

THE EFFECTIVENESS OF TABLET-BASED APPLICATION AS A MEDIUM OF FEEDBACK IN PERFORMANCE ANALYSIS DURING A COMPETITIVE MATCH IN ELITE SOCCER

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Abstract

This study aims to examine the effectiveness of Tablet based application (TBA) as a medium for feedback in real time at a half-time interval of a competitive match in improving the performance of soccer players. StatWatch application was installed on a tablet phone and used as a device for data collection. Eleven performance analysts were recruited to assist in the data collection such that each performance analysts covered a particular player during the game. Players Performances were assessed based on clearing, crossing, dribbling, heading, pursuing the loose ball, shooting, foul, and through pass. Data were collected as the game progressed, and information was transmitted to the controller of the analysis before being relayed to the chief coach at the half time interval of every match. Matches of the club for eight weeks were analysed. One-way repeated measure ANOVA was used to assess the progress of the team in between the first and second halves of the matches played. The result shows improvement on the performances of the club at the second halves of the eight matches played ($F(1, 14.10) = 8.94, p < .05$). A follow-up test demonstrates a significant progress on the overall team performance from week1 to week 8, $p > 0.001$. TBA appeared to be a useful medium for providing feedback at a first half interval of a competitive match to improving the performance of soccer players during the subsequent period.

Keywords: Tablet based application, competitive match, feedback, notational analysis, soccer

Introduction

Some different studies conducted earlier in various sports have demonstrated that verbal feedback method would most likely remain among the most widely powerful technique in changing behaviour and practice (Carlson & McKenzie, 1985; Salmoni, Schmidt, & Walter, 1984). Recently, varieties of verbal instructions and verbal signs, have received a wider recognition in the field of sports sciences, motor learning, and sports coaching (Abdullah, Musa, Kosni, Maliki, & Suppiah, 2016b). Verbal Feedback, words, and signs are compact expressions, frequently directed towards the attention to task-relevant stimuli or particular movement pattern of a motor skill. These signals are mostly given as a form of feedback during training with a sole purpose of improving sporting performance (Van Yperen, Blaga, & Postmes, 2014). Feedback are commonly utilised to trigger an individual into performing an action that can be taught to coordinate their learning by using the cues as a part of a self-talk strategies (Landin, 1994). A soccer coach, for instance, may improve a soccer player's ability in volley kick using none dominant foot. By using some instructions like "position the none dominant foot right before the actual contact," or the soccer player could encourage himself through pronouncing "Dominant foot back" while getting ready to hit the ball. Evidence from research has demonstrated that both types of the verbal instructions could improve performance (Masser, 1993).

Despite the fact that the significance of verbal feedback has been recognised over the preceding years, recent interest in their utilisation is identified with a current information related to the relevant assortment of instructional settings (Lemmink, Morgan, Sampaio, & Saupe, 2013). Physical training and game situations contain numerous interfacing components that complicate the instructional procedure which necessitates the requirement and the utilisation of multiple instructional methods (Abdullah, Musa, Maliki, Kosni, & Suppiah, 2016b). For instance, research has shown that verbal feedback may not adequately attract an individual to performing some critical tasks (Lee & Solmon, 1992). However, verbal feedbacks have been utilised to help students in focusing their attention on the key components of a motor skill (Lee, Landin, & Carter, 1992).

In the contemporary periods, tablet-based applications (TBAs) have grown in reputation, providing devices for performance evaluation that is capable of producing information on performance to both athletes and coaches (Abdullah et al., 2017a; Abdullah et al., 2016c). This information is reported as capable of assisting in developing their overall performances (Hook & Hughes, 2001; Shi et al., 2014). Despite the usefulness and cost-effectiveness of these TBAs in analyzing performance, most soccer clubs do not explore more on the significance of these applications as medium for providing feedbacks on the performance of their club and players, in spite of their portability, simple in data sharing, and the capacity to offer information to coaches on what is going on during the game in real time. The intention of the current study is to examine the effectiveness of TBA as a medium for feedback during a half time interval of a competitive match in improving the performance of elite soccer players.

Materials and Methods

Material's description

StatWatch is a portable and user-friendly application designed to monitor the performance of an athlete during a game or training. It is compatible with tablet or smartphones and can code the performances of two athletes at the same time each with 20 available cells to key in the performance parameters for each athlete such that their performances can be analysed at the same time. When the performance parameters are selected, and key in, the performance parameters of both athletes is shown on the screen of the tablet. All the vital actions needed to be coded will appear on the screen all that is required is to tap on the cell where the action is indicated, and it will be automatically recorded. The information generated can be transmitted to the coach at the required interval of the game, which means that the information can be sent as fast as possible to the coach as the match continues. The system has two ways of transmitting information or data to the coach. The information or data can be sent via Bluetooth or Email. At the end of the game analysis and summary are provided by the application. The number of actions performed by the athlete, the time the actions is completed and a number of success or fail can be seen. Conversely, bar charts are drawn by the application to illustrate the performance of the athlete based on the performance parameters the athlete is assessed on. Similarly, the information can further be transferred to Microsoft Excel for more in-depth analysis. A screen shot of StatWatch application is shown below:

0:00:00			
[0] CLEAR S	[0] CLEAR F	[0] OP-SP S	[0] OP-SP F
[0] CROSS S	[0] CROSS F	[0] PASS S	[0] PASS F
[0] DRB S	[0] DRB F	[0] SHOT S	[0] SHOT F
[0] HEAD S	[0] HEAD F	[0] FOUL S	[0] FOUL F
[0] CLB S	[0] CLB F	[0] T.P. S	[0] T.P. F

Figure 1: A screenshot of StatWatch application installed on an Android phone.

Setting

The study took place in Malaysia during 2015-2016 Malaysian Super League Season.

Participants

The research participants consist of one of the soccer club competing in the Malaysian Super League (T.Team). Eleven performance analysts and a control person (C.P) who is responsible for transmitting the data to the coach.

Materials

Eleven tablets phones installed with StatWatch applications were used as a device for data collection.

Players' performance evaluation

Performance parameters were selected based on their relevant to the demand of the game and were approved by the chief coach of the club. Eleven performance analysts who were familiar with the game were trained on how to use the application and assisted in the data collection. The operational definition of each parameter was given so that, the coach, the researchers, and the performance analysts were using the terms unanimously. The players in the position of defenders, midfielders and strikers were evaluated on clearing, crossing, dribbling, heading, pursuing the loose ball, shooting, foul and through pass notated either success (s) or fail (f). Each of the performance analysts was provided with one StatWatch application to cover a particular player during the game. The players were observed during their games, and their performances were recorded based on the performance indicators already selected. A reliability test was conducted prior to the match analysis based on the procedure adopted from Abdullah et al. (2016b).

Feedback transmission process

The data gathered were arranged by the controller of the analysis before being extended to the coach at the half-time interval of the match. Immediately after a half time whistle, the data generated from the performance of each player is made available to the coach. The data provides a report on the actual performance of every player. This report contains the number of actions performed by the player, the time the action is performed, the outcome of the actions as well the type of the action all made available at the particular time. The coach examines the main important actions from the game and relays the necessary information to the players through verbal instructions. The feedback sessions approximately range between 5-10 minutes after which the players would be encouraged to demonstrate the plans and observation the coach has made at the second half interval of the match. The nature of the report given to the coach via the application is shown in Figure 2.

Results

Table 1 discloses the reliability of the performance indicators recorded by the analysts for the player's performances prior to the matches analysed. It can be detected that the typical standardised errors range from 0.04 to 0.86 while the intra-class correlation coefficients vary from 0.40 to 0.94 depicting an excellent and adequate reliability for the overall analysis.

Table 1: Reliability tests for the performance analysts on the selected performance indicators.

Performance Indicators	Mean	Standard Deviation	Standardised typical error	Intra-Class Correlation (ICC)
Crosses Successful	39.27	14.46	0.36	0.87
Crosses Fail	24.36	21.14	0.37	0.93
Clearing Successful	23.36	21.54	0.49	0.83
Clearing Fail	24.00	21.05	0.35	0.90
Dribbles Successful	33.55	17.54	0.29	0.91
Dribbles Fail	26.18	19.89	0.6	0.94
Heading Successful	39.00	14.59	0.4	0.83
Heading Fail	34.45	17.39	0.24	0.94
Chasing Loose Ball Successful	26.18	20.27	0.11	0.92
Chasing Loose Ball Fail	34.82	24.41	0.36	0.75
Open-space Successful	32.91	17.72	0.34	0.80
Open-space Fail	23.64	21.84	0.59	0.87
Passes Successful	109.09	77.19	0.27	0.40
Passes Fail	40.09	16.30	0.91	0.80
Shots Successful	20.73	23.60	0.12	0.87
Shots Fail	25.36	20.09	0.06	0.91
Fouls Successful	23.45	21.60	0.51	0.91
Fouls Fail	25.09	20.41	0.15	0.89
Through Pass Successful	23.27	21.76	0.56	0.87
Through Pass Fail	21.82	22.74	0.86	0.86

Table 2 displays the descriptive statistics of the performances of the club for the eight matches played in between the two halves. The mean, the standard deviation and the number of the variables are shown. From the table, it can be observed that the mean of the second half is higher than the first half indicating that the performance of the team for the second halves of the matches is better as compared with that of first halves.

Table 2: Descriptive Statistics for one-way repeated measure ANOVA conducted between the halves.

Time	M	SD	N
First half	7.13	10.65	20.00
Second half	7.95	11.48	20.00

Table 3 shows the inferential statistics significant differences between the matches played by the team as the Greenhouse-Geisser value reported ($F(1, 14.10) = 8.94, p < .05$) the result is significant at (0.05) level of confidence which makes the researchers concluded that there was a marked improvement in the performance of the team at the second halves interval of the eight matches played.

Table 3: Inferential Statistics for within subjects' effects.

Greenhouse-Geisser	df	Error	F	Sig
	1	14.1	8.94	.008*

*Significant at $p < 0.05$

Table 4 projects the follow-up comparisons tests carried out between the eight weeks of the matches played. From the table, it can observe that there are significant differences from week1 to week8. This reveals that the overall performances of the players improved from the first week to the last.

Table 4: Pairwise comparisons between week1 to week8 of matches played.

Weeks Comparisons	M	SD	S.E	df	Sig
week 1 vs. week 2	-1.350	10.101	2.259	19.000	0.557
week 1 vs. week 3	-4.200	7.473	1.671	19.000	0.021*
week 1 vs. week 4	-4.900	12.949	2.895	19.000	0.107
week 1 vs. week 5	-5.600	12.365	2.765	19.000	0.057
week 1 vs. week 6	-5.650	16.294	3.644	19.000	0.137
week 1 vs. week 7	-6.400	14.218	3.179	19.000	0.058
week 1 vs. week 8	-23.250	25.344	5.667	19.000	0.001*
week 2 vs. week 3	-2.850	10.801	2.415	19.000	0.253
week 2 vs. week 4	-3.550	10.002	2.237	19.000	0.129
week 2 vs. week 5	-4.250	14.327	3.204	19.000	0.200
week 2 vs. week 6	-4.300	25.090	5.610	19.000	0.453
week 2 vs. week 7	-5.050	19.882	4.446	19.000	0.270
week 2 vs. week 8	-21.900	32.599	7.289	19.000	0.007*
week 3 vs. week 4	-0.700	12.570	2.811	19.000	0.806
week 3 vs. week 5	-1.400	9.891	2.212	19.000	0.534
week 3 vs. week 6	-1.450	17.843	3.990	19.000	0.720
week 3 vs. week 7	-2.200	15.340	3.430	19.000	0.529
week 3 vs. week 8	-19.050	27.651	6.183	19.000	0.006*
week 4 vs. week 5	-0.700	13.279	2.969	19.000	0.816
week 4 vs. week 6	-0.750	25.540	5.711	19.000	0.897
week 4 vs. week 7	-1.500	17.710	3.960	19.000	0.709
week 4 vs. week 8	-18.350	29.900	6.686	19.000	0.013*
week 5 vs. week 6	-0.050	21.799	4.874	19.000	0.992
week 5 vs. week 7	-0.800	18.240	4.079	19.000	0.847
week 5 vs. week 8	-17.650	28.396	6.350	19.000	0.012*
week 6 vs. week 7	-0.750	13.645	3.051	19.000	0.808
week 6 vs. week 8	-17.600	18.019	4.029	19.000	0.000*
week 7 vs. week 8	-16.850	21.695	4.851	19.000	0.003*

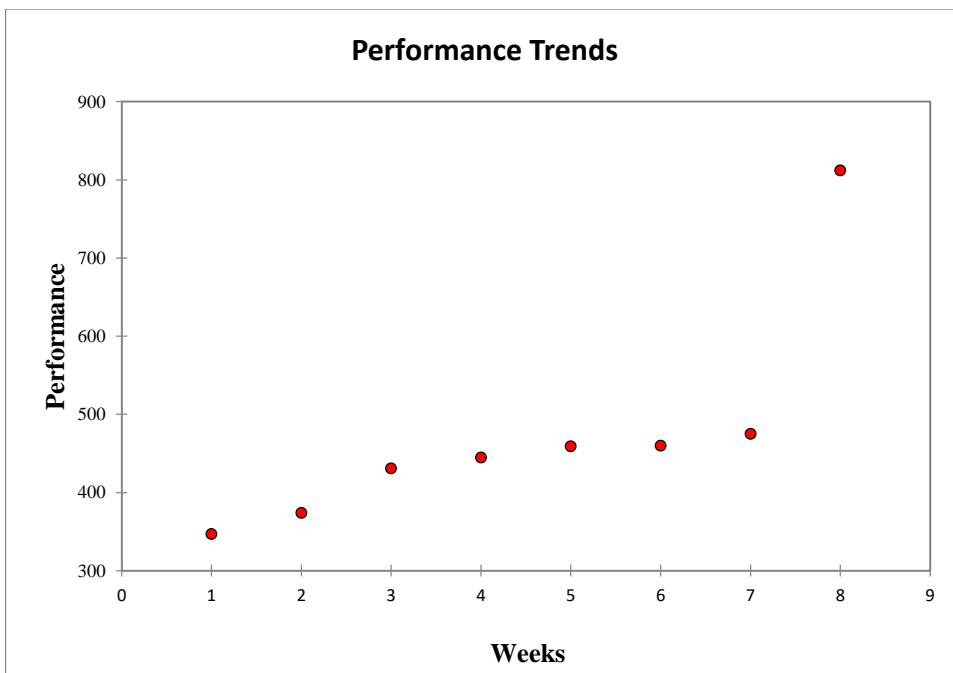


Figure 3: Performance trends of the team for the eight matches played.

Figure 3 highlights the performance trends of the team within the eight matches played. From the figure, it can be noticed that the team has a steady increase in performance from week 1 up to week 8.

Discussion

The present study examined the effectiveness of TBA as a medium for feedback in real time at half-time interim of a competitive match in improving the performance of soccer players. Performances of one of the soccer club competing in the Malaysian Super League were notated using a tablet-based application for eight matches based on the main important performance indicators relevant to the demand of the game. The information gathered was transmitted to the coach at the half time interval of every match, the coach then has a first-hand information about the performance of every player in a real-time which provided him with an opportunity to make the information available to the players in the form of feedback. One-way repeated measure ANOVA was used to assess the progress of the team between the first and second halves intervals of the eight matches played by the team.

The inferential statistics from Table 2 shows significant differences between the matches played by the team as the Greenhouse-Geisser value reported ($F(1, 14.10) = 8.94, p < .05$). The result is significant at (0.05) level of confidence which makes the researchers concluded that there was a marked improvement in the performance of the team at the second halves interval of the eight matches played. This evidence could be the result of the feedback transmitted to the coach via the application during the first halves interval of

the matches. The application has shown to be effective in providing the necessary information to the players on their performance in real time during the games which could serve a catalyst for the observed improvement in the performance of the team in between the weeks. This claim can be supported by the previous researchers who inferred that performance analysis provides the coach and the players with objective information to improve their performance through the means of viable and easy sharing application (Hughes & Bartlett, 2002). However, to attain to achievement coaches and players must know and comprehend what they have done so as to make them develop and excel which can easily be facilitated by the aid of feedback (Castañer & Sauch, 2014).

Players and coaches need an efficient method to guide their performance both during training and competition (Baca et al., 2010). However, this can only be achieved through the provision of information on performance via a system that is convenient, easy to understand method. Feedback in this study is found to be useful in enhancing the performance of the players as well as provide the coach with relevant information to figure out what is going on during a game so as to enable him to plan accordingly. Similarly, some researchers have stressed that, for any information to be used in performance analysis of sports, there is a need for it to be easy to convey to the athletes (Lemmink et al., 2013). Feedback using TBS examined in the current study appears to be powerful in triggering the players to improve their performance in real time. The goal for every coach is to be able to improve his player's performance, and one of the most crucial aspects that affect learning, and subsequent performance among athletes is the provision of information on performance (Lago & Martín, 2007). The player and the coach strive for a common goal which is to obtain reliable and comprehensive information upon which to base improvement on performance.

Figure 3 illustrated the performances of the team based on the performance indicators the team was assessed. It can be noticed from the scatter plots that there is a remarkable improvement on the performances of the team based on the performance parameters as the team keeps improving every week in the matches played. This might result from the feedback the coach relayed to the players during the first halves of their competitions. Team performance could be improved when the coach is fully provided with information on every player's performance which can be used to make changes necessary according to the demand of the situation (Gabin, Camerino, Anguera, & Castañer, 2012). Previous researchers highlighted that the main aim of match analysis was to identify the strength attributed to the team which can then be further solidified and enable the identification of the weaknesses that will suggest areas for improvement (Carling, Williams, & Reilly, 2005). The results of the performance analysis can be used to evaluate how effective the training program is in improving the performance of the team based on strategic areas required (Abdullah, Musa, Maliki, Suppiah, & Kosni, 2016d). However, it can only be possible when the application utilise is effective and reliable.

Conclusion

The effect of feedback in improving students' performance in classroom settings as well as its impacts in enhancing the performance of athletes in sports pedagogy as has long

been established. However, the role of simple verbal feedback using a tablet based application in soccer game has not been extensively researched. The current exploratory study revealed that tablet-based application might be effective as a medium for feedback at first half interval of every match in improving the overall performance of the players at the subsequent period of the match. The study has further indicated that the application could be useful in providing the coach with information on the performance of every player in real time which enables the coach makes decisions and plans on strategic positions that needed to transform both tactically and technically to ensure success. The nature of the information transmitted to both the coach and the players such as its simplicity and faster in sharing information provides the players with feedback upon their performance with the purpose of accelerating their development and achieving success. Simple and direct feedback should be given to the soccer players at first half interval of a competitive match.

Limitations of the study

Some factors such as the psychological preparation of the players, the strength or weakness of the opposing team could lead the players to perform differently in each game. Moreover, the number of wins or losses of the team under investigation were not considered in the current research. A study is required to investigate the effect of verbal feedbacks in the improvement of soccer players using a more purely experimental approach.

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