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BIOMOTOR AND PSYCHOMOTOR DOMINANT FACTORS ANALYSIS DETERMINANTS OF TENNIS GROUNDSTROKE FOREHAND ABILITY ON TENNIS ACHIEVEMENT COACHING OF STUDENTS OF FKIP UNIVERSITAS SEBELAS MARET, INDONESIA

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Abstract:
The purpose of study is to find out the dominant factors of biomotor and psychomotor determining tennis groundstroke forehand ability. The research methods were using a quantitative approach and confirmatory factor analysis design. The data collection was processed and analyzed by using Statistical Program Computerized system with SPSS (Statistical Product and Service Solutions) Version 23 and try-out Kaiser-Meyer-Olkin and Bartlett's Test. The population in this study was 40 students of coaching achievement tennis FKIP UNS Surakarta. The sampling technique was purposive sampling. Data collection techniques applied the test and measurement. The results of study as follows: biomotor and psychomotor factors that determine the tennis ability of forehand groundstrokes on having components value factor ≥ |0,5| is: grip strength with the factors component value of (0.84), flexibility with the factors component value of (0.34), limb muscle power by the factors component value of (0.82), speed with the factors component value of (0.91), cardiovascular endurance the factors component value of (0.79), hand-eye coordination with the factors component value of (0.50), agility with the factors component value of (0.79). The conclusion of study as follows: biomotor and psychomotor were the most dominant factors determining the forehand groundstrokes ability. Biomotor factors are the speed with the value (0.91) and psychomotor factors are the agility with the value (0.79).

Keywords: biomotor, psychomotor, tennis forehand groundstrokes ability

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1. Introduction

Sport is an activity always done by the society, its existence is no longer taken for granted but has become part of people's lives. Sports according Giriwijoyo (2007: 31), is a series of regular exercise motion and planned by people consciously to improve functional ability. Society exercise with a variety of purposes including: to the relation of co-workers, for health, gather with old friends, spending leisure time, education, to the coaching aspect of achievement.

Tennis is a sport game of the Greek state. Tennis are known by people in Indonesia since the Dutch colonial era in the early 20th century before PELTI (Persatuan Tenis Lapangan Seluruh Indonesia) was established, tennis association has been established under the name De Algemen Neederlansche Tennis Bound or ANILTB founded the Dutch. Along with the development and advancement of age, tennis is growing rapidly in Indonesia. According Mulyono B. (1999: 16) one of the reasons the game of tennis increasing enthusiasts is, "*can be played by all age levels provided they are strong enough and does not have a particular type of disease that is forbidden by doctors to exercise tennis*".

In any sport, both sports which are an individual, team or sport games is largely determined by factors that determining the success the sport both intrinsic (of the body) or extrinsic (of the surrounding environment). These factors include: factors techniques, tactics, mental, biomotor (physical), psychomotor, anthropometry, motivation, nutrition, genetics and others.

Psychomotor domain is regarding the behavior or control body movement. While the physical domain or biomotor regarding the physical working capacity. Between biomotor and psychomotor domains actually almost the same, these two are inseparable but distinguishable merely because they are both always going to work simultaneously. The two are conceptually different. Biomotor domain respects to the physical work capacity. Biomotor capability is the ability of motion in humans that are affected by organ system in the human being, namely: the neuromuscular system (nerves), gastrointestinal, respiratory, circulatory, bones, and joints. All biomotor quality is greatly needed to support or provide ease of learning process of the motion that would be applied to various sports. Biomotor and psychomotor plays a very important to maintain or improve the degree of physical fitness (physical fitness). The degree of one's physical fitness is very decisive of physical ability to carry out everyday charges. In other word, the higher degree of physical fitness so is the physical work ability. In other words, their work becomes more productive if the physical fitness more

increased. Biomotor and psychomotor exercises is a staple in the program of coaching athletes to excel in the sport.

Athletes who have the good biomotor and psychomotor level will be avoided injury. The exercising physical condition program needs to be planned systematically. The aim is to improve biomotor and psychomotor. Physical condition training process be done carefully and repeatedly will increase biomotor and psychomotor. This causes a person getting a skilled, powerful and efficient in performing movements. An athlete who followed an exercise program of intensive physical condition for 6-8 weeks before the season would have the strength, flexibility and endurance were much better during the season. The development of the best physical condition also helps an athlete to able to keep up the next exercise in order to achieve the highest achievement.

Groundstroke forehand s is one of the basic techniques of stroke with an important role in the game of tennis. Because of groundstroke forehand, is the only stroke that at least half of all strokes were available, and can be used for offense and defense in the game of tennis. Honm atc all (1988: 146) mentions that Groundstroke is a kind of blow that have a high enough presentations to get the numbers in tennis, even 47% Groundstroke techniques performed during the game. Based on that argument, it is clear that the technique can stroke the biggest contribution in every tennis stroke technique in comparison with others.

2. Material and Method

This research is using quantitative approach with Analysis Factor Confirmation method. Analysis factor is one of the multi-variant statistic methods which explain the relation between the numbers of alterations that interdependent between one to another with the result that can be made one or more some alterations than the number of first alteration. Analysis factor used for reveal the dominant factors to explain the most influenced variable. Population and sample in this research is all of the students of achievement tennis coach at Teacher Training and Education Faculty of Sebelas Maret University with 40 students. Technique of sample collection is purposive sampling. Type of this research is using co-relational research with analysis program of factor confirmation, which is confirming the relation between the indicator variable and latent variable that determine the ability of groundstroke forehand.

3. Results and Discussions

The result of the instrument ability method of groundstroke forehand of the tennis students from analysis results confirmatory factor analysis can be state as follows:

1) There are 2 factors from the result of extraction that has bigger Eigen value from (Eigen value >1) both of the factors are factor: F1, F2.

   F1: Include 4 measured variables: X1, X2, X3, X7, X8

   F2: Include 2 measured variables: X4, X5

The model that can be make from the result of analysis factor after rotation with observe the variables that has big loading as follows (source of the result of varimax rotation):

F1 = 0.843 X1 + 0.343 X2+ 0.822 + 0.503 X7 - 0.792 X8

F2 = - 0.910 X4 + 0.797 X5

Both of the factors that successful extracted is the dimensions of the ability of groundstroke forehand in detail, both of the dimensions and measured variable is completed with dimension naming (factor) can be seen in the table 2 as follows:

The results of the statistical test analysis bio-motor dominant factor in determining the ability of a forehand groundstroke is the speed with component values 0.91.Then, factor of psychomotor factors that determine the ability forehand groundstroke is agility of value component factor of 0.79.

Table 1: The Results Descriptive Analysis Data of Biomotor and Psychomotor Factor Determination of Tennis g*roundstroke forehand* Ability

Research Variable	Sample	Test Result				
		Total	Mean	Max	Min	St. Dev.
The Power Grip	40	1800.20	45.00	58.30	30.10	5.78
Flexibility		635	15.88	19	10	1.97
Limb Muscle Power		1914	47.85	60	31	7.54
Speed		400.08	10.00	11.20	8.09	.72
Cardiovascular Endurance		1417.50	35.43	44.50	31.00	2.67
Balance		331	8.28	10	7	.960
Hand Eye Coordination		327	8.18	10	7	.931
Agility		177.53	4.43	5.39	3.05	.53
Groundstroke Forehand Ability		1231.00	30.7750	33.50	28.00	1.46301

Table 2: The results of analysis determining factors biomotor and psychomotor of tennis forehand groundstrokes ability

	Component	
	1	**2**
The Power Grip	.843	-.054
Flexibility	.343	.321
Limb Muscle Power	.822	.236
Speed	-.075	-.910
Cardiovascular Endurance	.265	.797
Hand Eye Coordination	.503	.279
Agility	-.795	-.317

The hypothesis testing is basically a step to test or find out the truth if the null hypothesis (H_0) filed on significant level/ extent certain confidence was rejected and the alternative hypothesis (H_a) is accepted, or otherwise the null hypothesis (H_0) is received and the alternative hypothesis (H_a) is rejected .In this study, the hypothesis is obtained by looking at the value of the count results Anti-image Correlation Matrices and rotated matrix[a] component. Based on the hypothesis above and statistical calculation factor analysis, the hypothesis test results of this study are:

A. Factors biomotor grip strength, flexibility, limb muscle power, speed, endurance cardiovascular determines the tennis groundstrokes forehand ability.

a) The strength of the grip determines the tennis groundstrokes forehand ability

Based on the anti-image matrices correlation contained in table 4.5 of factors grip strength has a value of 0.695 or> 0.5 with communalities values in Table 4.8 amounted to 0.714, which means the percentage of grip strength has a role to a factor of 71% and the value of rotated component matrix 0.84 which means that grip strength is a member of the deciding factors biomotor and psychomotor abilities forehand groundstrokes (H1 accepted)

b) Flexibility determines the tennis groundstrokes forehand ability

Based on the anti-image matrices correlation contained in table 4.5 of flexibility factor has a value of 0.685 or> 0.5 with communalities values in Table 4.8 amounted to 0.220 which means that flexibility has a role to factor percentage at 22% and rotated component matrix value of 0, 34 which means that flexibility is a member of the factors that determine biomotor and psychomotor groundstrokes forehand abilities (H2 accepted).

c) Power limb muscles determines the tennis groundstrokes forehand ability

Based on the anti-image matrices correlation contained in table 4.5 of leg muscle power factor has a value of 0.802 or > 0.5 with communalities values in Table 4.8 amounted to

0.731 which means the limb muscle power has a role to factor percentage at 73% and the value of rotated component matrix of 0.82 which means the limb muscle power is a member of the factors that determine the ability biomotor groundstrokes forehand (H3 accepted).

d) Speed determines the tennis groundstrokes forehand ability

Based on the anti-image matrices correlation contained in table 4.5 the speed factor has a value of 0.801 or> 0.5 with communalities values in Table 4.8 amounted to 0,833, which means the percentage of speed has a role to a factor of 83% and rotated component matrix value of 0, 91 which means that speed is a member of the factors that determine the ability biomotor groundstrokes forehand (H4 accepted).

e) Cardiovascular endurance determines the tennis groundstrokes forehand ability

Based on the value of anti-image matrices correlation contained in table 4.5 of factors cardiovascular endurance has a value of 0.687 or> 0.5 with communalities values in Table 4.8 amounted to 0.705, which means the percentage of cardiovascular endurance has a role to a factor of 70% and the value of rotated component matrix at 0.79 which means that cardiovascular endurance a member of the factors that determine the ability biomotor groundstrokes forehand (H5 accepted)

B. Psychomotor balance factor, hand-eye coordination, agility determines the tennis groundstrokes forehand ability.

a) The balance determines the tennis groundstrokes forehand ability

Based on anti-image matrices correlation contained in table 4.5 the balance factor has a value of 0.375 or <0.5 and therefore is not eligible to be a balance members and the factors to be eliminated from further analysis, which means that the hypothesis is rejected (H6 rejected).

b) Hand-eye coordination determines the tennis groundstrokes forehand ability

Based on the anti-image matrices correlation contained in table 4.5 of factors Coordinating hand-eye has a value of 0.707 or> 0.5 with communalities values in Table 4.8 amounted to 0.331, which means hand-eye coordination role for factors have a percentage of 33% and the value of rotated component matrix of 0.50 which means hand-eye coordination is a member of the factors that determine the ability biomotor groundstrokes forehand (H7 accepted).

c) Agility determines the ability tennis forehand groundstrokes

Based on the anti-image matrices correlations contain in table 4.5. Factors agility has a value of 0.640 or > 0.5 with communalities values in table 4.6 amounted to 0.733 percent, which means the speed has a role to a factor of 73% and rotated component matrix

value of 0, 79 which means agility eligible to be a member of the factors that determine the ability of biomotor forehand groundstroke (H8 accepted).

Based on the result of hypothesis examination of analysis factor biomotor and psychomotor which determines the ability of tennis groundstroke forehand above found a variable psychomotor that must be eliminated from factor analysis dominant or ($H_{0\ rejected}$) because has value MSA under 0,5 is balance (0,375). Then, factor biomotor and psychomotor determine tennis groundstroke forehand ability ($H_{0\ accepted}$) or has factor component value ≥ 0,5 as follows:

1. The power grip with component values a factor of 0.84;
2. Flexibility with component values a factor of 0:34;
3. Power leg muscles with component values a factor of 0.82;
4. Free with component values a factor of 0.91;
5. Cardiovascular endurance with component values a factor of 0.79;
6. Coordination hand eye with component values a factor of 0:50;
7. Agility with component values a factor of 0.79.

4. Recommendations

Biomotor and psychomotor factors contribute in determining the ability of forehand groundstrokes. Based on the conclusions already taken, it can be argued implications in an effort to improve forehand groundstrokes, capable of utilizing biomotor and psychomotor factors namely grip strength, balance, flexibility, hand-eye coordination, limb muscle power, speed, agility and cardiovascular endurance. The implications could be developed then into practical implications which can be either an attempt or effort tangible in order to achievement in the tennis sport can be optimized. Biomotor and psychomotor factors has been explained in the research results are expected to be a benchmark in tennis sports coaching, so it will have an impact on the opening up the coach insight to the importance of improving the quality biomotor and psychomotor of tennis player by supported systematic and planned training program, in order to reckon all the psychological and biological effects results of coaching.

5. Conclusions

1. The most dominant biomotor factor determinate in tennis groundstroke forehand ability is speed with a value of 0.91.

2. The most dominant psychomotor factor determinate in tennis groundstroke forehand ability is agility with a value of 0.79.

Biomotor and psychomotor factors has been explained in the research results are expected to be a benchmark in tennis sports coaching, so it will have an impact on the opening up the coach insight to the importance of improving the quality biomotor and psychomotor of tennis player by supported systematic and planned training program, in order to reckon all the psychological and biological effects results of coaching.

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