# THE EFFECT OF CARDIORESPIRATORY FITNESS AND FATIGUE LEVEL ON LEARNING ABILITY OF MOVEMENT COORDINATION

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**Abstract**: This research aims to prove: 1) relationship between cardiorespiratory fitness with movement coordination learning ability, 2) relationship between cardiorespiratory fitness with fatigue level, and 3) relationship between cardiorespiratory fitness and fatigue level on learning ability of movement coordination. Samples were 30 students of Department of Sport Education determined by purposive sampling technique. To conduct the correlational research, the instruments included a Cardiorespiratory fitness measured by using Fitmate version 2.2, Wellness Technology a Division of Cosmed, also equipped with other supporting devices such as treadmills. Level of fatigue was measured by using the heart rate monitor of Polar brand and Stopwatch (BT Butterfly 60 Japan) while movement coordination learning ability measured by using Drawing Mirror Tracer Test. Using multiple regression analysis, it is concluded that: firstly, there is significant relationship between cardiorespiratory fitness and learning ability of movement coordination. Secondly, there is significant relationship between the level of fatigue and the learning ability of movement coordination. Thirdly, there is significant relationship between cardio respiratory fitness and level of fatigue in the learning ability of movement coordination.

**Keywords:** ***cardiorespiratory fitness, heart rate, learning, coordination, movement***

# PENGARUH KEBUGARAN KARDIORESPIRASI DAN TINGKAT KELELAHAN TERHADAP KEMAMPUAN BELAJAR KOORDINASI GERAK

**Abstrak:** Penelitian ini bertujuan untuk membuktikan: 1) hubungan antara kebugaran kardiorespirasi terhadap kemampuan belajar koordinasi gerak, 2) hubungan antara tingkat kelelahan terhadap kemampuan belajar koordinasi gerak, dan 3) hubungan antara kebugaran kardiorespirasi dan tingkat kelelahan terhadap kemampuan belajar koordinasi gerak. Sampel adalah 30 mahasiswa Jurusan Pendidikan Olahraga ditentukan dengan teknik *purposive sampling*. Untuk melaksanakan penelitian korelasional ini, instrumen yang digunakan antara lain: Kebugaran kardiorespirasi diukur dengan menggunakan *Fitmate version 2.2*, *Wellness Technology a Division of Cosmed,* juga dilengkapi alat pendukung lainnya seperti *treadmill*. Tingkat kelelahan, diukur dengan menggunakan *heart rate monitor* merek Polar dan *Stop watch* (*Butterfly BT 60 Japan*) sedangkan kemampuan belajar koordinasi gerak diukur dengan menggunakan *Drawing Mirror Tracer Test.* Dengan analisis regresi berganda, disimpulkan bahwa: pertama, terdapat hubungan yang signifikan antara kebugaran kardiorespirasi terhadap kemampuan belajar koordinasi gerak. Kedua, terdapat hubungan yang signifikan antara tingkat kelelahan terhadap kemampuan belajar koordinasi gerak. Ketiga, terdapat hubungan yang signifikan antara kebugaran kardiorespirasi dan tingkat kelelahan terhadap kemampuan belajar koordinasi gerak.

**Kata Kunci:** ***kebugaran kardiorespirasi, heart rate, belajar, koordinasi, gerak***

## INTRODUCTION

Lectures at the Faculty of Sport Sciences Yogyakarta State University consist of theory and practice courses. Fukuda, Yamano, Joudoi, Mizuno, Tanaka, Kawatani, & Watanabe (2010) claims that fatigue can affect in decrease of academic performance, undesirable health consequences, or not motivated going to school. Moreover, Barger, Runyon, Renn, Moore, Weiss, Condle, & Patterson (2018) states that fatigue consequence of exercise was consistent in many researches. Most of them indicate positive affects to patients and shift worker safety, individual performance, serious fatigue,

sleep quality, exhaustion/ stress and possibility of long term health. However, getting lecturing materials can possibly be ineffective if the students feel exhaustion and have slow recovery. Thus, learning some practical movements needs good coordination.

Level of cardiorespiratory fitness can be described by VO2 Max and is important variable to describe someone's fitness level (Plowman & Smith, 2011). Increase in cardio respiration causes the ability to increase heart function, this can be seen from the slow decline in heart rate because the heart will be more efficient and more pumping each pulse (Corbin & Lindsey, 2007). Cardiorespiratory fitness is the ability of the heart, lung, and blood vessels systems that are used during the body's metabolic processes both at rest and during activities. Good cardiorespiratory fitness causes an increase in the ability to work with high intensity with long time to achieve fatigue. This is in line with the statement (Wilmore & Costill, 2011) that the higher someone's VO2 Max (athlete), the higher he or she will also have special endurance and stamina.

When fitness level is good and the recovery is fast, it is expected that the fatigue caused is also not excessive. Fatigue can also increase errorsand make reaction time slow. This statement is in accordance with the opinion of Verawati (2016) claiming that fatigue can also result in workplace accidents that have direct impact on the level of work productivity. When it is associated with learning coordination movements, it is possibly to face not optimal coordination. Research conducted by Setyowati, Shaluhiyah, & Widjasena (2014), states that fatigue is directly affected by work stress.

Movement is the need of every human being, everyone has different abilities in doing movement. Movement maturity occurs according to age and movement experience. One effort so that humans are able to perform complex movements, of course, must be able to adapt the conditions and use them as part of their learning experience. Learning to move aims so that someone is capable and skilled in mastering movement, including in mastering the movement coordination. This is in line with the opinion of Nugraha (2016) that exercise is main process in order to master movement skills. Based on field observations when Physical Education, Sport, and Health learning is related to movement coordination learning, some students are easy to receive lessons quickly but some are slow to get the lesson. Movement coordination learning is sometimes still difficult, students are still dominant in certain movements. This can be seen at the lesson time that there were still students who were rigid and less patterned. The student still looked hesitant when going to do movement especially new movement. The impact that occurs when a student is unable to make a move will decrease the enthusiasm for learning. Student conditions when delivering movement learning material are also possible obstacles such as health, fatigue, fitness level or endurance of the students themselves. Learning movement coordination can be influenced by several factors. Motion coordination is a blend of performance from quality of muscles, bones and joints in producing effective and efficient movements. Movement component includes energy, muscle contraction, nerves, bones, and joints.

If movement component is not optimal, it is estimated that movement coordination learning is also not optimal. Some things that make the movement component not optimal are possible factors such as fitness and fatigue. Based on this, it is necessary to perform in-depth analysis related 1) whether there is correlation between cardiorespiratory fitness and movement coordination learning ability, 2) whether there is correlation between fatigue level and movement coordination learning ability, and 3) whether there is correlation between cardiorespiratory fitness and fatigue level with movement coordination learning ability.

Based on the opinions and statements above, it is necessary to prove what influences the learning ability of movement coordination. To be more convincing, the research conducted is related to the relationship of cardiorespiratory fitness and level of fatigue on learning ability of movement coordination. This research intends to prove: 1) correlation between cardiorespiratory fitness with movement coordination learning ability, 2) correlation between fatigue level with movement coordination learning ability, and 3) the effect of cardiorespiratory fitness and fatigue level toward learning ability of movement coordination.

## METHOD

The research method used was survey with correlational research type that aims to find correlation between cardiorespiratory fitness and fatigue level on learning ability of movement coordination. Research population used was students of Sport Education Department Faculty of Sport Sciences Yogyakarta State University. Samples were determined by purposive sampling technique, while criteria were 1) 2nd semester Sports Education Department students, 2) not in unhealthy condition, 3) no injuries, 4) male, 5) not professional athletes, 6) not undergoing an exercise program, 7) not being in training center, and 8) willing to be research subject. From the requirements determined, the samples were 30 students. This research had three variables consisting of independent variables, namely 1) cardiorespiratory fitness, 2) fatigue level, and dependent variable is the learning ability of movement coordination.

Instruments used in this research included: cardiorespiratory fitness was measured by Fitmate Version 2.2, Wellness Technology a Division of Cosmed, also equipped with other supporting devices such as treadmills. The level of fatigue, measured by using the heart rate monitor of the Polar Brand and Stopwatch (BT Butterfly 60 Japan) while the movement coordination learning ability was measured by using Drawing Mirror Tracer Test. The procedure for collecting the data was before the research subjects ran by using treadmill with 12 meter run test protocol, maximum test to maximum ability. The instruments used before data collection were done by checking and verification first. Equipment operation was performed by expert people in their fields in collaboration with the Achilles Sport Science Fitness Center (SSFC) laboratory, Faculty of Sport Sciences at Surabaya State University.

After the test of running in treadmill with maximum ability, then cardiorespiratory fitness measured by looking at VO2 Max on Cosmet Fitmate Pro monitor. At the same time, it was calculated by using stopwatch, in the third minute Heart rate recovery was measured to determine fatigue level including measuring movement coordination by looking at the completion time of the test by using Drawing Mirror Tracer Test. The data obtained were analyzed by using multiple regression analysis.

## FINDINGS AND DISCUSSION

### Findings

The findings of the cardiorespiratory fitness measurement test, fatigue level, and movement coordination learning ability data with the number of samples N = 30. Findings of cardiorespiratory fitness measurement data has minimum value 33.30, maximum value 52.60, average value (x) 43.2567 and standard of deviation 4.79523. The findings of the data on measuring of fatigue level has minimum value 93.00; maximum value 136.00; average value (x) is 117.0333 and the standard of deviation is 9.60418. The data finding on measuring of movement coordination learning ability has minimum value 59.00; maximum value 23.00; average value (x) is 37.8667 and standard of deviation 8.12291.

### Normality Test

Before testing data analysis, it is necessary to test the analysis requirements to prove that the data is normally distributed. To find out, it is proven by the reliability test. The finding of the analysis of data normality test in Table 4 is known for cardio-respiration sig value .872 ($p > .05$), it can be said that cardiorespiratory data is normally distributed. The fatigue level is obtained by the sig value .73 ($p > .05$), it can be said that the fatigue level data is normally distributed. Movement coordination learning ability is obtained sig.720 ($p > .05$), it can be said that the data on learning ability of movement coordination is normally distributed. Shapiro-Wilk test shows that the assumption of normality is met within each group.

### Linearity Test

Another requirement test is linearity test, linearity can be known if the correlation between independent variables with dependent variable is significance F value > .05. The finding of linearity test of movement coordination learning ability (Y) on cardiorespiratory fitness (X1) is obtained F value 2.690 at significance .395, which means that it is not significant, correlation between the two variables is linear.

Furthermore, the finding of linearity test of movement is coordination learning ability (Y) on fatigue level (X2). The finding of linearity test of movement coordination learning ability (Y) on fatigue level (X2) is obtained F value 2.670 at

significance .152, which means not significant, the correlation between the two variables is linear.

**Hypothesis Test**

**Correlation between Cardiorespiratory Fitness and Movement Coordination Learning Ability**

Hypothesis test to prove the correlation of cardiorespiratory fitness on coordination ability is by using simple regression test and Pearson correlation test. The testing table can be seen in the following table.

Based on Table 2, the constant/ intercept value (a) is obtained 110,012; slope/ regression coefficient value (b) obtained -1.668 with sig. value .000. Thus, the regression equation can be written as follows:

$\hat{Y} = a0 + b0\ X = 110.012 + 1.668\ X$

This can be interpreted if the cardiorespiratory fitness variable (X) rises by one unit, so the variable of movement coordination learning ability (Y) can be predicted to increase by 1.668 (165%) in the constant 110.012. The regression test based on Table 1 above is obtained by the $F_{value}$ 887. 268 with sig. value .000. Because of Sig <.05, the regression equation coefficient is significant. The findings of the correlation significance test can be seen in Table 3.

Based on the findings in Table 3, it is said that the Pearson correlation analysis is obtained .985 with the sig. value .00. Because it is Sig. value >.05, it can be concluded that the correlation between cardiorespiratory fitness (X) with movement coordination learning ability (Y) is significant.

**Table 1. Anova Test between Cardiorespiratory Fitness and Movement Coordination Learning Ability**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 1854,930 | 1 | 1854,930 | 887,268 | ,000[b] |
| Residual | 58,537 | 28 | 2,091 | | |
| Total | 1913,467 | 29 | | | |

**Table 2. Correlation Coefficient of Cardiorespiratory Fitness with Movement Coordination Learning Ability**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 110.012 | 2.436 | | 45.154 | .000 |
| Cardio respiration | -1.668 | .056 | -.985 | -29.787 | .000 |

**Table 3. Result of Correlation Significance Test of Cardiorespiratory Fitness and Movement Coordination Learning Ability**

| | | Cardiorespiratory | Coordination |
|---|---|---|---|
| Cardiorespiratory | Pearson Correlation | 1 | -.985** |
| | Sig. (2-tailed) | | .000 |
| | N | 30 | 30 |
| Coordination | Pearson Correlation | -.985** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 30 | 30 |

**Table 4. Anova Test of Fatigue Level on Movement Coordination Learning Ability**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 1852.166 | 1 | 1852.166 | 846.005 | .000[b] |
| Residual | 61.301 | 28 | 2.189 | | |
| Total | 1913.467 | 29 | | | |

**Correlation of Fatigue Level on Movement Coordination Learning Ability**

Hypothesis test is to prove the correlation of fatigue level on coordination ability using simple regression test and Pearson correlation test. The testing table can be seen in the following table.

Based on Table 5 above, the constant/ intercept (a) value is taken 135.251; the slope / regression coefficient value (b) is -.832 with sig. value .000. Thus, the regression equation can be written as follows:

$\hat{Y} = a0 + b0\ X = 135.251 + .832\ X$

This can be interpreted if the fatigue level variable (X) increases by one unit, so the variable of movement coordination learning ability (Y) can be predicted to increase by .832 (83.2%) in the constant 135.251. Regression test based on Table 4 above is obtained F value 846.005 with sig. value .000. Because of Sig < .05, the regression equation coefficient is significant. The findings of the correlation significance test can be seen in Table 6 below:

Based on the findings in Table 6, it is said that Pearson correlation analysis is taken .984 with the sig. value .00. Because of Sig. value > .05, it can be concluded that the correlation between fatigue level (X) and movement coordination learning ability (Y) is significant.

**Correlation between Cardiorespiratory Fitness and Fatigue Level on Movement Coordination Learning Ability**

Hypothesis test is used to prove the correlation of cardiorespiratory fitness and fatigue level on coordination ability by using multiple regression tests. The testing table can be seen in the table 7.

Based on Table 8 above, the constant / intercept value (a) is obtained 123.042; slope/ regression coefficient (a1) is taken at -.873 with sig. value .001 and the slope / regression coefficient (a2) is obtained at -.405 with sig. value .002. Thus, the regression equation can be written as follows:

$\hat{Y} = a0 + a1\ X1 + a2\ X2 = 123.042 + .873\ X1 + .405\ X2$

This can be interpreted if the variable of cardiorespiratory fitness level (X1) and fatigue level (X2) are close to or equal to 0, then the score for movement coordination learning ability (Y) is = 123.042. With the interpretation that if cardiorespiratory fitness level (X1) and fatigue level (X2) are low, then the average movement

**Table 5. Correlation Coefficient of Fatique Level with Movement Coordination Learning Ability**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 135.251 | 3.359 | | 40.265 | .000 |
| Fatigue | -.832 | .029 | -.984 | -29.086 | .000 |

**Table 6. Result of Correlation Significance Test of Fatigue Level with Movement Coordination Learning Ability**

| | | Fatigue | Coordination |
|---|---|---|---|
| Fatigue | Pearson Correlation | 1 | -.984** |
| | Sig. (2-tailed) | | .000 |
| | N | 30 | 30 |
| Coordination | Pearson Correlation | -.984** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 30 | 30 |

**Table 7. Anova Test between Fatigue Level and Cardiorespiratory Fitness with Movement Coordination Learning Ability**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 1872.592 | 2 | 936.296 | 618.483 | .000[b] |
| Residual | 40.874 | 27 | 1.514 | | |
| Total | 1913.467 | 29 | | | |

**Table 8. Correlation Coefficient between Cardiorespiratory Fitness and Fatigue Level with Movement Coordination Learning Ability**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 123.042 | 4.342 | | 28.340 | .000 |
| Cardiovascular | -.873 | .238 | -.515 | -3.673 | .001 |
| Fatigue | -.405 | .119 | -.479 | -3.416 | .002 |

**Table 9. Coefficient of Determination**

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|
| .989[a] | .979 | .977 | 1.23039 |

coordination learning ability (Y) is constant at 123.042. This means that, overall, movement coordination learning ability (Y) is not better.

If the level of cardiorespiratory fitness (X1) increases by one unit, while the level of fatigue (X2) remains, then the movement coordination learning ability (Y) will increase by .873 times. With the interpretation that every increase in cardiorespiratory fitness (X1) is 1 unit, it will have an impact on increasing the movement coordination learning ability (Y) by .873. If the fatigue level (X2) increases by one unit, while cardiorespiratory fitness (X1) remains, then movement coordination learning ability (Y) will increase by .405 times. With the interpretation that every increase in fatigue level (X2) is 1 unit, will have an impact on increasing the movement coordination learning ability (Y) by .405.

Regression test based on Table 8 above is taken F value 618.483 with sig. value .000. Because Sig < .05, the regression equation coefficient is significant. Then, analysing the coefficient of determination is by referring to Table 9.

Based on Table 9, it is obtained R Square .979. Then the coefficient of determination is .979 x 100% = 98%. Thus, 98% of the factors that influences movement coordination learning ability is cardiorespiratory fitness and fatigue and the rest are influenced by other factors that are not examined.

**Discussion**

Based on the data analysis that had been done, this research found that the level of cardiorespiratory fitness and fatigue has the correlation and effect on coordination learning. The variables were processed and analysed by calculating ability, normality, linearity, correlation coefficient, and determination coefficient. The findings provide detailed support for hypothesis analysis. The research is focused on investigating the condition relationship of cardiorespiratory fitness and the fatigue level to movement coordination learning. In addition, this research also finds the level of correlation and objectivity related to other relationships that influence the dependent variable that is movement coordination learning.

The researchers realize that the level of objectivity in researchers' findings has several things influenced by other factors that are not desired such as sample condition, as well as other activities not included in the research, such as lifestyle, family relationships and daily activities. The researchers know that these factors cannot get into the research variables because they have all happened in general. Therefore researchers attempt to carefully control the effects of unwanted independent variables and interpret the findings objectively.

Movement is the need of every human being, each individual has different abilities in doing movement. Learning to move aims to make someone capable and skilled in mastering movement, including mastering movement coordination. Regular and continuous physical activity is needed for coordination learning (Eifert, Wideman, Oberlin, & Labban, 2014; Langlois, Vu Tuong, Chassé, Dupuis, Kergoat, & Bhere, 2013; Paillard, Rolland, & Barreto, 2015). The end result of learning movement is the ability to do movement patterns of body skills, every movement learning goal generally has expectations with the emergence of certain findings, these findings are usually in the form of skill mastery. Skilful performance is the ultimate goal of movement learning.

**Cardiorespiratory Fitness on Movement Coordination Learning**

The researchers obtained the data that there is correlation between cardiorespiratory fitness with movement learning ability that is significant. This is strengthened by the statement of Adkins, Boychuk, Remple, & Kleim (2006) who state that regular physical activity causes an increase in cardiorespiratory fitness and creates an environment that supports nerve growth and survival through increasing growth levels, and someone's ability to move. Further, Ericsson (2008) states that individuals who have good movement ability are also capable of having good academic values and performance. This is also seen from the level of cardiorespiratory fitness.

Chaddock, Hillman, Pontifex, Johnson, Raine, & Kramer (2012) state that the higher the level of cardiorespiratory fitness will be able to show the accuracy of responses that are better at accepting and performing tasks. This shows that a person who has good cardiorespiratory fitness has good response to movement ability, especially movement coordination. Pontifex, Raine, Johnson, Chaddock, Voss, Cohen, …, Hillman (2011); Voss *et al.*, (2011) argue that someone who has good cardiorespiratory fitness will be more accurate in the accuracy of response and reaction time. This can occur because in movement learning, the end result is a series or coordination of movement, if the cardiorespiratory fitness is good, the expectation of stimulation of the movement coordination to do can be done without any obstacles because it is supported by optimal body condition and thinking power.

**Fatigue Level on Movement Coordination Learning**

Based on the research explained, there is correlation between fatigue level and movement coordination learning. Phillips (2015) states that fatigue is divided into two types, the first is fatigue as reduced muscle strength, the second is fatigue as a sensation. Cause of fatigue is an activity that uses energy continuously so that someone cannot perform optimally as before. Research findings by Basilius (2018) show that workload, individual characteristics, and school climate partially influence positive and significant on the emotional fatigue of elementary school teachers. When taken into conclusion related to the research, the fatigue level has correlation with movement coordination learning ability. All movements and activities have meaning for humans. But at some point, the power to do so gets diminished. Decreased movement ability (both physical and spiritual) will have effect on reducing the achievements that will be achieved. Fatigue can reduce work capacity and work resilience characterized by the onset of fatigue, decreased motivation, and decreased activity. The effect of fatigue can result in not optimal learning abilities of movement coordination.

Gustiana (2011) explains that the body's inability to produce cortisol, thyroid, estrogen and testosterone hormones also contributes significantly to fatigue. The mechanism of the barriers occurs complex. Besides, stress is referred to as the main cause of fatigue syndrome. In addition to stress, physical health factors also affect fatigue level, both of which are related. Although stress is psychological symptom, it is still related to physical health. The ability to learn one's movement will affect other abilities in performing movement activities. Someone's movement learning ability also facilitates mastery of complex movements in sports.

The movement learning ability is a form of muscular response expressed in body movements. This requires training to produce good ability to move, so that fatigue must be avoided or minimized because fatigue can cause decrease in movement performance. This is in line with Wascher, Rasch, Sänger, Hoffmann, Schneider, Rinkenauer, …, Gutberlet (2014) claiming that fatigue affects one's appearance and performance. This means that someone has a decreased ability to move due to the burden of activity. Giriwijoyo (2012) states that fatigue is a condition of decreased work capacity caused by doing work. Fatigue is divided into two types, namely mental fatigue and physical fatigue. Mental fatigue is a result of mental work caused by boredom and lack of interest. Whereas physical fatigue is caused by muscle work, which in general can be assessed based on percentage of muscle strength reduction, muscle fatigue recovery time, and time needed until fatigue occurs.

**Cardiorespiratory Fitness and Fatigue Level on Movement Coordination Learning**

The researchers conclude that there is significant correlation between cardiorespiratory fitness and fatigue level with movement coordination learning ability. This has been explained in the explanation above that cardiorespiratory fitness and fatigue level affect the learning ability of movement coordination. Movement coordination ability is based on healthy body and balanced with regular physical activity or exercise. When doing physical activity, the body must avoid fatigue so as not to indicate a decrease in one's performance.

Learning activities really need good health conditions because during learning, they involve physical and mental spiritual conditions. The brain is required to work hard which will drain energy quickly. Regarding movement coordination learning, students must prepare and arrange power strength optimally because motion learning does not only involve the role of the brain but also healthy physical conditions that have large contribution. As a result of the absence of balance between physical and mental conditions, students usually will get tired easily and their learning activities cannot be maximized. A good cardiorespiratory condition will affect someone's endurance in doing their activities. For students, this will affect the psychological condition of students in learning. Students who have high fitness level are not easily tired in learning and are able to receive movement lessons well. However, in learning movement, there is a need for precision in the correct movement technique that is starting from the beginning to the end of the movements, so that these abilities will contribute to the success of the next tasks.

Students who have good physical fitness can carry out activities effectively, efficiently and productively without experiencing significant fatigue still have the rest of the energy to fill their free time. This has an impact on learning process, students who have good physical fitness will be able to follow the learning process with good findings, students can comprehend and understand the lessons delivered by the teacher optimally, so that students' learning ability becomes better. In addition to the factors that are studied, different movement experiences will make children have stronger pattern and awareness of movement to be able to perform more efficiently in various situations (Bahri, Adisasmita, & Asmawi, 2016). The success of movement coordination learning, of course, depends not only on cardiovascular fitness and fatigue level, but also there are still other factors that can influence which in this case are not the focus of research.

## CONCLUSION

Based on the findings of data analysis, this research can be summarized as follows: first, there is significant correlation in cardiorespiratory fitness on learning ability of movement coordination. Second, there is significant correlation in fatigue level on learning ability of movement coordination. Third, there is significant correlation cardiorespiratory fitness towards fatigue level in learning ability of movement coordination.

After analyzed by using correlation analysis and regression analysis, research conclusions can be obtained as follows: (1) there is significant correlation between cardiorespiratory fitness and learning ability of movement coordination; (2) there is significant correlation between fatigue and learning ability of movement coordination; 3) there is significant correlation between cardiorespiratory fitness and fatigue with the learning ability of movement coordination. Then the coefficient of determination is .979 x 100% = 98%. Thus, 98% of the factors that influences the learning ability of movement coordination is cardiorespiratory fitness and fatigue and the rest is influenced by other factors that are not examined.

In connection with the conclusions that have been taken and the implications caused, the following are suggested: (1) efforts to improve the movement coordination ability should be done to increase cardiorespiratory fitness and fatigue level by adjusting the ratio of recovery; (2) for academics, they should always pay attention to variables that have correlation and influence on movement coordination ability; (3) after this research, it is expected that in the future there will be further research with wider scope and looking at other variables that have positive correlation with movement coordination ability.

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