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# The Impact of Arm Muscle Explosive Strength and Hand-Eye Coordination on Smash Performance Among Players at the Tulung Selapan Badminton Union Club

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**Abstract:** This study aims to evaluate the impact of arm muscle explosive strength and hand-eye coordination on smash performance among players at the Tulung Selapan Badminton Union Club. The research employs a quantitative method with a correlational approach. The study population and sample consist of 20 participants from the Tulung Selapan Badminton Union Club. Data collection was carried out using tests, and data analysis was performed through simple and multiple regression tests using the F-test formula. The findings of this study are 1) Arm muscle explosive strength has a significant impact on smash performance; 2) Hand-eye coordination also significantly affects smash performance; 3) Both arm muscle explosive strength and hand-eye coordination together have a significant impact on smash performance.

**Keywords:** Arm Muscle Explosive Strength, Hand-Eye Coordination, Impact, Smash Performance

## A. Introduction

According Bowles (2022) in history, badminton originated in India under the name "Poona." The game was then introduced to England and developed further there. In 1873, badminton was played in the garden of the Duke de Beaufort's palace in Badminton, Gloucestershire. Therefore, the game was later named "Badminton". Badminton is a highly popular sport both in Indonesia and globally. It enjoys widespread appeal across many countries, with a significant following and competitive presence on the international stage. In Indonesia, badminton is particularly well-loved and has a strong cultural and competitive significance, producing many skilled players who compete in various national and international tournaments. Worldwide, the sport is recognized for its dynamic gameplay and accessibility, contributing to its broad popularity and widespread participation.

As the game of badminton evolves, new training methods are emerging that are both more effective and efficient. Many countries previously underestimated are now

producing competitive and highly respected teams due to their ability to develop and optimize their potential. Recently, the enthusiasm of the Indonesian badminton team for the 2024 All England Championship has surged once again. The positive trajectory of the Indonesian national team will be further tested at the 2024 Asian Championship, which will be held at the Ningbo Olympic Sports Center Gymnasium in Ningbo, China, from April 9 to 14, 2024. Maintaining the winning momentum from the All-England Championship is crucial, as the victory has significantly boosted the players' self-confidence. This positive trend needs to be sustained throughout the Asian Championship.

The recent victories have bolstered the confidence of the Indonesian people, particularly badminton enthusiasts. Badminton is a widely popular sport in Indonesia and globally, known not only for its competitive aspect but also as a recreational activity. The rapid development of badminton in Indonesia is evident, with numerous badminton facilities available from both private and public sectors. Ni'mah & Deli (2020) confirms that badminton is a favored sport and source of entertainment for many Indonesians. The sport has been a part of Indonesian culture since the Dutch colonial era and continues to thrive today. To excel in badminton, players must engage in extensive practice, and understand the physical, technical, tactical, and mental components of the game. Effective training programs must include physical conditioning, followed by technical skill development. Proper training is essential for enhancing individual performance and achieving high levels of success in sports (Gunawan & Imanudin, 2018).

According to Suriyah, et al., (2021), ability is defined as the potential possessed by an individual to perform certain tasks or activities. Suriyah, et al., (2021) emphasized that ability includes aspects such as skills, knowledge, and attitudes that enable a person to complete work or achieve goals effectively. This ability is acquired and developed through education, training, and experience, and serves as a basis for good performance in various fields. Smash is a powerful stroke where the hand makes full contact with the ball at the top of the ball (Candra et al., 2019). Furthermore, according to Tohar (1992), the definition of a smash is a hard, steep downward stroke towards the opponent's court. Meanwhile, according to Herman Subardjah (2000), a smash punch is a hard and sharp punch, aimed at killing the opponent as quickly as possible.

The smash is a fundamental and highly effective technique in badminton, characterized by striking the shuttlecock with significant force from above, directing it sharply downward into the opponent's court. This aggressive shot is designed to overwhelm the opponent, making it challenging for them to return the shuttlecock, and is crucial for scoring points in the game. The smash is notable for its powerful, sharp, and fast shuttlecock speed. Mastering this technique requires not only strength and coordinated body movements but also excellent physical abilities,

including explosive muscle power in both the legs and arms. Compared to other shots, the smash is commonly used due to its potential to suppress the opponent's play, necessitating that opponent remain alert and agile to anticipate it effectively (Bondan, 2021). To master the smash, players must engage in continuous practice supported by high stamina and excellent physical conditioning. Without advanced technique and consistent practice, achieving proficiency in the smash is challenging.

A successful smash involves creating a sequence of movements with effective and efficient mechanics, supported by leg strength, followed by core, arm, and wrist muscles. Key aspects to master this technique include: (1) developing the ability to move quickly into the correct hitting position, (2) ensuring proper racket grip, (3) positioning the body flexibly with bent knees while focusing on the shuttlecock, (4) hitting the shuttlecock above the head by fully extending the arm and utilizing wrist strength, and (5) concluding the smash with a complete racket swing in front of the body (Nofrizal, 2019).

Good physical fitness, particularly explosive muscle strength, is essential for executing an effective smash. Explosive muscle strength is the ability of muscles to produce powerful contractions in a short time and is crucial for both arm and leg muscles. According to Hermansyah et al., (2020), explosive muscle strength is a combination of strength and speed, evident in performance results that combine these elements. This presents a challenge for researchers examining the impact of explosive muscle strength on smash performance in badminton players.

Wulandari et al. (2021) note that arm explosive strength contributes significantly to generating the necessary momentum for effective smashing, crucial from the service motion to the point of impact. This synergy ensures that the smash is delivered with maximum speed and effectiveness. Similarly, Miskalena & Tangkudung (2015) highlight explosive strength as a combination of speed and muscular power, which is essential for powerful and fast throws.

In badminton, explosive strength in the legs is vital for executing a powerful smash, as strong leg muscles enable higher jumps, ensuring the shuttlecock clears the net more easily. Arm muscle explosive strength is equally important for delivering a forceful smash, making it harder for opponents to return the shuttlecock (Syafriandi, 2020). The Tulung Selapan Badminton Association aims to channel and develop the talent of players, offering training in techniques frequently used in matches, such as drives, smashes, netting, drop shots, and lobs.

However, observations reveal that players from the Tulung Selapan Badminton Association face challenges with their smash technique, often hitting the net or failing to land the shuttlecock within the court boundaries. This issue is attributed to suboptimal arm muscle strength and hand-eye coordination. As Handayani (2018)

explains, arm muscle strength is crucial for effective strokes in badminton, with each stroke requiring maximum muscle contraction to achieve a powerful hit.

The players at the Tulung Selapan Badminton Association struggle with both hand-eye coordination and arm muscle strength during smashes. Addressing these issues could enhance their performance and effectiveness. The research aims to investigate these factors further, focusing on how explosive arm muscle strength and hand-eye coordination impact smash performance. This study, titled "The Impact of Arm Muscle Explosive Strength and Hand-Eye Coordination on Smash Performance" seeks to provide insights into improving training schemes and overcoming performance challenges.

**B. Methods**

According to Surakhmad (2018), a research method is a systematic approach employed to achieve objectives or present hypotheses using specific techniques and tools. Sugiyono (2019) also notes that the quality of research data is influenced by two primary factors: (1) the quality of the research instruments and (2) the quality of data collection. This particular study adopts a quantitative research method. Emzir (2009) defines a quantitative approach as one that primarily utilizes the postpositivist paradigm in scientific development. This includes considering cause and effect, reducing concepts to variables, forming hypotheses and specific questions, and employing measurement, observation, and theory testing. Research strategies like experiments and surveys, which require statistical data, are typical of this approach.

The quantitative method is grounded in positivism, emphasizing the study of objective phenomena through quantitative analysis. To maximize objectivity, this research uses numerical data and statistical processing to address issues through precise measurement of variables. This approach allows for conclusions that can be generalized regardless of time, context, or data type, especially when dealing with quantitative data. Sugiyono (2011) defines a population as a general area consisting of objects or subjects with specific qualities and characteristics that researchers study to draw conclusions. In this study, the population consists of 20 participants from the Tulung Selapan Badminton Union Club.

Data collection in this research uses the saturated sampling technique, and the data analysis follows steps designed to achieve the research objectives. Sugiyono (2011) explains that saturated sampling is a method where increasing the sample size does not improve representation or impact the value of the information obtained. Munadiroh (2022) further describes saturated sampling as a technique that continues gathering data until saturation is reached—meaning no new information is gained from further sampling. This ensures that the sample fully represents the variability

and depth of the research subject, eliminating the need for additional sampling.

The research process includes conducting tests, analyzing data descriptions, and assessing requirements like normality, homogeneity, and linearity. The data is then analyzed using both descriptive and inferential methods. Descriptive analysis focuses on presenting data through measures of central tendency and dispersion. Descriptive research aims to provide accurate data on subjects, conditions, or symptoms (Soekanto, 2007). Sugiyono (2014) adds that descriptive analysis depicts collected data as it is without intending to draw broad conclusions. Inferential analysis, on the other hand, is used to make predictions and generalizations based on the data. According to Firmantiar & Samsuddin (2024), inferential statistical analysis tests hypotheses, estimates population parameters, and assesses the significance of observed differences or relationships in the sample data. This research utilizes simple correlation and multiple regression techniques for data analysis, with the help of SPSS for Windows Version 26. The stages of analysis include (1) descriptive analysis, (2) testing analysis requirements, and (3) hypothesis testing.

The study was conducted with a sample of 20 badminton players from the Tulung Selapan Badminton Union Club. The participants were assessed for their muscle explosive strength and smash performance. Muscle explosive strength was measured using a standardized test, such as the vertical jump test or medicine ball throw, which are commonly used to assess power output. Smash performance was evaluated based on the speed and accuracy of the smash, as well as the ability to generate points from smash shots during gameplay.

The data collected from these assessments were then analyzed using the Product Moment Correlation technique to determine the relationship between muscle explosive strength and smash performance. The significance of the correlation was tested using both the correlation coefficient and t-test, as discussed earlier.

## C. Results and Discussion

This research examines the influence of arm muscle strength (X1) and hand-eye coordination (X2) on smash performance (Y) in badminton. The data used for analysis includes measurements of muscle explosive strength, derived from the assessment of smash performance using standardized instruments that have been tested for validity and reliability. Before the test, participants were given the opportunity to warm up, and the test was conducted in accordance with established norms. Each participant was required to perform the smash 10 times within a designated area, and if any errors occurred during the shuttlecock delivery, the test was repeated accordingly. The final test data reflects the impact of muscle explosive strength and hand-eye coordination on smash performance. The research findings

are summarized as follows:

**The Arm Muscle Explosive of strength Results of the Data**

To assess the explosive strength of participants' arm muscles, the Two-Hand Medicine Ball Put test was administered to a sample of 20 participants (n = 20). The test aimed to measure arm muscle explosive strength, with the results showing a maximum score of 300 and a minimum score of 190. The mean score was 242.25, with a standard deviation of 34.63 and a median of 240. The detailed results are presented in the following frequency distribution.

**Table 1. Frequency Distribution of Arm Muscle Explosive Strength of the Data**

| Number | Interval Class | Absolute Frequency | Relative Frequency (%) |
|---|---|---|---|
| 1 | 190 – 210 | 4 | 20 |
| 2 | 211 – 231 | 4 | 20 |
| 3 | 232 – 252 | 6 | 30 |
| 4 | 253 – 273 | 2 | 10 |
| 5 | 274 – 294 | 2 | 10 |
| 6 | 295 – 315 | 2 | 10 |
| Amount | | 20 | 100 |

Your summary of the frequency distribution of Arm Muscle Explosive Strength is mostly accurate, but there are a few corrections to consider for the value ranges of 253-273, 274-294, and 295-315: The percentage of samples in each of these ranges is 10%, not 20%. Here is a corrected summary. based on the frequency distribution data of Arm Muscle Explosive Strength in Table 1:

1. samples (20%) had Arm Muscle Explosive Strength in the range of 190-210.
2. 4 samples (20%) had Arm Muscle Explosive Strength in the range of 211-231.
3. 6 samples (30%) had Arm Muscle Explosive Strength in the range of 232-252.
4. 2 samples (10%) had Arm Muscle Explosive Strength in the range of 253-273.
5. 2 samples (10%) had Arm Muscle Explosive Strength in the range of 274-294.
6. 2 samples (10%) had Arm Muscle Explosive Strength in the range of 295-315.

**Hand Eye Coordination Results of the Data**

To determine Eye-Hand Coordination in students, a test measuring throwing and catching a tennis ball against a target wall was used with a sample of 20 people (n = 20) which aimed to measure Eye-Hand Coordination. After carrying out the test, a score was obtained. For more details, the data results were obtained as follows: the highest (Max) value of Eye-Hand Coordination in PB Harapan Beach sample participants was 19 and the lowest (Min) was 3. Median 10 standard deviations is 3.65. For more details, the standard deviation of the complete data distribution can be seen in the following table:

**Table 2. Frequency Distribution of Hand Eye Coordination of the Data**

| Number | Interval Class | Absolute Frequency | Relative Frequency (%) |
|---|---|---|---|
| 1 | 3 – 6 | 3 | 15 |
| 2 | 7 – 10 | 8 | 40 |
| 3 | 11 – 14 | 7 | 35 |
| 4 | 15 – 18 | 1 | 5 |
| 5 | 19 – 22 | 1 | 5 |
| 6 | 23 – 26 | 0 | 0 |
| **Amount** | | **20** | **100** |

Based on the frequency distribution data of hand eye coordination results in table 2, the achievements of the 20 sample people, 3 people (15%) had eye hand coordination scores between 3-6, then 8 people (40%) had hand eye coordination scores between 7- 10, then 7 people (35%) had a hand eye coordination score between 11-14, then 1 person (5%) had a hand eye coordination score between 15-18, then 1 person (5%) had a hand eye coordination score between 19 -22 and then not one person (0%) had a hand eye coordination score of 23-26.

**Smash performance Results of the Data**

To determine the Smash performance of Tulung Selapan Badminton Union Club, tests and measurements were used using the Clear Test technique with a sample size of 20 people (n = 20). After carrying out the test with the total score from 20 occasions recorded as the final test score, the following data results were obtained: the highest (Max) Smash Accuracy score for Tulung Selapan Badminton Union Club was 72 and the lowest (Min) was 17. Median 57, standard deviation (standard deviation) is 14.88. A description of the research results is presented in a frequency distribution as follows:

**Table 3. Frequency Distribution of Smash performance of the Data**

| Number | Interval Class | Absolute Frequency | Relative Frequency (%) |
|---|---|---|---|
| 1 | 17 – 27 | 1 | 5 |
| 2 | 28 – 38 | 3 | 15 |
| 3 | 39 – 49 | 3 | 15 |
| 4 | 50 – 60 | 4 | 20 |
| 5 | 61 – 71 | 8 | 40 |
| 6 | 72 – 82 | 1 | 5 |
| **Amount** | | **20** | **100** |

Based on the data distribution of Smash performance results in table 3, the results from 20 sample people, 1 person (5%) had a Smash performance score between 17-27, 3 people (15%) had a Smash performance score between 28-38, 3 people ( 15%)

have a Smash performance score between 39-49, 4 people (20%) have a Smash performance score between 50-60, then 8 people (40%) have a Smash performance score between 61-71 and 1 person (5%) has Smash performance scores between 72-82.

**Hypothesis 1 (One): The Explosive of the Power Impacts on Smash performance**

It can provide a detailed breakdown of the Product Moment Correlation analysis, discuss the implications of the findings, delve into the importance of muscle explosive strength in badminton, explore the methodology, and contextualize the results in relation to existing research. Below is a comprehensive expansion of the original statement. In the realm of sports science, understanding the relationship between physiological attributes and athletic performance is crucial for optimizing training programs and improving outcomes. In this context, the current study focuses on examining the impact of muscle explosive strength on smash performance in badminton players. Specifically, the research was conducted among players in the Tulung Selapan Badminton Union Club, and the findings were analyzed using the Product Moment Correlation technique. This analysis allows for the investigation of the strength and direction of the relationship between two variables in this case, muscle explosive strength and smash performance.

The Product Moment Correlation is a statistical tool widely used to measure the strength and direction of a linear relationship between two continuous variables. It is represented by the correlation coefficient (r), which ranges from -1 to +1. A positive correlation indicates that as one variable increases, the other also tends to increase, while a negative correlation suggests that as one variable increases, the other decreases. In this study, the calculated correlation coefficient (r_count) is 0.474, which suggests a moderate positive correlation between muscle explosive strength and smash performance. In statistical analysis, determining whether a correlation coefficient is significant requires comparing it to a critical value obtained from a correlation table (r_table) based on the sample size and desired level of significance. In this study, the r_table value is 0.444. Since the calculated r_count (0.474) is greater than r_table (0.444), the correlation is considered statistically significant. This means that the relationship between muscle explosive strength and smash performance is unlikely to be due to random chance, and there is sufficient evidence to suggest a real association between these two variables. To further validate the results, a t-test was conducted to compare the calculated t-value (t_count) with the critical t-value (t_table). The t-test is a hypothesis-testing tool that assesses whether the means of two groups are statistically different from each other. In this context, the t-test is used to determine whether the observed correlation is significantly different from zero. The calculated t-value (t_count) is 2.282, while the critical t-value (t_table) is 1.734. Since t_count exceeds t_table, this further supports the rejection of the null hypothesis (Ho) and the acceptance of the alternative hypothesis (Ha).

The rejection of the null hypothesis and acceptance of the alternative hypothesis indicate that there is a statistically significant impact of muscle explosive strength on smash performance in badminton players. This finding aligns with existing research in sports science, which suggests that explosive strength, particularly in the upper body, is a key determinant of performance in sports that require powerful, rapid movements, such as badminton. Muscle explosive strength, often referred to as power, is the ability to exert maximum force in a short amount of time. In badminton, explosive strength is crucial for executing powerful smashes, quick changes in direction, and rapid accelerations and decelerations on the court. The smash, in particular, is one of the most important offensive shots in badminton, as it allows players to generate high shuttlecock speeds, making it difficult for opponents to return the shot. The importance of muscle explosive strength in badminton can be attributed to the dynamic nature of the sport. Badminton players must frequently engage in rapid, high-intensity movements that require both strength and speed. For example, during a smash, the player must quickly generate force through the legs, transfer that force through the core, and finally deliver it through the arm and racket to hit the shuttlecock with maximum power. This sequence of movements relies heavily on the player's explosive strength.

**Impact of Training on Muscle Explosive Strength**

Given the significant role of muscle explosive strength in badminton performance, it is essential to consider how this attribute can be developed through training. Plyometric exercises, resistance training, and sport-specific drills are commonly used to enhance explosive strength. Plyometric exercises, such as jump squats and box jumps, help improve the ability of muscles to generate force quickly. Resistance training, on the other hand, focuses on increasing overall muscle strength, which can contribute to greater power output during explosive movements.

In badminton, training programs often include exercises that target the major muscle groups involved in the sport, including the legs, core, and upper body. For instance, leg exercises such as lunges and squats help improve the lower body strength needed for powerful jumps and quick lateral movements. Core exercises, such as planks and Russian twists, enhance the ability to transfer force from the lower body to the upper body, while upper body exercises, such as push-ups and shoulder presses, build the strength needed for powerful smashes.

The results of this study have several practical implications for coaches and athletes. First, the findings underscore the importance of incorporating explosive strength training into the training regimens of badminton players. By focusing on exercises that enhance power output, athletes can improve their ability to execute powerful smashes and other explosive movements on the court.

Second, the study highlights the need for sport-specific training programs that target the key muscle groups involved in badminton. For example, coaches can design training sessions that include a combination of plyometric exercises, resistance training, and badminton-specific drills to optimize the development of explosive strength.

Third, the findings suggest that regular assessments of muscle explosive strength can be useful for monitoring the progress of athletes and making adjustments to their training programs as needed. By tracking changes in explosive strength over time, coaches can identify areas of improvement and tailor their training approaches to meet the individual needs of their athletes.

The findings of this study are consistent with previous research in the field of sports science. Numerous studies have shown that explosive strength is a key predictor of performance in sports that require quick, powerful movements. For example, a study by Cronin and Hansen (2005) found that explosive strength, as measured by vertical jump height, was strongly correlated with sprint performance in rugby players. Similarly, research by Suchomel et al. (2016) demonstrated that plyometric training significantly improved power output and performance in weightlifters. In badminton, research by Lees (2003) highlighted the importance of explosive strength in executing powerful smashes and quick changes of direction. The current study adds to this body of knowledge by providing empirical evidence of the relationship between muscle explosive strength and smash performance in badminton players, specifically within the context of the Tulung Selapan Badminton Union Club.

While the current study provides valuable insights into the relationship between muscle explosive strength and smash performance, it is important to acknowledge its limitations. One limitation is the relatively small sample size of 20 participants, which may limit the generalizability of the findings. Future research with larger sample sizes could provide more robust evidence of the relationship between these variables. Additionally, the study focused exclusively on badminton players from a single club, which may not fully represent the broader population of badminton players. Future research could explore the relationship between muscle explosive strength and smash performance in different contexts, such as at the national or international level. Another area for future research is the exploration of other factors that may influence smash performance, such as technique, agility, and mental focus. While muscle explosive strength is undoubtedly important, it is likely that a combination of physical, technical, and psychological factors contribute to overall performance in badminton.

In conclusion, the results of the Product Moment Correlation analysis demonstrate a significant relationship between muscle explosive strength and smash performance in badminton players from the Tulung Selapan Badminton Union Club. The findings

highlight the importance of explosive strength in executing powerful smashes and suggest that training programs designed to enhance this attribute can lead to improved performance on the court. While the study has some limitations, it provides valuable insights that can inform future research and practice in the field of sports science.

**Table 4. Summary of Significance Test Analysis Results for the Correlation Coefficient of Muscle Explosive Strength on Smash performance**

| Correlation Coefficient $Rx_1y$ | $r_{count}$ | $r_{table}$ | Conclusion |
|---|---|---|---|
| 0,474 | 2,282 | 1,734 | Significant |

**Table 5. Summary of Correlation Coefficient Significance Test Analysis Results Hand Eye Coordination on Smash performance**

| Correlation Coefficient $Rx_2y$ | $r_{count}$ | $r_{table}$ | Conclusion |
|---|---|---|---|
| 0.481 | 2.330 | 1.734 | Significant |

**Table 6. Summary of the Results of the Power Correlation Coefficient Significance Test Analysis Muscle Explosion and Hand Eye Coordination on Smash performance**

| Correlation Coefficient $Rx_{12}y$ | $r_{count}$ | $r_{table}$ | Conclusion |
|---|---|---|---|
| 0.552 | 3.73 | 3.59 | Significant |

The Smash performance is a blow that is done while jumping and is often used to kill the opponent's game. This punch relies on strength, speed, arm and wrist whip. According Zarwan, (2012) Smash is a key hit to turn off the shuttle cock on the side of the opponent, this blow is a finishing blow that shuttlecock is very difficult to return. When performing a Smash, Badminton players are required to have good hand eye coordination. Coordination is the ability to control body movements. Digantara, et al., (2020) said that all sports require an element of coordination, because coordination is a component of physical condition which is very important for mastering sports skills and is a very complex thing. In order to successfully combine several movements into an effective movement, a person must have good coordination. With it, one can display skills smoothly, and the movement patterns will look beautiful. Meanwhile, Eye-Hand Coordination is a special type of coordination that only involves the eyes as senses or recipients of stimuli and the hands as a means of movement. The role of Hand Eye Coordination supports the movement ability in performing Smash by combining several movements to achieve a movement that is in harmony with the goal, so that you can control and place the shuttlecock as desired. If hand eye coordination can be maximized in the process of

performing the smash technique, it will support optimal Smash performance.

Explosive muscle power is essential for executing rapid forward or vertical jumps. This type of power enables the muscles to generate significant force quickly, allowing for swift and effective movements. Such jumps or motions rely on the ability to exert maximum strength in a brief time, facilitating immediate and powerful actions. Previously, the sample participants had prepared themselves to jump as hard as possible to reach the highest point, so that it was easy to hit the shuttlecock, so that the whole body was lifted up in the air and success in performing an Accurate Smash would be easier. In order for a Badminton player to be able to do a good Smash correctly, good muscle Explosive Strength is needed because it can provide body balance when doing a Badminton Smash. The role of explosive muscle power in Smash performance in badminton is very important. Muscle Explosive Strength is very important in jumping, especially in smashing.

In this case, muscle Explosive Strength greatly impacts Smash's ability. When doing a Smash, muscle Explosive Strength is a very dominant component because the greater the muscle Explosive Strength, the stronger the resulting jump and it will make it easier to do a Smash. Based on data analysis that researchers processed from the measurement results, it was stated that there was an impact of muscle Explosive Strength and hand-eye coordination on the Smash performance of Tulung Selapan Badminton Union Club. Then muscle Explosive Strength is needed when doing a Smash, muscle Explosive Strength is needed to jump forward or vertically. This jump or movement movement is done quickly. Previously, Tulung Selapan Badminton Union Club had prepared themselves to jump as hard as possible to reach the highest point, so that it was easy to hit the shuttlecock, so that the whole body was lifted up in the air and successful Smashing would be easier to do.

## D. Conclusions

Based on the data analysis, statistical calculations, and hypothesis testing, the conclusions of this research are 1) there is a significant effect of muscle explosive strength on the smash performance of the Tulung Selapan Badminton Union Club, with a calculated correlation value of 0.474, which is greater than the critical value (r_table) of 0.444 (0.474 > 0.444); 2) eye-hand coordination also significantly affects smash performance in the Tulung Selapan Badminton Union Club, with a calculated correlation value of 0.481, exceeding the critical value (r_table) of 0.444 (0.481 > 0.444); 3) the combined impact of muscle explosive strength and hand-eye coordination on smash performance in the Tulung Selapan Badminton Union Club is significant, with a calculated correlation value of 0.552, which is greater than the critical value (r_table) of 0.444 (0.552 > 0.444).

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