

TECHNICAL PERFORMANCE ANALYSES OF VOLLEYBALL PLAYERS USING VOLLEYBALL INFORMATION SYSTEM

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Abstract

The purpose of this study was to analyze the technical performance of team performance in an event of the main division in Indonesia. The sample of this study was the players' performance of the winning team. The data were collected using the Volleyball Tactical Information Skill (VTIS) software which is originally developed by the researcher based on the Volleyball Information System (VIS). The data collected using the VTIS includes service, ball receive, attack, toss, block, and dig that was performed by each player throughout the game. The statistical data is presented on average and percentage. The statistical data obtained from VTIS has been proven to be useful and provides valuable information for the team's technical performance.

Keywords: Volleyball, technical performance analysis, volleyball information system

Introduction

Volleyball is one among popular sports that have internationally acknowledged. The Federation International Volleyball (FIVB) was first established in 1947 and has been since contributing to the development of volleyball especially in the use of sports science (Ferretti, Papandrea, Contenduca, & Mariani, 1992; Coggiola, 2018). On every international competition under the FIVB and Asia Volleyball Confederation (AVC) requires every championship to collect statistical data using the volleyball information system (VIS) of each playing skill of each team in every game (DİNÇER, 2015). VIS is organized by each of the event committees and is a requirement to be acknowledged by either FIVB and/or AVC. The main purpose of the volleyball information system is to inform the national and international media about the result of the game and the statistic of each player individually (Valladares, García-Tormo, & João, 2016). The data serves more comprehensive information about the athletes' skills that can also be used to determine the best player in the competition. Some of the data that can be collected using the VIS are scoring and non-scoring skills. Scoring skills include serve, spike, and block, while non-scoring skills are toss and dig (Dearing, 2018; Hughes & Bartlett, 2002).

As volleyball receives more attention in the sports community, the game had become more competitive. Volleyball clubs are investing more funds to improve the players' skills and performance, which also has promoted the advancement of sports science in volleyball (Coutinho, Mesquita, Davids, Fonseca, & Côté, 2016). The advance of sports science nowadays has shown a valuable contribution for each team in gaining victory (Drikos & Vagenas, 2011). The Volleyball Tactical Information Skill (VTIS) used in this study is one example of tools designed specifically based on the condition of a team to support team performance enhancement. The VTIS observes the success and the failures, and the technical skills of the players from the team and the opponents, such as serve, receive, toss, spike, block, and dig. The VTIS serves valuable data as the basis for decision making for the coach since it allows detailed information of the ball and the players' movement to be recorded. On each success or failure of a strike, for instance, the VTIS may record on which direction did the ball fall, and at the same time, the position of each of the player on the field on each round in the game. Therefore, the VTIS is different from VIS that the former is used and developed by each team in the volleyball competition to analyze the player's skill, both of their own, and the opponents'. The information collected from such an information system is used to report all the volleyball playing skills to help coaches determine players' composition, tactical strategy, and designing exercise programs during and before the game (Humski & Skocir, 2011).

In Indonesia, however, the use of an information system to record technical performance is yet optimized. The VIS is only used during the final even in the highest volleyball competition in Indonesia to select the best player in the competition (e.g. Waluyo, Soegiyanto, Setijono, & Sulaiman, 2016; Apriyanto & Ilham, 2020). As for the participating team, the game statistic is usually recorded using the manual checklist form. Some of the issues in the manual recording of athletes' performances are that the data is not available immediately during the game and the manual calculation of the statistic may increase error in data reporting. These issues may significantly compromise the coach's

accuracy in decision making during the game regarding tactical strategy and players' rotation. Therefore, it is very crucial to develop a better system in technical performance recording to improve the accuracy of the coach's decision making and eventually, improve the teams' performance and achievement.

In this study, the VTIS is developed as an android-based software. The current paper is presenting data from the VTIS where the software was used to analyze the technical performance of one of the elite volleyball male teams in Indonesia. The particular team performance is valuable for analysis since the team is known for its outstanding performance and has recorded seven times champion of Livoli and ProLiga (both are the highest volleyball league in Indonesia), and therefore, often considered as the best male volleyball team. Furthermore, the Indonesian national volleyball team is often dominated by the athletes of this particular club. The analysis of the team performance would give important insight to any participating team about the bar of the team performance and the individual skill of the players of the highest volleyball competition in Indonesia.

Method

This study is a quantitative study with a descriptive statistic. A descriptive statistic is used to present the data as it is (Creswell, 2012). Generally, this study is aimed to analyze team performance of the often considered as the best male volleyball team in Indonesia. The data were collected using the VTIS (Volleyball Tactical Information System) which is an original information system developed by the researchers (authors of this paper) and has been listed under the intellectual rights of the researchers. The data presented in this paper were collected during the finale of the Livoli event in Indonesia in 2018 and had been used as one of the sample sets for the software try-outs. The VTIS is a software developed by the researcher to record the team performance as well as the individual skills of the volleyball players during competition. The VTIS processed the data and presented the data in descriptive statistics, which includes mean and percentage. The playing skills that are presented in this paper are service, receive, toss, attack, block, and dig. The example of the VTIS display can be seen in Figure (a).



Figure (a): An example of the VTIS display for setting players for data input on the software.

The VTIS is performed by initially setting the team and the players according to name and associated number. As shown in Figure 1. each player is set to a position or the line-up. During the game the observer input data of each of the player’s performance. The line-up or the player’s position is re-setted at the beginning of every set. The result can be seen as the display in Figure (b).



Figure (b): An example of result display in VTIS.

Result

Team performance discussed in this paper includes service, receive, attack, block, toss and dig performed by the winning team of the Livoli competition in 2018 (the SBS team). The result of this study is presented for each of the skills being observed and displayed in two tables. The first table is the descriptive statistic that reports the mean derived from the data, and the second table presents the percentage of the skill performed during the whole game.

Table 1: Statistic descriptive of the SBS team.

		Jump service	Non-jump service
N	Valid	3	3
	Missing	0	0
Mean		25,00	,00

Table 2: percentage of the type of service of the SBS team.

		Jump service	Non-jump service
Percentage		100	00.00

It can be inferred from Table 1. that the SBS team has a mean of jump service 25.00 and non-jump service .00. The mean is derived from the frequency of the jump service use in 3 sets. Based on the observation, it was found that the SBS team only used jump service (100%) as shown in Table 2.

Table 3: Statistic descriptive of ball receive by libero and non-libero of the SBS team.

		Libero receive	Non-libero receive
N	Valid	3	3
	Missing	0	0
Mean		6.33	12.00

Table 4: Percentage of ball receive by libero and non-libero of the SBS team.

	Libero receive	Non-libero receive
Percentage	34.5	65.4

It can be inferred from Table 3. that the ball receive of the SBS team has a mean of 6.33 for libero receive, and 12.00 for non-libero receive based on the frequency in 3 sets game. Based on the result displayed in Table 4. it was found the percentage of 34.54% and 65.46% for libero receive and non-libero receive respectively.

Table 5: Statistic descriptive of attack-type of the SBS team.

		Open	Semi	Quick	Back attack	Tip-ball
N	Valid	3	3	3	3	3
	Missing	0	0	0	0	0
Mean		10.67	6.67	1.67	4.33	1.67

Table 6: Percentage of attack-types of the SBS team.

	Open	Semi	Quick	Back attack	Tip-ball
Percentage	42.67	26.67	6.67	17.32	6.67

The mean for the statistic attack of the SBS team was 10.67, 6.67, 1.67, 4.33, and 1.67 each for an open attack, semi-open attack, quick attack, back attack, and tip-ball attack respectively. The percentage of each type of attack was 42.67%, 26.67%, 6.6%, 17.32%, and 6.67% for an open attack, semi-open attack, quick attack, back attack, and tip-ball attack respectively.

Table 7: Statistic descriptive of blocking based on the number of the blocker of the SBS team

		1 Block	2 Block	3 Block
N	Valid	3	3	3
	Missing	0	0	0
Mean		10.33	12.33	00.00

Table 8: Percentage of blocking based on the number of the blocker of the SBS team.

	1 Block	2 Block	3 Block
Percentage	45.58	54.42	00.00

The mean statistic for blocking presented by the SBS team was 10.33, 12.33, and .00 for block 1, block 2 and block 3 respectively. The percentage of each block was 45.58%, 54.42%, 0% for block 1, block 2, and block 3 respectively.

Table 9: Statistic descriptive of toss performance based on the toss types of the SBS team.

Type of toss	Jump toss	Non-jump toss
N Valid	3	3
Missing	0	0
Mean	19.00	6.33

Table 10: Percentage of toss performance based on the toss types of the SBS team.

	Front jump toss	Front non-jump toss	Back jump toss	Back non-jump toss
Percentage	70.18	63.15	29.82	36.85

The mean statistic for toss performed by the SBS team were 19.00 and 6.33 for jump toss and non-jump toss respectively. The percentage statistics were 70.18%, 63.15%, 29.82%, and 36.85% for front jump toss, front non-jump toss, back jump toss, and back non-jump toss respectively.

Table 11: Statistic descriptive of the dig by libero and non-libero of the SBS team.

Type of toss	Libero	Non-libero
N Valid	3	3
Missing	0	0
Mean	4.00	7.33

Table 12: Percentage of the dig by libero and non-libero of the SBS team.

	Libero	Non-libero
Percentage	35.29	64.71

Based on the data, it can be obtained that the mean statistic for digging of the SBS team was 4.00 and 7.33 each for libero and non-libero respectively. The percentage was 35.29% and 64.71% for each libero and non-libero respectively.

Discussion

Various research has suggested that there is a certain playing characteristic that may contribute to winning the game which can be categorized to receive and attack (Silva, Sattler, Lacerda, & João, 2016; Skazalski, Whiteley, & Bahr, 2018; Zetou, Moustakidis,

Tsigilis, & Komninakidou, 2007). This paper is suggesting a discussion in the skills required to execute effective receive and attack.

Service

Based on the data analysis, it can be seen that the SBS team is using jump serve technique throughout the game of the grand finale in 2018. The technique is known to be hard to receive and meant as a direct attack, which means that they serve was already meant to score. Skazalski et al. (2018) noted that volleyball elite players are often demanded to execute flawless jump serve. Service is very crucial in volleyball since it is the first modality that starts the game and gains an instant score. The more effective the services that a player has done, the more difficult it is to be received. Therefore, an effective service was one of the most important modalities in scoring for the SBS team on the Livoli grand finale event in 2018. It was seemed to be the key to winning the SBS team at the event.

Compared to the opposite team, the SBS team was better in service based on the type of services that were used and on the effectivity of the services on gaining instant score. The opposite team was still using the non-jump serve which considered to be less damaging as an attack. While for the SBS team, it can be seen from the data that the jump serve was used throughout the game. However, there were some flaws in the serve technique done by the SBS team, for instance, 12 services fell outside of the field and 4 services did not pass the net. If the team could overcome the flaws, the services may contribute more scores. It aligns with Moras et al. (2008) that although jump serve has a greater damaging effect on the opposite team's defense, it is also known for higher failure risk. High-level competition record the use of jump-serve is up to 90% of elite players (Moras, et.al, 2008). Inline with that Zetou et al. (2007) suggested that "ace-point" is one among the most predictive factor for winning the game.

Receive

Receiving is one of the technique to defend their area from the opposite attack, while at the same time may serve as an opportunity to fight back (Schläppi-Lienhard & Hossner, 2015). On the grand finale of the Livoli event in 2018, ball receive was crucial in starting an attack. A good receive will help a setter to improvise a strategy to attack the opposite team. A libero is a special member of a volleyball team whose main task is to handle ball receive as smooth as possible so that the other member can build a strategy of offense. On the other side, a smart player would not aim serve to a libero because it would reduce the chance to get an immediate score. Based on the data, it can be inferred that the most receive were not on liberos, which means that most of the players aimed to non-liberos to receive their services in the hope to fail the ball receives on the opposite team. Following Afonso, Esteves, Araújo, Thomas, and Mesquita (2012) that one of the characteristics of high-level players would be less likely to aim serve to the libero who is considered as a specialist in serve-receive and defensive. In the case of the finale of the SBS team at the Livoli event, the non-liberos receive almost 2 times more than liberos. It is apparent that the strategy to avoid aiming at liberos was used at the main division competitions. Zetou et

al. (2007) also emphasize that service-reception skill is an important predictor to win the game.

A bad receive, however, can be managed by a good setter, which can be considered as the “key-player” in volleyball and may significantly affect the team's performance (Papadimitriou, Pashali, Sermaki, Mellas, & Papas, 2004; Stutzig, Zimmermann, Büsch, & Siebert, 2015). The setter in the SBS team has shown a great performance which can be seen from the effectiveness of the attack executed by the team, which will be further discussed in the next session.

Attack

The attack is an offense mode done by a team to trick the opposite team and gain score (Papageorgiou & Spitzley, 2003). The attack can be performed in open, semi, and quick technique which is categorized based on the height of the ball from the net (Chakraborty & Meher, 2012). Back attack and tip-ball are variations among those three categories based on the movement of the players; the back attack is when one of the three back players behind the attack line attacks the ball and send it over the net, while tip-ball is when a player uses one open hand or knuckles instead of the palm to direct the ball over the net resulting in a slower attack.

Based on the data of the study, the SBS team is dominated by the open attack by almost half of the entire attack used in the game (42.67%). This may be an indication of a bad receive by the SBS team player that forced the SBS's setter to hit the ball higher which prevented the attackers to execute a quick attack on the opponents. It aligns with Stutzig, et.al, 2015 which stated that the sequence between the setter and the attacker may predict the effectiveness of an attack in a team. Semi and quick attack is commonly assumed as harder to receive and therefore, serve as more effective attack techniques, but they require an accurate receive. A quick attack may affect the attack coverage structuring which may lead to a higher error (Marcelino, Afonso, Cicero Moraes, & Mesquita, 2014). As suggested by Laporta, Nikolaidis, Thomas, and Afonso (2015) a high-level volleyball team tend to use a more complex and quicker attack.

As explained previously, based on the data of the SBS team performance the non-liberos receive more balls than the liberos. Since liberos supposedly are the receiver specialists, the opponents often avoid aiming attack to them to increase receive failures. This may explain the less accurate receive that led the SBS players significantly using more open attacks than the other types of attack. This may be one of the possible explanations for the SBS team performance. The more vary an attack presented by a team, the more difficult for the other team to predict the attack pattern and therefore, it would be less possible for them to handle the attack well. One of the strengths of the attack strategy from the SBS team was effective serves that immediately score a point.

Toss

Toss is an effort done by the setter to set the ball to a spiker for attack (Dearing, 2018). A good toss may happen from a good ball receive, and therefore may be strongly affected by the opposite team response (Bieleke, Kriech, & Wolff, 2019). A smart and quick setter is critical for a team to support excellent team performance. A setter must be able to quickly decide and determine a good timing to toss the ball to a spiker to score (Stutzig et al., 2015). On the grand finale of the Livoli event in 2018, the setter of the SBS team seemed to be more advance in managing the rhythm and setting various patterns of offense. It helps the spikers of the SBS team to execute each attack effectively. As mentioned earlier, building an attack is strongly influenced by the attack tempo. In one team that can lead to the tempo of the game, the team would be more likely to win (Stutzig et al., 2015). The type of toss that was most frequently used by the SBS team was the front jump toss and followed by the front non-jump toss.

Block

Block is an attempt to hold an attack from the opposite team and fail them from scoring (Palao, Santos, & Ureña, 2004). (Palao et al.) further, suggest that blocking is very important and crucial for every team. A good block is not only preventing the other team to score but it may also allow the team to score. Block is not as easy as it may look like; it requires a skillful blocker in observing the rhythm of the ball and determining a perfect timing to block. The difficulty of blocking is increased when the opposite team used various styles of attack. A smart blocker should be able to predict where the ball is directing. A blocker should actively move, shift, or jump adjusting to the spiker who is building an attack. In the case of SBS team performance on the grand finale of the Livoli event in 2018, blocking with 2 blockers was the type that was most frequently used and then followed by one-man blocking. The three players blocking was never been used throughout the game. In alignment with that, high-level players perform less blocking since they usually have more control in attacking the opposite team (Palao et al., 2004).

Dig

Dig is an effort of a player in ball receiving from another type of attack from the serve (Palao et al., 2004). Dig is one powerful defense that may prevent the other team to build an effective offense (Hughes & Bartlett, 2002). Dig is also important for starting an attack. Dig is one of the main tasks of a libero, although other players may also perform a dig. As mentioned earlier, as in receiving, a smart player will not intentionally aim his attack to a libero since it would reduce the chance of a successful attack (Stutzig et al., 2015). As can be seen from the data that most digs were not on liberos, although overall throughout the game, the dig was not frequently happened as the rally happened. If summarized in percentage, the dig of non-liberos is near twice the number of digs of liberos, which support the assumption that most of the players did not intentionally aim their attack on liberos.

Conclusion

Based on the result and the discussion above, it can be concluded that the SBS team perform a more effective skill in volleyball such as service, receive, attack, toss, block, and dig. One of the key performance is the service skill that often resulting in immediate points. This may be supported by the individual player skill. The data obtained from the VTIS is proved to provide valuable data for future evaluation and analysis. Comparison to the other high-level players can be made possible by the VTIS.

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