

## THE EFFECT OF MOTOR SKILLS AND VO2 MAX TO THE ACHIEVEMENT IN PLAYING BADMINTON

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The aim of this study is to reveal the effects of motor skills and Vo2Max toward the achievement of playing badminton of athletes of SGS PLN Bandung Badminton Club. The method used in this study is descriptive method with correlational technique. The data processing by using SPSS2 obtained results as follow: 1. Motor skills and Vo2 Max simultaneously have positive effects of 70.10% toward the achievement in playing badminton. Therefore, it can be argued that the better student's motor skills and Vo2 Max the better achievement of beginner male athlete of SGS PLN Badminton Club can get. 2. Motor skills give the effects of 64,80% to the achievement in playing badminton. 3. Vo2 Max capacity gives the effects of 58,5% to the achievement in playing badminton. 4. There are different effects of motor skills and Vo2 Max to the achievement in playing badminton in which motor skills have greater effect on the achievement in playing badminton if compared with the capacity of Vo2 Max on students of SGS PLN Bandung Badminton Club. In connection with that matter, therefore to increase the badminton playing skill the coach should also consider the students' motor skills, further providing ongoing coaching to improve their Vo2 Max gradually.

**Key words:** Playing Achievement, Motor Skills, Vo2 Max, Badminton

### INTRODUCTION

Badminton coaching at an early age is the starting point of coaching, with planned, organized, programmed, systematic and continuous training expected in time namely "Golden Age", the athletes are expected to achieve optimal achievements. For it should not just focus to coach the current outstanding athletes, but not less important is to develop the prospective athletes as early as possible so that at their "golden age" the athletes are able to perform optimally.

Athletes coaching on individual sport games such as badminton needs careful individual management and coaching. To achieve an optimal achievement in playing badminton requires systematic, tiered and ongoing teaching and training processes which are done carefully and continuously since the early age. Thus, it is necessary for gradual and continuous learning including some aspects which can affect their learning developments, such as students' motor skills and Vo2 Max. In order to effectively and efficiently manage the learning process to achieve the goals.

Nowadays, in some badminton clubs, there are many child athletes who has grew and developed or beginners who learn and practice with various purposes, some aims for achievement, health or just to get pleasure only. Yet, they often compete in championship even children who initially join the clubs for fun, due to

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their excellent motor skills, they can develop quickly and even have considerable achievements. This raises the expectations of their parents that someday they will become reliable badminton athletes. On the other hand, there are some children who compete seriously even diligently follow physical exercise but not accompanied by excellent motor skills. Their achievement developments often hindered because of their limited motions and maybe their talents are not in badminton.

Therefore, the fundamental issues that need attention and to be resolved is how to choose children who can follow the appropriate learning for early age badminton athletes that is based on the concepts and theories of learning, and able to explain the learning process to improve badminton playing skills. So it is necessary to review the motor skills aspects. Besides, the students' Vo2 Max condition in order to be able to play badminton without experiencing significant fatigue. Thus it requires an adequate Vo2 Max ability so that the athletes can achieve well.

From the observation of the implementation of the process of learning badminton games at some clubs, it found some problems which still focused on developing their interest in learning or in playing badminton. During this time, it still has not considered the motor skills of their students whereas motor skill is one of the aspects assumed to be able to affect students' skills development.

In order to complete the concept of badminton coaching on male beginner athletes to seize optimal learning achievements. This study is focused on the effects of motor skills and Vo2 Max on the achievements in playing badminton of male beginner students at "SGS PLN Bandung Badminton Club". Subsequently for further examining, in present study, the author proposes some research problems as follow: 1) How great are the effects of motor skills and Vo2 Max simultaneously to the achievements in playing? 2) How great are the effects of motor skills and Vo2 Max to the achievements in playing? 3) How great is the effect of Vo2Max to the achievements in playing? 4) How much is the difference between the effects of motor skills and Vo2 Max to the achievement in playing badminton of students at SGS PLN Bandung Badminton Club?

## **LITERATURE REVIEW**

### **Achievements in Playing Badminton**

Badminton is one of the sports which is very popular and favored by Indonesian people, even across the world. Using racket as a club and shuttlecock as a hit object, it can be played in enclosed or open fields. The field consists of four rectangles marked with lines, divided by a net to separate between one own area and the opponent area. Badminton is very exciting and relatively easy to play, because its racket is relatively light and also as a recreation since it does not need too long exercise.

Many experts have explained about motor skills learning, among of them are Schmidt, Fichman and Oxendine. Their view about motor skills learning have been widely used as references by other experts mostly because of having conceptual representation. According to Schmidt, motor skills learning is a series of process related to training and experience which lead to a relatively permanent change in a person's ability to perform skilled movements. In accordance with the views of Schmidt, Fischman and Oxendine cited by Williams (2012), confirmed that, motion learning as an internal process occurs in the brain's memory system and it cannot be directly observed, therefore they describe motor skills learning is a series of internal process related to training or experience which interprets relatively permanent behavior changes in the form of skilled movement. Based on that view, there are at least three main characteristics to understand motor skills learning, namely: First, motor skills learning is a series of internal process related to the activities of providing training or experience. The learning process or experience is a process which deliberately created to master new knowledge and skills. Such process is developed based on the experiences that the learners ever experienced so that it becomes a source of knowledge and affect the skills. Secondly, due to its internal nature, motor skills learning cannot be observed directly. When the process takes place, brain's memory system accepts some inputs of skill and experience of motion, such inputs then processed, organized, and changed into muscles movement pattern and all changing process take place without being able to be observed directly, except it can only be interpreted of its existence of changes that occur through the performance of its movement. Since that the learning process that occurs is internal. Thirdly, behavioral change that occurs is relatively permanent. The student is considered learning if the change he/she experiences is relatively permanent, which means that the learning achievement obtained may be last relatively longer. Conversely, he/she is not considered learning if the change he/she experiences is temporary and emerged by the process of physical maturity, factors of fatigue, drugs and others. Only through training or experience the relatively permanent change can be obtained, therefore training or experience is important in an attempt to seize the desired achievement. The higher the person's skills to achieve goals desired, then the more skilled that person is. A skilled badminton athlete will perform smash with high percentage of speed, accuracy and precision.

The skills needed in badminton such as: ways of holding racket, standing position, footwork and hitting skills. Ballout (Subarjah, 2014) outlines some basic skills in badminton such as: ways of holding racket, ready position, hitting position, hitting basic, service and footwork. Several badminton basic techniques known are: 1) racket holding, 2) footwork, 3) attitudes and position, 4) hitting position, 5) service, 6) Underhand lob, 7) Overhead lob, 8) Circular overhead lob, 9) Smash, 10) Drop-shot, 11) Netting, 12) return punch, 13) backhand punch, and 14) drive.

While Davis (2009) states that badminton basic skills cover; forehand holding, backhand holding, some basic strokes, service and footwork.

From that opinion, it can be argued that badminton skill is a skill to perform movements with one or several technique in badminton precisely, both in terms of time or situation. Badminton basic skills that need to be learned are classified into some sections, there are: ways of holding racket, standing position, footwork and hit the shuttlecock.

As mentioned before, motor skills learning is a part of learning, therefore the meaning of motor skill learning is basically not different with the meaning of learning in general. The difference adrifts on the suppression material being learned, learning proses and condition, the intensity of the involvement of each elements and the larning achievements.

Achievements in playing badminton is defined as the result obtained by the students when playing badminton.

### **Motor Skills**

Basically every person has different motor skills to each other. According to Wall and Murray (1994), the meaning of motor skills is the capacity of a person's performance to perform motion tasks. While Oxendine (1968) argues that motor skill is an overview of one of the prowess in performing various basic skills and physical activities as a whole. Based on that opinion, it can be argued that motor skills is the capacity of person's performance skill to perform various motor skills and physical activities as a whole, or individual capacity which becomes a determinant of individual achievement potential to perform specific skills.

Magill (2008) then cited Fleishman's opinion which argues that motor skill is a general capacity to perform various motion tasks, or an overview of the prowess in performing various basic skills and activities as a whole. This capacity is a combination of biological and environmental factors. However, biological factor is considered as the major supporter of motor skills. It is revealed from the previous views about biological factor as the major force which supports motor skills. In other words, motor skill is an innate skill to varying degrees in every person, it cannot be changed easily by training and experience, it develops relatively automatic in growth process, relatively durable and underlies the formation of skills.

Based on a brief illustration, it can be concluded that motor skill is an innate skill and a skill that need to be learned, which underlies the performance of several motor skills and physical activities as a whole. Even though innate and environmental factors take effect but innate factor is considered to be the major force which affects motor skill. To see students' motor skills, it is measured by using motor skills test for children of primary school age developed by Arnheim and Sinclair (1980).

**Maximum Oxygen Volume (VO2 Max)**

VO2 max is maximum oxygen volume processed by human body while performing strenuous activities such as sport. VO2 Max is a stage or the level of athlete's body ability which stated in liters per minute or milliliter/minute/kg of weight. In human body, every cell needs oxygen to convert food energy into ATP (Adenosine Triphosphate) which is ready to work, each cell which consume less oxygen is muscle in a resting state. The contracting muscle cell need more ATP. As a result, the muscles that are used on training need more oxygen. Muscle cell needs more oxygen and produces CO2. VO2 Max is the rate of oxygen consumption in maximum aerob metabolism. According to Giriwijoyo (2015) VO2Max is "oxygen uptake during maximum exertion effort". VO2Max stated by Gyton & Hall (1997:134) is "the rate of oxygen consumption in maximum aerob metabolism, supported by working capacity of the heart and lungs." Based on the definition, it can be defined that if students play badminton on the first, second and third game, student will need extra oxygen at the second game if compared with the first game. Likewise in the third game, You will consume more oxygen than at the second game. But in some points, it will not increase anymore. This is the point where the student can measure the maximum oxygen volume their bodies can accept. The performance at the level of CO2Max can only be sustained in a very short time, a maximum of several minutes. For instance in badminton, the moments needed to move as quickly as possible to catch up and hit the shuttlecock is during rally.

Aerobic fitness is defined as maximum capacity to inhale, transport and use the use the oxygen, better measured in laboratory test called Maximum Oxygen Volume (VO2Max). Aerobic fitness score (VO2Max) has been considered as the best way to measure fitness and believed to have relation with health and working and sport achievements. Even though these all are right, another ways to measure fitness has been uttered, and some looks to have relation with durability and performance. Maximum Oxygen Volume or training intensity test, are very related to the activities that last 15 minutes.

A person who has high VO<sub>2</sub>Max can perform more work before getting tired, if compared with people who have low VO2Max. The healthier and higher the physical of health of one person, the more oxygen can be processed within the body. While lungs training will consume more oxygen, which means that the blood circulation is fine, and muscle cell can get more oxygen from capillary blood vessel. Therefore, those who have high VO2Max are those whose physical health is fine in oxygen capacity when doing sport while low VO2Max are those whose physical health is less in oxygen capacity when doing sport. VO2Max is measured in terms of milliliters of oxygen consumed per Kg of weight in each minute.

Based on the description that VO2Max is determined by several factors, VO2 Max skill is the one who can measure how long body endurance can perform

sport, thus whether good or bad the predominance is also affected by body's ability to process oxygen or VO<sub>2</sub> Max skill.

### **The Effect of Motor Skills to the Achievements in Playing Badminton**

The overview of the involvement of motor skills in learning achievement or motor skills performance can be tracked by using measurement such as motor skills test which is in accordance with the subject of the study.

The type of test used in this study is motor skills test for children of primary school age which is intended to measure students' ability to perform motor skills and physical activities as a whole obtained from motion experiences in childhood. The intended motor skill is the component underlying the achievement of badminton skills learning and considered to be affect person's achievement in learning badminton skills.

Generally practitioners utilize motor skills to learn new motion tasks, and predict how much the potential of person will be able to learn and perform some motor skills. Furthermore, Zaichkowsky in Cheffers (2013) states that two main variables that affect motor skills learning, which are environmental factors consist of sub variables of feedback, training condition and individual variables which sum sub variables of perceptual and motor skills. Another figure, Adams, report the achievement of his study that motor skills learning is affected by learning process, individual, situational or environmental variables, motor skills variable, past experiences, training condition and transfer of learning. Furthermore, explained by Bucher and Wust that; another variables that may affect motor skills, are motivation, combination of holistic and partial learning methods, transfer of skills, training condition, feedback, enforcement, and individual differences such as background of socioeconomic, past experiences, motor skills, intelligence and personality.

Some classifications about motor skills based on the objective to determine characteristic main differences from each motor skills. These distinctions can be used by teachers for the benefit of the practical application especially to help facilitating the learning phasing. Magill divides motor skills into three classification systems, which are: (1) open and enclosed motor skills, (2) discreet, serial and continue motor skills, (3) hard and smooth motor skills.

The classification system of open motor skills and enclosed motor skills are based on the interaction between doer and environmental condition, how far the implementation of motor skills affected by environmental condition. Body movement when performing drop shot, smash, defensive clear and drive in badminton for instances, all of them are classified into open skills because the execution of the shot is affected by some factors within the environment itself. The doer does not only wait in one point only to perform shot but should move and act in accordance with speed and direction of the shuttlecock. In other words,

environmental condition is dynamics, changing and hard to predict, therefore achievement and open motor skills are determined by how far a person can adjust his attitude with the changes in environment. Conversely, in enclosed motor skills, the environment is relatively stable and predictable. Almost all kinds of sport skills classified into hard motor skills, among of them are hit the ball in softball, kick the ball in football, javelin throwing in athletics, hit the shuttlecock in badminton. Those movements besides involve the organization of large muscles also demand a lot of exertion and wide space. As for the smooth motor skills conceived as a skill that involves the use of small muscles, performed in limited space and demand accuracy and coordination of eye-hand.

Based on that opinions, it can be argued that motor skills is an internal variable that affects motor skills learning. Three main indicators from another sub-variables are feedback, enforcement and conducive training condition (condition of partial versus holistic training, drill versus problem-solving, distribution versus congested, and others). These three indicators give significant effects to the mastery of motor skills.

The overview of the relationship of motor skills and learning achievement, every skill designed to perform certain tasks, for instance coordination skills of several body parts at the same time should respond some stimulus quickly, and at other times, should respond to another motion stimulus. So each aspect of motor skills demand a series of certain skills and individual uses the combination of their motor skills aspects to perform different motor skills.

Motor skill is an aspect of skill which support the performance of some skilled movement pattern. Movement coordination is very potential to support achievement in sport, and certain specific tasks. Someone's level of coordination motor skills revealed from his achievement of motor skills performance. For instance the coordination of eye-feet is crucial for the success of a kick in football, as well as the success of throwing object to target, perform service, drop shot, drive, netting and smash in badminton is determined by the coordination of eye-hand and feet.

The overview of the relationship of motor skills and learning achievement, every skill designed to perform certain tasks, for instance coordination skills of several body parts at the same time should respond some stimulus quickly, and at other times, should respond to another motion stimulus. So each aspect of motor skills demand a series of certain skills and individual uses the combination of their motor skills aspects to perform different motor skills. However, each motion skills demand a series of certain skills using combination of motor skills aspects to perform different motor skills.

Movement coordination is an aspect of skill that supports the success in sport and certain specific tasks. Someone's level of coordination motor skills revealed from his achievement of motor skills performance. The agility aspect is very supportive the success of motor skills learning, it also need on sport skills such as

footwork in badminton. Balance is needed for the success of the performance of dynamic sport skills such as badminton which demand movement changes abruptly. The velocity is a skill that supports motor skills in badminton.

### **The Effect of VO<sub>2</sub>Max to the Achievement in Playing Badminton**

Badminton has dominant anaerobic characteristic which means it needs a quick and dynamic movement such as: do service shot, lob, dropshot, netting, smash and footwork, so that it needs high VO<sub>2</sub>Max skills to meet the actual demand of badminton. The VO<sub>2</sub>Max skills of each badminton athlete will be tested when they play badminton. One of assessment indicator in VO<sub>2</sub>Max skills or physical fitness of an athlete is his own performance, whether he looks get tired quickly or not so that it contributes to his achievement.

The ability of someone's cardiopulmonary to take oxygen as much or as maximum as possible is referred to VO<sub>2</sub>Max. VO<sub>2</sub>Max is a force or capacity that is very needed in sport activities, because with the capacity of maximum oxygen volume (VO<sub>2</sub>Max) then the oxygen supply pumped by the heart through the blood will act constantly to supply to all over the body as needed by the tissues of the body. So in performing sport activities requires good durability so that oxygen capacity is in a high level to be used at a long period of time. It is important to note that the durability of sport performance depend on the combination of variables related to aerobic metabolism. This is in accordance with the opinion from Pare, Rotella and Clenaghan which was translated by Idan (2005:7) that "maximum aerobic power is the fastest tempo, where someone can use oxygen during sport."

The capacity of VO<sub>2</sub>Max or aerobic capacity is one of the aspects of durability in general. Giriwijoyo (2015) explains that: "The capacity of VO<sub>2</sub>Max is the quality that enable us to perform it continuously and as long as possible, a muscle work of a general nature under aerobic condition. Aerobic work is performed in a condition where the needs of oxygen does not exceed the capacity of maximum consumption, therefore durability has a very close relationship with maximum oxygen consumption and physical work.

If we look closer and based on the above opinions, then the capacity of VO<sub>2</sub>Max is closely related with physical fitness and durability in general within an athlete who is able to cope with his workload with good performance.

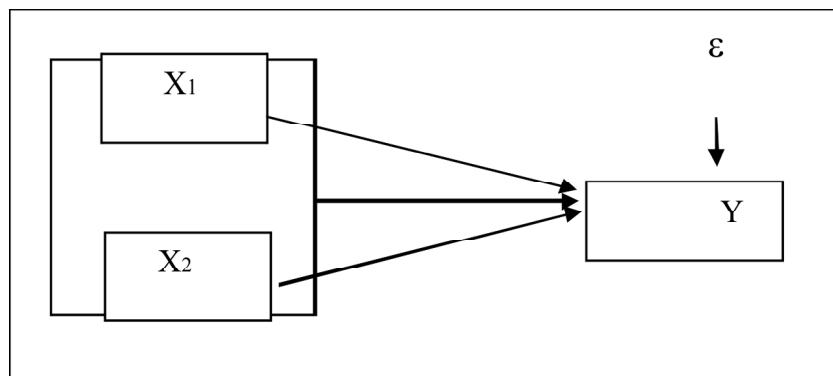
Exercise is a physical work. Physical or mental got different physical loads based on the sports they do. Thus, in every physical activities, it needs a level of VO<sub>2</sub>Max supported by good physical. On the other hand, physical training with certain loading will change the physiology which then will change the level of physical fitness. In sport, especially author focuses on badminton, that to seize high achievement (best achievement) the existence of physical fitness or high VO<sub>2</sub>Max is a requirement that can be ignored.



## METHODOLOGY OF THE STUDY

The present study is based on a general goal to get empirical clarity about the relationship of motor skills and the achievement in playing badminton of the male beginner students. The information obtained based on the achievement of data analysis is expected to be beneficial both conceptually or practical aspect.

The methodology used is descriptive with correlational technique. Through this method, it is expected that it can reveal the effect of students' motor skills and VO2Max with achievement in playing badminton.



**Figure 1:** Constellation Relationship between Free Variables X1 and X2 with the controlled variable Y.

This study was conducted on male beginner students of SGS PLN Bandung Badminton Club, West Java Province. The implementation of the study began with research instrument test to test the feasibility of measuring instrument to be used in the study.

Sampling technique used simple random sampling to get sample groups of 32 students. At this stage, the draw was done one by one by taking into box until it reached the number desired.

### Data collection technique

According to the variables studied, the instruments used in data collection were: (1) motor skills test, to test motor skills, and (2) the measurement of VO2Max while using blip test 3) achievement measuring instrument by contesting all all of the study samples. Motor skill will be measured with motor sill test. This test is used to measure students' skills obtained from childhood. The type of motor skill test for children consists of seven items, there are: throwing at the object (target throwing); togok and rear legs flexibility (back and harmstring stretch); jump ahead without the leading (standing longjump); face down and direct wake up (face down to standing); push-up on the chair (chair push-up\_; static balance; and agility run.

To measure VO2Max used blip test, held at badminton field Sporthall FPOK UPI. Then to obtain the data of achievement in playing badminton, all the sample of 32 athletes were divided into four pools randomly, in each pool they faced each other, so that the students played for 7 games. The scores obtained from 7 games were the achievement in playing badminton for each student.

For more detail, the results of data collection of Motor Skills, VO2Max and Achievement in Playing of SGS PLN Bandung Badminton Club is presented on this following table.

TALE 1: DESCRIPTIVE STATISTICS

	<i>Mean</i>	<i>Std. Deviation</i>	<i>N</i>
Achievement	84.8188	6.37189	32
Motor Skills	1.2928E2	10.82182	32
VO2MAX	47.8281	5.94628	32

From Table 1, it is known that its magnitudes descriptive, such as: mean, standard deviation and numbers of respondents involved.

## RESULT OF THE STUDY

Hypothesis testing in this study is done by using correlation analysis product moment from Pearson. Normality test is done to the scores of motor skills and badminton skills tests by using Liliefors Test, at significance level  $\alpha = 0,05$ . Based on the calculation achievement, it is known that  $\chi_h^2$  (count) is smaller than  $\chi_t^2$  (table) at significance level  $\alpha = 0,05$ . Therefore  $H_0$  is accepted. It means that the three groups of data tested are homogenous.

Hypothesis testing is done by using correlation analysis using SPSS 22, obtained the following results.

From Table 1, it is known that its magnitudes descriptive, such as mean, standard deviation and numbers of respondents involved.

TABLE 2: CORRELATIONS

		<i>Achievement</i>	<i>Motor Skill</i>	<i>VO2MAX</i>
Pearson Correlation	Achievement	1.000	.805	.765
	Motor Skill	.805	1.000	.769
	VO2MAX	.765	.769	1.000
Sig. (1-tailed)	Achievement	.	.000	.000
	Motor Skill	.000	.	.000
	VO2MAX	.000	.000	.
N	Achievement	32	32	32
	Motor Skill	32	32	32
	VO2MAX	32	32	32

Table 2 shows the magnitudes of its correlation coefficient and significance.

- Correlation and Coefficient of motor skills to the achievement is 0.805. and this score shows the significant effect with the probability of 0,000. The magnitude of the effect of motor skills to achievement  $(0,805)^2 \times 100\% = 64,80\%$ . While the rest (35,20%) caused by another factors.
- Correlation and coefficient of VO2MAX to the achievement is 0,765. And this score shows the significant effect with the probability of 0,000. The magnitude of the effect of VO2MAX to the achievement is  $(0,765)^2 \times 100\% = 58,52\%$ . While the rest (41,48%) caused by another factors.

TABLE 3: VARIABLES ENTERED/REMOVED<sup>B</sup>

<i>Model</i>	<i>Variables Entered</i>	<i>Variables Removed</i>	<i>Method</i>
1	VO2MAX, Motor Skill <sup>a</sup>	.	Enter

a. All requested variables entered.

b. Dependent Variable: Prestasi

Table 3 uses “*Enter*” method, which means that there are no variables removed. Or in other words, both independent variables (VO2MAX and Motor Skill) directly/ simultaneously included in the calculation.

TABLE 4: MODEL SUMMARY<sup>B</sup>

<i>Model</i>	<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>Std. Error of the Estimate</i>
1	.837 <sup>a</sup>	.701	.680	3.60442

a. Predictors: (Constant), VO2MAX, Motor Skill

b. Dependent Variable: Achievement

From Table 4, it is known that the shared correlation between two variables to Achievement is 0,837 (a positive, high and significant number). While the shared magnitude of the effect of Motor Skill and VO2MAX simultaneously to the Achievement is 70,1%. While the rest (29,9%) caused by another factors.

## DISCUSSION ON THE RESULTS OF THE STUDY

Based on the results of data analysis of the study, it is argued that the hypothesis of the study about the effects of motor skill and VO2Max to the achievement in playing badminton have positive effects. It means that students’ motor skills and VO2Max may affect the achievement in playing badminton. From that result, it can be stated that “the higher students’ motor skills and VO2Max then the better their achievement in badminton”. It also stated that to improve badminton skills of the beginner, their motor skills should be improved first. So it will ease them to perform movement learning. Then the students who have high motor skills will be

quicker in mastering badminton skills. On the other hand, students' level of VO2Max can affect the achievement in playing badminton. The differences of the effects of motor skills and VO2MAX to the achievement, quite simply it can be said that that is the difference in the contribution of both independent variables to the dependent variables. The difference is:  $64,80\% - 58,52\% = 6,28\%$ . In which the contribution of Motor Skills is greater of 6,28% than the use of VO2MAX.

Even though there are differences of the effects of both variables, but it shows that students' motor skills and VO2Max may affect the students' achievement in playing badminton at SGS PLN Bandung Badminton Club.

### CONCLUSION

Based on the hypothesis testing, and the discussion of the achievement of the study, it can be concluded as the following: 1. Motor Skill and Vo2Max simultaneously positively affect 70,10% to the achievement in playing badminton. Therefore, it can be argued that "the better students' motor skills and VO2Max then the better the achievement of male beginner athletes at SGS PLN Bandung Badminton Club. 2. Motor skills give an effect of 64,80% to the achievement in playing badminton. 3. The capacity of VO2Max gives an effect of 58,5% to the achievement in playing badminton. 4. There are differences of effects between Motor Skills and VO2Max to the achievement in playing badminton in which Motor Skills have greater effect to the achievement in playing badminton compared with the capacity of VO2Max of the students of SGS PLN Bandung Badminton Club.

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