Available online at https://journal.uny.ac.id/index.php/jorpres

JORPRES (Jurnal Olahraga Prestasi), 20 (1), 2024, 41-51

Exploring hidden potential: new strategies in women's cricket by examining muscle explosive intensity and eye-hand balance

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Abstrak
The aims of this study was to determine the relationship of grip strength and arm muscle strength to batting skills. This type of research is correlational. The population in this study was the West Sumatra women's Pre-PON cricket team which amounted to 14 people using total sampling technique where the population in accordance with certain requirements to be sampled, to obtain research data used two-hand medicine ball putt test, tennis ball throwing catch test and batting test. The data obtained were analyzed by simple correlation and multiple correlation. The results showed that: 1) arm muscle explosive power has a significant relationship with the batting skills of the West Sumatra women's Pre-PON cricket team. 2) eye-hand coordination has a significant relationship with the straight drive of the West Sumatra women's Pre-PON cricket team. 3) arm muscle explosive power, eye-hand coordination have a significant relationship with the straight drive of the West Sumatra women's cricket team.
Keywords: arm muscle explosive power; eye-hand coordination; straight drive shots

INTRODUCTION

Cricket, as a sport with rich historical roots, continues to evolve in various aspects, including playing techniques and skills (Dittert et al., 2023; Santhya & Francis Zavier, 2022; van Meurs et al., 2023). In recent years, research in cricket has increasingly focused on the physical and technical factors that can influence athlete performance, particularly in the role of the batsman (Higa et al., 2021; Pilco-Romero et al., 2023; Zhang et al., 2022). Several previous studies have explored the relationship between muscle strength and cricketing skills, with an emphasis on its relation to batting technique. However, the current state of the art suggests a shift in focus to specific elements such as grip strength and hand-eye coordination, which can contribute more significantly to the success of the straight drive, a classic decisive shot in the game (Mwangi et al., 2022; Pennay et al., 2022; Werneck et al., 2021).

The importance of grip strength in cricket has been highlighted in recent literature (Arama et al., 2023; Buszard et al., 2021; Singh, 2023). Several studies have shown that good grip strength can improve control over the bat, allowing players to execute different types of shots more effectively. Along with that, recent studies have also begun to observe the correlation between hand-eye coordination and cricketing skills. Not only does this coordination affect the batter's ability to follow the ball's movement precisely, but it can also have a significant impact on certain types of shots, such as straight drives, which are the focus of this study (King et al., 2023; Yan, 2023).

In addition to the physical and technical aspects, technological developments have opened up new opportunities in the analysis of cricket player performance (Bisconsin-Júnior et al., 2022; McGhee et al., 2023; Tran et al., 2023). The use of sensors and motion tracking systems allows for a deeper understanding of the biomechanics of cricket movements, providing valuable insights for coaches and trainers to design more specific training programs. By integrating findings from previous research and the latest technology, this study steps forward to holistically understand the factors that influence batting skills, opening the door for more advanced and effective training strategies in optimizing the performance of female cricket athletes (Hopkins et al., 2022; MacLachlan et al., 2022).

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

Women's cricket is a sport that is increasingly gaining global recognition, showing rapid growth in fan participation and interest (Meneses et al., 2023; Morgan & Wilk, 2021). Despite this, there is still much latent potential to be discovered and improved in the game. This article aims to explore new strategies in women's cricket by examining muscle explosive power intensity and hand-eye balance. Within this scope, an in-depth understanding of physical factors and technical skills can provide new insights to improve the performance of female athletes in this sport (Chembakottu et al., 2023; Meyer, 2022; Orchard et al., 2023).

First of all, it is important to note that the role of muscle explosiveness is crucial in executing batting techniques, involving optimal speed and power. Analyzing the intensity of muscle explosive power in female cricket players can help generate specific training aimed at improving movement efficiency and optimizing batting power. Therefore, a scientific understanding of this physical aspect can be the key to unlocking the hidden potential of athletes (J Morrison & Arjyal, 2021; Pillon, 2021; Suarez et al., 2023).

In addition, focusing on eye-hand balance is an important aspect in perfecting the technical skills of female cricket players. Proper balance between the eyes and hands can affect precision and consistency in batting. By engaging in an intensive study of the relationship between eye-hand balance and player performance, specific training guidelines can be developed to improve technical skills, which in turn, can have a positive impact on game outcomes (Anggoro & Masrun, 2023; Humairoh et al., 2023).

Furthermore, integrating this research in the coaching and training of female cricket players can create innovative and targeted training methods. The use of advanced technology in motion analysis, such as the use of sensors and motion analysis software, can provide accurate data to track and improve aspects of muscle explosiveness and eye-hand balance. This can be the foundation for designing more effective and personalized training programs for each athlete, maximizing their potential (Buser et al., 2021; Gupta, 2022).

As such, this article will open the door to a deeper understanding of the physical and technical factors that influence the performance of female cricket players. By unearthing hidden potential through the analysis of muscle explosive power intensity and hand-eye balance, it is hoped that a foundation can be created for the development of new strategies that can take the game of women's cricket to a higher level (Lee & Potrac, 2021; Sheerin & Garavan, 2022).

Sport is an activity that is very close to humans because humans are never separated from activities related to physical activity. Exercise will keep the body fit and not quickly experience performance decline (Haryanto & Welis, 2019). Sports achievements will only be achieved if there is coaching and development of various potentials.

That exist in individuals. Laksana et al., (2017) "sports achievements can be achieved if the existing coaching system can be planned and implemented properly". Priyanto et al., (2014) "in improving the achievement of a sport, the role of a coach in this case plays a big role in advancing it" while according to Candrawati & Ilahi, (2018) "the achievement of peak performance in sports can only be achieved through a systematic, planned, regular and continuous coaching process".

According to Soan,(2017)"sports achievement coaching based on public policy and cultural development will result in the achievement of maximum sports achievements at the national and even international levels". Triyasari et al., (2016) state "sports achievement coaching there are many factors that must be considered, including clear coaching objectives, systematic training programs, appropriate training materials and methods, and evaluations that can measure the success of the coaching process itself". In addition, Rudiansyah et al., (2017) also argues that "sports coaching is a nursery system that involves individual athletes in building self-professionalism through a predetermined system with achievement goals". So sports coaching is an effort to develop the potential of athletes so that they can improve their achievements. Of the various sports achievements that have developed widely in the midst of this community, cricket is one of the new sports developing in West Sumatra.

Trishandra, (2018) "Cricket is a sport that can be played by all ages and all groups of people, both teenagers and the general public as well as achievement tuntuntan there are even many sports competition activities in the village or even higher levels. So that the need for socialization is done early, socialization is done in schools and clubs so that it can be effective to develop sports to be higher ", besides that Putra Marnane, (2023); Jo Morrison, (2023) "Cricket sport is a game played by two teams

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

where each team has 11 people playing, and the length of the game i s not limited by time, but uses over (displacement) in two innings (round)".

Cricket originated in England. The sport was originally intended for royals who dressed quickly and elegantly. However, in its development the sport developed, especially in common wealt countries and became the favorite of the majority of local residents such as in Australia and Italy (Setyaningrum et al., 2021).

Cricket is a team sport game played between two groups of eleven people each (Juniarto & Tangkudung, 2022). Cricket is a game that uses bats, balls and supporting equipment in the game of cricket is also very important to protect themselves (safety procedures) such as glove (hand protector), helmet (head protector), pad (leg protector), box (sex protector), tie pad (thigh protector) and keeping glove (kipper hand protector (Kurniawan et al., 2022). (In the sport of cricket there are two teams that play, namely batting and fielding. The division is 2 batsman in the field against 11 fielder. If one batsman is out, the batsman outside the field must replace the batsman until there are no more replacement batsmen for batting. Batting itself is the batting team trying to get runs (points or scores). While fielding is a defensive team that tries to prevent the batting team from getting runs. In the fielding team itself there is a bowler (pitcher) who takes turns throwing the ball to the batsman (batter).

In Coaching Youth Cricket by (O'Neill et al., 2023) "there are three basic techniques that must be mastered by cricket players, namely batting, bowling, and fielding. The batting technique is one of the basic efforts to achieve numbers in cricket matches, so the better the cricket team's athlete technique in batting, the greater the team's chances of winning (Mardela et al., 2021). In this study, researchers focused on basic batting techniques. Some basic batting techniques are straight drive (straight hit), cover driver (hit towards cover), pull shot (hit towards the left), hook shot (hit towards the left corner), cut shot (cut shot right), sweep shot (sweeping shot), leg glance (hit slightly towards the left), late cut (cut shot), (slightly behind). Some of these basic batting techniques aim to protect the bat. stump (a wicket formed from three equal-height timbers) and get a run".

The most important basic technique or every batsman (batter) is mastering the straight drive or straight shot. However, what happens in the field is that there are many straight drives that miss or do not hit the ball so that the ball goes straight to the stump and causes the batsman out (dead) and or the ball hits the pad (shin protector) and the batsman is declared out known as LBW (leg before wicket).

Based on the results of interviews with coaches and some players, at the 2019 PON Cricket Pre-event in Jakarta, West Sumatra women's cricket players, often out because of bowled (the ball hits the stump). In a d d i t i o n , at the 2018 PORPROV event in Padang Pariaman, West Sumatra cricket players are divided according to their home districts. Likewise, the Padang Pariaman Women's Cricket Team batsman is quite often out because of bowled, although it does not spend the entire batsman. To anticipate LBW and bowled or balls that come in line with the stump, one of the techniques used is straight drive. The accuracy of a good straight drive, allows the ball hit to go straight ahead horizontally or soar away and is difficult for the fielder to anticipate so that it can protect the stump and get runs of course. The accuracy of a straight drive is influenced by several factors, namely arm muscle strength, grip strength, arm muscle explosiveness, hand eye coordination, timing, reaction speed from the batsman himself.

In a straight drive, arm muscle strength is useful to give power to the swing of the bat to hit the ball. The grip strength itself is useful in swinging the bat, so that the bat does not rotate when hitting the ball. The explosive power of the arm muscles plays a role in the strength of the ball hit, hand eye coordination plays a role in the harmony between the eyes and hand movements that are useful for swinging the bat towards the ball. In batting, a batsman must focus on seeing the direction of arrival and the point of possibility of falling and bouncing the ball. Reaction speed and timing play a role in making decisions on the use of hitting techniques against the ball that comes at the right time and the right ball.

Based on the observations of researchers, most of the accuracy of the straight drive batsman of the West Sumatra cricket team is still lacking, in several championships and training events and most recently at the 15th Porprov Padang Pariaman. This can be seen, sometimes the ball hit does not go far, making it difficult to get runs. The swing of the bat often does not hit the ball and causes the batsman to get out either LBW or bowled. Often the batsman is not precise in using his batting technique. Although the ball can be hit but it does not hit the sweetspot, so the ball does not go far. and also the direction of the shot does not point straight ahead. The inaccuracy of straight drive shots of West Sumatra Women's

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

cricket players, may be caused by several factors including arm muscle strength, grip strength, arm muscle explosiveness, hand eye coordination, timing, and reaction speed.

Seeing the above reality, the author on this occasion is interested in conducting a study related to arm muscle explosiveness and hand eye coordination with straight drive punches of the West Sumatra Women's Pre-PON cricket team, so that it is hoped that later it can be useful and overcome the problems that occur.

This study makes a significant contribution in deepening the understanding of the key factors that influence batting skills in cricket, particularly at the level of the West Sumatra women's Pre-PON team. The two specific aspects explored, namely grip strength and eye-hand coordination, provide new nuances in the cricket literature and strengthen the knowledge base related to the development of technical skills of female cricket athletes. The novelty of this study lies in its focus on grip strength and hand-eye coordination as key predictors of batting skills, which have not been fully explored in the context of women's cricket in Indonesia. Through this holistic approach, this study aims to uncover the following new and deeper insights to help coaches and trainers identify critical areas for attention in their training programs.

The purpose of this research evaluation was sharp and strong, namely to provide a solid empirical foundation for the development of more effective and specific training programs in improving the batting skills of female cricket athletes. By combining findings on grip strength and hand-eye coordination, the study sought to provide a more thorough understanding of the interaction of these two factors and how they together can influence the quality of straight drives. A rigorous and robust evaluation in this context ensures that this study not only provides descriptive findings, but also makes practical contributions that can be implemented directly in the coaching and training of female cricketers, leading to tangible and measurable performance improvements.

METHODS

This type of research is correlational, namely a study to determine the level of relationship between different research variables, namely the independent variables and dependent variables. In accordance with the research objectives to be revealed, namely arm muscle explosiveness, eye-hand coordination and straight drive shots, the type of data needed consists of primary and secondary data. Primary data is data directly taken by researchers by conducting Two-hand medicine ball put tests, throwing tennis ball catches and batting tests and secondary data relating to player documentation. Primary data or data obtained from the results of the 2019 West Sumatera Women's Pre-PON cricket team test. While secondary data from this study from various parties such as coaches and administrators of West Sumatra Cricket. The data was analyzed using simple correlation and multiple correlation.

RESULTS AND DISCUSSION

The result overall data was analyzed using simple correlation and multiple correlation. The results of this research are written based on the variables studied. Detailded data analysis result can be seen in the data description of each research variable as follows:

a. Arm Muscle Explosive Power

Based on the results of the measurement of arm muscle explosiveness using two- hand medicine ball putt against 14 West Sumatra women's cricket players obtained a maximum score of 4.19 and a minimum score of 3.29, besides that the average value is 3.72 and a standard deviation of 0.27. for more details on the ability of arm muscle explosiveness of the West Sumatra women's cricket team can be seen in the table below:

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

Table 1. Level of Ability of Arm Muscle Explosive Power *Cricket* Team West Sumatra Women's Pre-PON

No.	Interval Class	Fa	Fr (%)	Classification
1	≥4,14	1	7,14 %	Very good
2	3,87 - 4,13	4	28,57 %	Good
3	3,60 - 3,86	4	28,57 %	Medium
4	3,32 - 3,59	4	28,57 %	Less
5	≤3,31	1	7,14 %	Very Less
Total		14	100%	

From the table above it can be concluded from 14 female cricket players West Sumatra can be seen that 1 person (7.14%) has very good ability, 4 people (28.57%) have good ability, 4 people (28.57%) have moderate ability, 4 people (28.57%) have less ability, and 1 person (7.14%) has very less ability. The frequency results of the level of ability of arm muscle explosiveness of the West Sumatra women's cricket team.

b. Eye-hand coordination

Based on the results of eye-hand coordination measurements using handball throwing and catching against 14 West Sumatra women's cricket players obtained a maximum score of 31 and a minimum score of 17, besides that the average value is obtained 23.50 and standard deviation 4.47. For more details on the ability of the explosive power of the arm muscles of the West Sumatra women's cricket team can be seen in the table below:

Table 2: Level of Eye-Hand Coordination Ability of *Cricket* TeamWest Sumatra Women's Pre-PON

No.	Interval Class	Fa	Fr (%)	Classification
1	31 -29	2	14,29 %	Very good
2	28 -26	2	14,29 %	Good
3	25 -23	5	35,71 %	Medium
4	22 -20	1	7,14 %	Less
5	19 -17	4	28,57 %	Very Less
Total		14	100%	

From the table above it can be concluded from 14 female cricket players West Sumatra can be seen that 2 people (14.29%) have very good abilities, 2 people (14.29%) have good abilities, 5 people (35.71%) have moderate abilities, 1 person (7.14%) has less ability, and 4 people (28.57%) have very less ability. The frequency results of the level of eye-hand coordination ability of the West Sumatra women's cricket team.

c. Straight Drive

Based on the results of the measurement of straight drive skills using batting tests against 14 West Sumatra women's cricket players obtained a maximum score of 36 and a minimum score of 12 besides that obtained an average value of 24.71 and a standard deviation of 8.32. For more details of the ability of the straight drive punch West Sumatra women's cricket team can be seen in the table below:

Table 3. Straight Drive Ability Level of Cricket Team West Sumatra Women's Pre-PON

No.	Interval Class	Fa	Fr (%)	Classification
1	36 -32	3	21,43 %	Very good
2	31 -27	3	21,43 %	Good
3	26 -22	3	21,43 %	Medium
4	21 -17	1	7,14 %	Less
5	16 -12	4	28,57 %	Very Less
Total		14	100%	

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

From the table above it can be concluded from 14 West Sumatra women's cricket players it can be seen that 3 people (21.43%) have very good abilities, 3 people (21.43%) have good ability, 3 people (21.43%) have moderate ability, 1 person (7.14%) has less ability, and 4 people (28.57%) have very less ability. The results of the frequency of the level of ability of the straight drive of the West Sumatra women's cricket team.

Discussion

The results showed that there was a significant relationship between arm muscle explosiveness and straight drive shots on the West Sumatra Women's Pre-PON Cricket Team (Gómez-Corona & Valentin, 2023; Kosečková et al., 2022). The correlation value (r) of 0.98 shows a very strong positive correlation between arm muscle explosiveness and the skill of hitting straight drives. In addition, the t-test results show a tcount of 16.95, which is significantly greater than the ttable value (1.782). Therefore, it can be concluded that arm muscle explosiveness has a significant influence on the ability to hit straight drives in the team (McLeod et al., 2023).

Other findings indicate that there is a significant relationship between eye-hand coordination and straight drive shots on the West Sumatra Women's Pre-PON Cricket Team. The high correlation value (r = 0.98) indicates a strong positive correlation between eye-hand coordination and skill in hitting straight drives. The t-test results with a tcount of 16.95 which is much greater than the ttable (1.782) reinforces the conclusion that eye-hand coordination plays an important role in the success of straight drives in the team.

The analysis shows that there is a significant relationship between arm muscle explosiveness and eye-hand coordination with straight drive shots on the 2019 West Sumatra Women's Pre-PON Cricket Team. The correlation value of 0.82 shows a strong positive correlation between the two variables. Furthermore, the results of the F test with an Fcount of 11.33 which is significantly greater than Ftable (3.98) confirm that arm muscle explosiveness and eye-hand coordination together have a significant influence on the ability to hit straight drives in the team that year. This analysis provides a deep insight into the factors that need to be considered in training female cricket athletes to improve their performance, while providing a basis for the development of more effective training programs (Mowri & Bailey, 2023; Suga et al., 2023).

The results of the study which showed a significant relationship between arm muscle explosiveness and straight drive hitting on the West Sumatra Women's Pre-PON Cricket Team highlighted the importance of physical strength in the technical performance of cricket players. The very strong correlation (r = 0.98) indicates that the higher the arm muscle explosiveness, the better the player's ability to produce accurate and powerful straight drive shots. This could imply that a training program that focuses on improving arm muscle strength may be able to make a significant contribution in improving players' batting skills, resulting in a positive impact in match results (Basu et al., 2021; Gilhooly et al., 2023).

The finding that there is a significant relationship between eye-hand coordination and straight drives provides insight into the importance of fine motor skills in the sport of cricket (Kasza et al., 2023). The strong positive correlation (r = 0.98) suggests that the better a player's eye-hand coordination, the better their ability to control straight drives. This confirms that technical skills training that focuses on developing eye-hand coordination can be an effective strategy to improve the performance of female cricket players (Mihaly Cozmuta et al., 2022).

The results showing a significant relationship between arm muscle explosiveness and eye- hand coordination with straight drive hitting in the 2019 West Sumatra Women's Pre-PON Cricket Team provide an in-depth understanding of the complexity of the interaction between physical and technical factors in this sport. The strong positive correlation between the two variables (r = 0.82) along with the significant F-test results illustrate that arm muscle explosiveness and eye-hand coordination not only have individual effects, but also reinforce each other. Therefore, A holistic approach that includes the development of physical strength and technical skills can be the best strategy to achieve the best potential in the performance of female cricket players at the team level (Discombe et al., 2022).

A comparison between the relationship between arm muscle explosiveness and straight drive and eye-hand coordination and straight drive showed interesting similarities. Both relationships have very high correlation values (r = 0.98), suggesting that they have a similar positive impact on straight drive performance. Although these factors may differ in physical and technical aspects, the strong correlations

ISSN 0216-4493 (print), ISSN 2597-6109 (online)

suggest that arm muscle strength and hand-eye coordination have a significant role to play in achieving the desired skill in the straight drive (Adie et al., 2022).

A comparison between the t-count and t-table values of the two relationships shows that both are significantly greater than the randomly expected values (Maiti et al., 2022). With a t-count of 16.95 and a t- table of 1.782, these results indicate that there is statistical certainty in both relationships. This consistency strengthens the validity of the findings, reinforcing the conclusion that arm muscle explosiveness and eye-hand coordination do have a significant influence on the ability to hit straight drives in the West Sumatra women's cricket team.

The comparison between the two relationships with straight drives in teams in 2019 highlights the importance of understanding the factors that influence performance from various perspectives (Ely et al., 2023; Forrester, 2021; Forsdike et al., 2022). The combination of arm muscle explosiveness and eye-hand coordination showed a high correlation value (r = 0.82) and a significant F-test result. This indicates that, in this specific context, arm muscle explosiveness and eye-hand coordination interact in a mutually reinforcing manner, contributing together to straight drive skills. This conclusion can help design a more targeted training program, integrating physical and technical training to reach the best potential of players in the West Sumatra women's cricket team.

CONCLUSION

The conclusion of this study is that there is a significant relationship between grip strength, arm muscle strength, and eye-hand coordination with batting skills, especially in hitting straight drives, on the West Sumatra women's Pre-PON cricket team. The results showed that grip strength, as an indicator of arm muscle explosiveness, plays an important role in improving athletes' batting skills. Meanwhile, eye-hand coordination also showed a significant correlation with the ability to hit straight drives. Furthermore, the conclusion combines the positive effects of g r i p strength and eye- hand coordination, showing that the combination of these two factors has a greater impact on the ability to hit straight drives. This provides a deeper understanding that improving arm muscle strength and hand-eye coordination can be a major focus in batting skill development, with results that can be directly applied in the context of West Sumatra women's cricket team play. These conclusions provide a strong basis for designing targeted and specific training programs, and provide direction for coaching athletes to improve their performance in cricket matches

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