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"IMPACT OF AN 8-WEEK COMBINED TRAINING PROGRAMME ON SPEED AND SPEED-RELATED MOTOR ABILITIES OF HIGH SCHOOL HOCKEY PLAYERS."

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ABSTRACT

Speed is one of the most important physical fitness components influencing the performance of hockey players. Field hockey requires players to demonstrate rapid acceleration, sprinting ability, agility, explosive power and speed endurance during competitive situations. The development of these abilities is essential for effective attacking, defending and overall game performance. The purpose of the present study is to investigate the impact of an eight-week combined training programme on speed and selected speed-related motor abilities among high school hockey players. The study will employ a randomized pre-test and post-test experimental group design. Thirty high school hockey players aged 14–17 years will be selected as participants and randomly divided into two groups: an experimental group (n = 15) and a control group (n = 15). The experimental group will undergo an eight-week combined training programme consisting of sprint training, strength training, plyometric exercises and agility drills, three days per week, in addition to regular hockey practice. The control group will continue its regular hockey training programme. The selected dependent variables will include acceleration, sprint speed, agility, explosive muscular power and repeated sprint ability. These variables will be assessed using the 10-metre sprint test, 30-metre sprint test, 505 agility test, standing broad jump test and repeated sprint test, respectively. Data will be collected before and after the intervention. Descriptive statistics, including mean and standard deviation, and a 2 × 2 mixed-design analysis of variance will be used to examine changes in performance between the experimental and control groups.

Statistical significance will be established at the 0.05 level. The study is expected to provide useful scientific evidence regarding the effectiveness of combined training in developing speed and speed-related motor abilities among high school hockey players. The findings may help Physical Education teachers, hockey coaches and sports trainers design systematic and scientifically based training programmes for improving the physical performance of young hockey players.

KEYWORDS: Combined Training Programme, Sprint Speed, Acceleration, Agility, Explosive Power, Speed Endurance, Motor Abilities, High School Hockey Players.

1. INTRODUCTION

Field hockey is one of the most dynamic and physically demanding team sports, requiring a combination of physical fitness, technical skills, tactical awareness and psychological preparedness. The game involves continuous movement, rapid acceleration, sprinting, deceleration, sudden changes in direction and repeated high-intensity activities. Players are required to maintain a high level of physical performance throughout the match while executing technical skills such as dribbling, passing, receiving, tackling and shooting. Therefore, the development of physical fitness components, particularly speed and speed-related motor abilities, is essential for achieving higher levels of performance in hockey.

Speed is considered one of the fundamental components of physical fitness and plays a significant role in determining the effectiveness of hockey players during competitive situations. It enables players to reach the ball quickly, overcome opponents, create attacking opportunities, respond to defensive situations and move efficiently across the playing field. In modern hockey, players frequently perform short-distance sprints, rapid accelerations and explosive movements. Consequently, the ability to develop and maintain high levels of speed is an important requirement for successful hockey performance.

Speed is not an independent physical quality; rather, it is influenced by several interconnected motor abilities, including muscular strength, explosive power, agility, coordination and speed endurance. Acceleration refers to the ability to increase running velocity over a short distance, whereas maximum speed represents the highest velocity an individual can achieve during sprinting. Agility involves the ability to change direction rapidly and efficiently while maintaining balance and body control. Explosive power refers to the ability of muscles to produce maximum force in a minimum amount of time. Speed endurance enables players to maintain high-intensity movement and perform repeated sprint efforts with limited

performance deterioration. These abilities collectively contribute to the physical demands of competitive field hockey.

High school is an important stage in the physical and motor development of young athletes. During adolescence, appropriate physical training can contribute to improvements in muscular strength, neuromuscular coordination, movement efficiency and athletic performance. However, training programmes for young hockey players should be systematically planned according to their age, biological maturity, physical development and previous training experience. Scientifically designed training methods can help young players develop the physical qualities necessary for future competitive participation.

Combined training is an integrated training approach that incorporates two or more complementary training methods within a structured programme. It commonly includes resistance training, sprint training, plyometric exercises and agility drills. Resistance training aims to improve muscular strength and force-producing capacity. plyometric training develops explosive power through rapid muscle actions involving the stretch-shortening cycle. Sprint training focuses on acceleration, running mechanics and maximum sprint performance, while agility training develops the ability to change direction quickly and efficiently. The integration of these training methods may provide a comprehensive approach to improving speed and related motor abilities.

Previous research has highlighted the importance of strength and plyometric training for developing physical performance among young team-sport athletes. Oliver et al. (2024), in their systematic review and meta-analysis, examined the effects of strength, plyometric and combined training on strength, power and speed characteristics in highly trained male youth soccer players. Their findings emphasized the contribution of structured strength and plyometric training to the development of athletic performance. Similarly, Zhang et al. (2024) investigated the effects of combined strength, plyometric and sprint training on repeated sprint ability among team-sport athletes and reported beneficial effects of combined training approaches on repeated sprint performance.

An eight-week combined training programme may provide sufficient time to introduce progressive training loads and develop selected speed-related physical qualities among school-level hockey players. A systematic programme involving sprint exercises, resistance exercises, plyometric activities and agility drills may help improve acceleration, sprint performance, explosive muscular power and repeated sprint ability. Nevertheless, the

effectiveness of such an integrated programme should be examined through a controlled experimental investigation.

Although several studies have investigated different training methods for improving physical fitness and athletic performance, further research is required to understand the specific effects of combined training on speed and speed-related motor abilities among high school hockey players. School-level athletes may differ from elite athletes in their training experience, physical development and adaptation to exercise. Therefore, the findings of research conducted on professional or highly trained athletes cannot automatically be generalized to adolescent hockey players.

In this context, the present study, entitled "Impact of an 8-Week Combined Training Programme on Speed and Speed-Related Motor Abilities of High School Hockey Players," is designed to investigate the effectiveness of a structured eight-week combined training intervention. The programme will integrate sprint training, strength training, plyometric exercises and agility drills to develop selected physical performance variables among high school hockey players.

The study will focus on acceleration, sprint speed, agility, explosive muscular power and repeated sprint ability. These variables will be assessed before and after the training intervention to determine the extent of improvement and to compare the performance of the experimental group with that of the control group.

The findings of the study may provide useful scientific information for Physical Education teachers, hockey coaches, sports trainers and researchers in designing effective training programmes for young hockey players. Furthermore, the study may contribute to the development of evidence-based training practices aimed at improving speed and overall physical performance among school-level hockey players.

2. STATEMENT OF THE PROBLEM

The purpose of the present study is to investigate the **“Impact of an 8-Week Combined Training Programme on Speed and Speed-Related Motor Abilities of High School Hockey Players.”**

3. SIGNIFICANCE OF THE STUDY

The present study, entitled **“**Impact of an 8-Week Combined Training Programme on Speed and Speed-Related Motor Abilities of High School Hockey Players,” is significant in the field of Physical Education, sports training and hockey performance development. Speed and its

related motor abilities play a vital role in determining the physical and technical performance of hockey players. A systematic combination of sprint, strength, plyometric and agility training may contribute to the development of these essential physical qualities.

The significance of the study is explained under the following aspects:

1. Improvement of Sprint Speed

The study may provide scientific information regarding the effectiveness of combined training in improving sprint speed among high school hockey players. Improved sprint speed may help players move quickly during attacking and defensive situations.

2. Development of Acceleration Ability

The training programme may help improve acceleration over short distances, enabling hockey players to reach higher running speeds within a shorter period. This ability is particularly important during quick movements and short-distance sprints in hockey.

3. Enhancement of Agility

The study may help identify the contribution of combined training to agility development. Improved agility enables players to change direction rapidly, maintain body balance and respond effectively to changing game situations.

4. Improvement of Explosive Muscular Power

The inclusion of strength and plyometric exercises may contribute to the development of lower-limb explosive power. This physical quality is important for rapid acceleration, jumping and powerful movements during hockey performance.

5. Development of Speed Endurance

The study may provide information regarding the effectiveness of combined training in improving repeated sprint ability and maintaining high-intensity performance during different phases of a hockey match.

6. Scientific Training Methods for Hockey Coaches

The findings may help hockey coaches understand the importance of integrating sprint, resistance, plyometric and agility exercises into regular training schedules. It may provide a scientific foundation for developing structured training programmes.

7. Benefits for Physical Education Teachers

The study may assist Physical Education teachers in planning appropriate physical fitness activities for school-level hockey players. It may also encourage the adoption of systematic and progressive training methods in school sports programmes.

8. Development of Young Hockey Players

The research may contribute to the physical development of adolescent hockey players by emphasizing age-appropriate training methods that improve strength, speed, coordination and movement efficiency.

9. Contribution to Sports Science Research

The study may add to the existing body of knowledge in sports training and exercise science by providing experimental evidence on the effects of combined training on selected speed-related motor abilities among high school hockey players.

10. Foundation for Future Research

The findings may provide a basis for further research involving different age groups, training durations, exercise combinations and competitive levels in hockey and other team sports.

Overall Significance

The present study is expected to provide useful scientific and practical information about the role of combined training in developing speed and speed-related motor abilities among high school hockey players. The findings may help coaches, Physical Education teachers and sports trainers design effective, progressive and scientifically structured training programmes to improve the physical performance of young hockey players.

4. METHODOLOGY

The methodology of the present study entitled **"Impact of an 8-Week Combined Training Programme on Speed and Speed-Related Motor Abilities of High School Hockey Players"** is presented under the following headings.

4.1 Research Design

The present study will employ a randomized pre-test and post-test experimental group design with a control group to investigate the impact of an eight-week combined training programme on speed and selected speed-related motor abilities among high school hockey players.

The selected participants will be divided into two groups: an experimental group and a control group. The experimental group will undergo a structured combined training programme for eight weeks in addition to regular hockey practice, whereas the control group will continue its regular hockey training programme without the additional experimental intervention.

Pre-test and post-test measurements will be conducted to determine changes in the selected dependent variables.

4.2 Selection of Subjects

Thirty high school hockey players aged between 14 and 17 years will be selected as subjects for the proposed study. The participants will be selected from school-level hockey players based on their participation, training experience and physical fitness.

The selected participants will be randomly assigned to two groups consisting of 15 players each.

Group	Number of Subjects
Experimental Group	15
Control Group	15
Total	30

The final sample size will be confirmed through an appropriate statistical power analysis.

4.3 Sampling Technique

Purposive sampling will be used to identify eligible high school hockey players. After selection, participants will be randomly allocated to the experimental and control groups to minimize selection bias and improve the comparability of the groups.

4.4 Criteria for Selection of Subjects

The following criteria will be considered for selecting the participants.

Inclusion Criteria

1. Participants must be high school hockey players.
2. Their age must be between 14 and 17 years.
3. They should have basic hockey training experience.
4. They should be medically fit to participate in physical training.
5. Written parental or guardian consent and participant assent must be obtained.

Exclusion Criteria

1. Players suffering from injuries that prevent participation in training.
2. Players with medical conditions that make intensive physical exercise unsuitable.
3. Players unable to attend the required training sessions.
4. Players participating in another additional structured speed-training programme during the experimental period.

4.5 Variables of the Study

The following variables will be considered for the present investigation.

Independent Variable

Eight-week combined training programme consisting of sprint training, strength training, plyometric training and agility exercises.

Dependent Variables

1. Acceleration ability.
2. Sprint speed.
3. Agility.
4. Explosive muscular power.
5. Repeated sprint ability.

4.6 Selection of Tests and Tools

The following standardized physical fitness tests will be used to measure the selected dependent variables.

S. No.	Selected Variable	Test	Unit
1	Acceleration	10-Metre Sprint Test	Seconds
2	Sprint Speed	30-Metre Sprint Test	Seconds
3	Agility	505 Agility Test	Seconds
4	Explosive Power	Standing Broad Jump Test	Centimetres
5	Repeated Sprint Ability	6 × 30-Metre Repeated Sprint Test	Seconds

Electronic timing gates will preferably be used to record sprint and agility performance. The same equipment, testing surface and testing procedures will be maintained during pre-test and post-test assessments.

4.7 Duration of the Training Programme

The experimental training programme will be conducted for eight weeks.

The training schedule will be organized as follows:

- Total duration: Eight weeks.
- Training frequency: Three days per week.
- Total training sessions: 24 sessions.
- Duration of each session: Approximately 50–60 minutes.
- Training components: Sprint, strength, plyometric and agility exercises.

The experimental training sessions will be conducted in addition to regular hockey practice, with appropriate adjustment of the overall training load.

4.8 Description of the Combined Training Programme

The combined training programme will consist of four major training components.

A. Sprint Training

Sprint training will be included to improve acceleration and running speed.The exercises will include:

1. 10-metre acceleration sprints.
2. 20-metre sprint runs.
3. 30-metre maximum-speed sprints.
4. Flying sprint drills.
5. Sprint-start exercises.

B. Strength Training

Strength training will be incorporated to develop muscular strength and force production.The exercises will include:

1. Bodyweight squats.
2. Forward and backward lunges.
3. Step-ups.
4. Calf raises.
5. Glute bridges.
6. Push-ups.
7. Core-strengthening exercises.

C. Plyometric Training

Plyometric training will be included to develop explosive muscular power and rapid force production.

The exercises will include:

1. Squat jumps.
2. Standing broad jumps.
3. Skipping exercises.
4. Low-level hurdle jumps.
5. Bounding exercises.

6. Lateral jumps.

D. Agility Training

Agility training will be incorporated to improve directional changes, body control and movement efficiency.

The exercises will include:

1. Zigzag running.
2. Shuttle runs.
3. Cone drills.
4. 5-10-5 change-of-direction drills.
5. Hockey-specific movement drills.

All exercises will be supervised by qualified training personnel, and exercise intensity and volume will be adjusted according to participants' age, maturity and training experience.

4.9 Eight-Week Training Schedule

The combined training programme will be progressively organized over eight weeks.

Week	Training Emphasis	Major Activities
1	Initial Adaptation	Basic strength, running technique and low-intensity jumps
2	Foundation Development	Acceleration drills, squats, lunges and skipping
3	Strength Development	Resistance exercises, short sprints and plyometrics
4	Acceleration Development	10-metre and 20-metre sprints, broad jumps and agility drills
5	Speed Development	20-metre and 30-metre sprints and progressive plyometrics
6	Explosive Power	Jumping exercises, sprint starts and change-of-direction drills
7	Speed Endurance	Repeated sprint training and agility circuits
8	Performance Integration	Hockey-specific speed drills and reduced training volume

4.10 Structure of Each Training Session

Each experimental training session will follow a systematic structure.

Training Component	Duration
General warm-up and mobility exercises	10 minutes
Sprint and acceleration drills	10 minutes
Strength exercises	10 minutes
Plyometric exercises	10 minutes
Agility and hockey-specific drills	10 minutes
Cool-down and stretching	5–10 minutes
Total	55–60 minutes

Adequate rest intervals will be provided between high-intensity exercises to maintain movement quality and reduce fatigue.

4.11 Collection of Data

The data will be collected in three stages.

Stage I – Pre-test

Before commencing the experimental training programme, all participants will undergo pre-test assessments to measure their initial levels of acceleration, sprint speed, agility, explosive muscular power and repeated sprint ability.

Stage II – Experimental Training

The experimental group will participate in the eight-week combined training programme three days per week, in addition to regular hockey practice. The control group will continue its regular hockey training schedule.

Attendance, training load and any injuries or adverse events will be recorded throughout the intervention.

Stage III – Post-test

After completion of the eight-week training programme, the same physical fitness tests will be administered to both groups under standardized conditions.

The post-test scores will be compared with the pre-test scores to determine the impact of the combined training programme.

4.12 Statistical Techniques

The collected data will be analyzed using appropriate statistical techniques.

The following statistical methods will be employed:

1. Descriptive Statistics: Mean and standard deviation will be calculated for all selected variables.

2. Normality Test: The Shapiro–Wilk test will be used to examine the distribution of the collected data.

3. Baseline Comparison: Independent-samples t-tests may be used to examine initial differences between the experimental and control groups.

4. Mixed-Design ANOVA: A 2 × 2 mixed-design analysis of variance will be used to examine group, time and group-by-time interaction effects.

5. Effect Size: Appropriate effect sizes and 95% confidence intervals will be reported to determine the magnitude of training effects.

6. **Level of Significance:** Statistical significance will be established at the 0.05 level.

The statistical analysis will be performed using SPSS or equivalent statistical software.

4.13 Ethical Considerations

The study will be conducted according to appropriate ethical principles for research involving adolescent participants.

1. Prior approval will be obtained from the appropriate institutional ethics committee.
2. Written informed consent will be obtained from parents or legal guardians.
3. Age-appropriate assent will be obtained from participants.
4. Participation will be voluntary.
5. Confidentiality of personal and performance data will be maintained.
6. Training sessions will be conducted

5. DISCUSSION

The present study, entitled **"Impact of an 8-Week Combined Training Programme on Speed and Speed-Related Motor Abilities of High School Hockey Players,"** is designed to examine the effectiveness of an integrated training programme consisting of sprint training, strength training, plyometric exercises and agility drills. The primary focus of the investigation is to determine whether an eight-week combined training intervention can improve acceleration, sprint speed, agility, explosive muscular power and repeated sprint ability among high school hockey players.

Speed is an essential physical fitness component in field hockey because players are required to perform frequent short-distance sprints, rapid accelerations, sudden directional changes and repeated high-intensity movements. The ability to execute these movements efficiently can influence both offensive and defensive performance. Therefore, the development of speed-related motor abilities through systematic training is important for young hockey players.

5.1 Effect of Combined Training on Acceleration Ability

Acceleration is an important component of hockey performance because players frequently need to achieve high running speeds over short distances. The inclusion of short-distance sprint drills, sprint-start exercises and lower-body strength training in the combined training programme is intended to improve acceleration ability.

Strength training may improve the force-producing capacity of the lower-limb muscles, while sprint training may enhance sprint mechanics and neuromuscular coordination. These adaptations may contribute to improved acceleration performance.

The 10-metre sprint test will provide an objective measure of short-distance acceleration. Improvements in this test would indicate a positive change in the ability of players to accelerate rapidly from a stationary position.

5.2 Effect of Combined Training on Sprint Speed

Sprint speed is an important determinant of movement efficiency during competitive hockey. Players must demonstrate the ability to sprint rapidly to reach the ball, support teammates and respond to opponents.

The combined training programme incorporates sprint repetitions, progressive running drills and strength exercises to develop sprint performance. Sprint training focuses on improving running mechanics, stride frequency, stride length and the ability to produce force during ground contact.

The 30-metre sprint test will be used to assess sprint performance. A reduction in sprint completion time after the intervention would indicate improvement in running speed.

The findings of Oliver et al. (2024) provide relevant support for the role of strength and plyometric training in developing speed and power among young team-sport athletes.

5.3 Effect of Combined Training on Agility

Agility is another important physical quality required for successful hockey performance. Hockey players frequently change direction while dribbling, defending, tackling and moving into attacking positions.

The inclusion of zigzag running, shuttle runs, cone drills and change-of-direction exercises is intended to improve agility and movement control.

Strength training may help players maintain body stability during directional changes, while agility drills may improve movement coordination, braking ability and re-acceleration.

The 505 agility test will be used to evaluate change-of-direction performance. A reduction in completion time would indicate an improvement in agility.

5.4 Effect of Combined Training on Explosive Muscular Power

Explosive muscular power is the ability to generate force rapidly and is closely associated with sprint acceleration and jumping performance.

The plyometric component of the training programme includes squat jumps, standing broad jumps, skipping, bounding and low-level hurdle jumps. These exercises are designed to develop the stretch-shortening cycle, neuromuscular efficiency and rapid force production.

Strength exercises such as squats, lunges and step-ups may further support the development of lower-limb muscular strength.

The standing broad jump test will be used to measure horizontal explosive power. An increase in jumping distance after the intervention would indicate an improvement in lower-limb explosive performance.

The findings of Oliver et al. (2024) are particularly relevant because their systematic review and meta-analysis examined the effects of strength, plyometric and combined training on strength, power and speed characteristics in young team-sport athletes.

5.5 Effect of Combined Training on Repeated Sprint Ability

Repeated sprint ability is essential in field hockey because players are required to perform multiple high-intensity running efforts throughout a match with relatively short recovery periods.

The repeated sprint component of the proposed programme is designed to improve the ability of players to reproduce sprint performance under conditions of accumulated fatigue.

Sprint repetitions, appropriate recovery intervals and progressive training loads may contribute to improvements in repeated high-intensity performance.

The 6 × 30-metre repeated sprint test will be used to evaluate repeated sprint ability. Improvements may be reflected in lower total sprint time and reduced performance deterioration across successive sprint efforts.

Zhang et al. (2024), in their systematic review and meta-analysis, reported beneficial effects of combined strength, plyometric and sprint training on repeated sprint ability among team-sport athletes. This provides a relevant scientific basis for including repeated sprint training in the present investigation.

5.6 Overall Effectiveness of the Combined Training Programme

The major strength of combined training is its ability to address several physical performance components within one structured training programme.

Sprint training develops acceleration and running speed, resistance training improves muscular strength, plyometric training enhances explosive power, and agility exercises develop rapid directional changes.

The integration of these training methods may produce complementary training adaptations and improve the physical qualities required for hockey performance.

The eight-week duration of the programme provides an opportunity to introduce progressive training loads and systematically develop the selected motor abilities. However, the extent of improvement may depend on the participants' age, biological maturity, previous training experience, recovery, nutrition and adherence to the training programme.

5.7 Comparison Between Experimental and Control Groups

An important aspect of the present investigation is the comparison between the experimental and control groups.

The experimental group will receive the additional combined training intervention, whereas the control group will continue regular hockey practice.

The comparison of pre-test and post-test measurements will help determine whether the experimental training programme produces greater improvements than regular hockey training alone.

A statistically significant group-by-time interaction in favour of the experimental group would provide evidence supporting the effectiveness of the combined training programme.

Effect sizes and confidence intervals will also be considered to understand the practical importance of the observed differences.

5.8 Practical Implications for Hockey Training

The proposed study may provide useful information for Physical Education teachers, hockey coaches and sports trainers.

The integration of sprint, strength, plyometric and agility exercises into regular hockey training may offer a systematic approach to improving the physical performance of young hockey players.

However, training programmes for adolescent athletes should be age-appropriate, progressive and supervised by qualified professionals. Adequate recovery and injury-prevention procedures should be incorporated into the training schedule.

5.9 Overall Interpretation

The present study is expected to contribute to the understanding of how combined training can influence speed and speed-related motor abilities among high school hockey players.

The selected physical fitness tests will provide measurable information regarding changes in acceleration, sprint speed, agility, explosive muscular power and repeated sprint ability.

The final interpretation of the findings will depend on the actual statistical results obtained after completing the eight-week intervention. Any observed improvements should be discussed in relation to previous research and the practical demands of field hockey.

The study may contribute to the development of evidence-based training practices for improving speed and physical performance among school-level hockey players.

6. CONCLUSION

The present study, entitled **"Impact of an 8-Week Combined Training Programme on Speed and Speed-Related Motor Abilities of High School Hockey Players,"** is designed to examine the effectiveness of a structured combined training programme in developing selected physical fitness components among high school hockey players.

The proposed training programme integrates sprint training, strength training, plyometric exercises and agility drills to improve acceleration, sprint speed, agility, explosive muscular power and repeated sprint ability. These physical qualities play an important role in the performance of hockey players during competitive situations.

The integration of different training methods may provide a comprehensive approach to developing the physical abilities required for modern field hockey. Sprint training focuses on acceleration and running speed, strength training develops muscular force, plyometric exercises improve explosive power, and agility drills enhance directional movement and coordination.

The eight-week training intervention is expected to provide useful information regarding the effectiveness of combined training as a supplementary method for improving speed-related motor abilities among school-level hockey players.

The study may also offer practical guidance to Physical Education teachers, hockey coaches and sports trainers in designing systematic, progressive and scientifically based training programmes for young athletes.

Furthermore, the investigation may contribute to the existing knowledge of sports training and physical education by providing experimental evidence concerning the development of speed and related motor abilities among adolescent hockey players.

In conclusion, an appropriately designed and supervised combined training programme may be a valuable approach to developing speed and speed-related motor abilities among high school hockey players. However, the actual effectiveness of the programme must be established through the statistical analysis of the pre-test and post-test data obtained from the experimental and control groups.

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