EFFECT OF PERFORMANCE FEEDBACK WITH THREE DIFFERENT VIDEO MODELING METHODS ON ACQUISITION AND RETENTION OF BADMINTON LONG SERVICE

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Abstract
Effect of different types of modeling and performance feedback was examined on learning of badminton long service. For this purpose, 60 female volunteers (aged 22 ± 1.5) were randomly divided into six groups of 10 people (self-modeling without feedback, self-modeling with feedback, expert-modeling without feedback, expert-modeling with feedback, combined modeling without feedback, combined modeling with feedback). The standard Scott and Fox test was used to rate performance of participants. Data was analyzed by using mean and standard deviation, one-way ANOVA, two-way ANOVA (feedback: with feedback and without feedback), three-way ANOVA (type of modeling: self-modeling, expert-modeling, combined modeling) and post hoc Duncan test (P<0.05). As the results show, subjects of combined modeling with feedback could earn higher scores. Therefore, it can be argued that sports skills training leads to sustainable learning through video combined modeling with feedback.

Key words: *badminton long service, performance feedback, video modeling*

Introduction

Paying attention to regulations of motor skills is considerably effective in learning these skills (Magill ,2011). For optimal acquisition of skills by learners, trainers need methods to transfer the required techniques most effectively. Undoubtedly, skill modeling is one of the most important factors in a learning process. Video modeling is a short-term approach, in which one watches a video of a model performing the target behavior for easier learning and performing that behavior (Franzone & Collet-Klingenberg, 2008).When the learner watches a model, the modeled skill is learned by focusing on all features of that skill, including spatial and temporal features (Zetou et al., 2002). Among types of video modeling, self-modeling is a certain way to model a skill. Through self-modeling, the learner watches himself performing the behavior successfully in a video (Dowrick, 1999). Skill modeling provides the opportunity for the learner to link verbal description of a motor assignment and information obtained from valid signs of that assignment visually for a successful performance (Weiss & Klint, 1987). Carolina and Wulf (2007) asserted that modeling is a common approach to obtain information for performing motor skills. As a reference, modeling helps the learner acquire a behavior before it becomes fully operational. According to Starek and McCullagh (1999), self-observation is more helpful than observation of others for better and more optimal performance in swimming. Evaluating the effect of expert-modeling and self-modeling on learning of volleyball set and serve skills, Zetou et al (2002) found that expert-modeling group outperformed in performance retention. In video modeling technique, it is assumed that because one watches himself performing the target skills, he become interested in performing that assignment and confident in his abilities (Van Laarhoven, 2009). Results of studies indicated that engagement of the observer in cognitive performances of the model being learned facilitates skill learning. Studies show that expert modeling improves skill imitation; however, the observer does not recognize and understand skill-performing strategies, because the expert modeling provides little information about error for processing (Bandura, 1969). According to observational learning theory, whatever the model is more similar to the learner, it is more likely to be effective (Bandura, 1977, Bellini & Akullian, 2007). By comparing effects of video modeling and self-modeling in mentally retarded children, Pirmoradian et al (2014) concluded that performance of video self-modeling group was more stable and better. McCullagh et al (1990) stated that observation of the model being learned would be followed by lesser error than observation of expert modeling if it were accompanied with feedback. Herbert and Landing (1994) noted that the model being learned serves as a powerful learning technique, through which the learner observes another model and learns about corrections of the trainer. Features such as type of the skill being presented, modeling of that skill and features of the model significantly contribute to effectiveness of modeling technique (Whiting, 1988). In studies in which video feedback was used, it was asserted that novices benefit when video feedback is associated with verbal cues related to special skills, while experts benefit more from skill modeling (Rothstein & Arnold, 1976). Wright, Li and Coady (1997) showed that final augmented feedback, as a variable, could be effective on learning through exercise and similarly on observational learning. In this regard, Bingham, Schmidt and Zaal (1999) showed that observing process alone is not enough for learning and producing a complex motor skill, but if it is associated with augmented feedback. Different assumptions exist to explain usefulness of efforts in which feedback is not made. For example, Weinstein and Schmidt (1990) believed that the learner only relies on sensory feedback when no augmented feedback is provided; this leads to independence on feedback. Williams and Hodges (2004) showed that combination of observation and feedback will lead to correction of movement, development of error detection and correction of skill over time . Accordingly, this study attempts to examine the interventional effect of performance feedback with a combination of two modeling techniques. This study also determines whether combined modeling of the skill being taught is effective on acquisition and learning of that skill.

Material and methods

This study was an experimental research. Participants included 60 right-handed female students (aged 22 ± 1.5) who were randomly divided into 6 groups of 10 people including expert modeling with feedback, expert modeling without feedback, self-modeling with feedback, self-modeling without feedback, combined modeling with feedback and combined modeling without feedback. The standard test of Scott and Fox (1943) was used for rating performance in long service. Correct badminton long service and rating system were explained to participants. By introducing the ball to all the groups, participants exercised in six badminton courts for 60 minutes. Pretest was taken at the end of each session. Each group exercised for 3 weeks and 3 sessions per week based on protocols.

A) Expert modeling with feedback: Group A performed 15 skill acquisition efforts. After 30 minutes, they sat in front of two laptops and watched expert performance for 3 minutes (both front and side view) along with providing verbal feedback, emphasizing important points of performance and pointing out weakness in the performance. Then, they performed 15 other efforts for 30 minutes. Expert models were two badminton national team players who performed long service from both front and side view.
B) Expert modeling without feedback: the procedure was similar to Group A, with the difference that they did not receive any feedback. They simply watched the expert modeling.
C) Self-modeling with feedback: performance of individual subjects was recorded by using two cameras in front and side views. After 30 minutes of exercise, they watched their recorded performance for 3 minutes. While watching their performance, they received verbal feedback on strengths and weaknesses of their performance. Then, they continued their exercise for the other 30 minutes.
D) Self-modeling without feedback: the procedure was similar to Group C, with the difference that they did not receive any feedback.
E) Combined modeling with feedback: Group E performed 15 trials for 30 minutes. Performance of individual subjects was recorded. They watched expert modeling and self-modeling within 3 minutes of rest time. At the same time, the trainer provided differences and feedbacks related to the performances. The trainer asked participants to identify differences carefully. Then, the participants continued exercising for 30 minutes.
F) Combined modeling without feedback: the procedure was similar to Group E, with the difference that they did not receive any feedback. At the end of the ninth session, post-test was done immediately. Retention test was done after 72 hours.

Statistical Methods

Mean and standard deviation of data were calculated to examine main indicators of descriptive statistics. One-way ANOVA was used to find significant difference in pre-test. Two-way ANOVA (feedback: with feedback and without feedback), three-way ANOVA (type of modeling: self-modeling, expert-modeling, combined modeling) and post hoc Duncan test were used to measure the difference in performance of 6 groups after post-test and retention test ($P<0.05$).

Results

Using descriptive statistics, mean and standard deviation were calculated for performance of each group at pre-test, post-test and retention test. The results are shown in Figure 1 and tables 1-5.

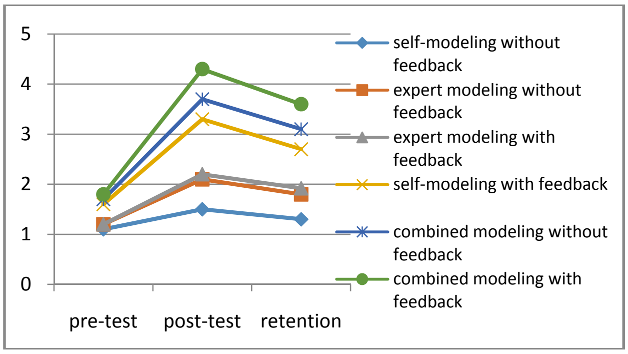

Fig.1.mean of performance in each step

Table 1. Mean and standard deviation for each test in subjects of 6 groups

Statistics Groups	Frequency	Post-test		Retention	
		Mean	Standard deviation	Mean	Standard deviation
Group A	10	2.2	0.85	1.92	0.87
Group B	10	2.1	0.9	1.8	0.74
Group C	10	3.3	1.2	2.7	1.02
Group D	10	1.5	0.62	1.3	0.7
Group E	10	4.3	1.34	3.8	1.4
Group F	10	3.7	1.03	3.1	1.24

According to *Table 1* and Figure 2, Group E had the highest and Group D had the lowest mean. One-way ANOVA was used to examine the effect of pre-test. The results showed no significant difference in performance of the groups at pre-test ($P>0.005$). At post-test, factorial ANOVA was used to evaluate effect of different modeling methods (self-modeling, expert modeling and combined modeling).

According to the results (F=528.342, η^2= 0.87, P=0.001), effect of these three methods was significant. Duncan test was used to locate the differences (*Table 2*). According to the results, there was a significant difference in performance of participants in all groups. Combined modeling group outperformed others.

Table 2. Duncan's post hoc test to compare the effect of modeling methods in the post-test

Groups	N	P-value = 0.05		
		1	2	3
Self-modeling	20	2.4		
Expert modeling	20		2.15	
Combined modeling	20			4
Sig.	--	0.001	0.001	0.001

Factorial ANOVA was used to examine main effect of feedback (feedback, lack of feedback) at post-test. The results showed that the effect was significant (F=298.804, η^2= 0.53, P=0.001). The results showed that performance of the subjects with feedback (x=3.26) was significantly better than that of participants without feedback (x=2.43). At post-test, interactive effect of modeling (self-modeling, expert modeling and combined modeling) and feedback (feedback, lack of feedback) was significant (F=432.75, η^2=0.72, P= 0.001). Duncan test showed a significant difference in performance of the groups at post-test, apart from Group C and Group B, which were significantly different. Group E showed the best and Group D showed the weakest performance (*Table 3*).

Table 3.Duncan test used to compare main effect of organizing at post-test

Groups	N	P-value = 0.05				
		1	2	3	4	5
Group D	10	1.5				
Group B	10		2.1			
Group A	10		2.2			
Group C	10			3.3		
Group F	10				3.7	
Group E	10					4.3
Sig.	--	0.001	0.526	0.001	0.001	0.001

Factorial ANOVA was used for statistical analysis in the retention phase. The results obtained for the effect of modeling (self-modeling, expert modeling and combined modeling) were significant (F=83.44, η^2= 0.63, P=0.001). In the retention phase, Duncan test showed a significant difference in performance of self-modeling, expert modeling and combined modeling groups.

Table 4. Duncan's post hoc test used to compare effect of different modeling methods in the retention phase

Groups	N	P-value=0.05		
		1	2	3
Self-modeling	20	2		
Expert modeling	20		1.86	
Combined modeling	20			3.45
Sig.	--	0.001	0.001	0.001

Combined modeling group showed the best and expert modeling group showed the weakest performance (*Table 4*). Factorial ANOVA was used to examine main effect of feedback (feedback, lack of feedback) in the retention phase.

The results showed significant effect of feedback at retention (F=41.49, η^2=0.54, P=0.001). The results showed that performance of the subjects with feedback (x=2.80) was significantly better than that of participants without feedback (x=2.06). In the retention phase, interactive effect of modeling (self-modeling, expert modeling and combined modeling) and feedback (feedback, lack of feedback) was significant (F=113.73, η^2=0.64, P= 0.001). Duncan test showed a significant difference in performance of the groups at retention phase, apart from Group A and Group B which were significantly different. Group E showed the best and Group D showed the weakest performance (*Table 5*).

Table 5. Duncan test used to compare main effect of organizing at retention phase

Groups	N	P-value = 0.05				
		1	2	3	4	5
Group D	10	1.3				
Group B	10		1.8			
Group A	10		1.92			
Group C	10			2.7		
Group F	10				3.1	
Group E	10					3.8
Sig.	--	0.001	0.481	0.001	0.001	0.001

Discussion and conclusion

This study determined the effect of various methods of video modeling, including self-modeling, video expert modeling and a combination of expert video modeling and video self-modeling with and without feedback of the trainer. According to Figure 1, all six studied groups that received different types of video modeling with and without feedback showed progress in the acquisition and retention phase. Accordingly, Group E showed the best and Group D showed the weakest performance in the acquisition and retention phase, while Group A and Group B showed similar performances in the acquisition and retention phase.

According to Bandura's social learning theory, the first process required for observational learning is attention. By providing feedback, the learner is actively involved in the learning process, receives strengths and weaknesses by the trainer and compares them with the expert model. These learners outperform the group which only observes and does not receive any feedback. Feedback helps learners to be more attentive to their performance. Learner control over the practice allows the learners to compare their successful efforts with external feedback of the trainer, find successful performance strategies through which they can outperform in efforts without feedback and increase stability of response. This is consistent with Shea et al (2001). It seems that different video modeling techniques improve performance and enhance learning in different manners (Carroll & Bandura, 1982). In fact, observation of motor skills not only leads to perceptual or cognitive representation of skills, but also the learner uses these representations later as a reference to assist in performance (Carroll & Bandura, 1985). Group C outperformed Group A. This finding is consistent with Shannon et al (2006). According to the results, subjects outperformed when they watched a model with similar capabilities. In fact, self-modeling is useful, because it leads to interventions to decide on the action required to improve performance in next efforts. These findings are consistent with Baudry, Leroy and Chollet (2006) suggesting that self-modeling is better than expert modeling and inconsistent with Zetou et al.(2002), and Barzouka (2007) suggesting that expert modeling is better. This finding is also consistent with Chiricowsky and Wulf (2002) suggesting that self-modeling and feedback are better. Watching self-modeling during practice and performance enhances motivation and active involvement of subjects in the learning process. Expert modeling without any feedback provides very little information about error to be processed. By watching combined modeling, the learners compare their performance and make more efforts to approach performance of the expert model. These findings are consistent with Williams and Hodges (2004), and Boyar, Miltenberger, Batsche and Fogel (2009). It can be concluded that combined self-modeling and expert modeling with feedback enhances learning. Therefore, trainers are recommended to display both self-modeling and expert modeling when teaching motor skills.

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EFEKT POVRATNE VEZE IZVEDBE S TRI RAZLIČITE METODE VIDEO MODELIRANJA U VEZI STJECANJA I ZADRŽAVANJA DUGOG SERVISA U BADMINTONU

Sažetak

Efekt različitih tipova modeliranja i povratna veza izvedbe proučeni su u vezi učenja dugog servisa u badmintonu. U ovu svrhu, 60 volonterki (u dobi od 22 ± 1.5) podijeljeno je nasumično u šest skupina od po 10 ljudi (samomodeliranje bez povratne veze, samomodeliranje s povratnom vezom, stručno modeliranje bez povratne veze, stručno modeliranje s povratnom vezom, kombinirano modeliranje bez povratne veze, kombinirano modeliranje s povratnom vezom). Standardni Scott i Fox test korišten je za ocjenu izvedbe sudionika. Podaci su analizirani koristeći srednju vrijednost i standardno odstupanje, jednosmjernu ANOVU, dvosmjernu ANOVU (povratna veza: s povratnom vezom i bez povratne veze), trosmjernu ANOVU (tip modeliranja: samomodeliranje, stručno modeliranje, kombinirano modeliranje) i post hoc Duncan test (p<0,05). Kako rezultati pokazuju, subjekti kombiniranog modeliranja s povratnom vezom mogli su postići više rezultate. Stoga, može se tvrditi da trening sportskih vještina vodi do održivog učenja kroz video kombinirano modeliranje s povratnom vezom.

Ključne riječi: *dugi servis u badmintonu, povratna veza izvedbe, video modeliranje*

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