Malaysian Journal of Social Sciences and Humanities (MJSSH) (e-ISSN : 2504-8562)
2023, Volume 8, Issue 7, e002390
DOI: https://doi.org/10.47405/mjssh.v8i7.2390

Anthropometric, Power, and Configuration of The Volleyball Game Between Sarawak and Penang Players

Goh Wei Feng[1*], Denise Koh Choon Lian[2]

[1]Faculty of Education, Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Selangor, Malaysia.
Email: p112128@siswa.ukm.edu.my
[2]Faculty of Education, Universiti Kebangsaan Malaysia (UKM), 43600 Bangi, Selangor, Malaysia.
Email: denise.koh@ukm.edu.my

CORRESPONDING AUTHOR (*):
Goh Wei Feng
(p112128@siswa.ukm.edu.my)

KEYWORDS:
Anthropometric
Leg power
Small-sided volleyball game

CITATION:
Goh, W. F. & Denise Koh, C. L. (2023). Anthropometric, Power, and Configuration of The Volleyball Game Between Sarawak and Penang Players. *Malaysian Journal of Social Sciences and Humanities (MJSSH), 8*(7), e002390. https://doi.org/10.47405/mjssh.v8i7.2390

ABSTRACT

This ex post facto research design was conducted to investigate the anthropometric aspects of power and small-sided volleyball game play configuration between Sarawak and Penang volleyball players. The performance of both teams was evaluated through the differences of height, power of leg muscles and skills execution (serve, digging and spiking) in 4 vs 4 volleyball game play. The sample of this research consists of volleyball player from both teams with 15 to 21 years old. The result indicated there was no significant differences between both teams players in term of height, t (30) = 1.696, p= 0.100. However, there was a significant difference in leg power (vertical jump) between the players from the two states, t (30) = 2.916, p = 0.007. Regarding skills execution, no significant differences were found in service skill in the 4 on 4 game play between both states t (30) = 0.808, p = 0.426. The same applied to digging skill in volleyball game play, t (30) = -0.486, p = 0.630 and spiking skill in volleyball game, t (30) = 1.623, p = 0.115. Moreover, tactical decision-making for opening and closing the space also showed no significant differences between the players from Sarawak and Penang, t (30) = 0.877, p = 0.387; t (30) = 0.939, p = 0.355. In conclusion, this finding proved that the development of volleyball game training between the two states are almost similar. It is suggested that volleyball player should focus on technical and tactical concurrently development in game play.

Contribution/Originality: This study is comparing ball control, decision-making, and skill execution in a 4 vs. 4 volleyball game situations, involving aspects such as serving, digging, and spiking, among volleyball players. This also can determine the extent of their skill proficiency in volleyball and assist coaches in establishing appropriate criteria for volleyball players.

1. Introduction

A good coach should plan the use of appropriate teaching methods or types of training for each athlete. Each instructional program or teaching method and learning needs to be

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

tailored to the abilities of each athlete. In a game of volleyball, a coach needs to understand every technique that should be used for each player because each player has their own unique strengths.

In volleyball, leg power (jumping power) is essential, especially when spiking or blocking jump to hold the opposing team's spike. Power is the ability to release maximum force in the shortest amount of time. Muscle contraction occurs as quickly as possible to produce the necessary power (Johnson & Nelson, 2006). Power is the basis for success in sports. It can be measured based on the distance a body or object is moved. Power is expressed as the speed of muscle contraction that can overcome obstacles in less than maximum time (Wilkerson et al., 1980).

Additionally, volleyball is also a game that requires players to have good physical endurance, and parallelly, it is essential to improve speed, power, and endurance. Volleyball is also a social game where to foster the spirit of team players, good understanding, and cooperation. The performance of volleyball depends on many external and unexpected factors, in which the coaching process always tries to adjust to achieve success. In fact, significant emphasis can be placed on the coach's ability to design training programs and improve player performance.

The various problems that exist in the conventional training process of volleyball, where players are unable to effectively apply the skills, they have learned in real game situations through various skill variations. Volleyball players are unable to apply serving, digging, and spiking skills with proper technique in game situations.

In terms of tactics, volleyball players also struggle to make decisions on when and how to open up space and close space. Additionally, they rely heavily on coach instruction to make decisions, limiting their cognitive development as a whole. Volleyball is an inverted sport that requires players not only to master technical skills such as digging, spiking, serving, blocking, and setting, but also physical fitness, interest in volleyball, and mental endurance. Furthermore, players need to use smart actions when making tactical decisions (Kirk & MacPhail, 2002).

1.1. Research objectives

i. To measure the comparison of anthropometric status through the height of volleyball players.
ii. To measure the comparison of leg muscle power through the vertical jump test.
iii. To examine the comparison of proficiency in skill aspects such as (serve, digging, and spiking) towards player performance in a 4 vs 4 volleyball game situation.
iv. To examine the comparison of performance between the states of Sarawak and Penang in terms of tactical decision making in a 4 vs 4 volleyball game situation.

2. Literature Review

2.1. Theory and Methodology of Training Bompa

According to Bompa and Buzzichelli (2018), sports performance does not rely solely on one factor. It involves various factors in achieving the best performance. Apart from the ability, talent, and motivation of the player, their knowledge and personality, facilities and equipment, as well as discoveries from scientific fields that aid in the competition also play a crucial role (Bompa & Haff, 2018). Bompa and Haff (2018) also stated that

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

through training, an individual will prepare themselves to achieve a certain goal. In physiological terms, a person will strive to improve their body's systems and functions to optimize their physical fitness level, leading to positive results and high performance in their sport.

2.2. Game Performance Assessment Instrument (GPAI)

The Game Performance Assessment Instrument (GPAI) provides a comprehensive analysis of ability components, skill execution, and assistance or overall ability such as participation in the game and game ability (Conejero Suárez et al., 2017). The individual game ability components will be improved and evaluated by experts in determining the validity and reliability of the assessment. GPAI is a comprehensive assessment tool for coaches to adapt to a particular game (Mitchell & Oslin, 2006). It contains seven basic components, including decision making, skill execution, support, mark, guard, cover, and adjust.

These components will be selected based on the types of games that will be played, and they also cover all game categories. This assessment is evaluated separately and also in combination with other components, such as the combination of decision making in open and closed space aspects and skill execution involving skills such as serving, digging, and spiking in a 4 vs 4 volleyball game situation (Nathan, 2013). In conclusion, the GPAI method is a continuous assessment and coaches have provided a clear picture that GPAI aims to improve player abilities (Nathan & Haynes, 2013). It also explains the formation of game situations and assessment towards the formation of high skills and efficiency to ensure that players can improve their skills performance and confidence.

3.Research Methods

3.1. The Background of This Study

The study aims to measure the comparison of anthropometric status, specifically height. Additionally, the study also aims to measure the leg muscle power through vertical jump test. Furthermore, the purpose of this study is to investigate the comparison of skill mastery in serving, digging, and spiking aspects towards the performance of Sarawak state and Penang state volleyball players in a 4 vs 4 volleyball game situation, which may involve players with both high and low skills. Moreover, this study also intends to compare the performance of Sarawak and Penang states in making tactical decisions, i.e., opening and closing spaces in a 4 vs 4 volleyball game situation.

3.2. Research Design

This study uses an ex-post facto design, which compares two non-experimental independent variables (IV), namely the Sarawak and Penang state volleyball teams. The dependent variable (DV) is anthropometric status, leg muscle power, mastery of skills, and tactical decision-making in a 4 on 4 volleyball game situation.

3.3. Sampling

The sampling for this study is quantitative in nature. The study uses a sample size recommended by Cohen (1992). A total of 32 subjects (n=32) participated in this study, consisting of n=16 players from the Sarawak state volleyball team and n=16 players from

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

the Penang state volleyball team. Only male players were selected as participants. Since the researcher chose a modified volleyball match (4 vs 4), each team has four small groups within it, namely A, B, C, and D. Group A will play against Group B, while Group C will play against Group D.

3.4. Data Collection Procedure

The data collection procedure involves using instruments such as the Height Instrument, the Leg Power Instrument (Vertical Jump Test) to test the level of leg power of the volleyball players. In addition, the Game Performance Assessment Instrument: Invasion Games (GPAI) is also used to assess the level of mastery of the serving, digging, and spiking skills of the volleyball players through a 4 vs 4 volleyball game observation. The data obtained are recorded manually and analysed using the SPSS 26.0 (Statistical Package for Social Science) program for Mean, SD, and t-test analysis.

4. Result

This exploratory study compared Sarawak and Penang state volleyball players in terms of height, leg muscle power and the components of volleyball game, which include tactical decision-making (creating and closing space) and skill execution (serve, dig and spike) in a 4 vs 4 game situation. Data analysis was conducted according to the research questions and hypotheses using Statistical Package for Social Science (SPSS) version 26.0, including independent t-Test for Mean, Standard Deviation (SD), and t-value. Finally, the overall findings of the study depend on the null hypothesis being accepted or rejected.

4.1. The Height of the Volleyball Players

The study found no significant mean difference between Sarawak (M=176, SP=7.07) and Penang (M=172.69, SP=3.32) volleyball players; t-value (30) = 1.696 in terms of players' height. Since the p-value examined was 0.100, the null hypothesis (Ho) was accepted.

As shown in Table 1, the mean scores for the height of the volleyball players indicate that Sarawak's volleyball players have a greater height than the Penang state volleyball players.

Table 1: Results of Mean, SD, and t-value for Player Height

State	N	Mean	SD	t-value
Sarawak	16	176.00	7.07	1.696
Penang	16	172.69	3.32	

4.2. Leg Muscle Power of Volleyball Players (Vertical Jump Test)

The study found a significant difference between Sarawak and Penang state volleyball players in terms of leg muscle power as measured by the vertical jump test. The results showed a significant difference between the two groups with a t-value of (30) = 2.916 and p= 0.007. Therefore, the null hypothesis (Ho) is rejected, indicating a significant difference between the two groups in terms of leg muscle power as measured by the vertical jump test.

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

As shown in Table 2, the leg muscle power mean scores of the Sarawak state volleyball players (286.06) are better than those of the Penang state volleyball players (274.38). This indicates that Sarawak players have a higher level of muscle power and leg muscle strength compared to Penang players.

Table 2: Results of Mean, SD, and t-value for Player Vertical Jump Test

State	N	Mean	SD	t-value
Sarawak	16	286.06	11.74	2.916
Penang	16	274.38	10.92	

4.3. Service Skill in 4 vs 4 Volleyball Game

The results indicate that there is no significant difference between Sarawak and Penang volleyball players in terms of serving skills in the 4 vs 4 game, with a t-value (30) of 0.808 and a p= 0.426. Therefore, the null hypothesis (Ho) is accepted because there is no significant difference in serving skills in the 4 vs 4 volleyball game.

As shown in Table 3, the mean scores for service skills of the Sarawak state volleyball players (4.44) are better than those of the Penang state volleyball players (4.25). Sarawak's volleyball players have a superior service skill compared to Penang's volleyball players.

Table 3: Results of Mean, SD, and t-value for the Serving Skill in 4 vs 4 Volleyball Game

State	N	Mean	SD	t-value
Sarawak	16	4.44	0.51	0.808
Penang	16	4.25	0.78	

4.4. Digging Skill in 4 vs 4 Volleyball Game

The results show that there is no significant difference between Sarawak and Penang Volleyball players in terms of digging skills in the 4 vs 4 volleyball game, with a t-value of (30) = -0.486, p = 0.630. Therefore, the null hypothesis is accepted because there is no significant difference. As shown in Table 4, the mean scores for digging skills of the Penang state volleyball players (3.81) are better than those of the Sarawak state volleyball players (3.69). Penang's volleyball players have superior digging skills compared to Sarawak's volleyball players.

Table 4: Results of Mean, SD, and t-value for the Digging Skill in 4 vs 4 Volleyball Game

State	N	Mean	SD	t-value
Sarawak	16	3.69	0.60	-0.486
Penang	16	3.81	0.83	

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

4.5. Spiking Skill in 4 vs 4 Volleyball Game

The results indicate that there is no significant difference between Sarawak and Penang volleyballs players in spiking skills in 4 vs 4 volleyball, with a t-value of (30) = 1.623 and p = 0.115. The null hypothesis (Ho) is accepted because there is no significant difference.

As shown in Table 5, the mean scores for spiking skills of the Sarawak state volleyball players (4.19) are better than those of the Penang state volleyball players (3.75). Sarawak's volleyball players have a superior spiking skill compared to Penang's volleyball players.

Table 5: Results of Mean, SD, and t-value for the Spiking Skill in 4 vs 4 Volleyball Game

State	N	Mean	SD	t-value
Sarawak	16	4.19	0.75	1.623
Penang	16	3.75	0.78	

4.6. Making Tactical Decisions to Open Space in 4 vs 4 Volleyball Game

The findings indicate that there is no significant difference between Sarawak and Penang volleyball players in terms of making tactical decisions to open up space during 4 vs 4 volleyball games, with a t-value of (30) = 0.877 and p = 0.387. Thus, the null hypothesis is accepted (Ho) as there is no significant difference.

As shown in Table 6, the mean scores for making tactical decisions to open space in the 4 vs. 4 volleyball game of the Sarawak state volleyball players (4.13) are better than those of the Penang state volleyball players (3.88). Sarawak's volleyball players have superior skills in making tactical decisions to open space in the 4 vs. 4 volleyball game compared to Penang's volleyball players.

Table 6: Mean, SD, and t-value results for the Tactical Skill of Open Space in 4 vs 4 Volleyball Games

State	N	Mean	SD	t-value
Sarawak	16	4.13	0.81	0.877
Penang	16	3.88	0.81	

4.7. Making Tactical Decisions to Close Space in 4 vs 4 Volleyball Game

The results showed that there was no significant difference between Sarawak and Penang Volleyball players in terms of making tactical decisions to cover the court in the 4 vs 4 volleyball game, with a t-value of (30) = 0.939, p= 0.355. Therefore, the null hypothesis (Ho) was accepted, as there was no significant difference.

As shown in Table 7, the mean scores for making tactical decisions to close space in the 4 vs. 4 volleyball game of the Sarawak state volleyball players (4.00) are better than those of the Penang state volleyball players (3.75). Sarawak's volleyball players have superior

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

skills in making tactical decisions to close space in the 4 vs. 4 volleyball game compared to Penang's volleyball players.

Table 7: Mean, SD, and t-value results for the Tactical Skill of Close Space in 4 vs 4 Volleyball Games

State	N	Mean	SD	t-value
Sarawak	16	4.00	0.73	0.939
Penang	16	3.75	0.78	

5. Discussion

In this study, it was found that there was a significant difference between Sarawak and Penang state volleyball players in terms of leg muscle power as measured by the vertical jump test. The study by Fattahi et al. (2012) examined the relationship between anthropometric parameters and vertical jump in elite male volleyball players. However, we should consider the factors that may influence the results of this test. This is because power and strength are not the same. According to Komi (2011), the relationship between the level of leg muscle power and football performance at the University of Arkansas was measured using standing long jump test, vertical jump test, 5-meter sprint test, 35-meter sprint test, wingate test, and margaria-kalamen test. A total of 41 male players were selected as subjects for this study. The data obtained were analyzed using ANOVA. The results of the study showed that the standing long jump test had a significant relationship ($p<0.05$) with the 5-meter sprint test ($r=0.64$) and the 35-meter sprint test ($r=0.89$).

The Game Performance Assessment Instrument (GPAI) provides an analysis of the components of ability, skill execution, support, or overall ability such as participation in the game and game ability. Individual game ability components are enhanced and assessed by experts to determine the validity and reliability of the assessment. GPAI is a comprehensive assessment tool for coaches to adapt to a particular game. It contains seven basic components that include decision making, skill execution, support, marking, guarding, covering, and adjustment.

6. Conclusion

The findings of this study indicate that the development of volleyball training programs between the two states is relatively similar. It is suggested that volleyball players should master skills and tactics in accordance with the game situation. Based on the analysis and discussion of the data, it can be concluded that there is only a significant difference between Sarawak and Penang state volleyball players in terms of vertical jump test. The leg muscle strength of Sarawak volleyball players is better than that of Penang volleyball players.

Meanwhile, based on the analysis and discussion of the data conducted by the researcher, it can be concluded that there is no significant difference between Sarawak and Penang state volleyball players in terms of height, service, digging and spiking skills, as well as tactical skills in making decisions to open and close space during the game.

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

Based on this study, the researcher has identified several limitations and weaknesses that need to be addressed to update and improve the quality of future research in this field. Therefore, the researcher recommends several things that can be used as guidelines for future researchers interested in continuing this area of research.

Thirty-six subjects selected by the examiner cannot fully represent the overall results. Therefore, the researcher suggests that the number of subjects be increased to obtain comprehensive results.

There are many external variables that can influence the results. Researchers are advised to control external variables such as nutrition, concentration, motivation, and fatigue to produce accurate test results.

Considering that physical fitness components can affect individual performance, it is recommended that teachers and coaches involved give more attention to training towards improving physical fitness components. Teachers and coaches involved should understand the correlation between age factors and the level of leg muscle power. This is evident in the study conducted by Fox and Mathews (1981), where the level of leg muscle power for maximum aerobic power is obtained at the age of 15 to 17 years and decreases when reaching the age of 30 years. Those involved should strive to improve the level of leg muscle power of players under their control with systematic weight-bearing exercises. Teachers and coaches can also use the level of leg muscle power as a measuring tool to select high-performing players. Success in selecting athletes based on high leg muscle power levels will certainly improve their performance level, besides being able to shape potential and high-performing backup players.

Ethics Approval and Consent to Participate

The researchers used the research ethics guidelines provided by the Research Ethics Committee of Universiti Kebangsaan Malaysia (RECUKM). All procedures carried out in this study involving human subjects were conducted in accordance with the ethical standards of the institutional research committee. Permission and consent to participate in the study were also obtained from all study participants.

Acknowledgement

Part of this article was extracted from a master dissertation submitted National University of Malaysia, Bangi, Malaysia.

Funding

This study received no funding.

Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).

References

Bompa, T. O., & Haff, G. G. (2018). *Periodization*. Human Kinetics.

Bompa, T. O., & Buzzichelli, C. (2018). *Periodization-6th Edition*. Human Kinetics.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Conejero Suárez, M., Claver Rabaz, F., Fernández-Echeverría, C., González-Silva, J., & Moreno Arroyo, M. P. (2017). Design and validation of an observation instrument to assess decision making in the reception action of volleyball. *Cultura_Ciencia_Deporte*, *12*(34), 67–75. https://doi.org/10.12800/ccd.v12i34.833

Fattahi, A., Ameli, M., Sadeghi, H., & Mahmoodi, B. (2012). Relationship between anthropometric parameters with vertical jump in male elite volleyball players due to game's position. *Journal of Human Sport and Exercise*, *7*(3), 714–726. https://doi.org/10.4100/jhse.2012.73.11

Fox, E.L, & Mathew, D. K. (1981). *The physiological basic of physical education and athletics (3rd ed.).* Philadelphia:W.B.Saunders College Publisher.

Johnson, B. L., & Nelson, J. K. (2006). *Practical measurement for evaluation in physical education(4th .ed.).* Minnespolis: Burgess Publishing.

Kirk, D., & MacPhail, A. (2002). Teaching Games for Understanding and Situated Learning: Rethinking the Bunker-Thorpe Model. *Journal of Teaching in Physical Education*, *21*(2), 177–192. https://doi.org/10.1123/jtpe.21.2.177

Komi, P. (2011). *Strength and power in sport.* USA: Blackwell Scientific Publications.

Mitchell, S. A., Oslin, J. L., & Griffin, L. L. (2006). *Teaching sport concepts and skills: A tactical games approach (2nd ed.).* Champaign, IL: Human Kinetics.

Nathan, S. (2013). Effect and Sustainability of Hybrid Training Styles on Speed, Accuracy, Knowledge Acquisition among Varying School Hockey Players. *Journal of Sustainable Society, 2*(2), 49–58. https://doi.org/10.11634/216825851403380

Nathan, S., & Haynes, J. (2013). A move to an innovative games teaching model: Style E Tactical (SET). *Asia-Pacific Journal of Health, Sport and Physical Education*, *4*(3), 287–302. https://doi.org/10.1080/18377122.2013.836769

Wilkerson, J. E., Horvath, S. M., & Gutin, B. (1980). Plasma testosterone during treadmill exercise. *Journal of Applied Physiology*, *49*(2), 249–253. https://doi.org/10.1152/jappl.1980.49.2.249

© 2023 by the authors. Published by Secholian Publication. This article is licensed under a Creative Commons Attribution 4.0 International License (CC BY).