

Original Article

The effect of feedback on serve and bump skills training in volleyball

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Abstract

Background: The purpose of the present study is to examine the effects of visual, verbal and verbal-visual feedback on the success of serve and bump skills training in volleyball. **Methods:** The total participants of the study were 42 university students. All the participants attended the PE lectures during the 2012-2013 academic years in a form of 3 different classes which consisted of 14 students per each. Each class was assigned as an experimental group and received different feedback styles for bump and serve skills in volleyball. The feedback was as follows: verbal feedback (mean age= 12.28 ± 0.46; sport age=1.85 ± 0.62), visual feedback (12.14 ± 0.37; 1.66 ± 0.44) and verbal-visual feedback (12.21 ± 0.42; 1.91 ± 0.38). Considering the pre-test/ post-test design, the data collected from students' test scores in cognitive domain and video records were assessed and scored by experts related to the achievements in the psychomotor area. Descriptive statistics and T- Test analysis was used to investigate if there were any significant differences between pre-test and post-test scores of each experimental group. Also, an ANOVA Test was conducted to assess the significant differences between groups.

Results: Results showed that there were meaningful differences between the levels of success in verbal, visual and verbal-visual feedback of pre-test and post-test scores of each group in terms of cognitive domain [F(39,2)=26.87;p=0.001] and [F(39,2)=7.807;p=0.001]. For each type of evaluation, all feedback styles increased the success levels of bumps and serve skills of the participants.

Conclusions: Consequently, the findings of the present work suggested that the use of verbal-visual feedback styles that were given by teachers' instructions and video records can positively affect the learning process of bump and serve skills in volleyball.

Key Words: Study Skills, Volleyball, Visual Feedback, Feedback.

Introduction

Learning is a continuous process which aims to change the behavioral consequences to reinforced repetitions. It is also a skill that includes various processes depending on highly complex and different variables. One of the most vital factors in regulation of training process that enables learning is the feedback provided to the learner parallel to his/her performance. Feedback is considered as a pivotal variable to determine the level of learning acquisition (Salmoni, Schmidt, & Walter, 1984).

The role and the importance of feedback, which has an unquestionable place in education, is a subject matter of many debates. In this context, many researchers have focused on studies about the role and the effects of feedback in developing the learning skills and learners' performance (Morya, Ranvaud, & Pinheiro, 2003). Feedback is not a process that is merely applicable on its own, yet it involves various concepts such as reinforcements, awards, result information, etc. (R. Schmidt & Wrisberg, 2000).

The information about the consequences of action (movement) is called as feedback. There are different kinds of feedback such as extrinsic feedback, intrinsic feedback, knowledge of result (KR), and knowledge of performance (KP). Extrinsic feedback refers to the one that is received from extrinsic sources and is added or enhancing the intrinsic feedback of the individual (R. Magill, 2004). Intrinsic feedback is the sensory feedback that an individual naturally experiences during and after the movement (R. Magill, 2004). Intrinsic feedback is provided while many motor tasks are performed or come up with their completion. Knowledge of result (KR) refers to extrinsic verbal feedback that informs the learner about the success of the movement in line with the environmental goals. If extrinsic feedback is given as KR, then the quick and permanent learning is realized (R. A. Schmidt, 1991); (R. Schmidt, Wrisberg, Schmidt, & Wrisberg, 2008). Knowledge of performance (KP) is the information about the way the movement is made that leads to the result of the performance (R. A. Magill & Anderson, 2007). Information related about the movement or movement patterns constitutes the KP.

One of the most widely used methods for teaching a new skill to students is the implementation of the verbal expression (R. Schmidt & Lee, 1999). Verbal feedback, provided by the teacher, helps the learner to decide what to do in the next trial and gives an idea about the quality of the displayed skill (R. A. Schmidt, 2008) (R. Schmidt & Wrisberg, 2000). While teaching happens, generally verbal or written information would be given

as the fundamental aspect of the skill. This approach includes the information addressing how to perform (group activity, contest etc.), which kind of tools will be used (ball, etc.), how they will be used, and, also, the specific details or instructions regarding the skill of the posture of the body, etc. (Austermann Hula, Robin, Maas, Ballard, & Schmidt, 2008). Another classification refers to the way the extrinsic feedback is presented. This classification is in the form of verbal or visual feedback. Verbal feedback can be given through a movement, touch, material presentation or speaking. There are four kinds of verbal feedback in physical education and sports training: corrective expressions, value expressions, objective expressions and indefinite expressions (Mosston & Ashworth, 2002). Visual feedback can be provided by the teacher him/herself or by a video-film or a model. The most efficient and intensive method is through the video. Video recordings are used to show the specific skill to the learner during the learning process. The feedback is provided via the recorded image (Pellett & Harrison, 1995).

According to the studies conducted with respect to the effect of verbal feedback and visual feedback on achievement, visual feedback through video use is more effective than the verbal feedback when the achievement is considered (Badami, Vaez Mousavi, Wulf, & Namazizadeh, 2012). Weekes et al. (Weeks et al., 2002) performed an investigation on a group which received the visual feedback via video. They showed that the group was more successful than the control group that received no feedback in the movement training. In addition, the study of Merian and Baumberger (Merian & Baumberger, 2007) on children between ages 10-11 showed that the performance of the group among which visual feedback was provided by video was more successful than the group that received verbal feedback. In a study that was conducted about the serve skills of tennis players, (Van Wieringen, Emmen, Bootsma, Hoogesteger, & Whiting, 1989) found that the achievement level of the group in which the visual feedback was provided via video was higher than the group with verbal feedback. Similarly, Menickelli (Menickelli, 2004), in his study about the free kick skill, found that the group that received visual feedback via video was more successful when compared to the group with verbal feedback. In contrast, Taylor's study (Taylor, 2006) about the foot fakes in football with 8th-grade students did not find a significant difference between the group which received the visual feedback through video and the group that received the verbal feedback. Furthermore, the study performed on golfers by (Guadagnoli, Holcomb, & Davis, 2002), revealed that the groups to which verbal and visual feedbacks were provided were less successful than the control group.

Sigrist & et al (Sigrist et al., 2011) indicated that both visual and auditory concurrent feedback designs were practical to support the immediately multidimensional movement. In the other study, Sigrist et al. (Sigrist, Rauter, Riener, & Wolf, 2013) found that visual, auditory, haptic, and multimodal feedback are necessary for success.

The absence of studies about the effect of feedback on learning the serve and bump skills in volleyball constituted the basis of the present study. By taking training into consideration, the technology used by the teachers' gains importance particularly in physical education lessons. Through the help of these kinds of technologies (video, camera, etc.) skill learning process can be easily consolidated as the students apply records or analyze their own skills independently. By adding teacher's verbal feedback to this kind of education, fruitful results would be yielded. In this regard, having the knowledge of which kind of feedback is more effective during the physical education, lessons seems to be significant (Kangalgil, 2013). Thus, the aim of the present study is to evaluate the effect of verbal, visual and verbal-visual feedback on students' serve and bump skills performance in volleyball.

Method

Research group: 42 students studying at the 6th and 7th grade in Private School voluntarily participated in the research. 14 (six males and eight females) students participated in the verbal feedback group, other 14 (eight males and six females) participated in the visual feedback group and 14 (seven males and seven females) participated in the verbal-visual group. The averages of students' ages were 12.28 ± 0.46 for the verbal feedback group, 12.14 ± 0.37 for the visual feedback group and 12.21 ± 0.42 for the verbal-visual feedback group.

Data Collecting Tools:

The opinions of experts were asked in order to determine the cognitive and psychomotor domain skills and "observation forms" included the steps of the process covering all the subjects of the volleyball unit.

Data Collecting Tools about Cognitive Domain

In order to test the cognitive domain, the researcher developed a multiple-choice test with 25 questions which covers all the subjects to be studied in the volleyball unit. The majority is the multiple-choice questions that address the knowledge of the rules, etiquette, techniques, and the tactics of the sport. This questionnaire is an extract from cognitive evaluation criteria in volleyball which is used in the study. Upon designing the questions, opinions of five experts working in volleyball field were turned into a Likert-type scale to study the reliability. The CVI was used to analyze the validity and it was calculated to be 0.93 (Lawshe, 1975a). To assess the scale's content validity, CVI was applied to a pilot group of 100 people who had similar sampling like the study group. Total correlation and Cronbach Alpha coefficients for the items were calculated respectively (Nunnally & Bernstein, 1994). Scale's Cronbach Alpha reliability coefficient was calculated to be 0.86.

Data Collecting Tools with Respect to the Psychomotor Domain

After reviewing the related literature about these volleyball skills, opinions of five experts were requested about the performances of all the participants that were recorded in video and the movements covering the subjects of volleyball unit and then the videos recorded with the help of the models. This questionnaire extract was from volleyball skill observational forms which Mirzeoglu (Mirzeoğlu, 2014) used it in his study. The scale was scored as a 5-likert type and according to a 0-4 grading score where 0 = not observed, 1= poor, 2 = fair, 3 = good and 4 = very good.

The opinions of five experts, who were working as professionals in volleyball, were transformed into a Likert-type scale for the reliability study: the grading framework was: 1-2 = I don't agree at all, 3-4 = I totally agree. According to the expert ideas, the validity coefficient (content validity) was calculated by using the CVI analysis technique (Lawshe, 1975b) and it was calculated to be 0.94.

In order to determine the scoring reliability for the psychomotor domain between the experts, the scale was applied to 20 volleyball players studying at volleyball high school and at the same time playing in the official league. Additionally, ICC analysis was performed and calculated as 0.89 for serve and 0.97 for the bump.

Feedback content in groups during acquisition

Visual feedback group: 'You are grouped as subjects. You are the visual group which is going to perform the serve and bump task 10 times. Then, you are going to watch your own performance from the TV.'

Verbal feedback group: 'You are grouped as subjects. You are the verbal group which is going to perform the serve and bump task 10 times. Then, you are going to receive feedback from the instructor one by one.'

Visual-Verbal feedback group: 'You are grouped as subjects. You are the visual group which is going to perform the serve and bump task 10 times. Then, you will get feedback from the instructor and watch your own performance from the TV one by one.'

Expert Reliability

Five experts came to assist the research. Among them, a lecturer and four trainers who work at Hacettepe University Sports Sciences and Technology College were present. One of them had A (5th grade) and other four had B (4th grade) Category Trainer Certificates granted by the Turkish Volleyball Federation. The performances of the subjects about these skills were recorded by video uploaded to a DVD and it was sent to the experts. They watched them once on computer and then scored the psychomotor domain forms. The same procedure was repeated after 15 days and scoring process was carried out again. Later on, since obtained scores showed normal distribution, reliability coefficients were calculated according to the ICC statistics by viewing the reliability of the experts and the reliability between them.

Table1. Expert Scoring Reliability Values

Skills	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Experts
Serve	0.95	0.88	0.70	0.91	0.83	0.89
Bump	0.91	0.96	0.86	0.95	0.86	0.97

Obtained reliability values showed that the scoring reliabilities of the experts were high.

Data Collecting

"Bump" and "serve" skills included in the volleyball unit were used on the experimental design. Lessons were taught by giving verbal feedback to the first experiment group, visual feedback to the second experiment group, and both verbal and visual feedback to the third experiment group. Students did not see each other during the lessons.

Standard daily plan was followed and study sheets were given to all groups. Before the initiation of the lesson, students were asked to perform the skill of that day to determine their initial knowledge. They were recorded by video camera and these records were backed up in order to be evaluated by the experts.

While teaching bump and serve skills, three different feedback styles were provided to the participants. According to these feedback styles, three experimental groups were assigned by the researcher. From these groups; the feedback expressions were determined and standardized in advance. In verbal feedback group, participants received verbal feedback after 10 times of repetitions. The feedback was given to the students one by one. In visual feedback group, each participant received feedback during the training session via video recordings on their movements after 10 times of repetitions. Also, prior to the lesson, the students were instructed to which points they should pay attention in their video records. For the group that received both verbal and visual feedback, instructions were given both verbally and visually (video recordings) after 10 times of repetitions during the training. Similarly, in order to determine what was learned, students were asked individually to show thought movement. Students were recorded by a video camera and these records were backed up in order to be evaluated by the experts later on.

Data Analysis

After the scores were obtained from pre-test and post-test phases, measurements on students' cognitive behaviors and video recordings were evaluated and then scored by the experts and saved in the computers. CVI analysis was used in order to assess the reliability of the measurement tool of the study. The Levene (Test of Homogeneity of Variances) Test was used in order to identify the cognitive and psychomotor domain equivalencies of the group. The Shapiro-Wilk analysis was used in order to determine whether the cognitive and

psychomotor domain data of the group showed a normal distribution or not. The following formula was used to determine the effect of cognitive and psychomotor domain scores on the success of the verbal, visual and verbal-visual feedback domain groups in volleyball bump and serve training.

$$\frac{x1 - x2}{m \cdot s \times d}$$

ICC test was used and due to the fact that the data in relation to the intrinsic scoring reliability of experts had a normal distribution. The descriptive statistics of the data were calculated and throughout the data analysis, the Paired Samples T-test analysis was used for the groups which were parametric and dependent. Since the data normally distributed, to identify whether there was a difference between pre-test and post-test, the ANOVA test was implemented. Finally, the Bonferroni was applied to identify the source of the difference, if any. $P < 0.05$ was used as the margin of error (meaningfulness level).

Findings

The achievement scores of the participants were calculated by subtracting the post-test scores from the volleyball serve and bump evaluation inventory obtained from the pre-test scores. The Levene Test results revealed that achievement score variances were homogeneous according to cognitive domain scores for serve [$F(2/39)=0.159;p=0.943$] and bump [$F(2/39)=1.519;p=0.232$], and according to psychomotor domain scores for serve [$F(2/39)=3.234;p=0.060$] and for bump [$F(2/39)=0.151;p=0.860$]. No significant difference was found between the cognitive domain scores of the studied groups ($p > 0.05$). Based on this finding, it can be said that groups showed a normal distribution at the cognitive domain level. Again, no significant difference was found between psychomotor domain scores of the studied groups ($p > 0.05$). Based on this result, it can be said that the groups showed a normal distribution at the psychomotor domain level.

Table 2. Cognitive Domain Success Level of Verbal, Visual and Verbal-Visual Groups in Volleyball Bump and Serve Skills Training, Paired, T-Test Results:

Group	Test	N	Ave	SD	DF	T	P
Verbal	Bump Pre-Test	14	17.07	2.164	13	-16.402	0.001**
	Bump Post-Test	14	28.14	1.561			
	Serve Pre-Test	14	16.92	3.496	13	-11.854	0.001**
	Serve Post-Test	14	30.07	1.899			
Visual	Bump Pre-Test	14	16.071	1.899	13	-14.55	0.001**
	Bump Post-Test	14	26.357	1.336			
	Serve Pre-Test	14	17.428	3.435	13	-14.09	0.001**
	Serve Post-Test	14	28.571	1.398			
Verbal-Visual	Bump Pre-Test	14	15.928	1.639	13	-18.95	0.001**
	Bump Post-Test	14	30.928	2.017			
	Serve Pre-Test	14	17.571	3.344	13	-20.22	0.001**
	Serve Post-Test	14	35.142	1.703			

For all the verbal, visual and verbal-visual feedback groups in volleyball bump and serve skills training, an increase in cognitive domain scores from pre-test to post-test was observed. It was observed that there was a statistically significant difference in terms of cognitive domain achievement scores between the pre-test and post-test.

Table 3. Psychomotor Domain Success Level of Verbal, Visual and Verbal-Visual Groups in Volleyball Bump and Serve Skills Training, Paired, T-Test Results:

Group	Test	N	Ave	SD	DF	T	P
Verbal	Bump Pre-Test	14	23.757	18.685	13	-20.330	0.001**
	Bump Post-Test	14	36.385	33.428			
	Serve Pre-Test	14	15.200	0.678	13	-28.557	0.001**
	Serve Post-Test	14	29.271	1.741			
Visual	Bump Pre-Test	14	19.185	1.410	13	-19.929	0.001**
	Bump Post-Test	14	31.457	2.484			
	Serve Pre-Test	14	16.300	0.865	13	-28.010	0.001**
	Serve Post-Test	14	26.857	1.436			
Verbal-Visual	Bump Pre-Test	14	19.571	1.502	13	-35.692	0.001**
	Bump Post-Test	14	34.928	1.441			
	Serve Pre-Test	14	16.242	1.343	13	-35.942	0.001**
	Serve Post-Test	14	33.885	1.358			

It was revealed that psychomotor domain achievement scores of verbal, visual and verbal-visual feedback groups in volleyball bump and serve skills education increased from pre-test to post-test. It was depicted that there was a statistically significant difference in psychomotor domain achievement scores between the pre-test and post-tests.

The effect of cognitive and psychomotor domain scores for the verbal feedback group on serve knowledge and skill learning was calculated to be 3.17; 7.64, and its effect on bump knowledge learning came to be 4.39; 5.43. The effect of the cognitive and psychomotor domain scores of the visual feedback group on serve knowledge and skills learning was calculated to be 3.77; 7.48 and on bump knowledge learning as 3.89; 5.33. Ultimately, the effect of the cognitive and psychomotor domain scores of the verbal-visual feedback group on serve knowledge and skills learning was calculated to be 5.40, 9.63, and on bump knowledge learning it was 4.06; 8.59.

Discussion

The findings of the present research suggest that all the groups acquired higher scores in the post-test than in the pre-test phase in the cognitive domain. However, verbal-visual feedback group scores were higher when compared to other groups and this difference is due to the scores obtained from this group.

When these results are focused in the context of other similar research, some findings are supportive while some others are not. Studies that support the specific premise in which feedback is an important part of learning are numerous (for example, (Sigrist et al., 2013; Sigrist et al., 2011). However, when feedback types are considered, determining the most effective one, verbal or visual, etc., is of particular importance.

In our study, students were provided with both verbal information and visual information in the verbal-visual feedback group. Therefore, it can be said that using verbal expressions as well as visual feedback can enhance the learning quality. It was noticed that there was a difference in all groups between the pre-test and post-test in terms of the achievement scores for the psychomotor domain volleyball bump skill in a way that verbal-visual feedback group had the highest. When the difference between the groups was examined, it was understood that visual feedback fell behind the other two and as a result, the difference originated from the visual feedback group.

It was also found that for serve skills, in terms of the achievement points of the experiment group, the visual feedback group had lower scores. Verbal-visual feedback group had the highest scores. Also, according to the average of scoring in both tasks, it was found that verbal group was better than visual group.

Visual feedback is a characteristic of progress in learning and in the study, it increased the ability to detect the movement errors. But it must be supplemented with verbal information that directs the attention of the subjects to those cues and techniques to a better performance (Akıncı, 2004). Without verbal feedback, learner may pay attention to unnecessary cues, such as the outcome of the movement or simulation of the movement. Consequently, subject may become disappointed, decrease motivation or suppress with visual feedback. It seems that the observation of the demonstration already led to a development of the intrinsic movement representations of the task.

When the difference between groups was examined, a significant difference was found between the verbal feedback group and verbal-visual feedback group and also between visual feedback group and verbal-visual feedback group, and between verbal-visual feedback group and the verbal and visual feedback one.

In terms of the achievement scores for both skills, the verbal-visual feedback group was found to have the highest scores. It was revealed that implementation of feedback for volleyball bump and serve training was certainly effective, but verbal-visual feedback was more effective when compared to others when one talks about the complex skills. However, it can be said that for complex skills, not only the use of visual feedback but also verbal feedback combined with visual feedback, could create the largest effect.

(Hebert & Landin, 1994) examined the effects of verbal and visual feedback on forehand volley shot training in tennis. They conducted their study on the beginners. 48 female university students, who had never received training in any racket sports, were recruited. They were provided with basic training former to the study. Four groups were created in a randomized way. These groups were categorized as: the group that received verbal feedback from the teacher, the group that received visual feedback by watching learning models and feedbacks through a video, the group that received verbal feedback from teacher in addition to observing learning models and visual feedback, and the control group, which did not receive any feedback. According to the findings, the three experiment groups obtained more significant learning when compared to control group. The most significant progress was achieved by the group that received verbal feedback from the teacher in addition to visual feedback. According to the researchers, the feedback provided through video was beneficial for grasping and improving skills.

In a study that was conducted on forehand shot skill, (Hebert & Landin, 1994), created four groups of female university students and enabled students to use rackets with their non-dominant hand. The first group received verbal feedback from the teacher, the second group received feedback through a monitor, the third group received feedback from a monitor as well as verbal feedback, and the fourth group was controlled and did not receive any kind of feedback. At the end of the study, it was revealed that the scores of the first three groups were better than that of the controlled group. It was also found that the best scores were obtained by the verbal-visual feedback group.

In a study on 27 university students, Ignico (Ignico, 1997) compared the difference between the visual feedback group and the group that received verbal feedback from the teacher. In the study, the visual feedback group received feedback by watching the application of the right skill in slow motion and by freezing the image.

In the verbal group, no video was used but skills criteria and the important points were explained. At the end, it was revealed that giving visual information was more effective than teacher's verbal feedback to develop the skill, performance and evaluation.

According to the studies, it was stated that the teacher's corrective feedback parallel to the skills level would be more effective for skill development. In our study, we found that the use of feedback in learning was effective but in complex skills, verbal-visual feedbacks were more effective when compared to other feedback. The obtained findings support those of the previous studies.

Conclusions

This study aimed to investigate the effect of verbal feedback, visual feedback and verbal-visual feedback on the success of students during volleyball serve and bump skills training. In the light of the obtained findings, following results were found:

Results of the experiment groups in terms of cognitive domain: according to the cognitive domain, a significant difference between pre-test and post-test scores of the groups was found. However, scores of verbal-visual feedbacks group were higher when compared to other groups and had more impact on the level of success. The results of the experiment groups in terms of the psychomotor domain: the scores of volleyballs bump skill of the experiment groups were higher than the visual feedback group with respect to the experiment group achievement scores. It was also found that the verbal-visual feedback group had the highest score. When the difference between the groups was examined, a significant difference was found between the visual feedback group and the verbal-visual feedback group. No significant difference was found between the verbal feedback group and visual feedback group, and also between the verbal feedback group and verbal-visual feedback group. When the experiment groups were examined in terms of the achievement scores in the psychomotor domain volleyball serve skill, an increase was observed in all the experiment groups. It was identified that the verbal-visual feedback group had the highest score. When we looked for a difference between the groups, a significant difference was found between the verbal feedback group and visual feedback group, verbal feedback group and verbal-visual feedback group, and also between verbal-visual feedback group and visual feedback group. It was also observed that the use of feedback for bump and serve skill was effective. It can be said that verbal-visual feedback was the most effective method within the feedback groups.

It has been also revealed that the use of feedback for volleyball bump and serve skill training was definitely effective. However, for complex skills, verbal-visual feedback was more effective when compared to the others.

It must be stated that verbal feedback is effective for the development of complex skills as well as the visual feedback. When they are integrated, they can emanate more effective results.

The contributions of the authors

All the authors contributed to the writing of the manuscript. SLS carried out the experiments under the instruction of QCJ and FQ. All the authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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