

## **Different Task, Motivational and Combinational Feedback, and a Comparison of the Role of Different Augmented Feedbacks in Learning & Self-Perception**

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### **ABSTRACT**

*This study aims to investigate the role of different augmented feedbacks on performance, learning and self-perception with regard to spiking in volleyball. The sample includes 60 non-athlete students of Islamic Azad University – Shiraz Branch who were beginners in spiking skill and who were passing a course on Physical Education II. The sample was classified under four categories (control group, task feedback, motivational feedback and combinational feedback groups). Self-perception Questionnaire was submitted to the subjects at the end of the first, the sixth and the twelfth sessions. The test was carried out after 12 sessions of spiking practice and the retention test was carried out after 72 hours and the transfer test was carried out 72 hours later. When the data was collected and the scores were analyzed using ANOVA method, the following results were obtained:*

- *The motivational feedback has a significant effect on the transfer of the spiking skill in volleyball.*
- *The motivational feedback has a significant effect on the retention of the spiking skill in volleyball.*
- *The task feedback has a significant effect on the transfer of the spiking skill in volleyball.*
- *The task feedback has a significant effect on the retention of the spiking skill in volleyball.*
- *The combinational feedback has a significant effect on the retention of the spiking skill in volleyball.*
- *The combinational feedback has a significant effect on the transfer of the spiking skill in volleyball.*
- *The motivational feedback has no significant effect on the individual's self-perception for the spiking skill in volleyball.*
- *The task feedback has no significant effect on the individual's self-perception for the spiking skill in volleyball.*
- *The combinational feedback has no significant effect on the individual's self-perception for the spiking skill in volleyball.*
- *The type of the augmented feedback has a significant effect on the transfer of the spiking skill in volleyball.*
- *The type of the augmented feedback has a significant effect on the retention of the spiking skill in volleyball.*
- *The type of the augmented feedback has no significant effect on the self-perception for the spiking skill in volleyball.*

**Keywords:** Task Feedback, Motivational Feedback, Self-perception.

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## INTRODUCTION

Learning ability is a critical issue for man. Without the abilities to speak, to write, to read and most importantly to do complex motor skills in physical exercises, human beings will be simple creatures. In line with progresses in several sciences, physical education has also increasingly followed a progressive path. People attribute all these progresses to training duties, tasks and learning various skills. Accordingly, we have witnessed skillful and extraordinary performances of distinguished athletes in sport fields; a display of power and delicacy, creativity and art that will undoubtedly raise many questions in our minds. How such a degree of progress can be achieved in performing the skills? How are these skills developed? How can one approach such a level of skillfulness?

What most coaches follow in several ways, while teaching the skills, is to focus on learning and performing these skills. Hence, the better a coach considers the effective learning procedures, the more successful they will be in teaching these skills to the athletes.

The knowledge obtained in this regard reveals that an effective factor for skillful performance is to provide the required information to improve the function. The information that is known as feedback refers to the data obtained through the response received during or after the movement. The novices receive different kinds of feedback data from the internal resources as the inherent consequence of the movement (the intrinsic feedback) or from the external resources related to mistake and error, in achieving the purpose of the movement (extrinsic or augmented feedback). Augmented feedback includes two groups: knowledge of results and knowledge of performance. Each group involves several ways to present the augmented feedback. However, the extrinsic feedback for the error, referred to the knowledge of performance, is one essential aspect of the learning environment (Schmidt, 1991; translated by Namazizadeh&VaezMousavi; 2007).

The investigations on the ways training can lead to learning as well as the study of the learner's role in the learning process are increasingly influenced by cognitive intermediate pattern. We might believe that learning is a motor skill, merely a set of physical techniques. However, we should know that the highest level of learning is obtained when an individual has a mutual interaction with the teacher, since some cognitive processes emerge after the training process by the teacher and before the time the skill is being performed by the student. These processes act as mediators. Learners are not empty containers to be filled by knowledge. They are dynamically involved in the learning process. The experiences from present and the past are filtered by special lenses and then turned into behaviors and acts after being processed [28].

The motivation and the reward for the learner is received from the instructions of the coach and practicing; that is to say through practice and instructions of the coach, today the learner is enabled to do the things he/she was not able to do yesterday. While performing a motor skill, there are several data resources involved in the consequences of the performance and the reason behind one particular consequence. One source is the sensory feedback system of the individual and another resource is the data existing outside the feedback system of the individual and known as augmented feedback. The factors that influence the needs for the augmented feedback include the skill practice features and conditions. According to Viney's Theory (1998), the student's learning requires two kinds of information: task information and motivational information.

Other researchers believe that the augmented feedback may be not necessary for motor learning. Based on the results obtained, these researchers realized that, as compared with the situation of deprivation from the augmented feedback, the presence of such a feedback during practicing did not led to a better learning. Some other studies including Eghan (1988), Pieron (1982), Silverman, Tyson and Krampitz (1991) have underestimated the augmented feedback [16]. Meanwhile, some other researchers (Salmon & Lee, 1996) have suggested that if the task and motivational data are simultaneously presented and studied, the advantage and effectiveness of the teacher's feedback might be perceived in a better way [16].

Considering the disagreements among researchers on the role and type of the augmented feedback from 1970 to 2006, this area seems to be in need of further researches. Moreover, the insufficiency of researches on the self-perception of the abilities in different sport fields has made these two topics appealing for the researcher and has created an incentive for the investigation on the role of task, motivational and combinational augmented feedback in self-perception and learning a sport skill.

The studies on different fields of physical education include a wide scope and it is valuable to have contributions on them. The purpose of the coach in using different training methods is to choose a method that enhances the learning of the learner. The highest level of learning is achieved when an individual has a mutual interaction with the coach. Communications form the basis for information providing. Communication, feedback and training methods are

inseparably interrelated. The feedback from the coach is an essential element in the process of teaching for a better recognition, improvement, correction and purification of the students' understanding of their own physical skills and performances. Feedback is not only a way to identify the quality of teaching, but it is also a concept to improve teaching and performance. A high number of scientists have welcomed the feedback and have improved the supplementary techniques for classroom training [16]. Hence, considering the fact that as a discipline, physical education has a highly wide scope and it includes several skills, it is very important to identify which kind of feedback improves a task or skill in a much better way. As very limited studies have been carried out on different skills and the comparison of the different kinds of feedbacks for simple and complicated skills in a certain field of sport, further studies are needed to be carried out.

## MATERIALS AND METHODS

### Instrumentation: Data Collection Instrument

1. Demographic Characteristics Questionnaire and Salmon's Validated Questionnaire on Self-perception (b) with 80% validity and acceptable reliability, including 3 questions [4]. The scoring method for this questionnaire is enclosed in appendix (B).
2. Approved Spike Test with an acceptable validity and reliability. The tools used in the test include a standard (Mikasa) ball and volleyball court and net [9].

The test considered here measures the accuracy skill in volleyball spiking. In this test, the person who bumped the ball threw a high ball for the subject standing on the specified point, and the subject tried to spike the ball onto the hachured area. The subject spiked the ball from the right side to the right area and from the left side to the left area, alternatively. Every subject had 20 spikes. The balls that did not reach the hachured area scored no point. If the bumped ball did not reach the specified area for the subject, the bump was repeated again. The highest score for this test was 20.

### Statistical Population

The statistical population for this study included non-athlete male students of Islamic Azad University – Shiraz Branch who studied at the Bachelor's Degree Program and were passing a course on Physical Education I & II in the academic year 2007-08. The age, standard deviation and height range for them was 18-24 years old, 2.67 and 168-182 cm, respectively. All subjects were right-handed and they had no experience in spiking skill.

60 subjects out of the statistical population who were willing to participate in this research were randomly selected as the sample. In the first step, a questionnaire on the demographic specifications was distributed among the participants who were passing a course on physical Education I & II in order to identify the subjects who were qualified to participate in this study. When the questionnaires were filled in, the respondents who had the experience of familiarity or participation in playing volleyball and the skill of spiking were excluded from the list. In the second step, 60 subjects were sampled and a primary (self-perception) test was given to ensure homogenous groups with regard to the level of self-perception. When the self-perception scores were obtained, the subjects were graded based on their self-perception scores and then classified under 3 experimental groups and one control group using ABCDDCBA method.

### Research Method

The first session included skill training and displaying the video related to performing the spiking skill in volleyball for every four groups. The subjects were not classified under different groups in this session. First the coach explained on spiking and performed the skill and then the video was played. After that, the verbal instructions accompanied the display of the video in a marking form (Appendix A). The validated self-perception questionnaire was handed over to all participants after providing them with the required information. The questionnaires were collected and then a pre-test was carried out which yielded the same result for all groups. Hence, all these groups were at the same level of primary performance, considering the statistical comparison (Appendix B). Using the matching process, the sample was classified under three experimental groups and one control group, based on the primary self-perception scores in the first session. Self-perception questionnaires were handed over to the subjects in all four groups, filled in and then collected in the first session and the last session of the acquisition phase, prior to the drills. The groups were labeled by numbers 1 (Task Feedback Group), 2 (Motivational Feedback Group), 3 (Combinational Feedback Group) and 4 (Control Group). The specified groups were different with each other with regard to the type of feedback. To properly perform the spike, one needs to observe all technical principles of this skill in their own order. Even if only one step and part of the movement is wrongly or defectively performed, the whole strike will be wrongly done and the performance will be unsuccessful. Therefore, the feedback of the coach in this research is provided with regard to the technical principles of this skill as provided in appendix. The feedbacks were offered in the drills so that a final verbal feedback was provided to the learners in three experimental groups,

after every attempt in informational, motivational or combinational forms. In these attempts, only one sentence was considered as feedback for the group, based on the performance of the subject.

In this study, the first group included the subjects who only received task feedback of information type with a final verbal statement on their performance, so that the coach did not say anything about the abilities or attempts of subjects. During the drills, instructional hint (feedback) was provided related to the correct technique to optimize the performance of the skill and proper implementation of the skill, including: look at the ball. Jump on both your feet. Bend the wrist totally while striking the ball. Open your fingers wide apart ...

In the second group, the subjects received positive motivational feedback about their personal ability and attempt and the coach did not provide any feedback on the technique during the drill, rather encouraging statements were made during the movement and after the completion of the considered attempts. Statements such as: you are really diligent, I can see you will be successful in that and you will improve, you have a rapid reaction, you have a perfect cadence, you do really well.

The subjects of the third group also received motivational feedback on their own attempts and abilities during the drills and performing the skill, and they also received task feedback on the performance quality. In the combinational feedback, there was an equal proportion of the informational as well as the motivational feedback, each one having a 50% share. That is to say, the provided feedback in all training sessions included an equal combination of both task and motivational feedbacks, so that the task feedback was provided in a half of the attempts and motivational feedback in another half.

The purpose of this method was to provide the subjects with combinational feedback statements. Statements such as: you are very diligent (motivational), you'd better move your wrist downwards at the last moment (task), ...

The subjects of the fourth group included the control group. The drills in this group were similar to other groups, but the subjects did not receive any feedback during the drills.

This research was carried out for 4 weeks, 3 sessions a week including a total number of 12 training sessions. The groups exercised in different days not coinciding with each other. Each session lasted for 45 minutes and each session included 4 different drills with 20 attempts. The drills were considered from easy to difficult levels during the training sessions. The practices included in every training session were designed under the supervision of specialists of this discipline, from easy to difficult, the examples of which are included in appendix (C).

The rest interval between attempts was different with regard to the type of drill and the consumed energy cost. The interval between the attempts that required a higher level of energy varied from 30 to 60 seconds, and the interval between the attempts that needed a lower level of energy was 5 to 10 seconds.

To evaluate the result of the performance, a test similar to the pre-test was considered in the first and the twelfth (last) sessions. The retention test, similar to the former tests, was carried out 72 hours after the test in the last session and the transfer test was carried out 48 hours later. No feedback was provided by the coach to the students during the retention and the transfer test. The dimensions of the marked area in the transfer test was changed into smaller ones (a half of the dimensions in the acquisition test).

It should be added that the subjects were at a separate hall during the transfer test, and they were called one by one to enter the exercise court to perform the skill. The purpose of this act was to avoid the intervention of the observational learning in the drill and also to control the effect of the competition among the groups (John Henry Effect).

### **Scoring Method for the Subjects' Performance**

The person who bumped the ball was the same for all subjects. All the marked dimensions and specifications on the court were specified by 5-cm colored adhesive tapes. A trusted referee counted the number of the correct spikes. The final test and scoring for the players was also carried out by the referee who was also responsible for training the four groups. The transfer test scoring method was also similar to other tests.

### **Statistical Method and Research Findings**

1. **The First Hypothesis:** Motivational Feedback has no significant effect on the retention of spiking skill.
2. **The Second Hypothesis:** Task Feedback has no significant effect on the retention of spiking skill.
3. **The Third Hypothesis:** Combinational Feedback has no significant effect on the retention of spiking skill.

4. **The Fourth Hypothesis:** Different types of Feedback (motivational, task and combinational feedbacks) have no significant effect on the retention of spiking skill.
5. **The Fifth Hypothesis:** Motivational Feedback has no significant effect on the transfer of spiking skill.
6. **The Sixth Hypothesis:** Task Feedback has no significant effect on the transfer of spiking skill.
7. **The Seventh Hypothesis:** Combinational Feedback has no significant effect on the transfer of spiking skill.
8. **The Eighth Hypothesis:** Different types of Feedback (motivational, task and combinational feedbacks) have no significant effect on the transfer of spiking skill.
9. **The Ninth Hypothesis:** Combinational Feedback has no significant effect on the individual's self-perception with regard to the spiking skill.
10. **The Tenth Hypothesis:** Motivational Feedback has no significant effect on the individual's self-perception with regard to the spiking skill.
11. **The Eleventh Hypothesis:** Task Feedback has no significant effect on the individual's self-perception with regard to the spiking skill.
12. The type of the augmented feedback has no significant effect on the retention of spiking skill.
13. The type of the augmented feedback has no significant effect on the transfer of spiking skill.

Kolmogorov-Smirnov Distribution test (the default test with the pre-assumption that the dependent variables have a normal distribution in different levels of factor) is also mentioned in this study together with match test.

To compare the mean for the dependent variable among the studied groups, a two-factor ANOVA with four feedbacks in four tests was used with repeated measurement of the testing factor, and a two-factor ANOVA with four feedbacks in two tests with the repeated measurement of testing factor, as well as post-hoc one-way ANOVA tests and t-test with Bonferroni correction, for paired comparisons (Main Effect and Significant Interactions Test).

The min significance level in testing the related hypotheses was considered to be 0.05. to analyze the data, SPSS 16 was used and the diagrams were drawn using Excel.

### Descriptive Statistics of the Measured Variables

The specifications of the subjects in all four groups including mean and standard deviation for all measured variables in this research, are illustrated in table 4-1 and figure 4-1 illustrates the descriptive statistics for the measured variables in four groups.

**Table 4-1 Descriptive Statistics of Spike Accuracy in Four groups under Investigation**

Statistics Group-Variable		Mean	SD
Task Feedback	Pre-Test	0.000	0.000
	Acquisition Test	5.600	4.032
	Retention Test	7.533	3.248
	Transfer Test	8.933	3.712
Motivational Feedback	Pre-Test	0.000	0.000
	Acquisition Test	6.800	2.808
	Retention Test	5.800	2.858
	Transfer Test	6.800	2.512
Combinational Feedback	Pre-Test	0.000	0.000
	Acquisition Test	3.866	1.922
	Retention Test	2.733	1.751
	Transfer Test	2.066	1.099
Control	Pre-Test	0.000	0.000
	Acquisition Test	3.933	2.186
	Retention Test	1.600	1.055
	Transfer Test	1.600	1.502

**Table 4-2 Descriptive Statistics for the Self-perception Variable in Four groups under Investigation**

Statistics Group-Variable		Mean	SD
Task Feedback	Self-perception at the First Session	5.220	1.237
	Self-perception at the Last Session	5.020	0.947
Motivational Feedback	Self-perception at the First Session	5.153	0.557
	Self-perception at the Last Session	4.693	1.418
Combinational Feedback	Self-perception at the First Session	5.493	0.856
	Self-perception at the Last Session	5.566	0.731
Control Group	Self-perception at the First Session	5.166	1.236
	Self-perception at the Last Session	4.780	1.077



**Kolmogorov-Smirnov Test**

Table 4-3- shows the results of Kolmogorov-Smirnov Test (default test with the pre-assumption of normal distribution for dependent variables in different factor levels).

**Table 4-3 Kolmogorov-Smirnov Test**

Variable Group-Statistic		Acquisition	Retention	Transfer	Self-perception	
					First Session	Last Session
Task Feedback	Z	0.727	0.574	0.466	0.614	1.051
	P	0.667	0.897	0.982	0.846	0.220
Motivational feedback	Z	0.581	0.964	0.519	0.793	0.537
	P	0.888	0.721	0.950	0.556	0.935
Combinational Feedback	Z	0.753	0.758	1.068	0.974	0.716
	P	0.623	0.614	0.204	0.299	0.658
Control	Z	0.562	1.220	0.735	0.629	1.098
	p	0.911	0.102	0.625	0.824	0.179

Considering the results of table 4-3, the default test for the normal distribution of the measured variables (Kolmogorov-Smirnov) reveals that all variables in this research have a normal distribution, because the Kolmogorov-Smirnov test for the matching of the sample distribution with a normal distribution is not significant ( $P > 0.05$ ).

**Hypothesis Testing**

To analyze the effect of the augmented feedback on acquisition, retention and transfer of spike skill in volleyball considering the results of Kolmogorov-Smirnov test (table 4-3) indicating the normal distribution of the data, the Two-Factor Analysis of Variance test of four feedbacks in four tests was used, with repeated measurement of the testing factor. As it is shown below, table 4-4 reports Mauchly's sphericity test on the covariance homogeneity, table 4-5 reports the analysis of variance for the within-subject factor and the interactions between the within-subject and between-subject factors. Table 4-6 reports the Levene's test for the analysis of the homogeneity of the variances in the studied groups and table 4-7 reports the analysis of variance for the within-subject factors and their interactions.

**Table 4-4 Mauchly's Sphericity Test**

Statistic Variable	Mauchly's Statistic	Chi-Square Statistic	Degree of Freedom	Significance
tests	0.744	16.158	5	0.006

Table 4-4 shows that Mauchly's test is significant ( $P < 0.05$ ). Considering the fact that Mauchly's Test is significant (non-homogeneity of the covariances), and since ANOVA also reports the results of more conservative tests (resistant to the assumption of non-homogeneity of covariances), the results of a more conservative test such as Greenhouse-Geisser are reported in table 4-5.

**Table 4-5 ANOVA for the within-subject factor and the interactions of the within-subject and between-subject factors**

Statistic Resources	Degree of Freedom	Mean Square	F Statistic	Significance
Tests	2.476	418.974	86.606	<0.001
Test $\times$ Group	7.428	50.152	10.367	<0.001
Error	670.800	138.660	4.838	

The results of table 4-5 reveal that the testing factor with  $p < 0.001$  and  $F = 86.606$  is significant and the interaction of the test and the group is also significant for  $p < 0.001$ ,  $F = 10.367$ .

**Table 4-6 Levene's Test for the analysis of homogeneity of the variances**

	F Statistic	Degree of Freedom 1	Degree of Freedom 2	Significance
Spiking Skill in Pre-Test	0	3	56	0
Spiking Skill in Acquisition Test	3.267	3	56	0.028
Spiking Skill in Retention Test	8.805	3	56	0.001
Spiking Skill in Transfer Test	6.239	3	56	0.001

As it can be observed in table 4-6, the assumption of the non-homogeneity of variances has been verified in all cases. (However it should be noted that considering the sample size, the non-homogeneity of variances can be ignored).

**Table 4-7 ANOVA for the between-subject factors and their interactions**

	Degree of Freedom	Mean Square	F Statistic	Significance
Group	3	211.782	27.176	<0.001
Error	56	7.793		

Table 4-7 shows that the effect of the type of augmented feedback is significant with  $p < 0.001$  and  $F(3,56) = 27.176$ .

Considering the significant effect of the group factor, the results of the Games-Howell Post-hoc test is reported below to observe the differences between the groups (table 4-8).

With regard to the significant effect of the testing factor and the group factor in tables 4-5 and 4-7, the results of One-Way Analysis of Variance test is illustrated in table 4-14 to observe the effect of the type of feedback in the retention test in the studied groups.

**Table 4-14 one-way ANOVA for the observation of the effect of retention test in the studied groups**

Statistic Resource	Degree of Freedom	Mean Square	F Statistic	Significance
Between-Group	3	111.972	19.554	<0.001
Within-Group	56	5.726		
Total	59			

Table 4-14 shows that there is a significant difference in the retention test between the studied groups. Table 4-15 shows that by Bonferroni Correction, this difference is significant between task and combinational feedback groups, task feedback and control groups, motivational and combinational feedback groups, as well as the motivational feedback and control groups at the level of  $p = 0.013$ .

**Table 4-15 The results of Games-Howell post-hoc test for observing the difference between groups in retention test**

Statistic Group	Mean Deviation	SD	Significance
Task-Motivational	1.733	1.117	0.422
Task-Combinational	4.800	0.952	<0.001
Task-Control	5.933	0.881	<0.001
Motivational-Combinational	3.066	0.865	0.009
Motivational-Control	4.200	0.786	<0.001
Combinational-Control	1.133	0.527	0.169

Task Feedback has no significant effect on the retention of spiking skill.

To observe the effect of task feedback on the retention of the spiking skill, dependent t-test was used (table 4-16).

**Table 4-16 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
Retention test – Pre-Test	7.533	8.982	14	<0.001

The results of t-test shows that task feedback has a significant effect on the retention of spiking skill ( $p = 0.013$ ).

Motivational feedback has no significant effect on the retention of spiking skill.

Dependent t-test was used to observe the effect of motivational feedback on the retention of spiking skill (table 4-17).

**Table 4-17 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
Retention test – Pre-Test	5.800	7.858	14	<0.001

The results of t-test revealed that motivational feedback has a significant effect on the retention of spiking skill ( $p = 0.013$ ).

Combinational feedback has no significant effect on the retention of spiking skill.

Dependent t-test was used to see the effect of combinational feedback on the retention of spiking skill (table 4-18).

**Table 4-18 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
Retention test – Pre-Test	2.733	6.046	14	<0.001

The results of t-test revealed that combinational feedback has a significant effect on the retention of spiking skill ( $p=0.013$ ).

**Table 4-19 one-way ANOVA test for the effect of transfer test in the studied groups**

Statistic Resource	Degree of Freedom	Mean Square	F Statistic	Significance
Between-Groups	3	193.928	32.922	<0.001
Within-Groups	56	5.890		
Total	59			

Table 4-19 shows that there is a significant difference in the transfer test between the studied groups. Table 4-20 shows that by Bonferroni Correction, this difference is significant between task and combinational feedback groups, task feedback and control groups, motivational and combinational feedback groups, as well as the motivational feedback and control groups at the level of  $p=0.013$ .

**Table 4-20 The results of Games-Howell post-hoc test for observing the difference between groups in transfer test**

Statistic Group	Mean Deviation	SD	Significance
Task-Motivational	2.133	1.157	0.278
Task-Combinational	6.866	0.999	<0.001
Task-Control	7.333	1.034	<0.001
Motivational-Combinational	4.733	0.708	<0.001
Motivational-Control	5.200	0.755	<0.001
Combinational-Control	0.466	0.480	0.767

Task Feedback has no significant effect on the transfer of spiking skill.

To observe the effect of task feedback on the transfer of the spiking skill, dependent t-test was used (table 4-21).

**Table 4-21 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
Transfer test – Pre-Test	8.933	9.320	14	<0.001

The results of t-test shows that task feedback has a significant effect on the transfer of spiking skill ( $p=0.013$ ).

Motivational feedback has no significant effect on the transfer of spiking skill.

Dependent t-test was used to observe the effect of motivational feedback on the transfer of spiking skill (table 4-22).

**Table 4-22 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
Transfer test – Pre-Test	6.800	10.481	14	<0.001

The results of t-test revealed that motivational feedback has a significant effect on the transfer of spiking skill ( $p=0.013$ ).

Combinational feedback has no significant effect on the transfer of spiking skill.

Dependent t-test was used to see the effect of combinational feedback on the transfer of spiking skill (table 4-23).



**Table 4-23 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
Transfer test – Pre-Test	2.066	7.278	14	<0.001

The results of t-test revealed that combinational feedback has a significant effect on the transfer of spiking skill ( $p=0.013$ ).

The type of augmented feedback has no significant effect on the self-perception of an individual in performing the spike in volleyball.

To study the effect of the augmented feedback on the self-perception of an individual in performing spike, considering the results of Kolmogorov-Smirnov test (table 4-3) indicating the normal distribution of data, two-factor ANOVA test of four feedbacks in 2 tests was used, with the repeated measurement of the testing factor. As it can be observed, table 4-24 reports the ANOVA for the within-subject factor and the interactions between the within-subject factors and the between-subject factors. Table 4-25 reports Levene's test for the investigation of the homogeneity of the variances of the studied groups and table 4-26 reports on the ANOVA for the between-subject factors and their interactions.

**Table 4-24 ANOVA for the within-subject factor and the interactions of the within-subject and between-subject factors**

Statistic Resources	Degree of Freedom	Mean Square	F Statistic	Significance
Tests	1	1.776	1.549	0.218
Test $\times$ Group	3	0.424	0.370	0.775
Error	56	1.147		

The results of table 4-24 reveal that the testing factor and the interaction of test and group are not significant.

**Table 4-25 Levene's Test for the analysis of homogeneity of the variances**

	F Statistic	Degree of Freedom 1	Degree of Freedom 2	Significance
First Session	4.946	3	56	0.004
Last Session	1.943	3	56	0.133

As it can be observed in table 4-25, the assumption of the non-homogeneity of variances has been verified for the first session and the homogeneity assumption of variances has been verified for the second session. (However it should be noted that considering the sample size, the non-homogeneity of variances can be ignored).

**Table 4-26 ANOVA for the between-subject factors and their interactions**

	Degree of Freedom	Mean Square	F Statistic	Significance
Group	3	2.272	2.204	0.098
Error	56	1.031		

Table 4-26 shows that the effect of the type of augmented feedback on the self-perception is not significant.

The results of table 4-26 revealed that the type of feedback does not affect the self-perception of an individual; however, the results of LSD test revealed that this effect is significant between motivational and combinational feedback groups as well as between combinational feedback group and control group (table 4-27).

**Table 4-27 The results of LSD test for observing the difference between groups**

Statistic Group	Mean Deviation	SD	Significance
Task-Motivational	1.196	0.262	0.456
Task-Combinational	-0.410	0.262	0.123
Task-Control	0.146	0.262	0.578
Motivational-Combinational	-0.606	0.262	0.024
Motivational-Control	-0.050	0.262	0.849
Combinational-Control	-0.556	0.262	0.038

Task feedback has no significant effect on the self-perception of an individual in performing spiking skill.

Dependent t-test was used to observe the effect of task feedback on the self-perception of an individual in performing spiking skill (table 4-27).

**Table 4-28 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
First Session-Second Session	0.200	0.613	14	0.550

The results of t-test shows that task feedback has no significant effect on self-perception of the subject in performing the spiking skill ( $p=0.025$ ).

Motivational feedback has no significant effect on the self-perception of an individual in performing spiking skill.

Dependent t-test was used to observe the effect of motivational feedback on the self-perception of an individual in performing spiking skill (table 4-28).

**Table 4-29 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
First Session-Last Session	0.460	1.208	14	0.247

The results of t-test revealed that motivational feedback has no significant effect on the self-perception of an individual in performing spiking skill ( $p=0.025$ ).

Combinational feedback has no significant effect on the self-perception of an individual in performing spiking skill.

Dependent t-test was used to see the effect of combinational feedback on the self-perception of an individual in performing spiking skill (table 4-29).

**Table 4-30 The results of Dependent T-Test**

Statistic Variable	Mean deviation	t Statistic	Degree of Freedom	Significance
First Session-Last Session	-0.073	-0.219	14	0.830

The results of t-test revealed that combinational feedback has no significant effect on the self-perception of an individual in performing spiking skill ( $p=0.025$ ).

## DISCUSSION AND CONCLUSION

The purpose of this study is to compare the effect of different kinds of augmented feedback on acquisition, transfer and self-perception of subjects in performing spiking skill. The subjects included 60 non-athlete male students of Islamic Azad University – Shiraz Branch who were classified under three experimental groups and one control group based on their primary self-perception scores. They took learning tests including retention and transfer tests after 12 sessions of drilling on spiking.

The data analysis revealed that:

- The motivational feedback has a significant effect on the transfer of the spiking skill in volleyball.
- The motivational feedback has a significant effect on the retention of the spiking skill in volleyball.
- The task feedback has a significant effect on the transfer of the spiking skill in volleyball.
- The task feedback has a significant effect on the retention of the spiking skill in volleyball.
- The combinational feedback has a significant effect on the retention of the spiking skill in volleyball.
- The combinational feedback has a significant effect on the transfer of the spiking skill in volleyball.
- The motivational feedback has no significant effect on the individual's self-perception for performing the spiking skill in volleyball.
- The task feedback has no significant effect on the individual's self-perception for performing the spiking skill in volleyball.
- The combinational feedback has no significant effect on the individual's self-perception for performing the spiking skill in volleyball.
- The type of the augmented feedback has a significant effect on the transfer of the spiking skill in volleyball.

- The type of the augmented feedback has a significant effect on the retention of the spiking skill in volleyball.
- The type of the augmented feedback has no significant effect on the self-perception for the performing spiking skill in volleyball.

The statistical analysis of the scores obtained from the effect of different feedbacks on retention of spiking skill in volleyball revealed that the task feedback group had a higher mean, as compared with other three groups and control group had the lowest mean, and there was no significant difference between this group and the combinational group. However, the difference among the groups was significant with regard to the retention test.

The statistical analysis of the scores obtained for the effect of different feedbacks on the transfer of spiking skill in volleyball revealed that task feedback group had the highest mean, compared with other three groups and control group had the lowest mean. There was a significant difference among the groups with regard to the transfer test.

The statistical analysis of the scores obtained for the effect of different feedbacks on self-perception of the subject in performing spiking skill in volleyball revealed that although the combinational feedback group had the highest mean, compared with other three groups and motivational feedback group had the lowest mean, the difference was not significant.

The results of this study reveal that task feedback or the information it provides for the learner on the techniques of this skill, and motivational feedback, by encouraging the learner to continue correct movements and to attempts to properly perform the skill, and the combinational feedback by providing the information on the techniques and motivating the individual, all affect the acquisition, retention and transfer of spiking skill in volleyball. Since there was a significant difference between the groups, we can conclude, through a comparison of the obtained scores, that the task feedback group has achieved a more stable and sustainable learning, obtaining the highest mean in the retention and transfer tests. Considering the fact that spike is one of the complicated skills in volleyball, there might be a potential for the task feedback to lead to more sustainable changes in performance, as the skill gets more and more complicated through time. Therefore, this hypothesis is in agreement with the studies of Salmon, Goodman, Howell, Dallas, Mononen, Sillavi, August, Freudenberg and Hashemian that have shown that task feedback leads to the improvement and progress in the skill through the passage of time and drilling sessions. However, it does not conform to the results obtained by Gibson and Feltz and Kariss and Magil. The reason for such a difference might be due to the kind of task that has been different with regard to complexity as well as motor and cognitive features, or the duration of drills and the frequency of feedbacks.

Based on the studies carried out by Salmon and Dallas and Helger and Gibson, there is a high correlation between the effect of different kinds of feedback with the type of task with regard to simplicity and complexity.

Through the analysis of the effect of different augmented feedbacks on acquisition, retention and self-perception for cup stacking, Salmon suggested that in a simple task, the type of feedback will have no effect on the self-perception and performance of the skill learning. However, in a complex task, the type of feedback will have a significant effect on performance, self-perception and learning of the skill.

Freudenberg also investigated the effect of augmented feedback on performance and self-perception of the learner of his/her ability in learning a new motor skill and he concluded that the type of feedback has no significant effect of performance and self-perception of the learner about his/her ability in a simple task; however, the type of feedback revealed different effects with regard to the complex task. It revealed that augmented feedback in the form of a task is a significant factor in improving the performance and the development of a positive self-perception of the learner about his/her ability.

As spiking is a complex skill in volleyball, and considering the fact that the learning of a complex task is affected by the type of feedback, this study is in agreement with that of Salmon and Freudenberg. Despite the significant differences between the effects of type of feedbacks on groups in this study, the results obtained from the comparison of differences between groups revealed that there is no significant difference between the task and motivational feedback groups as well as between combinational feedback group and control group. This reflects the fact that the task and motivational feedback group and combinational feedback group and control group had a relatively similar progress in drills. Considering the means, one can observe that the mean for these groups are relatively close to each other. It might suggest that although task feedback group obtained the highest mean in the retention and transfer tests, the motivational feedback can also be somewhat effective in learning a complex skill. Moreover, the application of several feedbacks for the learning of a complex skill will lead to an improved learning of the skill. The more complicated a skill is the more essential the task feedback will be. This finding is in agreement with the findings of Salmon, Xiang and Freudenberg that showed motivational feedback will have an enhanced effect after creating a primary understanding of the way of performing the technique and actually after realizing and

learning the cadent pattern of movement (or generalized motor program) and as the task gets more complicated, the motivational feedback will not be sufficient to facilitate the performance. However it does not agree with the results obtained by Gibson on the effects of motivational feedback in learning compared with the task feedback.

Another finding of this study is the significant effect of type of feedback on the self-perception of an individual concerning the ability to perform spike in volleyball. This is in agreement with the results obtained by Salmon and Hashemian for a simple and a complex task and it does not conform to the Freudenberg's studies on complex task. The self-perception improved to the relatively similar degrees in this study. The reports on the self-perception have mostly focused on the effects of self-perception in learning and performing the skill. There are very limited studies on the effect and comparison between different types of feedback on self-perception. Salmon and Feltz studied the effect of motivational feedback on self-perception for the ability to perform the skill and they concluded that motivational feedback has a significant effect on self-perception. This result does not match the results obtained here. The reason might be the fact that the type of task is different considering the complexity and motor and cognitive features. The comparison of the means of the groups in this study showed that combinational feedback group obtained the highest mean and motivational feedback group obtained the lowest mean. This can indicate that there is no relationship between the self-perception of an individual with regard to his/her abilities and the results obtained from retention and transfer tests for spike in volleyball. That is to say that despite the fact that the combinational feedback group obtained the lowest scores in the retention and transfer tests, it had the highest score in the self-perception test. The motivational feedback had the lowest mean in the self-perception test.

On the other hand, a comparison of the groups revealed that there is a significant difference between motivational and combinational feedback group, and combinational feedback group and control group in their self-perception scores. Moreover, this study does not agree with the study of Christian Harmel on the effect of positive motivational feedback on the improvement of self-perception for the ability to perform the skill. A careful evaluation of the ability needs an accuracy and adaption with the task. The difficulty and complexity of the skill also affect the self-perception and the estimation of the feedback. More complex skills lead to a better self-perception. So, the type of practice can be regarded as a factor for the type of feedback not to affect the self-perception.

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