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Analysis of the Physical Condition of Male Outdoor Hockey Athletes in East Java

Hanas Hutama Arinsa Putra[1A-E], Imam Hariadi[2B-D*]

[1,2]Sport Coaching Education Study Program, Faculty of Sport Science, Malang State University, Malang City, East Java, Indonesia

hanas.hutama.2006316@students.um.ac.id[1], imam.hariadi.fik@um.ac.id[2]

ABSTRACT

The purpose of this research is to identify and evaluate the physical condition profile of outdoor hockey athletes in East Java Province comprehensively. The research method employs a survey research design with a quantitative descriptive approach. Sampling is conducted using purposive sampling with a sample of 18 male outdoor hockey athletes registered in PUSLATDA East Java 2024. The instruments used in this research include physical condition tests comprising cardiorespiratory endurance (multi-fitness stage test), speed (20-meter sprint), agility (Illinois agility run), leg muscle explosiveness (standing triple jump), arm muscle strength (push up), abdominal muscle strength (sit up), back muscle strength (back up), and flexibility (sit and reach test). Based on the research results, it is shown that: (1) Cardiorespiratory endurance achieved a percentage of 87% categorized as good; (2) Leg muscle explosiveness achieved a percentage of 67% categorized as sufficient; (3) Speed achieved a percentage of 68% categorized as sufficient; (4) Agility achieved a percentage of 83% categorized as good; (5) Abdominal muscle strength achieved a percentage of 83% categorized as good; (6) Arm muscle strength achieved a percentage of 89% categorized as very good; (7) Back muscle strength achieved a percentage of 85% categorized as sufficient; (8) Flexibility achieved a percentage of 96% categorized as very good. Based on the overall results of the physical condition tests of the male outdoor hockey athletes from East Java, who have not yet demonstrated ideal performance to support the activities of male outdoor hockey athletes from East Java, a training program is required to improve the physical condition of the male outdoor hockey athletes from East Java as a whole.

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INTRODUCTION

Outdoor hockey is a sport that requires its athletes to perform at maximum intensity during matches. In terms of the level of play in outdoor hockey, the primary systems utilized are aerobic and anaerobic systems, which are employed during attacking and defending, interspersed with brief high-intensity bursts (Boyle et al., 1994). Outdoor hockey falls into the category of high-intensity sports with significant physiological demands, placing it in the

heavy category and requiring a good level of endurance (Elferink-Gemser et al., 2006). Outdoor hockey is a sport typically played by two teams competing to score as many goals or points as possible against the opposing team. In line with the views of Spencer et al. (2002), outdoor hockey is characterized by a fast style of play, quick ball passing, minimal ball handling, and rapid attacks towards the opponent's goal.

Outdoor hockey is a sport that requires technical skills and is supported by good physical condition, such as aerobic and anaerobic endurance. Both elements are utilized to perform complex movements for 60 minutes (15x4) during normal time, thus athletes are required to possess good anaerobic and aerobic endurance (Manna et al., 2010). In addition, outdoor hockey athletes are expected to have optimal physical conditions to complete matches with winning results and to avoid significant fatigue during the match until the designated time ends (Sugand & Pramono, 2019). Outdoor hockey athletes, whether defending or attacking, must have good physical conditions to withstand hard impacts, run at high speeds, manoeuvre past opponents with maximum speed and agility, and stop suddenly to gain control of the ball (Siregar et al., 2020).

The important components of physical condition in outdoor hockey are endurance, speed, and agility. These components can be interrelated, meaning that they can influence each other. Based on this, outdoor hockey athletes must possess a high level of physical fitness furthermore, outdoor hockey athletes must also have the capacity to generate relatively short and rapid muscle explosiveness in the legs for use during running (Reilly & Borrie, 1992). To become a good Outdoor Hockey athlete, an outdoor hockey athlete must master basic skills and techniques, including pushing the ball, dribbling the ball, and stopping the ball. Suntoda (2000) states that speed is one of the very important elements to be developed in outdoor hockey because outdoor hockey athletes require optimal physical condition. Therefore, periodically outdoor hockey athletes need to conduct physical condition tests to assess their physical state.

Outdoor hockey athletes require a combination of physical mastery, technique, tactics, and mental strength to achieve good performance and deliver optimal results. On average, outdoor hockey athletes can cover a distance of approximately 10.000 meters during a match. This distance varies depending on the athlete's position during the game; for instance, defenders cover about 9.300 meters, midfielders around 10.300 meters, and forwards an average of 10,870 meters. This distance is covered at a moderate speed ranging from 2.2 to 2.59 m/s, with a maximum speed capable of reaching 8.03 to 9.27 m/s (Spencer et al., 2002). Based on this, in outdoor hockey, physical condition becomes a key component, particularly endurance, speed, agility, and leg muscle explosiveness (Vikki Leslie, 2012). In addition to physical condition, technical skills are also a crucial element for success in outdoor hockey, as mentioned earlier, such as techniques like the push (pushing), hit (striking), jab (reaching for the ball), and tackle (stealing the ball), all of which are performed using a stick to move the ball. Among all the technical skills in outdoor hockey, good physical condition is required so that athletes can apply these techniques in line with their intended goals. Therefore, physical condition is very important to maintain and improve (Nurlathifah et al., 2017).

Hanas Hutama Arinsa Putra[1A-E],Imam Hariadi[2B-D*]
imam.hariadi.fik@um.ac.id[2*]

The essence of physical conditioning training, besides being beneficial for improving physical fitness, is that it serves as a fundamental program in the development of athletes to excel in a particular sport (Konarski & Strzelczyk, 2009). Among the various physical components utilized in outdoor hockey, developing the ideal physical condition necessitates the formulation of a training program aimed at enhancing the physical condition of outdoor hockey athletes. To design a training program, it is essential to understand the physical condition possessed by the athletes; in other words, an analysis of the physical condition must be conducted beforehand to ensure that the training program aligns with the needs of each athlete. This follows Bompa's (2019) statement that in every sport requiring strength, speed, and endurance, these abilities are of primary importance.

In other words, in the training process, it is necessary and important to conduct measurements first to understand the state of several factors that influence performance, one of which is the physical condition of the athlete. Furthermore, physical elements serve as the foundation for achievement, as technique, tactics, and mental aspects can be well developed if the athlete possesses good physical qualities. Based on the above description, this research aims to determine the physical condition of outdoor hockey athletes, which will be used to develop a training program to enhance the physical performance of outdoor hockey athletes.

METHODS

This research employs a survey study with a quantitative descriptive approach. This method was chosen to provide a comprehensive overview of the physical condition of male Outdoor Hockey athletes from East Java at a specific point in time (Sahir, 2022). The population in this study consists of male outdoor hockey athletes from East Java, with a total sampling method involving 18 athletes. Research Instruments The physical condition of the athletes was measured using a series of tests that include the following components: a) Cardiovascular endurance: Multistage Fitness Test; b) Speed: 20-meter Sprint; c) Agility: Illinois Agility Test; d) Leg muscle power: Standing Triple Jump; e) Muscle endurance: Push-up, Sit-up, Back-up Test (1 minute); f) Flexibility: Sit and Reach Test.

The data collection procedure was conducted in a single test session lasting one day. Before the test implementation, subjects were given time to perform a standard warm-up lasting 15 minutes before the test commenced. The order of the tests was arranged to minimize the effects of fatigue, with tests requiring greater energy being conducted at the beginning of the session. The data was collected and analyzed using the percentage formula per component of physical condition. In analyzing the data, assistance was obtained from the SPSS Statistics 26 software application.

RESULTS AND DISCUSSION

Based on the results of the analysis of physical condition tests carried out by athletes outdoor hockey males in East Java got the following results:

Hanas Hutama Arinsa Putra[1A-E],Imam Hariadi[2B-D*]
imam.hariadi.fik@um.ac.id[2*]

Table 1.
Results of the Athlete's Physical Condition Test Outdoor Hockey in East Java

No	Name	MFT	TJ	S	IL	SU	PU	BU	S&R
1	AB	5	3	3	4	5	5	4	5
2	RW	5	4	3	4	4	5	4	5
3	MAL	4	3	4	4	5	5	3	5
4	RAG	4	2	2	4	4	3	3	5
5	BW	5	2	2	4	4	4	3	5
6	RMA	4	3	3	4	4	5	4	5
7	DER	5	3	2	4	5	4	3	5
8	TW	5	2	3	4	5	5	4	5
9	MAI	4	2	3	4	4	5	3	5
10	MF	4	3	3	4	5	4	3	1
11	HH	4	3	3	4	3	5	4	5
12	TA	4	2	2	4	2	3	3	5
13	SA	4	4	4	5	5	5	4	5
14	DS	4	2	2	4	4	3	3	5
15	ZD	4	2	2	4	3	4	3	5
16	FR	5	3	3	5	5	5	4	5
17	IK	4	2	2	4	4	5	3	5
18	MDU	4	3	3	5	4	5	3	5
Total		**78**	**48**	**49**	**75**	**75**	**80**	**61**	**86**
Percentage		**87%**	**67%**	**68%**	**83%**	**83%**	**89%**	**85%**	**96%**
Category		**Good**	**Moderate**	**Moderate**	**Good**	**Good**	**Good**	**Moderate**	**Very Good**

Information: SU= Sit Up, PU= Push Up, BU= Back Up, TJ= Triple Jump, S= Sprint, IL= Illinois Agility Run Test, S&R= Sit & Reach, MFT= Multistage Fitness Test (VO2Max)

Overall physical condition test results for outdoor hockey male athletes in East Java, athletes who got the highest scores on the test sit up, push up and backup is FR, while the lowest score of the three instruments was obtained by TA, DS, and RAG athletes respectively. On the instrument triple jump test, the highest score was obtained by RW and the lowest score was obtained by DS. In the Illinois agility run test, FR athletes had the lowest results, while in the test results sprint all athletes achieved maximum results. In the results of the Illinois agility run test, the highest score was obtained by TA while the lowest score was obtained by SA. In the test sit & reach TW got the highest score while MF got the lowest score. Furthermore, in the test results, VO2Max the highest score was obtained by TW and the lowest score was obtained by MDU.

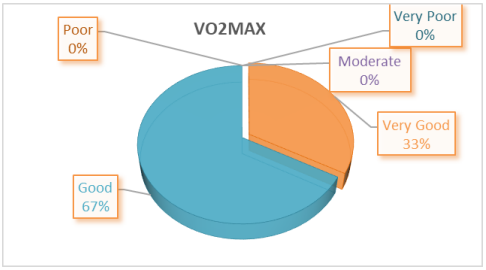

Image 1.
Graphic of VO2Max Results for Male Outdoor Hockey Athletes from East Java

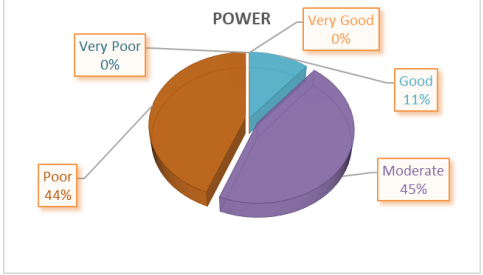

Image 2.
Graphic of Power Results for Male Outdoor Hockey Athletes from East Java

Hanas Hutama Arinsa Putra[1A-E],**Imam Hariadi**[2B-D*]
imam.hariadi.fik@um.ac.id[2*]

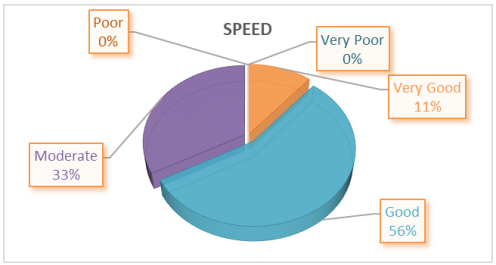

Image 3.
Graphic of Speed Results for Male Outdoor Hockey Athletes from East Java

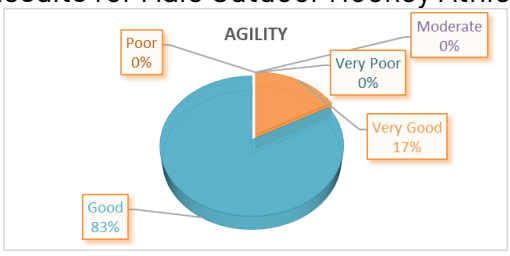

Image 4.
Graphic of Agility Results for Male Outdoor Hockey Athletes from East Java

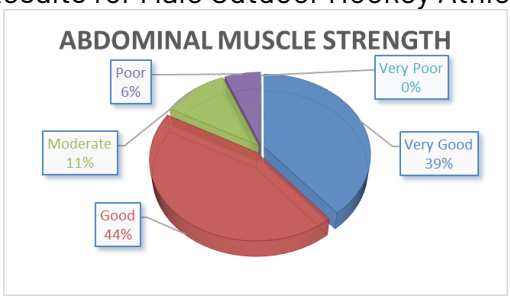

Image 5.
Graphic of Abdominal Muscle Strength Results for Male Outdoor Hockey Athletes from East Java

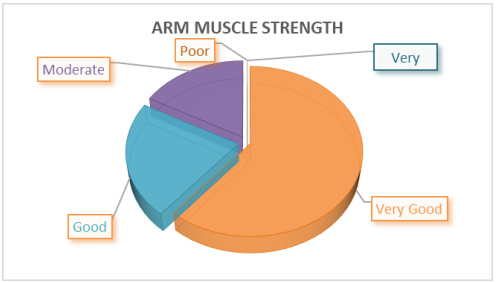

Image 6.
Graphic of Arm Muscle Strength Results for Male Outdoor Hockey Athletes from East Java

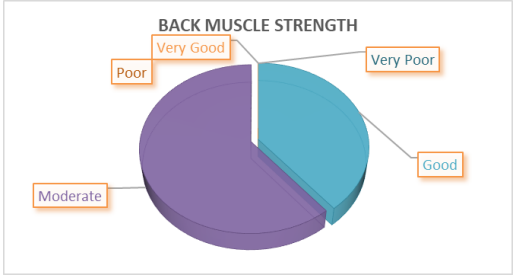

Image 7.
Graphic of Back Muscle Strength Results for Male Outdoor Hockey Athletes from East Java

Hanas Hutama Arinsa Putra[1A-E],Imam Hariadi[2B-D*]
imam.hariadi.fik@um.ac.id[2*]

Image 8.
Graphic of Flexibility Results for Male Outdoor Hockey Athletes from East Java

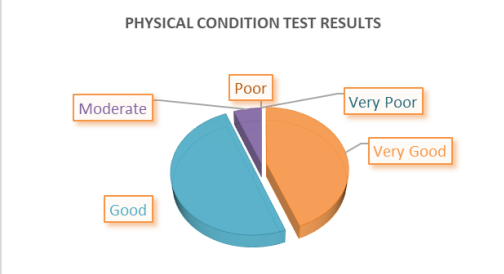

Image 9.
The Graphic of The Physical Condition Test Results of Male Outdoor Hockey Athletes from East Java.

Based on the research results above, show that male outdoor hockey athletes from East Java have relatively good physical conditions of abdominal muscle endurance. The categories of "good" and "very good" each include 15 athletes, which means that most athletes have adequate abdominal muscle endurance to perform intensive physical activities such as hockey. However, it should be noted that 2 athletes are still in the "moderate" category, and 1 athlete is in the "less" category, indicating that there is still a need to improve their physical condition. This finding is in line with the research of A. Sharma et al., (2012) emphasize the importance of abdominal muscle endurance in athlete performance in outdoor hockey. In addition, (Konarski et al., 2023) found a positive correlation between abdominal muscle strength and punch speed in outdoor hockey.

In back muscle strength tests male outdoor hockey athletes in East Java showed a limited distribution in two categories. The majority of athletes (11 people) were in the "moderate" category, while 7 other athletes were in the "good" category. The absence of the "very good" and "poor" categories indicates that the overall back muscle strength of the team was at an intermediate level. This finding is relevant to research (Konarski et al., 2023) which emphasizes the importance of back muscle strength as part of core strength in improving stability, postural control, and movement efficiency in athlete outdoor hockey. In addition, a study by (Kumar et al., 2019) found a positive correlation between back muscle strength and shot power. Given the absence of athletes in the "very good" category, there is significant room for improvement.

Meanwhile, the results of the arm muscle strength test on male outdoor hockey athletes from East Java showed the desired results. The majority of athletes (11 people) were in the "very good" category, followed by 4 athletes in the "good" category, and 3 athletes in the "moderate" category. This distribution indicates that most of the team has optimal arm muscle strength for performance in outdoor hockey. Based on research from (Kumar et al., 2019), it is stated that the strength of the arm muscles is very

Hanas Hutama Arinsa Putra[1A-E],Imam Hariadi[2B-D*]
imam.hariadi.fik@um.ac.id[2*]

important in mastering hitting techniques and ball control. In addition, (Michaud-Paquette et al., 2011) it was found that there is a relationship between arm muscle strength and shooting accuracy.

On the other hand, the results of the athlete's leg muscle power test that male outdoor hockey athletes in East Java showed a distribution that tended towards the bottom. The majority of athletes were evenly divided between the "moderate" and "less" categories with 8 athletes each, while only 2 athletes reached the "good" category. The absence of the "very good" category and the dominance of the "moderate" and "less" categories indicated that the overall leg muscle power of the team was below optimal levels. In line with (Michaud-Paquette et al., 2011) emphasizing the crucial role of leg muscle power in acceleration, change of direction, and speed of playing outdoor hockey. Besides that, the study (Elferink-Gemser et al., 2004) found a positive relationship between leg muscle power and sprint ability. Given the dominance of the categories "sufficient" and "poor", there is an urgent need for improvement.

Speed test results on male outdoor hockey athletes from East Java showed a distribution that tended to be positive. The majority of athletes (10 people) were in the "good" category, followed by 6 athletes in the "moderate" category, and 2 athletes reached the "very good" category. However, the descriptive statistical analysis showed a slightly different picture. The mean value of 2.78 indicated that the average team performance was slightly below the "sufficient" category. This finding is relevant to the study (Kierot et al., 2024), which emphasized the crucial role of speed in various aspects of the game of outdoor hockey, including quick transitions between attack and defence. In addition, a study (Bartolomei et al., 2021) found a positive correlation between running speed and agility, both of which are important in outdoor hockey. Consistently increasing speed can give a team a significant competitive advantage in a match.

Agility test results on male outdoor hockey athletes from East Java showed a very encouraging profile. The distribution of results was only divided into two high categories, with the majority of athletes (15 people) in the "good" category and 3 athletes reaching the "very good" category. The absence of the "moderate" category or below indicates that the entire team has an optimal level of agility for performance in outdoor hockey. A minimum value of 4 and a maximum of 5 confirms that all athletes are at a high level in terms of agility. In line with (Chaudhary et al., 2021), which emphasizes the importance of agility in performance outdoor hockey, especially in one-on-one situations and rapid changes of direction. In addition, a study (Elferink-Gemser et al., 2004) found a positive correlation between agility test scores and player effectiveness during the match, although the results were already very good, there is still room for improvement. By maintaining and improving the already high level of agility, teams can have a significant competitive advantage in matches. Results of agility tests on male outdoor hockey athletes from East Java showed a very polarized distribution. The absolute majority of athletes (17 people) were in the "very good" category, while only 1 athlete was in the "very good" category. In addition, the study (Cejudo et al., 2020) found a positive relationship between flexibility levels and stick control abilities.

Based on the results of this study, the researcher provides recommendations for the team including: (1) maintaining and strengthening the arm, back, arm and leg muscle strength training program that has been proven effective, and increasing the portion of endurance, agility, speed and plyometric training (2) focusing on improving the performance of each athlete because each athlete has the right to achieve optimal condition, and (3) integrating strength training with specific technique training outdoor hockey to optimize transfer to field performance.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the physical condition of male outdoor hockey athletes in East Java showed that the level of arm muscle strength and flexibility had the highest results with a very good category, while the level of abdominal muscle endurance, speed, agility and endurance aerobic obtained results in the good category, in the back muscle strength test results obtained the lowest test results, namely in the moderate category. In addition, in the test results power. There were 2 equally high results for leg muscles, namely obtaining scores in the sufficient and insufficient categories. Based on the results, it is known that arm muscle strength and flexibility have the highest values so both components of physical condition are important to always be maintained and improved. While the lowest result is the component power leg muscles, so it is necessary and important to improve these components. From the overall results of the athlete's physical condition test male outdoor hockey athletes in East Java, which as a whole has not shown ideal performance to support athlete activities male outdoor hockey athletes in East Java, a training program is needed that can be used to improve the physical condition of athletes outdoor hockey in East Java as a whole.

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