Analysis of the Most Dominant Physical Condition Factors (Arm Muscle Power, Grip Strength, and Hand Eye Coordination) to Determine Indoor Push Hockey Shooting Ability

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ABSTRACT: This study aims to determine the analysis of the most dominant physical condition factors (Arm Muscle Power, Grip Strength, and Hand Eye Coordination) to determine indoor push hockey shooting ability. The research was carried out in March 2022 at Gor Wergu Kudus Regency, Prima Mijen Futsal Field, and Kartika Kartika Futsal Stadium The research was carried out in March 2022. The population in this study were all male Hockey athletes in Central Java in each district/city that active as many as 70 people. The method used in this research is descriptive quantitative research method with data analysis technique using exploratory factor analysis design. Based on the results of the study showed that arm muscle power can determine the shooting ability of indoor push hockey. Based on the results of factor analysis, the correlation value of the variables in factor 1 was 0.830 and factor 2 was 0.130, because the correlation value of factor 1 > factor 2, the arm muscle power variable was included in the factor group 1. Factor 1 was the dominant factor. Then eye-hand coordination can determine indoor push hockey shooting ability. Based on the results of factor analysis, the correlation value of the variables in factor 1 is -0.142 and factor 2 is 0.834, because the correlation value of factor 1 < factor 2, the variable belongs to the group of factor 2. Factor 2 is a supporting factor. So it can be concluded that the physical condition factor with the arm muscle power variable is the most dominant factor in the shooting push ability with a correlation number of 0.830, so the greater the arm muscle power is very important for hockey players to have, so that the shot is not easily blocked by the goalkeeper.

KEYWORDS: Physical Condition, Dominant, Shooting Push, Indoor Hockey

INTRODUCTION

Indoor hockey (room hockey) is a type of game that is played indoors such as a gym or sports hall that has a function so that when the weather conditions are rainy or too hot, you can still play hockey. Indoor hockey has 12 players on a team. In these 12 players, 6 people become core players and 6 other people become substitutes or reserves (Sutanto, 2020). In the core players, which consist of 6 people, the tasks are divided into 1 goalkeeper and 5 other players such as defenders, wings and attackers. Indoor hockey games are played by 2 teams or teams with the aim of getting as many balls into the opponent's goal as possible with indoor hockey rules.

In indoor and outdoor hockey games, you are not allowed to use your feet when touching the ball, you must use the stick in the game and the part of the stick that is allowed to hit only the inside of the stick, if it hits the outside it is considered a violation. The difference between indoor and outdoor hockey is that the ball cannot go up or go up when dribbling or passing the ball, in contrast to outdoor hockey which allows the ball to go up or be poked when dribbling or passing. In indoor hockey games the ball must always touch the field, unless the goal is to make a shot into the opponent's goal, the ball is allowed to rise or be gouged. The requirement to score a goal in a hockey game is to enter the ball into the goal by entering the shooting area and making a shot towards the goal and the ball crossing the goal line as a whole. The shooting area in indoor hockey is in the circle of the opponent's goal area, if a player scores a goal but does not enter the area it will be considered a goalless or invalid. Players must enter the opponent's goal area and then enter the ball into the opponent's goal so that the goals scored are considered valid (FIH, 2019).

According to (Syahruddin et al., 2020) indoor hockey (room hockey) is a game adopted by outdoor hockey/field hockey (field hockey), with a smaller field size than outdoor hockey and played with a total of 6 people, 5 players. players and 1 goalkeeper. The game of hockey as it is known by many people in winning a match must score as many goals as the opposing team (Sutanto, 2020). To score a goal a player must shoot a hockey ball into the enemy's goal with a shooting technique that is legalized in the indoor hockey rules (Yudianti, 2016). For shooting techniques on goal, the common way is to use the push technique with the intended target being the corner of the goal by shooting as hard as possible and away from the goalkeeper's reach (Anders & Myers,

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2008).

Push shooting techniques are included in the basic techniques which are generally understood and understood by all hockey players (E. P. Utomo et al., 2019). To make a push shot the player must position the ball on the right side of the body and place the ball on the body of the stick, then the body position must be ready with the stance of the feet shoulder-width apart and must be as low as possible, then the ball is pushed as hard as possible towards the goal using a stick (Subijana et al., 2011). The result of the push can create a goal if the push has good power and also the positioning of the shot is far from the reach of the goalkeeper (McGinnis, 2013). The success of the players in doing the shooting push technique is the result of hard training and repeated drills carried out by the athletes (FIH, 2019). On the other hand, there are several physical condition factors that affect the success of the shooting push technique in order to obtain strong and precise shots (Arqom, 2016).

Physical condition is one of the things that is very much needed and is said to be an important requirement for success in the world of sports (Saputra & Indra, 2019). Regarding physical condition, there are 10 physical components, namely strength, endurance, muscular power, speed, coordination, flexibility, agility, balance, accuracy, reaction. Physical condition is something that cannot be broken down both in terms of improvement and maintenance, so an athlete must continue to train physical conditions so that there is no decline in ability. The cause of the decline in the physical ability of an athlete is mostly due to the negligence of the athlete and also the lack of attention from the coach so that there is a decrease in sports achievement both at the national and international level. Based on the facts above, it can be seen that the ability of an athlete is not only in mastering technical skills, but the physical components also need to be improved.

An athlete is said to be in a good physical condition if he is able to carry out physical activities and motion well and does it without feeling too tired. Tests and measurements of the ability of physical conditions are used to determine the condition of the physical status of each person. This test can be carried out both in the laboratory and in the field. The purpose of laboratory checks and field tests is used for truly objective assessments so that the results obtained are accurate, with the aim that the programming of athletes is targeted, effective, and can achieve ideal results for an athlete. Physical conditions can get ideal results if the exercises are carried out in accordance with what is needed and cannot be separated from the guidelines for the basics of training, because improving physical condition is not an easy thing and one must also have a licensed and highly experienced trainer so that he can foster development. athlete's physique continuously.

Physical conditions are related to arm muscle power which affects the ability of a hockey athlete to make shooting movements so that the resulting shot becomes stronger if the athlete's arm muscle power is also strong. Then the grip strength in question is the grip of the hand when holding the stick in the technique of shooting the ball. A strong grip will produce a strong ball push and will affect when to direct the ball to the goal. Furthermore, eye-hand coordination is very necessary as the ultimate goal in doing shooting push, namely to place the ball on the intended target so that the ball is directed according to the desired target depending on the condition of the goalkeeper who keeps the intended target difficult for the goalkeeper to reach the fired ball.

METHODS

The research was carried out in March 2022 at Gor Wergu Kudus Regency, Prima Mijen Futsal Field, and Kartika Kartika Futsal Stadium The research was carried out in March 2022. The population in this study were all male Hockey athletes in Central Java in each district/city that active as many as 70 people. The method used in this research is descriptive quantitative research method with data analysis technique using exploratory factor analysis design.

RESULT AND DISCUSSION

Table 1 Data Description

Data	N	Min	Max	Sum	Mean	Std. Dev
Arm Muscle Power	70	3,65	5,15	325,50	4,6500	,37619
Grasping Strength	70	38,30	50,85	2989,30	42,7043	2,66149
Hand Eye Coordination	70	10,00	18,00	985,00	14,0714	2,16909
Shooting Push	70	13,00	21,00	1196,00	17,0857	1,93175
Valid N	70					

A. Result of data description
   1. Arm Muscle Power
      Based on the results of research data from the measurement of arm muscle power with a sample of 70 Central Java Hockey athletes, the average data for arm muscle power was 4.65 with a standard deviation of 0.3762, the highest score on arm muscle power was 5.15 and lowest score 3.65.
   2. Grasping Strength

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Based on the results of research data from the results of measuring gripping strength with a sample of 70 Central Java Hockey athletes, the average data for grip strength was 42.735 with a standard deviation of 2.5482, the highest score on grip strength was 50.85 and the lowest score was 38.3.

3. Hand Eye Coordination
Based on the results of research data from the results of eye-hand coordination measurements with a sample of 70 Central Java Hockey athletes, the average data for eye-hand coordination was 14.1571 with a standard deviation of 2.1911, the highest score on eye-hand coordination was 18 and the lowest score 10.

4. Shooting Push Results
Based on the research data from shooting push measurements with a sample of 70 Central Java Hockey athletes, the average shooting push data obtained was 17.0857 with a standard deviation of 1.9318, the highest score at shooting push was 21 and the lowest score was 13.

B. Data Normality Test

Normality test is used to determine whether the data obtained from each variable is normally distributed or not. The normality test of the data in this study used the SPSS 23.0 application using the one sample Kolmogorov-Smirnov test. The assumption is that if the significance of p is greater than 0.05 ($p>0.05$), then the data will be said to be normally distributed, and vice versa if p is less than 0.05 ($p<0.05$), then the data will be said to be not distributed. normal.

Table 2. Normality test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		70
Normal Parameters[a,b]	Mean	,0000000
	Std. Deviation	1,59915636
Most Extreme Differences	Absolute	,065
	Positive	,042
	Negative	-,065
Test Statistic		,065
Asymp. Sig. (2-tailed)		**,200[c,d]**

The results of the Kolmogorov-Smirnov one sample normality test using the SPSS application are known as the Asymp value. Sig (2-tailed) or p value = 0.200 so that p> 0.05 which means the hypothesis is accepted and the overall data of the variables are normally distributed.

C. Factor Analysis Test Results

Table 3. Invalid Anti Image Matrices

Arm Muscle Power	-,238	,075	-,157	,671[a]	,077	,029
Grasping Strength	-,183	,255	-,016	,077	,330[a]	-,116
Hand Eye Coordination	,012	-,052	,089	,029	-,116	,518a

The table above shows that the gripping strength only gets 0.330 and for other variables gets a score above 0.5, because the number of gripping strength that appears below the requirement of 0.5 then the gripping strength is not included in the factor analysis because it does not meet the requirements of the analysis. factor. So that the factor analysis must be repeated again by eliminating the grip strength variable.

D. Hypothesis Test

Table 4. Rotated Component Matrix

	Component	
	1	2
Arm Muscle Power	**,830**	,130
Hand Eye Coordination	-,142	**,834**

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Dominant physical condition factor that determines indoor push hockey shooting ability:

1. Variable physical condition Arm muscle power can determine indoor push hockey shooting ability
   This hypothesis aims to test the truth of whether arm muscle power can determine indoor push hockey shooting ability. Based on the results of factor analysis, the correlation value of the variable in factor 1 is 0.830 and factor 2 is 0.130, because the correlation value of factor 1 > factor 2, the arm muscle power variable belongs to the factor group 1. Factor 1 is the dominant factor.

2. Variable physical condition of grip strength can determine indoor push hockey shooting ability
   This hypothesis aims to test the truth of whether grip strength can determine indoor push hockey shooting ability. Based on the results of the factor analysis, the gripping strength variable is not included in all factors, because from the results of the factor analysis there is a variable that in the second stage of factor analysis, namely the anti-image matrix, gripping strength only gets a matrix number of 0.330 and does not meet the matrix number requirements to proceed to the next stage because it has matrix value is below 0.5, so the analysis must be repeated by eliminating variables that do not meet the requirements.

3. Variable physical condition eye-hand coordination can determine indoor push hockey shooting ability
   This hypothesis aims to test the truth of whether eye-hand coordination can determine indoor push hockey shooting ability. Based on the results of factor analysis, the correlation value of the variables in factor 1 is -0.142 and factor 2 is 0.834, because the correlation value of factor 1 < factor 2, the variable belongs to the group of factor 2. Factor 2 is a supporting factor

CONCLUSION

So it can be concluded that the physical condition factor with the arm muscle power variable is the most dominant factor in the shooting push ability with a correlation number of 0.830, so the greater the arm muscle power is very important for hockey players to have, so that the shot is not easily blocked by the goalkeeper.

REFERENCES

1) Anders, E., & Myers, S. (2008). *Field hockey: Steps to success*. Human Kinetics.
2) Arqom, M. Z. (2016). *Hubungan Kekuatan Otot Lengan dan Panjang Lengan dengan Hasil Push Permainan Hoki Indoor Pada Mahasiswa Putra Penjaskesrek Angkatan 2014 Universitas Lampung*. Universitas Lampung.
3) de Subijana, C. L., Juárez, D., Mallo, J., & Navarro, E. (2011). The application of biomechanics to penalty corner drag-flick training: a case study. *Journal of Sports Science & Medicine*, *10*(3), 590.
4) FIH. (2019). Rules Of Indoor Hockey. *The International Hockey Federation*, *October 2019*, 67.
5) Kardiawan, H., & Kusuma, A. (2014). Pembentukan dan Pembinaan Kondisi Fisik. *Bali: Graha Ilmu*.
6) McGinnis, P. M. (2013). *Biomechanics of sport and exercise*. Human Kinetics.
7) Putra, M. S., & Imam Solikin. (2020). Implementasi Aplikasi Pengukuran Kondisi Fisik Pemain Sepak Bola Berbasis Web Mobile. *IT Journal Research and Development*, *5*(2), 135–146. https://doi.org/10.25299/itjrd.2021.vol5(2).5281
8) Saputra, B. A., & Indra, E. N. (2019). Profil Kondisi Fisik Atlet Sepatu Roda Daerah Istimewa Yogyakarta. *Medikora*, *18*(2), 70–78. https://doi.org/10.21831/medikora.v18i2.29199
9) Sutanto, T. (2020). Buku Pintar Olahraga. In *Yogyakarta: Pustaka Baru Presss*. Yogyakarta: Pustaka Baru Press.
10) Syahruddin, Saleh, M. S., Saleh, M. S., & Rahman, A. (2020). Permainan Hockey Ruangan. *Jurnal Kepelatihan Olahraga*, 343–346.
11) Utomo, E. P., Kusnanik, N. W., & Fuad, Y. (2019). Analysis of Biomechanics Slap Hit and Push in The Field Hockey. *2nd International Conference on Sports Sciences and Health 2018 (2nd ICSSH 2018)*, 17–21.
12) Yudianti, M. N. (2016). Profil Tingkat Kebugaran Jasmani (Vo2Max) Atlet Hockey (Field) Putri Sman 1 Kedungwaru Tulungagung. *Jurnal Kesehatan Olahraga*, *4*(2), 120–126.