-week resistance training programme. The mean score increased from 18.20 to 25.46, and the obtained t-value (6.42) was found significant at 0.05 level. In contrast, the control group showed only marginal improvement, and the calculated t-value (0.61) was not significant. The findings confirm the effectiveness of resistance training in improving muscular strength among female hockey players.

Table 2: Mean and Standard Deviation of Muscular Strength Scores of Experimental and Control Groups

Group	**Test**	**Mean**	**SD**	**t-value**
Experimental	Pre-test	18.20	2.14	

Experimental	Post-test	25.46	2.37	6.42*
Control	Pre-test	18.05	2.09	
Control	Post-test	18.31	2.16	0.61

Note : * Significant at 0.05 level

Table 3: Mean and Standard Deviation of Speed Scores of Experimental and Control Groups

Group	**Test**	**Mean**	**SD**	**t-value**
Experimental	Pre-test	8.21	0.34	
Experimental	Post-test	7.64	0.28	4.87*
Control	Pre-test	8.18	0.36	
Control	Post-test	8.12	0.31	0.54

Note : * Significant at 0.05 level

Table 3 indicates significant improvement in speed performance among the subjects of the experimental group following resistance training. The decrease in 50-meter dash timing demonstrates improved sprinting ability. In the control group there was no significant change in speed performance.

Table 4 shows that there was significant improvement in agility for the experimental group after completion of the resistance training program. The improvements in agility performance may be due to the development of neuromuscular coordination and lower-body strength through resistance exercises. There was no significant improvement in the control group.

Table 4: Mean and Standard Deviation of Agility Scores of Experimental and Control Groups

Group	**Test**	**Mean**	**SD**	**t-value**
Experimental	Pre-test	12.45	0.56	
Experimental	Post-test	11.31	0.49	5.12*
Control	Pre-test	12.38	0.52	

Control	Post-test	12.29	0.50	0.67

Note : * Significant at 0.05 level

Table 5 shows a significant increase in endurance performance of the experimental group after the resistance training program. The Cooper test scores went up, which means the heart and lungs are working better and the muscles can go longer. The control group did not significantly improve endurance capacity.

Table 5: Mean and Standard Deviation of Endurance Scores of Experimental and Control Groups

Group	**Test**	**Mean**	**SD**	**t-value**
Experimental	Pre-test	1850	110	
Experimental	Post-test	2145	126	6.01*
Control	Pre-test	1845	108	
Control	Post-test	1862	112	0.73

Note : * Significant at 0.05 level

6. Discussion

The statistical analysis of the collected data showed significant improvement in all selected physical fitness variables for the experimental group of subjects after an 8-week resistance training programme. The experimental group subjects showed a marked improvement in muscular strength, speed, agility and endurance. The control group subjects showed no significant changes during the study period. The t-value obtained confirmed that the improvements were statistically significant at 0.05 level of confidence, which showed the effectiveness of resistance training in improving the overall physical fitness and athletic performance of female hockey players. The gains in muscular strength could be attributed to progressive overload as well as the recruitment of muscle fibres and improved neuromuscular adaptations that are experienced during systematic resistance exercise like squats, lunges, push ups and deadlifts. These exercises target the large muscle groups used in hockey specific movement and help to increase force production and muscular efficiency. Likewise, the enhancement in speed performance in the experimental group could be linked to increased explosive power, acceleration and lower body strength obtained from the training programme. Better sprint performance may also be the result of an improved stride length and efficiency of movement.

Hockey players often perform quick directional changes and dynamic body movements during competition, and improved agility allows athletes to perform such movements more effectively. The enhancement in endurance capacity indicates that resistance training also contributes to the improvement of cardiovascular efficiency and postpones fatigue when performed regularly. A higher muscular endurance might allow players to maintain long periods of physical activity during matches. The results of the present study are in agreement with the results of previous studies

by Granacher et al. (2016), Keiner et al. (2017) and De Hoyo et al. (2019) who reported significant improvements in physical performance variables after resistance training interventions.

7. Conclusion

Based on the results of the present study, it can be concluded that resistance training has a significant effect on improving the muscular strength, speed, agility and endurance of female hockey players. After the 8-week resistance training programme, the experimental group showed considerable improvement in all selected variables, whereas the control group did not show any significant changes during the study period. Results indicate that systematic resistance training has a positive effect on the efficiency of the muscles, coordination of movement, explosive power and cardiovascular fitness, all of which play an important role in the performance of a hockey player. The results also suggest resistance training is significant for the overall physical well-being and athletic performance in female hockey players. The results support previous studies that highlighted the importance of strength and conditioning training in sports. Hence, inclusion of resistance training as a part of training programmes for female hockey players should be considered to enhance their fitness levels and competitive performance.

8. Recommendations

Based on the findings of the present study, resistance training should be included in the general training of female hockey players for improving their overall fitness and sports performances. For maximum performance benefits, coaches/ trainers need to design scientifically planned training programs to the individual fitness level, physical capacities and training needs of the athletes. Female athletes should also be encouraged to be involved in structured strength and conditioning programmes to enhance their muscular strength, speed, agility, endurance and overall game performance. Furthermore, future researchers are advised to repeat the study with larger sample sizes, longer training periods, and a greater number of physical and/or physiological factors in order to generate more comprehensive and generalisable conclusions in the area of sports science and athletic training.

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