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Comparison feedback after good and poor trials on the learning

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ABSTRACT
Recent studies have shown that feedback can be more effective for learning if it was provided for the good trials compared to the poor trials. In this research we examined the effect of feedback after good and poor trials on the learning. Participants were randomly divided into two groups: feedback after good and poor trials. All participants produced 10 kg force in acquisition phase. They couldn't see the produced force and received KR on two trials in each 6-trial block. After 48 hour, they performed a retention and transfer tests without KR. To analyze data, T- test was used ($P \leq 0.05$). Results showed there is significant difference between feedback after good and poor trials.
***Key words**: good trials, poor trials, force production, learning*

INTRODUCTION

Recognizing the factors which influence the performance is one of the issues that the educational scientists are dealing with for centuries. This knowledge has many applications in improving performance in sport and physical activities(S Chiviacowsky, Wulf, laroque de Medeiros, Kaefer, & Wally, 2008). There is little disagreement that augmented feedback (knowledge of result & knowledge of performance) is one of the most important variables for motor learning(Ahmadi, Sabzi, Heirani, & Hasanvand, 2011). Knowledge of result provided after completing a response such as spatial deviation from a goal or temporal deviation from goal movement time. Knowledge of performance refers to the nature of the movement such as kinematic of the movement (Schmidt & Lee, 2011).In learning motor skills, it is emphasized that the feedback information which make a performer successful in dealing with the desired goal is a crucial factor in acquisition and performance. (Hartman, 2005; Vaezmousavi, Masoumi, & S.jalali, 2008). During the recent years, attempts have been largely devoted to clarify the role of augmented feedback and its potential benefits in order to reduce the negative effects of feedback. But the contradictory findings in this regard have made it difficult to determine suitable method for giving feedback (Schmidt & Lee, 2011). Meanwhile, the impact of the relevant frequency of augmented feedback on learning motor skills has been one of the most challenging issues for the specialists in motor learning (S Chiviacowsky, Wulf, laroque de Medeiros, & Kaefer, 2006). In order to explain the effects of frequency of KR on learning motor skills, researchers (Salmoni, 1984; Schmidt, 1991) proposed the concept of guidance hypothesis and stated that in spite of positive effects of the frequency of feedback during the practice, it can also be associated with several negative effects such as making the learner dependant to feedback(Magill, 2011; Salmoni, Schmidt, & Walter, 1984).some studies did not support it and concluded that learning complex motor skills that require high control, attention and memory are not necessarily influenced by frequent feedback(Badami & Vaezmousavi, 2010; Swinnen, Lee.T.D, Verschueren, Serrien, & Bogaerds, 1997; G. Wulf, Shea, & Matschiner, 1998). Wolf and Shea in a review of the feedback literature, concluded that despite the fact that the guidance hypothesis contributes to better understanding of the influence of feedback on performance and learning of motor skills, it is necessary to determine the nature of interaction between feedback and other factors such as task complexity, skill level, focus of attention and learners' characteristics (Ahmadi et al., 2011). On the other hand, many studies supported the guidance hypothesis and in order to prevent the negative effects mentioned earlier, they examined different methods to decrease the frequency of augmented feedback(Butki & Hoffman.S.I, 2003; Salmoni et al., 1984; Schmidt , Young, Swinnen, & Shapiro.D.E, 1989; G Wulf & Schmidt 1996; Young & Schmidt 1992).

Previous Research

The research evidence so far had indicated that the presence of feedback after poor trials (informative role of KR) is more effective in improving performance and performer's experience gains by error correction is highly important in acquisition of motor skill. But the results of recent studies have led to different views and stated that giving feedback after good trials (motivational role of KR) has greater effect on learning motor skills(S. Chiviacowsky & Wulf, 2007).Ilies and Judg (2005) in their research concluded that when learners receive positive feedback they set higher goals and as a result their learning enhances.

Chiviacowsky and Wulf (2007, 2009) demonstrated that providing feedback after good rather than poor trials results in better leaning. Such findings seemed to be in contrast with this view that providing feedback after significant errors is more effective. They explained their findings by stating that receiving positive results in higher motivation and this feedback consequently leads to more effective learning. Feltz (1992) in his review of literature in self-sufficiency concluded that success or failure in the last performances play a key role in the performer's perception of his or her abilities. These findings suggest that the trainer or the teacher can give feedback in order to influence the performer's perception of success or failure, affecting the stability of person in performing skills and leads to the enhancement of performance(Bruechert, Lai, & Shea, 2003).

In addition to controlling the frequency of feedback which is an important issue in this field, the researcher intends to compare the effects of feedback after good and poor trials on force production task to reveal that Can receiving feedback after good trials is more effective than after poor trials. Then we can provide trainers some information about the impacts of types of feedback. Obviously, the proper application of feedback in accelerating learning will save expenses and time.

Methodology

The Participant

The method of this study is Quasi experimental. Participants were all the old female people aged between 55-60 years. The sample of this study comprised of 24 qualified subjects who were randomly selected and divided into two groups: feedback after good trials and feedback after poor trials.

The Apparatus

The following tool and method were used to gather the required data:

An electric dynamometer (model ED-100N YAGAMI) with reliability of 0.82 that is used to measure the power of grip.

The Task

The task was used in this research was 10 force production task by electric dynamometer.

The Procedure

After that the subjects learned how dynamometer (force-producing device) works, in order to ensure the similarity of groups, a pretest revealed that there was no significant difference in absolute errors between the groups at the beginning of the study. Then during the acquisition phase each group practiced producing a force of 10 kg in 10 six-trial blocks. It should be mentioned that the subjects were not allowed to see the dynamometer, not only during the acquisition phase but also in all other phases of the study and they received KR on only two trials of each 6-trial block (feedback frequency =33%). It was arranged in such a way that the subjects of the KR after good trials group received feedback after each three trials for the closest performance to the set target force 10 kg (good trial) whereas the KR after poor trials group received it after each three trials for the trial with the most distance from the 10 kg force (poor trial). The retention test was taken upon the termination of the acquisition phase, two days later with the same force as acquisition phase and the transfer test was done with the production of 15kg force in a 6-trial block and without any feedback.

The gathered data was first analyzed using descriptive statistics methods (such as mean, standard deviation, etc.). Then Kolomogrov-Smirnov and T- tests ($p \leq 0.05$) were used in order to examine the effect of interventions done. All of the statistical analyses were administered using SPSS Ver.16.

RESULTS

Two groups which were studied in this research are shown in table 1.

Table 1: Number, mean and standard deviation of the subjects' age

Groups	Number	Age mean	SD
Feedback after good trial	12	58.77	2.02
Feedback after poor trial	12	57.11	2.6

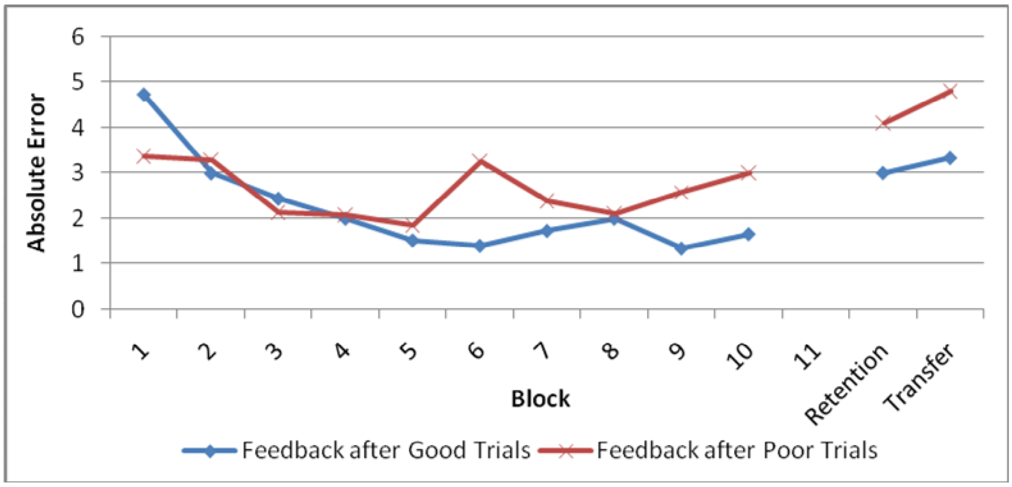

Figure 1: The of absolute errors of study groups in the acquisition, retention and transfer phases

According to figure 1, the study groups reduced their errors in force production task during acquisition phase but they have performed differently in acquisition, retention and transfer tests.

Table 2:**Results of ANOVA test for comparison of groups' performances in theacquisition, retention and transfer tests**

	F	P Value	Result
Acquisition	75.93	0.037*	Significant
Retention	94.53	0.001*	Significant
Transfer	24.87	0.001*	Significant

* The difference is significant at $\alpha \leq 0.05$

As it can be seen in table 2, the results of T- test are significant between the study groups in the acquisition, retention and transfer phases. It means that there is a significant difference between the two groups in learning force production task in these phases.

DISCUSSION

The aim of this research was to compare the effects of feedback following the good and poor trials in acquisition and learning of a force production task. The results indicated some significant differences between the study groups during the acquisition phase. In this phase the guiding effects of augmented feedback improved the performance of subjects in force production task (Figure 1), as it was shown in tables 2 receiving feedback after good trials performed better than group receiving feedback after poor trials in the acquisition phase. In a similar study, Wulf and Chiviacowsky (2007, 2009) explored the effect of feedback after good and poor trials. Their findings showed no significant difference between these two types of feedback during the acquisition phase. The results of present study are inconsistent with Wulf and Chiviacowsky's research results. The reason is that the feedback after good trials has a high motivational role for the subjects(S Chiviacowsky & Wulf, 2005; Schmidt & Lee, 2011).Therefore the subjects who received feedback after good trials in the acquisition phase could enjoy this advantage and had a better performance comparing to the group receiving feedback after poor trials. The subjects of the latter group lost the ability to be actively involved in problem solving and they were somehow confused and could not benefit from the motivational role of the feedback after good trials.

Comparing the groups in the retention and transfer tests indicated that the group which received feedback after good trials showed better performance which means giving feedback after good trials will result in more effective learning.

Cauraugh, Chen, & Ruldo (1993) and Wright et. al. (1997) came up with the conclusion that giving feedback to out-of-range trials (poor trials) will lead to better and more integrated performance. These findings are not trended with the results of the present study. The reason for such inconsistencies may be the application of different methods in evaluating and specifying good and poor trials and having no control on the frequency of feedback in these researches. Most of these researches have used the range approach to define the poor and good trials. In this approach, the more a learner comes closer to the end of practice, the more improvement in performance occurs and his performances will be more acceptable in the range. Therefore, if an individual is in the group of feedback after good trials (close to the target), he/she repeatedly receives feedback and is bound to the dependency effects of feedback and will demonstrate a poor performance in retention and transfer tests in which no feedback is given, while in the present study, the criterion for defining the poor or good trials was the best or the worst performance of a person in a 6-trial block. This probably is the reason for the inconsistencies of these research' findings with the findings of the present study.

Ahmadi, Sabzi, Heirani & Hasanvand (2011) showed if feedback is provided after a good trial rather than a poor or good-poor trial enhanced learning. Badami, Taghian, Koohestani (2011) also examine the effect feedback on more accurate trials on sport skills. Their results indicated that feedback on more accurate trials resulted in more effective learning. These findings are interpreted as evidence for a motivational function of feedback and are trended with our research.

Wulf and Chiviacowsky (2009) concluded that for old people, feedback after good trials leads to better retention than after poor trials. Wulf attributed this superiority to the motivational role of the feedback after good trials, which supports our findings in the present study. However, the results of this study are compatible with West et al (2005), Chiviacowsky and Wulf (2007). However, Chiviacowsky and Wulf (2007, 2009) claimed that if the trainer or instructor gives feedback after the good trials, it can result in more learning. These results were contradictory with the guidance hypothesis that says "feedback following large errors is more important." They justified their findings by saying that giving feedback to the subject following his good trials can be a confirmation that the movement has been correct and it may help setting the harmony for the movement by reducing unnecessary changes. Thus such information can be as important as the error feedback or even more. In addition, it is also possible that positive feedback is more motivating for the learner than the negative feedback and cause more effective learning.

Also the fact that motivational role of feedback is more important in the beginning of learning can be considered as another justification for this lack of difference. When subjects start learning a new skill they seek motivational role more.

Summary and Concluding Remarks

The results of this study indicates that motivating subject resulted from giving feedback after good trials causes more and better learning and is more effective than the information given to the subjects by providing feedback after their poor trials. Considering the results of this research, if the trainer is to give feedback to the trainees during the practice, they are suggested to give it upon their good trials.

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