International Journal of Physical Education, Exercise and Sports
www.physicaleducationjournal.com
Online ISSN: 2664-9896, Print ISSN: 2664-9888
Received: 08-11-2025, Accepted: 07-12-2025, Published: 22-12-2025
Volume 7, Issue 2, 2025, Page No. 69-76

Hockey playing skill is predicted by anthropometric measures, motor performance, physiological factors, and psychological characteristics: A survey

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Abstract
An analysis of anthropometric, physiological, and psychological factors influencing hockey performance indicates that while physical measurements (such as height, weight, and body fat) and physiological metrics (including VO2max, strength, power, aerobic fitness, and heart rate recovery) are strong predictors of success, psychological aspects (like stress, motivation, and focus) tend to exhibit weaker or inconsistent correlations. Nevertheless, these psychological factors are essential for high-level competition, underscoring that achievement relies on a combination of physical attributes, cardiovascular fitness, muscular strength, agility, and mental resilience. Significant findings frequently suggest that body fat percentage and BMI adversely affect endurance, whereas leg power, flexibility, and aerobic capacity enhance skill performance. Predictive models have identified particular combinations, such as calf circumference, vital capacity, and resting heart rate, as reliable indicators of hockey ability and the research article describes the more information on to know the investigate the connection between hockey playing ability and specific anthropometric measurements, investigate the connection between hockey playing ability and specific motor performance variables, understand how certain physiological factors relate to hockey playing ability, investigate the connection between a few psychological factors and hockey skill and investigate how the criterion variables (playing ability) of hockey players are predicted by predictor variables (anthropometric measurements, motor performance, physiological, and psychological variables).

Keywords: Anthropometric, physical attributes, sports, hockey skill, physical education, hockey playing

Introduction

The realm of athletics encompasses a wide range of social values. It serves as an exhilarating source of choice and rejuvenation for individuals from various vibrant segments of society. Historically, during times when physical strength was the primary source of power, both physical and mental abilities have been recognized in the athletic arena. Historical records indicate that, at times, these activities led to competitions among humans and occasionally between humans and animals. Champions in the athletic arena are celebrated for their exceptional performances in social circles. The emergence of new sports and game strategies has further motivated individuals. Throughout numerous competitions, the vigor and resilience of each muscle, subsystem, and physiological structure are put to the test. The world of athletics has provided humanity with a continuous platform to compare every physical aspect of the human body against the best. Sports experts and related research have created a highly effective and competitive environment. Consequently, today, every sport is conducted in a highly organized manner, with specific training and preparation for participants in various international events. In the contemporary era of competitive sports, every athlete is in a race to outdo their peers. Competition has evolved into a fundamental expression of human nature. Competitive sports play a crucial role in enhancing a nation's reputation and status on a global scale. By its very nature, sports are enjoyable, invigorating, and require a certain level of skill and physical condition, showcasing their best in competitions. The performance of elite athletes brings recognition and prestige to their countries. Physical fitness is an essential characteristic of humans. An individual with good strength feels empowered and is more adaptable, while someone lacking strength may feel inferior, leading to social challenges that remain unaddressed. Aristotle, the renowned Greek philosopher, asserted that every person should maintain physical fitness to fully enjoy life. A physically fit person is alert mentally, stable emotionally, and well-adjusted socially. They face life's challenges with optimism. In essence, physical well-being serves as the foundation for all forms of excellence. The concept of motor ability, or motor fitness, is synonymous and regarded as a distinct term. Although it has been extensively studied over the years, many aspects related to skill development have been mistakenly identified as components of physical fitness. It is important to remember that only those elements that contribute to health improvement and enhance the body's functional capacity should be classified as physical fitness components. Conversely, those elements essential for the proficient execution of an action are categorized as motor ability components. Both motor ability and physical fitness develop through movement and mutually enhance each other, as motor ability directly relates to physical fitness and assists in achieving optimal fitness. Physiological fitness profiles provide crucial insights in significant quantities and beneficial ways for both athletes and coaches. Engaging in a structured training program leads to necessary changes in physical and physiological characteristics, fostering the development of functional abilities that enhance human performance in sports and games. Sport psychology is a scientific discipline that applies psychological techniques and principles specifically within the context of physical activities (Cox, 1998). This field is still developing, drawing insights from various branches of psychology, such as social psychology and psychophysiology, to assist coaches and athletes in understanding their own characteristics and those that are beneficial to them in relation to sports performance and utilization. At present, sport psychology addresses a

wide range of challenges that athletes encounter. Sport psychologists strive to work effectively with athletes in areas such as team dynamics and recovery from injuries, aiming to enhance their performance. Additionally, identifying and addressing the issues faced by athletes is a crucial aspect of sport psychology. The fundamental question of why individuals engage in sports is becoming increasingly significant. Participation in sports has been a vital aspect of human experience. For centuries, people have sought to demonstrate their strength through displays of speed and endurance. Early competitors would engage in months of rigorous training to prepare for the initial athletic competitions. Similarly, contemporary athletes also undergo such demanding training regimens. It is typical for current Olympians, as well as secondary school students and college athletes, to dedicate their time and resources to rigorous preparation for upcoming competitions. Athletes put their bodies and health on the line every day in their pursuit of excellence in their respective fields. They endure daily pain and make sacrifices with the hope that it will all culminate in a significant event. However, the reality is that while many athletes are prepared to make these sacrifices, exceptional psychological support plays a crucial role not only in competition but also in fostering a successful sports career. In 1925, Coleman Griffith established the athletics research laboratory at the University of Illinois, marking the beginning of sport psychology. He is recognized as the 'father of sport psychology' for initiating a university course, publishing two major texts, and serving as an advisor to professional sports teams. The early development of sport psychology faced challenges, as the Athletic Research Laboratory closed in 1932 due to financial constraints. Success in sports is a combination of physiological skills, tactical knowledge, and mental factors. All four components are essential for achieving peak performance. While most athletes share similarities in their physical, technical, and tactical abilities, it is the mental aspect that often provides the greatest opportunity for a competitive edge. The performance of a team is not merely the sum of individual efforts; rather, it is a complex interplay of interpersonal and situational factors. Consequently, sports psychologists cannot ignore the impact of psychosocial elements on a team's performance. In recent years, some researchers have even investigated the influence of psychosocial factors on team success. Another critical factor that influences performance is team cohesion. This method is proactive and reflects the tendency of a group to remain composed and united in pursuit of its collective goals and the satisfaction of its members' emotional needs. Stability necessitates both commitment and social dimensions. The relationship between job stability and social stability is interconnected, leading to improved performance and demonstrating a positive correlation between stability and performance. Key areas such as anthropometric, physiological, technical, tactical, and psychological traits are essential for participants aiming to achieve professional status in field hockey. Technical skill refers to the degree of sensorimotor coordination from which refined, skilled, and effective movement patterns develop. For a player with high technical ability, dribbling becomes an instinctive action, and the top players stand out due to their speed while handling the ball. Hockey is a widely popular sport globally, especially in India. It is one of the most accessible sports; a physically fit player not only enjoys the game more but is also adept at utilizing all the skills acquired and honed during play. Both skill and physical fitness are vital for a player; lacking either will hinder their ability to excel, particularly in any ball game. Players must be sufficiently fit to execute any skill with maximum power in the shortest time possible. Hockey is recognized as our national sport. Historically, India dominated the hockey scene until the sixteenth Summer Olympic Games, where it triumphed over Pakistan with a score of 1-0 to secure first place. However, due to the introduction of synthetic surfaces and changes in rules, India has unfortunately not achieved significant victories in recent major international competitions, except for the 1980 Moscow Olympics, which were overshadowed by widespread boycotts. The history of hockey traces its roots back to some of the earliest societies in the world. The expertise of our team was put to the test during the 1928 Amsterdam Olympics, where they achieved first place. India’s remarkable performance was hindered by the introduction of artificial grass. This change occurred in the 1970s and significantly altered many aspects of the game. Since then, India has struggled to regain its Olympic standing after 1980. Field hockey is a highly organized and critical sport that requires players to continuously adapt to a complex and rapidly changing environment. To succeed, they must execute the right actions at the right moments. Consequently, they need to develop strong tactical skills. Strategic proficiency is essential for skilled performance across nearly all areas of success. However, in sports, tactical skills encompass not only the ability to determine the most suitable strategy for a given situation but also the capacity to effectively implement that strategy within the constraints of the necessary actions. Thus, the demonstration of strategic skills in field hockey has always been a blend of the physiological and technical limitations of individual players, teammates, or opponents. To perform at the highest level, players must operate under significant pressure. It is therefore not surprising that psychological factors such as motivation, confidence, anxiety management, mental training, team focus, and concentration often distinguish successful athletes from those who do not achieve. Exceptional psychological skills play a vital role in crucial matches and are also necessary for building a successful sports career. Commitment from the athletes is essential, as participation in training is not inherently motivating. To meet the demands of field hockey players, coaches utilize various training methods aimed at achieving elite levels and fostering pride for India on the global stage. Throughout life, competition is a frequent occurrence. Individuals must confront competition at every stage of their lives. Sports competitions have also gained significant prominence. Engaging in sports contests requires athletes to develop exceptional physical, physiological, and psychological attributes to succeed at the highest levels of competition. In any sporting event, whether an individual athlete or a team, the focus is on enhancing performance to achieve success. The potential success of an athlete or a team is a result of rigorous training and dedicated effort. It is clear that preparing for successful sports performance necessitates a comprehensive approach that encompasses physiological, psychological, technical, and other factors. Regardless of the sport, an athlete's success or failure hinges on a combination of physical and psychological strengths. Each individual possesses unique physical and psychological attributes, but sports skills can also be learned and

developed. A champion must possess mental skills that are systematically applied and integrated with various physical capabilities. In the realm of sports, we can distinguish between individual and team games. Team sports have a distinct impact on players compared to individual sports, where elements such as team cohesion and group dynamics play a crucial role in building an athlete's mental resilience. Unity is essential for effective teamwork, as successful team performance relies on high team spirit and collaboration. The manner in which teams manage these aspects distinguishes the successful from the less successful. A fundamental requirement for achieving success in sports is a shared sense of cooperation among team members, where they are aware of how their actions are interconnected. This awareness enables the team to perform at a level that exceeds the combined strength of its individual members. When physical abilities are evenly matched, as is often the case in competitive sports, the competitor who possesses greater mental control typically emerges as the victor. Mental strength does not merely compensate for a lack of achievement; rather, in closely contested situations, it can be the distinguishing factor between winning and losing. Psychosomatic confidence plays a significant role in sports success. Despite widespread belief in this notion, it is surprising to find that the existing literature on emotional resilience often lacks theoretical clarity and consensus regarding its definition and application. The challenge in understanding a clear concept of psychological resilience stems from previous research, which has struggled to differentiate between 'what mental toughness is' and the essential characteristics of emotional resilience. However, there have been some promising recent developments in research within this field. Researchers are dedicated to providing conceptual clarity by proposing enhanced theoretical frameworks to examine the attributes of mental toughness. Psychological assessment refers to a systematic approach involving psychological testing or behavioral evaluation.

Review of Literature

Vileep, K.S. (2017) sought to explore the influence of anthropometric parameters on the motor performance of hockey players. In this research, they argued that in the current era of scientific advancement, individuals are rapidly progressing in all aspects of life, including sports. This is indeed a multifaceted aspect of human performance, requiring an optimal combination of technological, tactical, physical, physiological, anthropometric, and psychological factors to achieve success in sports. Many professionals in the field of sports, such as coaches, managers, and researchers, believe that the success in this sport is linked to the anthropometric measurements of the athletes. During coaching camps at universities, data related to anthropometric variables and motor skills were gathered and analyzed using the 'r' value (correlation) statistical method to test the study's hypothesis. The results of the study revealed a significant correlation between motor performance and the anthropometric characteristics of field hockey players. Ashutosh (2018) carried out a study titled "Relationship between the anthropometric variables of the upper limb and the performance of college-level hockey players." The aim of this research was to investigate the correlation between the performance of female collegiate hockey players and the anthropometric variables of their upper limbs. To achieve this objective, a total of forty female hockey players (n = 40) were selected from various colleges affiliated with Punjabi University, Patiala, with ages ranging from 17 to 25 years. Data concerning the chosen variables were collected using standardized methods and techniques. Once the relevant data was gathered, it was processed and analyzed using descriptive statistics. To explore the relationship between the upper limb's anthropometric variables and the performance of collegiate hockey players, the data was examined through multiple correlation and regression analysis, utilizing the SPSS statistical package. The significance level for testing the hypothesis was established at 0.05 percent. Following the data analysis, the findings indicated a significant impact of the selected variables on hockey performance at the intercollegiate level.

Assessments are utilized to evaluate the development of aptitude, personality, attitudes, and mental, social, or emotional functioning, and they are also employed by professionals to examine disorders. Psychological evaluations may involve questionnaires, interviews, or observational techniques. A mentally resilient athlete is likely to maintain a relatively consistent performance regardless of situational factors; they exhibit a confident, positive, and hopeful mindset, even when circumstances are challenging, and do not succumb to pressure; they manage distractions without allowing them to interfere with their primary focus; they endure pain and discomfort; they remain persistent when faced with difficulties; and they possess the resilience to recover after setbacks. It is widely acknowledged that mental preparation and training are more complex and demanding in team sports, as they require greater collective commitment, group communication, cohesion, and motivation. Consequently, it is generally accepted that sports psychology experts can enhance performance by developing psychosomatic skills. The significance of mental training for skill execution and performance improvement is well documented in the literature. Mental preparation facilitates the acquisition of necessary mental skills, which can then be applied to enhance performance. Mastering mental skills along with fostering positive mental attitudes will elevate the athlete's quality of life. At the international level, training for success in field hockey focuses on the physical aspects of the game. Training sessions are designed to enhance conditioning and physical abilities such as stick control, running, shooting, and defending against opponents. Psychological factors like focus and emotional control often don’t get the attention they deserve. Recognizing the emotional aspects that contribute to successful athletic performance is crucial in the realm of practical sport psychology, particularly the psychological links to peak performance. To deepen our understanding in this area, it’s essential to explore specific psychological constructs relevant to achieving optimal functioning and to grasp the mental processes that can elevate performance standards. History offers plenty of examples of gifted teams that fell short of expectations, as well as less talented teams that exceeded them. Success in sports extends beyond the individual accomplishments of players; it hinges on effective collaboration and camaraderie. Team members must not only work together but also enjoy playing alongside one another to achieve success.

Therefore, it's imperative to conduct research that delves into various factors, including anthropometric measurements, motor performance, and both physiological and psychological variables that influence sports performance. This necessity drives the current investigation forward.

Objectives of the Study

1. To investigate the connection between hockey playing ability and specific anthropometric measurements.
2. To investigate the connection between hockey playing ability and specific motor performance variables.
3. To understand how certain physiological factors relate to hockey playing ability.
4. To investigate the connection between a few psychological factors and hockey skill.
5. To investigate how the criterion variables (playing ability) of hockey players are predicted by predictor variables (anthropometric measurements, motor performance, physiological, and psychological variables).

Statement of the Problem

This study aimed to predict hockey players' playing ability using anthropometric measures, motor performance, physiological, and psychological aspect.

Delimitations

1. A total of ninety male hockey players from various universities were selected as participants.
2. The participants were chosen from different universities in Karnataka state that took part in the South Zone Inter-University Men's Hockey Tournament in 2016.
3. Scope of the study was limited to anthropometric, motor performance, physiological, and psychological factors.

Hypotheses

1. It was proposed that there is no significant correlation between standing height and hockey playing ability.
2. It was proposed that there is no significant correlation between leg length and hockey playing ability.
3. It was proposed that there is no significant correlation between upper arm girth and hockey playing ability.
4. It was proposed that there is no significant correlation between chest girth and hockey playing ability.
5. It was proposed that there is no significant correlation between thigh girth and hockey playing ability.
6. It was proposed that there is no significant correlation between calf girth and hockey playing ability.
7. It was proposed that there is no significant correlation between bioacromial width (shoulder width) and hockey playing ability.
8. It was proposed that there is no significant correlation between bicristal width (waist width) and hockey playing ability.
9. It was proposed that there is no significant correlation between elbow width (humerus bicondylar diameter) and hockey playing ability.
10. It was proposed that there is no significant correlation between knee width (femur bicondylar diameter) and hockey playing ability.
11. It was proposed that there is no notable correlation between speed and hockey playing skills.
12. It was proposed that there is no notable correlation between grip strength and hockey playing skills.
13. It was proposed that there is no notable correlation between balance and hockey playing skills.
14. It was proposed that there is no notable correlation between flexibility and hockey playing skills.
15. It was proposed that there is no notable correlation between reaction time and hockey playing skills.
16. It was proposed that there is no notable correlation between resting pulse rate and hockey playing skills.
17. It was proposed that there is no notable correlation between blood pressure and hockey playing skills.
18. It was proposed that there is no notable correlation between vital capacity and hockey playing skills.
19. It was proposed that there is no notable correlation between mental toughness and hockey playing skills.
20. It was proposed that there is no notable correlation between team cohesion and hockey playing skills.
21. It was proposed that predictor variables (anthropometric measurements, motor performance variables, physiological variables, and psychological variables) do not significantly contribute to predicting the criterion variable (playing ability) of male hockey players.

Significance of the Study

1. This research will be beneficial in understanding the anthropometric measurements, motor performance, and both physiological and psychological factors of male hockey players
2. This research will aid in assessing the correlation between anthropometric measurements, motor performance, and both physiological and psychological factors with the playing ability of university male hockey players.
3. This research will support coaches and administrators in the selection of male players for the hockey team.
4. The findings of the research will assist coaches in creating suitable training programs aimed at enhancing specific motor performance, physiological, and psychological factors. Definitions and explanations of technical terms.

a. University players: Individuals selected to represent the university team in inter-university competitions.
b. Anthropometry: This field involves measuring the human body and its functions. It is utilized to assist in the study of human evolution and variation.
c. Anthropometric measurements: These are the dimensions of human structures taken at specific sites to evaluate span, girth, and breadth.
d. Height: Human height is defined as the distance from the back of the foot to the highest point of the head when a person is standing upright.
e. Leg length: A condition characterized by a noticeable difference in length between the paired lower limbs.
f. Upper arm girth: This measurement refers to the circumference of the right arm, taken parallel to the long axis of the humerus while the subject stands upright with arms relaxed.
g. Chest girth: This is the measurement around the thorax at the level of the nipples in front and the subscapular region at the back, taken at the end of a normal exhalation.
h. Thigh girth: This refers to the circumference of the thigh measured at the midpoint of the femur.

i. Calf girth: This is the largest circumference of the lower leg measured over the calf muscle.
j. Biacromial diameter: This is the straight-line distance between the left and right acromial points, which are the outermost points on the superior and lateral borders of the acromion process of the scapula.
k. Bicristal diameter: This is the straight-line distance between the right and left iliocristal points on the iliocrist. In simpler terms, it measures the maximum width of the abdomen between the iliac crests on both sides.
l. Humerus bicondylar diameter: This is the maximum distance across the outermost points of the two lateral condyles at the lower end of the humerus.
m. Femur bicondylar diameter: This is the maximum distance across the outermost points of the condyles at the lower end of the femur.
n. Grip strength test: The strength of the hand grip was determined by estimating the continuous power volume that the arm can exert on a dynamometer. 16. Balance: The ability to maintain a body position for an extended duration.
o. Flexibility: It is commonly defined as the range of motion of a particular joint, quantified in specific units.
p. Reaction time: This refers to the interval between the presentation of a stimulus and the initiation of a response.
q. Resting pulse rate: The measurement of pulse rate when an individual is in a state of complete physical and emotional relaxation is referred to as resting pulse rate.
r. Blood pressure: This refers to the force exerted by blood against the walls of blood vessels.
s. Systolic blood pressure: The peak level of blood pressure during the systole phase in the left ventricle.
t. Diastolic blood pressure: This is the pressure in the blood vessels between heartbeats when at rest.
u. Vital capacity: It is the maximum amount of air that can be exhaled following the deepest possible inhalation.
v. Team cohesion: This is an active process that is reflected in the effort of a group to remain united and work together towards shared goals while fulfilling the needs of its members. 25. Mental toughness: Mental toughness encompasses a set of traits that enable an individual to endure challenging situations and emerge without losing confidence.

Summary, conclusion and recommendations

Summary, the aim of the investigation was to forecast the hockey playing capability based on specific anthropometric measurements, motor performance, and physiological factors of male hockey players. To achieve the study's objective, ninety male hockey players who represented various universities in Karnataka during the 2016-2017 season were chosen as subjects for this research. They were reported at Alagappa University in Karaikudi, Tamil Nadu, to take part in the South Zone Inter University Hockey men's tournament, which took place from December 27 to December 31, 2016. Data were collected from the participants regarding the selected anthropometric measurements using a gullick tape, anthropometric compass, and sliding caliper. Motor performance variables included speed, measured through a 50-meter dash, grip strength assessed with a hand dynamometer, balance evaluated using the stork balance test, flexibility measured with the modified sit and reach test, and reaction time assessed with an electronic visual hand reaction timer. Physiological variables such as resting pulse rate and blood pressure (both systolic and diastolic) were measured using the Omran Automatic Monitor MX3. Vital capacity was assessed with a dry spirometer. The psychological variable of team cohesion was measured using the standardized Group Environmental Questionnaire developed by Albert V. Carron, while mental toughness was evaluated through the Psychological Performance Inventory created by James E. Loehr. The ability to play hockey was evaluated using a hockey playing ability rating scale with a maximum of 50 points. This assessment was conducted by three experts, and the average scores from these experts were recorded as the playing ability of the participants. The independent variables selected for this study included various anthropometric measurements, specifically standing height, leg length, upper arm girth, chest girth, thigh girth, calf girth, shoulder width, waist width, elbow width, and knee width. In terms of motor performance, the study focused on speed, left and right strength, balance, flexibility, and reaction time. Physiological variables taken into account included resting pulse rate, blood pressure (both systolic and diastolic), and vital capacity. The data collected from the subjects was analyzed using Pearson Product Moment Correlation to determine the relationships between the independent variables—namely, anthropometric measurements, motor performance, physiological variables, psychological variables—and the dependent variable, which is hockey playing ability. To assess the contribution of each variable to hockey playing ability, linear regression analysis was performed with the help of the Statistical Package for Social Sciences (SPSS) Version 23. The data analysis indicated a significant relationship between hockey playing ability and each of the following anthropometric measurements: standing height (r=0.577), leg length (r=0.480), upper arm girth (r=0.470), chest girth (r=0.278), thigh girth (r=0.362), calf girth (r=0.454), shoulder width (r=0.592), waist width (r=0.607), elbow width (r=0.498), and knee width (r=0.342). A notable correlation exists between hockey playing skills and various motor performance metrics, including speed (r=-0.609), left strength (r=0.671), right strength (r=0.722), balance (r=-0.126), flexibility (r=0.747), and reaction time (r=-0.637). Additionally, a significant link was identified between hockey playing skills and physiological factors such as resting pulse rate (r=0.269), systolic blood pressure (r=0.222), diastolic blood pressure (r=0.256), and vital capacity (r=0.362). Furthermore, a significant relationship was observed between hockey playing ability and psychological factors, including AGT (r=0.425), AGS (r=0.502), GIT (r=0.479), GIS (r=0.378), team cohesion (r=0.613), self-confidence (r=0.746), negative energy control (r=0.850), attention control (r=0.763), visualization and imagery (r=0.866), motivation (r=0.731), positive energy control (r=0.751), attitude control (r=0.600), and mental toughness (r=0.822). The overall impact of anthropometric measurements on the playing ability of hockey players was determined to be 56.53%, with waist width (X8=17.54%), standing height (X1=17.08%), calf girth (X6=11.90%), leg length (X2=9.22%), upper arm girth (X3=8.70%), shoulder width (X7=2.55%), elbow width (X9=-1.54%), knee width (X10=-1.98%), thigh girth (X5=-2.61%), and chest girth (X4=-4.31%) contributing

respectively. Consequently, it has been determined that the waist width (X8=17.54%) is the primary contributor, followed by standing height, calf girth, leg length, upper arm girth, shoulder width, elbow width, knee width, thigh girth, and chest girth. The selected motor performance factors, including speed, right hand strength, left hand strength, balance, flexibility, and reaction time, are significant predictors of the playing ability of male hockey players. The overall contribution of motor performance variables to the playing ability of hockey players is 76.32%. Specifically, flexibility (X5=22.56%), speed (X1=15.77%), right hand strength (X2=14.51%), reaction time (X6=12.49%), left hand strength (X3=12.28%), and balance (X6=-1.29%) are noted. Therefore, it is concluded that flexibility (X5=22.56%) is the leading contributor, followed by speed, right hand strength, reaction time, left hand strength, and balance. The total contribution of all independent variables (physiological variables) to the playing ability of male hockey players is 34.1%, with vital capacity (X4=11.51%), resting pulse rate 169 (X1=8.81%), diastolic blood pressure (X3=7.06%), and systolic blood pressure (X2=6.63%) respectively. Thus, it is concluded that vital capacity (X4=11.51%) is the primary contributor, followed by resting pulse rate, diastolic blood pressure, and systolic blood pressure. The total contribution of independent variables (team cohesion) to the playing ability of hockey players is 41.6%, with AGS (X2=12.85%), GIT (X3=11.49%), AGT (X1=10.37%), and GIS (X4=6.92%) respectively. Therefore, it is concluded that AGS (X2=12.85%) is the primary contributor, followed by GIT, AGT, and GIS. The total contribution of mental toughness to the playing ability of hockey players is 84.8%, including visualization and imagery (X4=41.65), negative energy control (X2=18.19%), motivation (X5=11.84%), self-confidence (X1=11.48%), positive energy control (X6=10.21%), and attention control.

Conclusions

Based on the findings of the current study, the following conclusions were made. 170 A medium-level correlation exists between standing height and the playing ability of inter-university hockey players. A medium-level correlation is also observed between leg length and the playing ability of inter-university hockey players. Furthermore, a medium-level correlation is noted between upper arm girth and the playing ability of inter-university hockey players. In contrast, a low correlation is found between chest girth and the playing ability of inter-university hockey players. Similarly, a low correlation exists between thigh girth and the playing ability of inter-university hockey players. A medium-level correlation is present between calf girth and the playing ability of inter-university hockey players. Additionally, a medium-level correlation is observed between shoulder width and the playing ability of inter-university hockey players. A high correlation is noted between waist width and the playing ability of inter-university hockey players. Moreover, a medium-level correlation exists between elbow width and the playing ability of inter-university hockey players. Lastly, a low correlation is found between knee width and the playing ability of inter-university hockey players. 171 A strong correlation was identified between speed and the playing ability of inter-university hockey players. There is a high correlation between strength right and playing ability of inter university hockey players. There is a high correlation between left hand strength and playing ability of inter university hockey players. Low correlation was found between balance and playing ability of inter university hockey players. There is a high correlation between flexibility and playing ability of inter university hockey players. There is a high correlation between reaction time and playing ability of inter university hockey players. The result directs that there is a low negative correlation between resting pulse rate and playing ability of inter university hockey players. Low correlation was found between systolic blood pressure and playing ability of inter university hockey players. The results, directs that there is a low correlation between diastolic blood pressure and playing ability of inter university hockey players. 172 In vital capacity there is a low correlation with playing ability of inter university hockey players. The outcome of team cohesion dimension attraction to group task shows that there is a correlation of medium order between attraction to group task (AGT) and field hockey players' playing ability. The outcome of team cohesion dimension attraction to group social shows that there is a correlation of medium order between attraction to group social (AGS) and field hockey players' playing ability. The outcome of team cohesion dimension group integration task that there is a correlation of medium order between GIT and playing ability. The outcome of team cohesion dimension group integration social shows that, there is a low correlation between GIS and hockey players' playing ability. The outcome of overall team cohesion shows that, there is a high correlation between overall team cohesion and hockey players' playing ability. The outcome of mental toughness dimension self-confidence directs that there is a high correlation between self-confidence and field hockey player's playing ability. The outcome of mental toughness dimension negative energy control shows that there is a high correlation between negative energy control and hockey playing ability. 173 The outcome of mental toughness dimension attention control directs that there is a high correlation between attention control and hockey playing ability. The outcome of mental toughness dimension visualization and imagery specifies that there is a very good correlation between visualization and imagery and playing ability. The results from the mental toughness dimension of motivation reveal a strong correlation between motivation and hockey playing ability. Similarly, the findings from the mental toughness dimension of positive energy control show a significant correlation between positive energy control and playing ability. Furthermore, the results from the mental toughness dimension of attitude control indicate a good correlation between attitude control and playing ability. Overall, the findings regarding mental toughness suggest a very high correlation between overall mental toughness and playing ability. The linear regression analysis identified that selected anthropometric measurements, including standing height, leg length, upper arm girth, chest girth, thigh girth, calf girth, shoulder width, waist width, elbow width, and knee width, significantly contribute to predicting the playing ability of male field hockey players. The total contribution of these independent variables (anthropometric measurements) to the playing ability of hockey players was determined to be 56.53%. This includes waist width (X8=17.54%), standing height (X1=17.08%), calf girth (X6=11.90%), leg length (X2=9.22%), upper arm girth (X3=8.70%), shoulder width (X7=2.55%), elbow width

(X9= -1.54%), knee width (X10= -1.98%), thigh girth (X5= -2.61%), and chest girth (X4= -4.31%) respectively. Therefore, it is resolved that, the waist width (X8=17.54%) is the first contributor followed by standing height, calf girth, leg length, upper arm girth, shoulder width, elbow width, knee width, thigh girth, and chest girth. There is a significant contribution of selected motor performance components namely speed, right hand strength, left hand strength, balance, flexibility and reaction time are the significant predictors of playing ability of hockey men players. The total contribution of the independent variables (motor performance variables) on playing ability of hockey players was 76.32% in which flexibility (X5=22.56%), speed (X1=15.77%), strength right (X2=14.51%), reaction time (X6=12.49%), strength left (X3=12.28%) and balance (X6= -1.29%) respectively, therefore it is determined that flexibility (X5=22.56%), is first contributor, followed by speed, strength right, reaction time, strength left and balance. There is a significant contribution of selected physiological variables namely resting pulse rate, systolic blood pressure, diastolic blood pressure and 175 vital capacities are the significant predictors of playing ability of hockey men players. The total contribution of all the independent variables (physiological variables) on playing ability of hockey men players. The total contribution of the independent variables (physiological variables) on playing ability of hockey players was 34.1% in which vital capacity (X4=11.51%) resting pulse rate (X1=8.81%), diastolic blood pressure (X3=7.06%) and systolic blood pressure (X2= 6.63%), respectively. Therefore, it is resolved that, the vital capacity (X4=11.51%) is first contributor followed by resting pulse rate, diastolic blood pressure and systolic blood pressure. The selected team cohesion variables (AGT, AGS, GIT and GIS) are significant predictors of playing ability of hockey men players. The total contribution of the independent variables (team cohesion) on playing ability of hockey players was found to be 41.6%, in which AGS (X2=12.85%), GIT (X3=11.49%), AGT (X1=10.37%), and GIS (X4=6.92%), respectively. Therefore, it is resolved that, the AGS (X2=12.85%), is the first contributor followed by GIT, AGT and GIS. The mental toughness sub scales such as self-confidence, negative energy control, attention control, visualization and imagery, motivation, positive energy control, and attitude control are important predictors in hockey playing ability. 176 The total contribution of the independent variables (mental toughness) on playing ability of hockey players was found to be 84.8%. in which visualization and imagery (X4=41.65), negative energy control (X2=18.19%), motivation (X5=11.84%), self-confidence (X1=11.48%), positive energy control (X6=10.21%), attention control (X3=-4.27%) and attitude control (X7= -4.44%) respectively. Consequently, it has been determined that visualization and imagery serve as the primary contributor (X4=41.65), followed by negative energy management, motivation, self-confidence, positive energy management, attention regulation, and attitude management.

Recommendations

Based on the findings of the current study, the following suggestions are

1. Physical Education teachers, trainers, and coaches can utilize the results of this research to identify young talented hockey players.
2. A similar study could be carried out with a larger sample size. 3. Research may focus on inter-university female hockey players.
3. A comparable study could be conducted for hockey players across various age groups.
4. A similar investigation may be performed on international male and female hockey players. 6. Further studies could also explore other sports players using a similar approach.
5. Given that psychological factors significantly influence sports performance; the same study could incorporate psychological variables.
6. Future research may include additional variables that were not addressed in this study.
7. A similar study could employ different testing methods and the latest equipment.
8. Research may also be conducted on state-level male and female hockey players.
9. The same study could be executed to compare different levels of achievers in the sport of hockey.

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