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Bandwidth Feedback: Does it Effective When Provided near or Far from Target on Learning of Putting Skill?

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Abstract: Most researchers were introduced augmented feedback as one of the most effective factors in motor learning. Base of guidance hypothesis, alternative feedback has negative effect on learning. Several methods like bandwidth feedback and feedback after good trials feedback have considered for reducing negative effect of alternative feedback. The aim of this study was investigating whether feedback in bandwidth near or far from target was more effective on performance and learning of golf putting skill. Sixty two of university undergraduate females participated in this experiment. They were randomly selected and assigned to four groups:1) The group of KR in bandwidth far from target. 2) The group of KR in band width near target and two control group yoked with each of groups. Learners should have guided without using of viewing, a distance from 3 meters toward 10 concentric circles with radii of 10, 20, 30,…,100 centimetres. Acquisition phase was considered one session of 60 trials that was formed 10 blocks of 6 trials and transfer phase has done one day after acquisition phase and was formed one set of 6 trials. Group 1 were received KR in around out of 5 internal circles and group 2 in the 5 central circles. Data were analyzed by 4 (group) x 11 (blocks of trials) with repeated of measure on block factor. According to results, performance of both groups near and far from target on the last block of acquisition phase, were significantly better than first block. Between performance of all groups were not different significant in transfer test and first block ($P > 0.05$). Furthermore between performance of different groups were not observed different significant in last block of acquisition phase and transfer test ($P > 0.05$). in general results of this study indicated that bandwidth feedback is very effective for motor learning.

Key words: Bandwidth Feedback · Motor Learning · Performance · Putting Skill

INTRODUCTION

Comprehending the function of augmented feedback in learning has been an initial focus of motor skills study [1]. Beside the practice, Knowledge of results feedback (KR) is regarded the most important variable for motor skill learning [2-4]. Knowledge of results (KR) is a kind of feedback provided to a learner regarding the result of the performance. It could be relative to an environmental goal, such as spatial deviation from a target or the temporal deviation from a goal movement time [5]. Researchers believed that KR will be more influence when the information provided by it could be used to reduce error as quickly as possible [3].*Salmoni et al.* [1] proposed the guidance hypothesis to illustrate the effects of knowledge of results on motor learning. They believed that although feedback guides the learner to do the correct movement, several negative effects often accompany the frequent presentation. Specifically, it caused to obstruct the information processing activities, especially those related to detect and correct errors ability based on intrinsic information. It also decrease movement stability, when participants attempt to correct small errors and lost their attention by the KR and finally frequent feedback cause participants to depend on it instead of their intrinsic feedback [1, 6, 7].

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Several methods like Summery feedback that is provided for a block of every trial result is provided for a block of every trial result or average feedback that represents the overall performance in a set of trials, were suggested to reduce relative feedback [6]. Bandwidth knowledge of results is also one of the methods used to decrease the relative frequency of augmented feedback [8, 9].

Nevertheless, there are also findings inconsistent with the guidance view. Some authors proposed that frequent feedback compare to less frequent feedback does not consistently lead to a more effective performance during acquisition phase [10-12]. Furthermore, frequent feedback is effective to learning complex [13]. The guidance hypothesis also cannot explain the interactions between feedback frequency and the type of attention focus [14]. Chiviacowsky & Wulf [15] investigated the effects of self-controlled feedback. They observed that Learners preferred to receive feedback when they supposed had a good trial compare when they thought their performance was poor. Furthermore the yoked group also told that they preferred to receive feedback after good trials, but not after poor trials although, they received feedback basically randomly and independent of their performance on the respective trial.

This finding suggests that self-controlled feedback compare to externally controlled feedback (yoked condition) is probably more effective because it is more in line with the learner's needs. Furthermore independent of whether feedback is self-controlled or externally controlled, feedback could be more effective if it is given after good trials instead of poor trials (e.g. bandwidth KR). Accordingly, the primary purpose of the present study was to examine whether bandwidth feedback is more effective when it is provided in bandwidth near to target (good trials) or in bandwidth far from target (poor trials). If learning really benefits more from feedback after successful rather than unsuccessful trials, this would display extra difficulties for the guidance view of feedback [17].

MATERIALS AND METHODS

Participants: Sixty-two undergraduate students with a mean age of 21.6 years (all were woman) participated in this study. Each student completed an informed consent form before participating in the experiment. All participants were self-declared right handed and were unaware of our goals in the experiment.

Apparatus and Task: The task required participants to putt golf balls to a target placed on the floor with dominant arm. The circular target had a radius of 5 cm. It was placed at a distance of 3 m from the participants. Concentric circles with radii of 10, 15, 20, 25, 30, 35, 40, 45and 50 cm were drawn around the target. These served as zones to assess the accuracy of the putting skill. If the golf ball placed on the central circle, 100 points were awarded and If it landed in one of the other zones, or outside the circles 90, 80, 70, 60, 50, 40, 30, 20, 10, or 0 points, respectively, were recorded.

Procedures: Participants were completely novice and were randomly assigned to the "KR in band width far from target" and "KR in bandwidth near to target" groups and two controlled group yoked with each of groups. Subjects should have guided without using of viewing, a distance from 3 meters toward 10 concentric circles with radii of 5 to 50 centimeters. Acquisition phase was considered one session of 60 trials that was designed 10 blocks of 6 trials and transfer test has done one day after acquisition phase and was designed one set of 6 trials without KR.

KR in band width far from target group was provided feedback when their balls placed out of the 5 internal circles and KR in bandwidth near to target group received feedback when their balls placed in the 5 internal circles. Furthermore, participants in bandwidth groups were told that if no verbal feedback was provided, their performance were not in determined bandwidth. Each participant in bandwidth groups was matched in pair with one in yoked groups. In yoked group, subjects received knowledge of results at the same numbered trial as their matches in bandwidth groups. They received feedback randomly and independent of their performance on the respective trial.

Data Analysis: The data were analyzed in 4 (group) × 11 (blocks of 6 trials) analysis of variance (ANOVA), with the repeated measures on the trial block factor. LSD post-hoc test and paired sample t test were used to considering the main effect and interaction effect of group and trial block too.

RESULTS

According to results, the main effect of block, $F(10, 49) = 4.41$, $p < .05$, the main effect of group, $F(3, 58) = 5.42$, $p < .05$ and the group x block interaction, $F(30, 145) = 1.55$, $p = .05$ were significant.

Table 1: The mean score and standard deviation of groups

Groups	Mean	Std. Error
Far KR	19.67	1.40
Near KR	15.99	1.45
Yoked with far KR	14.91	1.40
yoked with near KR	11.65	1.45

Performance of both groups near and far from target on the last block of acquisition phase, were significantly better than first block (P <.05). There were not different significant between performance of all groups in the first block of acquisition phase (P >.05). On the transfer test without KR, which was performed one day after the practice phase, there were not different significant between performance of all groups (P >.05). The scores of both groups near and far from target were higher than yoked groups on most of trial blocks in acquisition and transfer test. KR in the bandwidth far from target group tended to have higher scores than other groups in both acquisition and transfer test.The means and standard deviations for the interaction and main effect are presented in Table 1.

DISCUSSION

The present study examined whether bandwidth KR feedback would be more effective after relatively successful or unsuccessful trials. In accord with the guidance hypothesis feedback would be expected to be more advantageous if presented after larger, rather than smaller errors [1, 6]. Still, there are also findings inconsistent with the guidance view, for example,Chiviacowsky & Wulf [15, 17] suggested that feedback after small errors (successful trials) might actually be more advantageous for learning if presented by self-controlled approach.

The findings didn't show any advantage if feedback was presented after trials with high scores (near to target), compared to trials with low scores (far from target). The KR far from target group tended to have somewhat higher scores than the KR near to target group in acquisition phase, but both groups showed similar performances in transfer test (Figure 1).

These results are in contrast with Chiviacowsky & Wulf [15] and Badets & Blandin [16] demonstrated that KR after good trials lead to effective learning, but in this study didn't observe any differences between two near (good) and far (poor) from target feedback groups. Possibly the learning advantages of feedback after good trials are mainly associated with the condition of presenting it. There are important differences between the

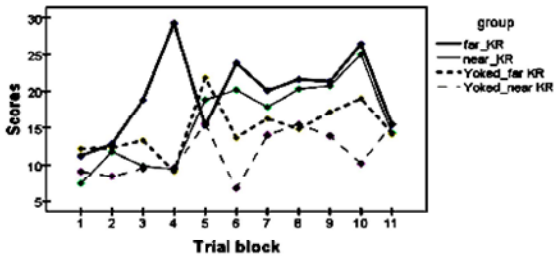

Fig. 1: Mean score of groups in acquisition and transfer test

self- controlled and external controlled condition. It seems that feedback after good trials leads to more effective learning if it presented by self-controlled rather than presenting by external controlled feedback in near to target (good) group, because it is in according with performer needs. However progress and better performance of both groups near and far from target compare with yoked groups on both acquisition and transfer test, is probably the result of the bandwidth feedback effect.

The results are not consistent with Chiviacowsky & Wulf [17], regard to effects of good KR on learning too. In their study subjects received feedback for the three most or least accurate trials after each six-trial block and they didn't know the given feedback is related to which of the trials whereas in our study learners could received feedback in all of six trials in each block. Therefore the important variables like summery feedback and KR delay interval may be affected the results of Chiviacowsky and Wulfs' research. It seems that the method of presenting feedback in their study has led to more effective learning in transfer test. May be the self-controlled feedback has caused to better learning do to the fact that learners didn't aware of the poor trials.

In addition distracting participants' attention from intrinsic information and additional cognitive involvement during initial levels of learning may be led to the present results. Perhaps, effective feedback in initial levels of learning is different from the following ones. The difference between the result of this study and other studies in transfer test maybe was caused by the type of task or the condition of presenting feedbacks (in the bandwidth far or near from target) too.

CONCLUSION

The result of the present study was not in contrast with the guidance view of feedback. It seems that in initial level of learning the golf putting skill, there is no

difference among the kinds of feedback, so instructors can offer more simple or taking less time feedback. It is suggested, similar study on the other golf skills like Shut, which in there are no vision feedback. It might be also fruitful to examine the expertise differences to consider the effect of feedback after good trials.

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