

## THE INFLUENCE OF EXERCISE METHODS AND EYE-FOOT COORDINATION ON THE SMASH ABILITY OF VOLLEY BALL ATHLETES

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### Abstract

This article aims to determine the effect of extensive and intensive interval training methods and eye-foot coordination on the smash ability of volleyball athletes. This type of research uses a quasi-experimental method using treatment with a Level 2 x 2 design. Populasi pada penelitian ini berjumlah 28 siswa. The sample in this study was male volleyball athletes from the Riau Province Sports High School, amounting to 28 people. Ankle coordination test using Soccer Wall Volley test, and smash ability using smash skill test. The results showed 1) there was a difference in the effect of the extensive interval training method and the intensive interval training method on smash ability where  $F_h 47.14 > F_t 3.01$ . 2) there is an interaction between the exercise method and ankle coordination seen from  $F_h 24 > F_t 3.01$ . 3) In high category eye-foot coordination, extensive interval training method is better than intensive interval training method to improve smash ability as seen from  $Q_{count} 11.36 > Q_{table} 3.34$ . 4) There is no difference in the effect of low eye-foot coordination between the intensive training method and the extensive interval method on increasing smash ability, it can be seen from  $Q_{count} 2.60 < Q_{table} 3.34$ .

**Keywords:** *Smash Ability; Eye-foot Coordination; Training Method*

## **INTRODUCTION**

Volleyball is a sport that is loved by all levels of Indonesian society. This sport can be played from the level of children to adults, both men and women. Volleyball was originally a game that was carried out as a mere "fad". The possibility of developing into a popular sport that is popular today (Fitriani et al., 2021). The volleyball game has basic techniques that must be mastered, the following techniques include: top serve, bottom serve, top passing, bottom passing, block, and smash. According to Bachtiar in (Sovens, 2018) the smash is the main blow in attacking the opponent's area. Many points in the smash results are accurate and sharp, so the smash technique is often referred to as a deadly and ultimate attack technique to get points. For good results in smashing, high reach and high jumping ability are required (Oktariana & Hardiyono, 2020).

The main problem in this volleyball game includes basic techniques, one of which is the basic smash technique. There are several factors that cause the weakness of the quality of the technique, namely the limited ability of the trainer and the resources used to carry out the training

process so that the trainer as a teacher is always faced with the problem of the limited ability of the trainer who is not adequate so that they are less able to carry out their profession competently.

The training method carried out by the coach in the practice of basic volleyball techniques tends to do just a movement where players do physical exercise or practice playing volleyball based on previously known movements without clear control in doing so. Training is an activity to improve the skills (skills) of exercising by using various equipments in accordance with the purpose and needs of sports (Sukadiyanto in (Agusdi et al., 2021)) Pleasure by the coach in applying in training the technique of playing volleyball.

The application of the right training method in the process of practicing volleyball skills will also provide opportunities for coaches to make maximum use of the available facilities so that there is no excuse for volleyball coaches because of the delay in the volleyball player's training process and the inadequate factor of volleyball facilities at the school.

The selection and application of methods in volleyball playing skills

training, especially the smash technique given to athletes so as to improve smash skills in playing volleyball, in this study will try two kinds of methods that will be applied in the volleyball training process, namely the extensive interval method and the interval method that are carried out using equipment and without tools.

Harsono in (Zakky Mubarak, 2020) suggests the notion of interval training is an exercise system that is punctuated by intervals in the form of periods of rest. According to (Suharjan, 2013) interval training also uses the principle of increasing the load in each exercise. Furthermore, according to (Sugihartono, 2012) interval training has the characteristics of a variation between work and exercise. Interval training not only allows athletes to work at high intensity but athletes can work during continuous training.

Intensive interval training method is an exercise method that is carried out with moderate to high intensity exercise with a pulse rate of more than 180-190x/minute, few repetitions, not a lot of intervals, a maximum of 3 sets (Syafuruddin, 2016). According to Suharno in (Cookson & Stirk, 2019) extensive interval training is a form of exercise used to increase

endurance. The extensive interval method is an exercise method that is almost the same as the intensive interval training method in which the intensity, repetitions, number of sets and rest have been determined. The difference lies in the intensity of work, and the rest is shorter than the intensive interval. (Syafuruddin, 2011) explained that the characteristics of the extensive interval method are moderate load intensity, which is 60% - 80%, high load/volume and many repetitions, which are 20-30 times series, intervals/rests are not full, which is 45-90 seconds series, and the resulting training effect is an increase in speed endurance. While intensive interval training according to (Syafuruddin, 2016), the intensive interval training method is carried out with a relatively small amount of load with an exercise intensity ranging from 80-90%, the amount/volume of moderate load is 6-10 times per series, intervals/rests 90-180 seconds each series, and the duration of the moderate load is 30-60 seconds and the effect of this exercise is to increase speed endurance.

Riau Province Sports High School is a school for coaching athletes. It can be seen in terms of the

achievements achieved in 2017, namely the 2nd place in PORPROV, in 2017 the 3rd place in the Regional Championship. Furthermore, at the Regional Student Sports Week (POPWIL) won 2nd place in 2018. It can be seen in 2020 that the Sports High School volleyball achievement during the CUP event for the Financial Vocational School in Pekanbaru City where usually the Riau Province Sports High School volleyball team always won, but on This time, the Sports High School volleyball team's performance declined. Athletes from the Riau Province Sports State High School did not look optimal, because during the match they looked weak and lacked attack while playing.

The information obtained from Mr. Pitoyo as one of the volleyball coaches at the Riau Province State High School and observations in the field showed that the smash ability of the Riau Province Sports High School volleyball athletes was still low in practice and competition, this could be seen from the implementation of the smash performed, where most of the smashes are done late or can't put the body position in the right place, and also sometimes there are still many who get stuck on the net and get out of the field. The low smash ability of

volleyball athletes is inseparable from the components of physical conditions that affect it such as strength, speed, power and one of them is eye-foot coordination and many other physical components.

Based on the problems that occur, researchers are interested in conducting research and want to provide an exercise program to improve the smash skills of volleyball athletes at the Riau Province Sports High School. The training program given is in the form of an extensive interval method and an intensive interval method. The intervening variable is eye-foot coordination which is measured using an eye-foot coordination test. From the variables studied, it is hoped that it can improve the smash ability of volleyball athletes at SMA Negeri Sport Riau Province.

## **METHODS**

The purpose of this study was to analyze the differences in the effect of training methods and eye-foot coordination on the smash ability of volleyball athletes. The method used in this research is a quasi-experimental research. Thus, this research design is a 2x2 factorial design. This study examines the effect of the independent

variable on the dependent variable and the moderator variable. According to (Barlian, 2018), the sample is part of the number and characteristics possessed by the population. The research sampling technique was total sampling, where the entire population of 28 people was used as the research sample because the research population was less than 100 people and the research was carried out in the volleyball court of SMA Negeri Sport Riau Province.

**RESULTS AND DISCUSSION**

**1. Eye-foot Coordination**

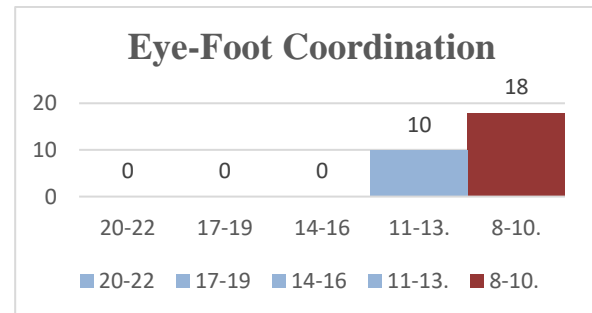
From the results of measurements carried out on a sample of volleyball athletes at SMA Negeri Sport Riau Province, the highest score was 13, the lowest score was 8. With an average of 10.00, standard deviation of 1.66. For more details, see the table below:

**Table 1. Eye-Foot Distribution**

Interval Class	Absolute Frequency	Relative Frequency
20-22	0	0%
17-19	0	0%
14-16	0	0%
11-13	10	36%
8-10	18	64%
	28	100%

Based on the calculations in table 1. It can be seen that there are 10 athletes who have eye-foot coordination in the 10-13 interval class with a frequency of

36%, and 18 athletes who have eye-foot coordination in the 8-10 interval class with a frequency of 64%. For more details can be seen in the graph below:



**Figure 1. Histogram of Eye-Foot Coordination**

**2. Smash Test**

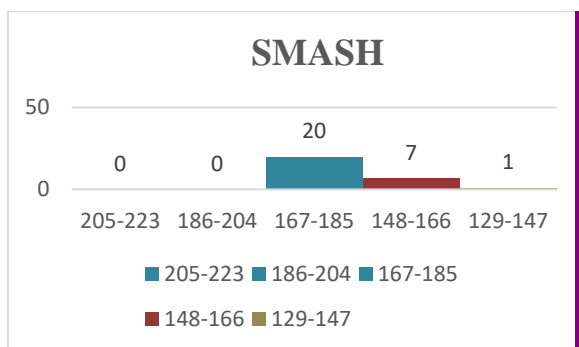
Based on the results of the smash measurement test in a group consisting of 28 people, the highest score was 183 and the lowest was 129. With an average of 169.46 and a standard deviation of 12.50. More details can be seen in the following frequency distribution table:

**Table 2 . Smash Test Distribution**

Interval Class	Absolute Frequency	Relative Frequency
205-223	0	0%
186-204	0	0%
167-185	20	71,42%
148-166	7	25%
129-147	1	3,57%
	28	100%

From table 2 it can be seen that 20 athletes have the ability to smash in the interval class 167-185 with a frequency of 71.42%, 7 athletes have the ability to

smash in the interval class 148-166 with a frequency of 25% and 1 athlete has the ability to smash in the interval class 129-147. with a frequency of 3.57%. For more details can be seen in the graph below:



**Figure 2. Histogram of Smash Test**

**a. Smash Ability in the Extensive Interval Training Method Group (A<sub>1</sub>)**

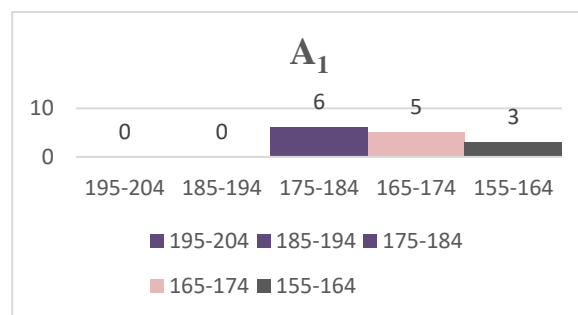
The volleyball smash measurement data in this group consisted of 14 people, with a maximum score of 180, the lowest score of 155, an average of 170.43 and a standard deviation of 8.36. The frequency distribution of the smash ability of members of this group can be described in the following frequency distribution table:

**Table 3. Smash in the Extensive Interval Training Method Group (A<sub>1</sub>)**

Interval Class	Absolute Frequency	Relative Frequency
195-204	0	0%
185-194	0	0%
175-184	6	42,81%
165-174	5	35,71%

155-164	3	21,42%
	14	100%

Based on table 3, it can be seen that 6 people have the ability to smash in the 175-184 interval class with a frequency of 42.81%, 5 people have the smash ability in the 165-174 interval class with a frequency of 35.71%, and 3 people have the smash ability in the 155-164 interval class. with a frequency of 21.42%. For more details, see the following graph:



**Figure 3. Histogram of Smash in the Extensive Interval Training Method Group (A<sub>1</sub>)**

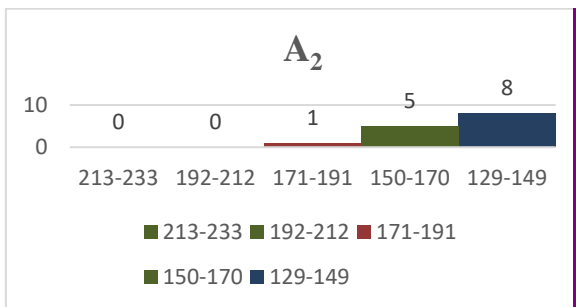
**b. Smash Ability in Intensive Interval Training Method Group (A<sub>2</sub>)**

The data from the measurement of the smash ability of this group consisted of 14 people, the highest score was 183 and the lowest score was 129. The average score was 168.50 and the standard deviation was 15.90. The following table shows the frequency distribution of the smash ability data in this group:

**Table 4. Smash Ability in Intensive Interval Training Group (A<sub>2</sub>)**

Interval Class	Absolute Frequency	Relative Frequency
213-233	0	0%
192-212	0	0%
171-191	1	7,14%
150-170	5	35,71%
129-149	8	42,85%
	14	100%

Based on the calculations in table 4, it can be seen that 1 person in the interval class 171-191 with a frequency of 7.14%, 5 people in the interval class 150-170 with a frequency of 35.71% and 8 people in the interval class 129-149 with a frequency of 42.85 %. For more details, see the distribution chart below:



**Figure 4. Histogram of Smash Ability in Intensive Interval Training Method Group (A<sub>2</sub>)**

**c. High Category Eye-foot Coordination Group Exercise (B<sub>1</sub>)**

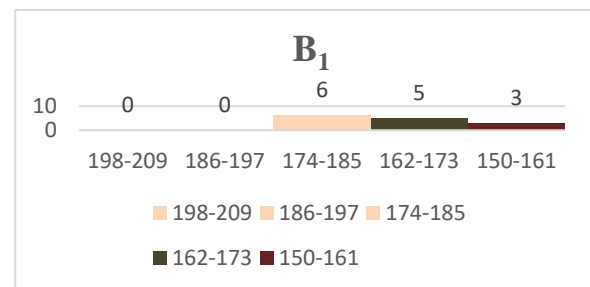
The data from the measurement of smash ability in this group consisted of 14 people with the highest score of 180, the lowest score of 150 with an average of 170,29 and standard deviation of 9,90. The distribution of the smash ability of the Riau Province Sports High School

athletes in this group can be described in the following frequency distribution table:

**Table 5. Exercises in the High Category Eye-foot Coordination Exercise Group (B<sub>1</sub>)**

Interval Class	Absolute Frequency	Relative Frequency
198-209	0	0%
186-197	0	0%
174-185	6	42,85%
162-173	5	35,71%
150-161	3	21,42%
	14	100%

Based on the calculations listed in table 5, it can be seen that 6 athletes in the 174-185 interval class with a frequency of 42.85%, 5 athletes in the 162-173 interval class with a frequency of 35.71% and 3 athletes in the 150-161 interval class with a frequency of 21.42%. For details, see the graph below:



**Figure 5. Histogram of Exercises in the High Category Eye-foot Coordination Exercise Group (B<sub>1</sub>)**

**d. Low Category Eye-foot Coordination Group Exercise (B<sub>2</sub>)**

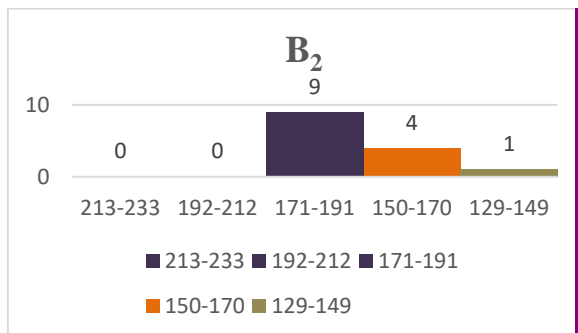
Data from the exercise measurement results in the low eye-foot coordination group consisting of 14 people in this group had the highest score

of 183, the lowest score of 129, the average score of 168.64 and the standard deviation of 15.01. The distribution of volleyball athletes at the Riau Province State Sports High School in this group is illustrated by the table below:

**Table 6. Low Eye-Foot Coordination Group Exercise Distribution (B<sub>2</sub>)**

Interval Class	Absolute Frequency	Relative Frequency
213-233	0	0%
192-212	0	0%
171-191	9	64,28%
150-170	4	28,57%
129-149	1	7,14%
	14	100%

Based on the calculations listed in table 6, it can be seen that 9 athletes in the 171-191 interval class with a frequency of 64.28%, 4 athletes in the 150-170 interval class with a frequency of 28.57% and 1 athlete in the 129-149 interval class with a frequency 7.14%. For more details, the elaboration of the distribution of the training frequency for the athletes of the Riau Province Sports State Senior High School can be seen in the following graph:



**Figure 6. Histogram of Exercise in the Low Category Eye-foot Coordination Group (B<sub>2</sub>)**

**e. Smash Ability Data in the Extensive Interval Training Method Group with Eye-foot Coordination in the High Category (A<sub>1</sub>B<sub>1</sub>)**

The data from the volleyball smash measurement of the members of this group consisted of 7 people with the highest score of 180, the lowest score of 160, an average of 172.43, and a standard deviation of 7.28. The distribution of the frequency of the volleyball smash at the Riau Province Sports High School is described in the following table:

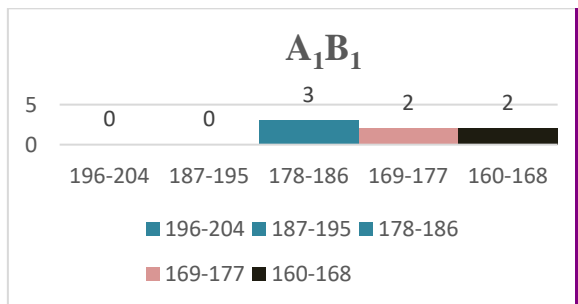
**Table 7. Smash Distribution of Extensive Interval Training Method Group with High Eye-foot Coordination (A<sub>1</sub>B<sub>1</sub>)**

Interval Class	Absolute Frequency	Relative Frequency
196-204	0	0%
187-195	0	0%
178-186	3	42,85%
169-177	2	28,57%
160-168	2	28,57%
	7	100%

Based on the calculations shown in table 7, it can be seen that 3 athletes in the 178-186 interval class with a frequency of 42.85%, 2 athletes in the 169-177 interval class with a frequency of 28.57%, and 2 athletes in the 160-168 interval class with frequency 28.57%.



For more details, it can be seen in the frequency distribution graph below:



**Figure 7. Histogram of Smash Ability Group of Extensive Interval Training Method with Eye-foot Coordination High Category ( $A_1B_1$ )**

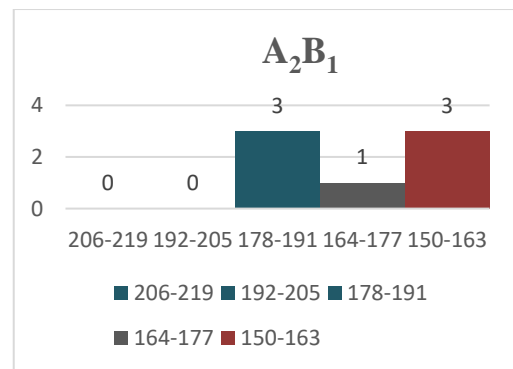
**f. Smash Ability Intensive Interval Training Method Group with High Category Eye Coordination ( $A_2B_1$ )**

The data on the results of measuring the smash ability of the athletes of the Riau Province Sports State Senior High School in this group had the highest score of 180, the lowest score of 150, an average of 168.14 and a standard deviation of 12.20. The frequency distribution of smash ability is depicted in the following table:

**Table 8. Distribution of Smash Ability Group Intensive Interval Training Method with Eye-foot Coordination in High Category ( $A_2B_1$ )**

Interval Class	Absolute Frequency	Relative Frequency
206-219	0	0%
192-205	0	0%
178-191	3	42,85%
164-177	1	14,28%
150-163	3	42,85%
	7	100%

Based on table 8 the results of the calculation of smash ability in the intensive interval training method group with high eye-foot coordination, 3 athletes in the 178-19 interval class with a frequency of 42.85%, 1 athlete in the 164-177 interval class with a frequency of 14.28 %, and 3 athletes in the 150-163 interval class with frequency. For more details, see the graph below:



**Figure 8. Histogram of Smash Ability Group Intensive Interval Training Method with Eye-foot Coordination High Category ( $A_2B_1$ )**

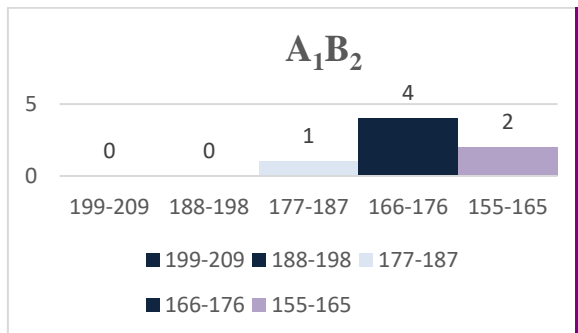
**g. Smash Ability Group Extensive Interval Training Method with Eye-foot Coordination Low Category ( $A_1B_2$ )**

The measurement data in the extensive interval training method group consisted of 7 people with the highest score of 178, the lowest score of 155, an average of 168.43 and a standard deviation of 9.45. The frequency distribution can be described below:

**Table 9. Distribution of Smash Ability Group Extensive Interval Training Method with Eye-foot Coordination Low Category ( $A_1B_2$ )**

Interval Class	Absolute Frequency	Relative Frequency
199-209	0	0%
188-198	0	0%
177-187	1	14,28%
166-176	4	57,14%
155-165	2	42,85%
	7	100%

Based on the distribution table in table 9 above, the extensive interval training method in this group is 1 athlete in the interval class 177-187 with a frequency of 14.28%, 4 athletes in the interval class 166-176 with a frequency of 57.14% and 2 athletes in the class interval 155-165 with a frequency of 42.85%. For more details, see the graph below:



**Figure 9. Histogram of Ability of the Extensive Interval Training Method Group with Low Eye-foot Coordination ( $A_1B_2$ )**

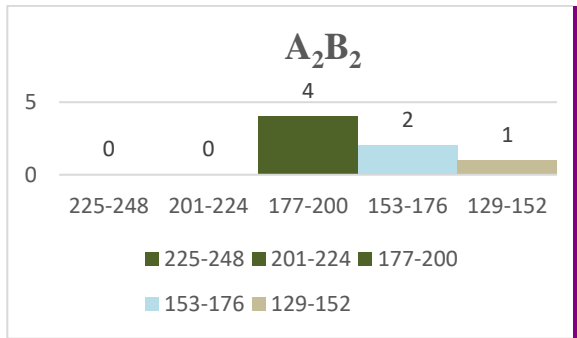
**h. Smash Ability Intensive Interval Training Method Group with Eye-foot Coordination Low Category ( $A_2B_2$ )**

The data from the measurement of smash ability in this group consisted of 7 people, the maximum score was 183, the lowest score was 129, the average was 168.86 and the standard deviation was 19.96. The frequency distribution of the smash athlete ability of the Riau Province Sports State Senior High School is described in the following table:

**Table 10. Distribution of Intensive Interval Training Method Group Ability with Eye-foot Coordination Low Category ( $A_2B_2$ )**

Interval Class	Absolute Frequency	Relative Frequency
225-248	0	0%
201-224	0	0%
177-200	4	57,14%
153-176	2	42,85%
129-152	1	14,28%
	7	100%

Based on the calculations listed in table 10, it can be seen that there are 4 athletes in the 177-200 interval class with a frequency of 57.14%, 2 athletes in the 153-176 interval class with a frequency of 42.28% and 1 athlete in the 129 interval class. -152 with a frequency of 14.28%. For more details, see the frequency distribution chart below:



**Figure 10. Histogram of Intensive Exercise Method Group Ability with Eye-foot Coordination Low Category ( $A_2B_2$ )**

### A. Hypothesis test

Hypothesis testing uses two-way Analysis of Variance (ANOVA). The purpose of the two-way Analysis of Variance (ANOVA) is to find out how the independent variables influence the experimental results and to determine the interaction effect of the treatments. For more details, the results of hypothesis testing can be seen in the table below:

**Table 11. Results of Analysis of Variance (ANOVA)**

Variant Source	JK	Db	RJK	$F_h$	$F_t$
Deliver A	3,57	1	3,57	47,14	3,01
Deliver B	89,28	1	89,28	1,88	3,01
AB Interaction	493,99	1	493,99	24	3,01
In (Error)	4038,9	24	168,29		
Total	4625,74	27			

Information:

Db = Degrees of Freedom

JK = Number of Squares  
 RJK = Average Sum of Squares  
 $F_h$  =  $F_{count}$   
 $F_t$  =  $F_{table}$

Based on table 11, it can be concluded that there is an effect of the group of extensive interval training methods and intensive training methods on volleyball smash abilities where  $F_{count} (A) 47.14 > F_{table} 3.01$  then  $H_0$  is accepted. There is no significant difference, to the training method and eye-foot coordination on the smash ability of the athletes of SMA Negeri Sport Riau Province  $F_{count} (B) 1.88 < F_{table} 3.01$  then  $H_a$  is accepted. There is an interaction between training methods and eye-foot coordination on smash ability athletes of SMA Negeri Olahraga Riau Province  $F_{count} (AB) 24 > F_{table} 3.01$  then  $H_0$  is rejected and  $H_a$  is accepted so that it can be concluded that there is a significant overall interaction between extensive and intensive interval training methods with eye-foot coordination on the smash ability of SMA Negeri Sports athletes Riau Province.

With the proof of the research hypothesis which states that there is a significant interaction between extensive and intensive interval training methods with eye-foot coordination on the smash ability of the athletes of SMA Negeri

Olahraga, Riau Province, a further test was carried out (Tukey Test). The following is table 12. Further test results (ANOVA)

**Tabel 12. Analysis Of Variance (ANOVA) Test with Tukey Test**

Compared group	Dk	Q <sub>h</sub>	Q <sub>t</sub>	Information
A <sub>1</sub> and A <sub>2</sub>	3,467	6,20	3,03	Significant
B <sub>1</sub> and B <sub>2</sub>	3,467	6,20	3,03	Significant
A <sub>1</sub> B <sub>1</sub> and A <sub>2</sub> B <sub>1</sub>	4,903	11,36	3,34	Significant
A <sub>2</sub> B <sub>1</sub> and A <sub>2</sub> B <sub>2</sub>	4,903	2,60	3,34	Not Significant

Based on table 12, the hypothesis of the Analysis of Variance (ANOVA) and Tukey test can be analyzed as follows:

1. The first research hypothesis which states that overall there are differences in the extensive interval training method (A<sub>1</sub>) the results are better than those trained with the intensive interval method. The mean score of the exercise method sample in the A<sub>1</sub> 170.43 group was significantly higher than the average exercise method in the A<sub>2</sub> group 168.50. ( $Q_{count} 6,20 > Q_{table} 3,03$ ).
2. The second research hypothesis states that overall eye-foot coordination in the high category eye-foot coordination group, the ability to smash in volleyball is better than the low eye-foot coordination group, the sample group B<sub>1</sub> is

170.29, which is significantly higher than the average low eye-foot coordination B<sub>2</sub> 168.93. ( $Q_{count} 6,20 > Q_{table} 3,03$ ).

3. The third research hypothesis which states that there is an interaction between the training method and eye-foot coordination on the smash ability of the Riau Province Sports Public High School can be seen  $F_{count} (AB) 24 > F_{table} 3.01$
4. The fourth research hypothesis states that the extensive interval training method with high eye-foot coordination is better than the intensive interval training method with high eye-foot coordination on the smash ability of SMA Negeri Sport Riau Province. The hypothesis is accepted, the mean A<sub>1</sub>B<sub>1</sub> 172.43 is higher than A<sub>2</sub>B<sub>1</sub> 169.71 ( $Q_{count} 11.36 > Q_{table} 3.34$ )
5. The fifth research hypothesis which states that the average intensive interval method with low eye-foot coordination compared to the extensive interval training method with low eye-foot coordination has no difference or is still considered the same. The mean of A<sub>1</sub>B<sub>2</sub> was 168.43 higher than A<sub>2</sub>B<sub>2</sub> 168.86 ( $Q_{count} 2.60 < Q_{table} 3.34$ ).

## **DISCUSSION CONCLUSIONS AND RECOMMENDATIONS**

Based on research findings and discussion of research results, it can be concluded as follows:

There is a difference in the effect of the extensive interval training method with the intensive interval training method on the smash ability of volleyball athletes at SMA Negeri Sport Riau Province, seen from the two-way ANOVA calculation there is a significant difference because  $F_{\text{count}} > F_{\text{table}}$  ( $F_h 47.14 > F_t 3.01$ ). There is an interaction between the training method and the coordination of the athlete's ankle on the smash ability of the volleyball athlete at SMA Negeri Sport Riau Province which can be seen from  $F_{\text{count}} (AB) 24 > F_{\text{table}} 3.01$ ). In the eye-foot coordination group, in the high category, the extensive interval training method was better than the intensive interval training method to improve the smash ability of volleyball athletes at SMA Negeri Sport Riau Province, it can be seen from  $Q_{\text{count}} 11.36 > Q_{\text{table}} 3.34$ . There is no difference in the effect on eye-foot coordination in the low category between the intensive training method and the extensive interval method to improve the smash ability of

volleyball athletes at SMA Negeri Sport Riau Province, it can be seen from  $Q_{\text{count}} 2.60 < Q_{\text{table}} 3.34$ .

Based on the conclusions and implications above, several suggestions are proposed to:

1. In an effort to increase the ability to smash volleyball effectively, it is necessary to use a form of exercise that is truly suitable and in accordance with the characteristics of the player. In addition, in using the exercise method consider other factors.
2. Athletes are expected to always attend every scheduled training day and carry out exercises continuously and repeatedly.
3. In improving the ability to smash, it is also necessary to pay attention to other factors that can affect the results of the exercise itself, such as physical, mental and motivational conditions.
4. For further researchers who are interested in conducting similar research, it is recommended to involve other variables, the object of research that is more expanded, and consider various limitations in this study.

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