The Effect of Feedback Teacher-determined different procedures on Error Estimation accuracy in non athlete Students

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Abstract

Although many studies being done for indentifying different feedback presentation procedures with positive effect on learning, but yet there are great numbers of questions regarding to the best possible procedure for presenting feedback to enhance learning remained to be considered. The aim of this study was investigate comparison different procedures in teacher-determined feedback on improve capability of error estimation accuracy in non athlete students. The present research is semi-experimental and is performed by participation in four stages as pre-test, acquisition, retention and transfer. The research design is as pre-test - post-test with 3 experimental groups. The Participants of this research consisted of 36 non-athlete students’ volunteers. Measuring apparatus is a manual dynamometer. According to the research results, no significant statistical difference between 3 teacher-determined feedback groups in terms of error estimation accuracy variable of force production in retention and transfer phases, and all these 3 manipulating result in improvement of error estimation accuracy. These researches results show that Choosing suitable methods and presenting teacher-determined feedback added with decreased frequency, in addition to led to improve error estimation accuracy and efficient learning, is also time consuming.

1. Introduction

Although those movement planning pretenders convincingly show that movement could be made in the absence of feedback, but approximately all of them are agreeing about an issue that feedback usually could play an important role in movement performance. The role of the relative frequency of teacher-determined feedback, as a type of different feedbacks, on learning the motor skills is one of the challenges that thinkers in the motor learning field are always concerned with. In teacher-determined method, the coach evaluates the entity of different practices during the exercise sessions, and then gives the instructions and feedback to the athletes. So, the athlete will be more or less passive. In fact, he is instructed with the aid of the coach and has a little control over the practice session. The feedback brings about a suitable opportunity for learning mechanisms practice, this mechanism is error estimation capability through the response feedback (Eshmidth & lee 1999). For many years, the issue of feedback frequency manipulation and different planning for how it should be provided is the focus of different researches regarding to motor learning. According to the Guidance Hypothesis, one of the roles which are referred to the feedback is to

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guide and direct individuals toward the correct performance. And in this case when the feedback is provided, it will lead to performance improvement, but on the other hand providing a frequency feedback will block the processing procedure that is considered as a performing element in the error detection and its correction, as it will make an individual to be dependent to the feedback (Eshmidth 1991, Salmoni et al 1984). On this basis, some research works demonstrated that in the acquisition stage, there is a direct relationship between the percentage of those trials with related feedbacks and comprehension (Annet 1959). But in the transfer and retention stage, learning will be more in groups that their trials have less feedback percentage comparing to those group trials with more feedback percentage (Eshmidth & Wrisberg 2000). Decrease in feedback frequency for the performer will lead to improve in the capability for detecting an intrinsic error and subsequently its correction during performing those trials without any feedback. Different methods such as bandwidth, summary, faded and average feedbacks are used to prevent such effect of feedback frequency which leads to the feedback dependence, and is the aim of feedback elimination in some trials. Sherwood et al (1998) studied the bandwidth feedback in different ranges and get to this result that the 10 % bandwidth could create more motor consistency and lead to better learning. Eshmith et al (1990) also studied the effect of feedback manipulation on the error detection capability, the result of this research showed that the process of error detection capability in the summary feedback group of 5 trials is respectively better in the 1, 10 and 15 trials. Nicholson and Eshmith (1991) showed that comparing to the inverted faded group, the faded feedback group enjoy of better performance in retention test. Lisa et al (2003) studied the effect of feedback frequency on the error detection increase, the result of this research indicated that decrease of feedback frequency in the practice trials will lead to an improve in the error detection capability. Badtes et al (2006) stated that providing feedback in the greater bandwidth comparing to the smaller one will cause more error detection capability and motor skill learning. Although there are many researches which carried to recognize those feedback programs with most influences, but there are still remained many questions in the mind regarding to the best methods for providing teacher-determined feedback in order to enhance learning.

In the current research, the researchers are seeking to prove which of these planning regarding to teacher-determined feedback has more influence on improving the estimation accuracy of motor skill error?

2. Method
The present research is semi-experimental and is performed by participation in four stages as pre-test, acquisition, retention and transfer. The research design is as pre-test - post-test with 3 experimental groups.

2.1. Participants
The Participants of research consisted of 36 non-athlete volunteer students that were right-handed and were randomly divided in to three groups, including 10% bandwidth feedback, 5-trial summary feedback, and faded feedback. None of the subjects were aware of the research aim and had no previous experience in such a test.

2.1.1. Apparatus and task
Measuring apparatus is a manual dynamometer, YAGAMI Model. The above device has a display plate and a grip that the subject produces target force by pressing this grip.

2.1.1.1. Procedure
The necessary data for this research are collected in 4 steps including pre-test, acquisition, retention and transfer. After being familiar with this device, the participant is requested to do 2 maximum repetitions to register maximum force. In pre-test, the participant is requested to produce force equivalent to 20% maximum force, without see the dynamometer plate, in a 10 trial block. The rest time between these trials are 15s. The acquisition phase includes of seven 10-trail blocks, in which 30% of maximum force that is produced by the subject being used as a target force. 3 seconds before each performance, the subject is being told to produce some kilogram force (30% of maximum force). 3 seconds after the participant performs the trial, the quantity knowledge of results (KR) feedback is presented to him verbally, that is actually produced force about 0.1 kg. The rest time between each block is 120s. The retention and transfer test is performed after 24 hours in a 10-trial block. In retention phase, force production is based on 30% maximum force. In transfer phase, 40% of maximum force is used as target force. In pre-test, retention and transfer phases, the participant is requested to verbally estimate the amount of his force production during 2 seconds after each trial. The data are registered for analysis error estimation in pre-test, retention and transfer these data is registered in the form of the difference between error estimation and actual error.
3. Results
The total mean, age, weight, height and the maximum force of the subjects, respectively, are as 25.4 age, 71.9 kg, 175.6 cm, and 43.8 kg. There isn’t any significant statistical relationship between the age, weight, height and maximum force of the participants in these three groups (p>0.5). The mean and standard deviation of the general characteristics of the participants according to the group division is shown in table 1.

<table>
<thead>
<tr>
<th>Summary</th>
<th>Bandwidth</th>
<th>Faded</th>
<th>Sum of Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>25.3±2.0</td>
<td>25.4±1.3</td>
<td>25.4±1.4</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>73.2±9.3</td>
<td>71.5±10.4</td>
<td>71.0±12.3</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>176.2±3.4</td>
<td>175.4±6.2</td>
<td>175.2±6.0</td>
</tr>
<tr>
<td>Maximum force (kg)</td>
<td>42.2±6.3</td>
<td>42.3±4.8</td>
<td>44.8±7.7</td>
</tr>
</tbody>
</table>

According to kolmogorov-smirnov test, the distribution of error estimation accuracy variable, is normal among all groups (p>0.5). According to graph 1, it is indicated that in comparison with pre-test phase, force production error estimation accuracy in retention and transfer phases is being improved.

Graph 1. Mean & standard deviation error estimation accuracy of force production

**Pre-test Comparison:** The results of one-way variance analysis test show that there is the significant difference is being seen in these 3 groups (table2). So, in testing hypotheses related to error estimation accuracy variable of force production, the pre-test is considered as a random auxiliary variable and covariance analysis is applied.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error estimation accuracy</td>
<td>2.33</td>
<td>34.60</td>
<td>14.04</td>
<td>0.0005*</td>
</tr>
</tbody>
</table>

* p<0.05

One of the research result is that in retention phase, no significant statistical difference indicated between 3 feedback groups of 10% bandwidth, 5-trials summary and faded in terms of error estimation accuracy variable of force production in retention phase, and all these 3 planning result in improvement of error estimation accuracy in retention test. As pre-test comparison show in table 2, there is a significant difference between error estimation accuracy of force production in each of these 3 groups. In this regard, a one-way covariance analysis with justified pre-test is applied, that due to no meaningful difference interaction between group and pre-test, so the regression default for covariance analysis is observed (table 3, p>0.5).

| Table3. One-way analysis of co-variance at retention test |
|----------------|-------|--------|------|
| Groups * pre-test | 3.32  | 1.69   | 0.19 |
| Groups            | 2.32  | 1.16   | 0.32 |

Another test result is that in transfer phase, no significant statistical difference between 3 feedback groups of 10% bandwidth, 5-trials summary and faded is indicated in estimation accuracy variable of force production, and all these 3 manipulating lead to performance improvement in error estimation accuracy in transfer test (table4, p>0.05). Because of the difference in error estimation accuracy pre-test of force production between 3 groups (table2), and also observing regression homogenous default (table4, the lack of significant interaction between pre-test and group), so a one-way covariance analysis test is applied for testing.
The research results show there isn’t any significant statistical difference between 3 feedback groups of 10% bandwidth, 5-trials summary and faded in error estimation accuracy variable, and all these 3 manipulating lead to performance improvement. The researches being done by Schmidt et al (1990), Lee & Maraj (1994), Yao et al (1994), Lisa et al (2003), Badets et al (2006) also confirmed these research result. Regarding to the obtained results, it could be briefly said that in the present research feedback providing for any trial will lead to increase in the performance variability. Since providing the feedback frequency will cause the response to be changed in any trial, so this will lead the consistency and development of motor planning to be weakened. Therefore, motor pattern representations will be confused in the case of feedback elimination. But the feedback elimination and decrease of its frequency in some trials will provide more opportunities for an individual to focus on the intrinsic feedback processing, error detection and also its correction. The better performance of these three planning show that decrease in feedback frequency is one of the most important and basic aspect of feedback manipulation of knowledge of results of several programming which will lead to the learning improvement. So, the current result supports the Guidance Hypothesis. The KR guidance hypothesis suggests that two opposing processes are associated with the role of feedback in motor learning. First, feedback has a beneficial effect in that it guides the learner toward the goal movement by providing information for error correction, and it tends to keep the learner motivated and interested in the task (Bilodeau, 1969). Second, similar to guidance, feedback also has a detrimental effect in that it allows the subject to continue to use its guiding and motivating properties to maintain performance and may even allow the learner to become dependent on it. According to the guidance view this dependence may involve at least two distinct and separable processes. First, when feedback is always available during practice, it actually becomes part of the task, so that when it is withdrawn later in a retention test, part of the task is withdrawn with it and performance suffers. This view is reminiscent of paired-associate verbal learning tasks in which strong stimulus-response associations resulting from response generation can ultimately be detrimental to later free recall of the generated response (e.g., Yekovich & Manelis, 1980). The second factor in feedback dependency deals with an interference in, or prevention of other important task-related operations such as those involved in error-detection. When error information is supplied externally via KR, the subject may be less likely to process the inherent response-produced feedback associated with movement production. If such processing is prevented by the consistent provision of the more salient KR, formation of an effective memory representation of the to-be learned action might suffer (Winston & Schmidt 1990). In regard to closed loop control, an error detection procedure needs to a motor reference that could compare sensing feedback with the movement. According to Adams theory & Schmidt theory (1975), error detection capability is a function of re-identifying memory potential that develops with physical exercise and result acknowledge feedback. Re-identifying memory, create a reference for movements that according to Adams theory (1971) is known as perception trace and Schmidt theory (1975) as expected sensing outcome. They are compared with the response resulted feedback and every difference between expected sensing feedback and the feedback originated from a response will lead to an error signal that in turn makes it possible for the error detection capability and also its correction. In this research decreased frequency feedback leads to more coordination between an estimated error and an actual error that make it possible for the subject to improve error detection capability and its correction in trial without any feedback during retention and transfer phase. Finally, these researches results show that each of these feedback presenting methods aren’t preferable on others and generally are efficient in task error detection of force production. Choosing suitable methods and presenting feedback added with decreased frequency, in addition to efficient learning, is also time consuming. As an investigation suggestion it could refer to the individual difference in the subject’s psychological characteristics among different groups as anxiety, self confidence and so on, that these variables should be controlled in the next researches. As the current research task has a simple structure and most of sport skills also enjoy of complex in structure and while Sherwood (2008) believe that error detection capability is a special ability and couldn’t generalized it to other tasks, so only when tasks have a same movement pattern or are based on a
movement task with complex structure.

References