The Anthropometry and Physical Factors in Determining Drive Blowing Skills in *Squash* Game to the Students at Faculty of Sport Science UNIMED

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Abstract. This study used correlational methods, for the design the writer used confirmatory factor analysis. Data was processed through: (a) Analysis of multivariate statistical factors by using Statistical Product and Service Solutions (SPSS) version 20 software therefore it can be reduced to be some factors. (b) Calculating the average deviation value of each factor in the latent variable and the dependent variable. (c) Describing the value and the position of the average score of the dominant variable in the transformation of *matrix importance-performance.* To conclude, the factors of anthropometry and physical (latent variables ξ1) determining the blowing drive skills in squash game can be measured by the indicator of variables such as weight (0.888 and 0.855), height (0.877 and 0.854), leg length (0.451 and 0.375) , grip strength (0.719 and 0.670), flexibility (0.432 and 0.335), hand-eye coordination (0.546 and 0.539), leg muscle power (0.765 and 0.750), agility (0.789 and 0, 783), speed (0.8158 and 0.816)) and cardiovascular endurance (0.754 and 0.715) that will benefit the students of the faculty of sport science UNM to increase their *drive* blowing skills in *squash* game.

Keywords: Anthropometry, Physical, *Drive* blowing skills and squash game

1 Introduction

1.1 Research background

To improve the students' achievements in squash sports, students should master some basic technical skills in playing squash. Some of the basic techniques are punch drives, servicing, volleyball, boast, lob, drop-shot, etc. Those are supported by physical conditions.

One of the indications in developing the students' achievements of sports is physical formation and the aspect of athletes' anthropometry. The formation of physical elements are to create suitable *squash* players with the demands of the *squash* match criteria. Exactly, it cannot be separated from the training process which is expected to excogitate the professional athlete. Mochamad Sajoto (1995: 11) said that "The aspect of achieving appreciation in sports is the biological aspect that includes the structure and posture of the body, namely the height and length of legs, size, width and weight, and somatotype (body shape)".

To develop squash sport skills, students have to master some basic technical skills in playing squash. Some of the basic techniques are punch drive, service, volleyball, boast, lob, drop-shot and so on. Mastering the some basic technical skills students must be trained in a continuous training program.

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A *squash* player should know some ways in mastering basic technical of *drive* blowing skills in playing *squash*. One of them are to control the blow so that the player can direct ball to an empty corner of the field where the opponent has difficulty in reaching the ball. One of the tricks in getting score is to place and direct the ball from the front wall, then it will fall in the corner between the side wall and the floor, so that the ball does not bounce again and it cannot be struck by the opponent. There are many methods that have been applied in order to develop the technique of blowing *drive.* However, many players still haven't realized the right way that can produce good blowing *drive.*

2 Literature review

2.1 History of the squash game

The *Squash* sports actually had been existed in the 19th century, in the Fleet Prison area of London, taken form (http://ggo-blog.blogspot.com/2013/11/ sejarah-dan-cara-bermain-*squash*.html). According to Hanlon (2009: 226) the popularity of squash has been spread to various countries and it had been played by 15 million people worldwide, and almost every country has the *squash* courts. Recently, the game has been extremely popular in South America, Eastern Europe, and the United States.

Although the *squash* game was invented and discovered in England, the United States was primarily established the the first *squash* association in 1907 under the name of the United States Squash Racquets Association. In fact, in its origin country England, *squash* was originally a branch of field tennis. Back then, *Squash* was just established in England in 1928 under the name Squash Rackets Association. Since that year, England has always held *squash* tournaments under the name of the British Open. Britain had brought the sport to all over parts of the world too, especially during colonialism.

In Indonesia, *squash* sports have actually been known at the end of the World War II, precisely in 1948. The British Army first built a *squash* field in Indonesia located in Embong Sawo Surabaya. The red thread of the history of *squash* development began to be inscribed by an Indonesian named Bambang Gatot Subroto. At that time Bambang often watched *squash* matches because he worked in a star-rated hotel in Jakarta. He was offered to learn *squash* in Pakistan.

2.2 The factors of anthropometry and physical

2.2.1 The factor of anthropometry in playing *squash*

Antrhopometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. The word "anthropometry" comes from the Greek word "anthropo" which means human and "metron" which means size. Anthropometry includes various measurements of the human body. Body weight, height, body posture, length, skin fold thickness, circumference (head, chest, waist, legs, etc.), length of limbs (arms, legs).

In general, there are 3 human shapes and structures can be described: (1) endomorph, (2) mesomorph, and (3) ectomorph. Every human body is formed from various levels of them.

2.3 The factor of physical in playing *squash*

Djoko Pekik I, 2002: 65) suggests that a good physical condition has many advantages, it includes that the athletes are able and easy to learn skills that are relatively difficult, the athletes are not easily get tired during training or matches, training programs can be completed without having any obstacles and can complete heavy training.

Physical factors that are suitable for the characteristics of *squash*, as follows;

(1) Flexibility

Flexibility means yaitu broad motion of one joint or several joints. There are two kinds flexibility, such as (1) static flexibility, and (2) dynamic flexibility.

(2) Endurability

Endurance is the body's ability or parts of the body that work in a certain time which is influenced by the work ability of the cardiorespiratory work system. Endurance is often defined as the ability to build the muscles to be active for a long time.

(3) Speed

Speed is a component of the physical condition needed in every sport. Speed is a crucial physical component in any kinds of sports, because it is included in elements of basic physical conditions besides strength (strength) and endurance.

(4) Power of Arm Muscles

The formula used in explosive power is: power/muscle explosive power = work/ time = strength x mileage.

Power is divided into2 (two), namely:

a) Explosive power; this power is used to overcome lower resistance, but it used with the maximum of explosive power acceleration.

It is frequently used to do one movement or one test (long jump, throwing discs, etc.).

b). Fast motion strength; this movement is carried out to against the resistance with an acceleration below the maximum, it is used for repetitive movements, such as running, riding, etc.

2.4 Hand- eye coordination

Harsono (2001: 39) defined that coordination is the ability to integrate various kinds of movements into one or more specific motion patterns.

2.5 Research hypothesis

The research hypothesis can be formulated as follows; 1) The anthropometry factors of height, weight, and leg length determine blowing drive skills in squash game. 2) The Physical factors strength of grip, flexibility, endurance, speed, arm muscle power, leg muscle power, hand-eye coordination and cardiovascular endurance determine the blowing drive skills in *squash* game.

3 Research design

3.1 Research method

In this study, the writer used the correlational research with a confirmatory factor analysis design that ensures the relationship of indicator variables with latent variables that determine the blowing *drive* skills. The data was analyzed through; a) The analysis of multivariate statistical factor analysis using SPSS computerized software that can be reduced to be just

some factors; b) The calculation of the average deviation of each factor in the latent variable and the dependent variable.

The research design can be seen in the following figure. Statistical Analysis Factor

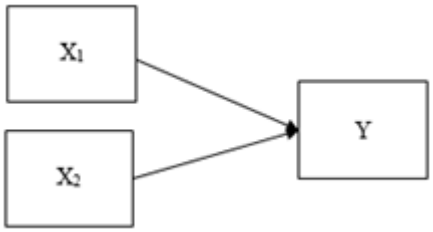

Figure.1. Research Design

3.2 Technique of data collection

Measurement of: 1) anthropometry a) measurement a) height, b) body weight and c) leg length, 2) physical components namely a) grip strength; b) balance; c) flexibility; d) hand-eye coordination, e) leg power (vertical jump); f) agility; g) speed; cardiovascular endurance; 3) blow *drive* includes; (a) initial position; (b) the implementation of the movement; and (c) final position.

3.3 Technique of data analysis

The data was analysed by using descriptive frequency test, simple correlation test, and multiple correlation test along with KMO-MSA (Kaiser-Meyer-Olkin and Measured of Sampling Adequacy); Anti-image correlation test; initial engine value; Communalities; Component matrix and Component score coefficient matrix. Furthermore, in statistical factor analysis the writer used the SPSS program 23.00 statistical assistance test.

4 Result and discussion

4.1 Research result

The research result can be seen in the tabel 1, as follows:

Table 1. Research Result

Variable	Initial	Extraction
Body Weight (X1)	1.000	855
Body Height (X2)	1.000	854
Limb Length (X3)	1.000	375
Grip Strength (X4)	1.000	670
Balance (X5)	1.000	783
Flexcibility (X6)	1.000	335
Hand Eye Coordination (X7)	1.000	539
Leg Muscle Power (X8)	1.000	750
Agility Running Back And Forth (X9)	1.000	783
Speed (X10)	1.000	816
Durability (X11)	1.000	715

From table above, it can be seen the initial value and the extraction value. The initial value reflects the role or deviation, if the variable determines the individual factors in forming these factors, while the results of the communalities for each variable are found in the extraction column. Extraction values explain the percentage of roles or the deviation of each dimension or sub-variable making up the factors individually to factors. This also means that the numbers in the extraction column show the percentage of rotated component matrix. From the table above it is known that the role of the largest dimension is the sub-variable weight, with a value of 0.855 or 85.5% and the smallest is flexibility with a value of 0.335 or 33.5%. Then to find out the deviation of each variable in each component, it is necessary to do a rotation process that produces the Matrix component as above. The results of Rotated Component Matrixa Anthropometry Factor Analysis and Determining Physical *Drive* skills in the *squash* game in Table 2, shown as below;

Table 2. Rotated Component Materix [4]

	Component		
	1	2	3
Body Weight (X1)	-.018	.918	.110
Body Height (X2)	-.116	.907	.130
Limb Length (X3)	.336	.447	-.250
Grip Strength (X4)	.813	-.085	.029
Balance (X5)	.183	-.126	-.225
Flexcibility (X6)	.507	-.156	.230
Hand Eye Coordination (X7)	.549	.460	.159
Leg Muscle Power (X8)	.836	.135	.180
Agility Running Back And Forth (X9)	-.845	-.128	-.228
Speed (X10)	-.137	-.085	-.889
Durability (X11)	.397	.106	.739

Based on the results of Rotated Component Matrixa Analysis of anthropometry factors and physical analysis factor of blowing *drive* skills in squash game, it showed that all the factor components have a value of ≥ 0.5. In other words, it means that the dimensions of the anthropometry and physical factors which consist of strength grip, flexibility, hand-eye coordination, leg muscle power, speed, and cardiovascular endurance that determine the blowing *drive* in squash game.

4.2 Discussion

Based on the results of hypothesis test about the analysis of anthropometry factors ($\xi 1$) and physical analysis factors ($\xi 2$) in determining the blowing *drive* skills above in playing squash game. There was one anthropometric and physical variable that is eliminated from the dominant analysis factor or (H0 is rejected) because it has an MSA value below 0,5 is balance (0.397) while anthropometric and physical factors that determine the blowing *drive* skills in squash games (H0 is accepted) or it has a component value factor of ≥ 0.5

1) Body weight with the value of the factor that determines the blowing *drive* skill is 0.855

2) Height with the value of the factor component that determines the blowing *drive* skill is 0.854

3) Leg length with the component value factor that determines the blowing drive skill is 0.375

4) Grip strength with the value of the factor component that determines the blowing drive skill is 0.670

5) Balance with the value of the factor component that determines the blowing drive skill in the squash game is 0.783

6) Flexibility with the value of the factor component that determines the blowing drive skill in squash games is 0.335

7) Hand eye coordination with the component value factor that determines the blowing drive skill in the squash game is 0, 395

8) Power of leg muscles with the value of the factor component that determines the blowing drive skill in a squash game is 0.750

9) Speed with the value of the component factor that determines the blowing drive skill in squash games is 0.816.

10) Cardiovascular endurance with the value of the component factors that determines the blowing drive skill in squash games is 0.715

The results of this study illustrated that the anthropometric and physical factors that determine blowing drive skills in squash games were weight, height, leg length, grip strength, flexibility, hand-eye coordination, leg muscle power, cardiovascular speed and endurance.

From the results of data analysis and the explanation above, it is known that there is one variable that has a small or less dominant value contribution. So, it must be eliminated, namely balance. Balance is eliminated because the balance biomechanically does not have a close relationship with skills, or in this case specifically tennis the field of explanation that acceptable is a balance. The balance is the asset of the UNIMED student's blowing drive skills in the squash game so during the long-term training process the balance of students' blowing drive skills. As a result the UNIMED student will play squash games relatively constant or static, unlike grip flexibility or strength, which later on growth and improve both quality and function

The results of factor analysis in this study were calculated using the KMO and Bartlett's Test method with SPSS computerized statistical software which is supported by a theoretical basis, from the explanation and analysis of the data that has been done then obtained the anthropometric and physical factor variables determining blowing drive skills in squash games consisting of 8 (eight) indicator variables. The results of the factor analysis statistical test of all variables are as follows:

a. The dominant anthropometric factor in determining blowing drive skills in squash games is body weight, height and leg length. While the physical factors that determine blowing drive skills in squash games are the strength of grip, flexibility, hand eye coordination, leg muscle power, speed, and cardiovascular endurance. After data collection and further analysis of the data in the sample, it can be stated that the blowing drive skills in the squash game of student blowing drive skills in UNIMED student squash games are formed or influenced by weight, height, leg length, grip strength, flexibility, hand-eye coordination, leg muscle power, agility, speed and cardiovascular endurance. The ten independent variables have a positive correlation value and are above ≥ 0.5 based on the value of rotated component matrixes. Then it can be concluded that the greater value of rotated component matrix than the

independent variables will be more beneficial for students to increase the skill of the drive-in squash game.

b. Anthropometry and physical factors that have a low or less dominant correlation value in determining blowing drive skills in squash games are balance. This can be seen in the Anti-Image matrices correlation table 5.5, in the table there is one variable with MSA values below 0.50 is equilibrium (0.397), thus these factors must be eliminated or excluded from further analysis tests because they do not have sufficient values for further testing.

5 Conclusion

The conclusion of the research presented was based on the results of tabulated data for descriptive frequency testing and simple correlation test and multiple correlation test using KMO-MSA (Kaiser-Meyer-Olkin and Measure of Sampling Adequacy); Anti-image correlation test; initial enginevalue; Communalities; Component matrix and Component score coefient matrix.

5.1 Conclusion

Anthropometry and physical factors (latent variable ξ1) that determine the blowing drive skills in squash games can be measured by the indicator variables weight (0.888 and 0.855), height (0.877 and 0.854), leg length (0.451 and 0.375), grip strength (0.719 and 0.670), flexibility (0.432 and 0.335), hand eye coordination (0.546 and 0.539), leg muscle power (0.765 and 0.750), agility (0.789 and 0, 783), speed (0.8158 and 0.816) and cardiovascular endurance (0.754 and 0.715) will benefit students in increasing blowing drive skills.

5.2 Suggestion

Suggestions to the teachers / squash coaches to choose the professional athletes who will be athletes must always consider the elements of anthropometry and physical especially weight, height, leg length, grip strength, balance, flexibility, hand eye coordination, leg muscle power, speed, agility and

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