

Effect of Self- Control Feedback on the Learning of a Throwing Task with Emphasis on Decision-Making Process

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Abstract

In researches to measure the effectiveness of self-control feedback Researchers were more interested in the number of feedback and decision about when to get feedback has been less attention. Since the factor of choice and not the amount of choice feedback to the learner was the mechanism underlying motor learning in self-controlled context. The purpose of this study was investigating the effect of self- control feedback on the learning of throwing with one-hand with use of yoked self-control group. Forty five male students among university students of Shahid Beheshti University With the age range 18 to 28, years voluntary participated in this study and were randomly divided into 3 groups: self-control, traditional yoked and yoked self control. Task was throwing sand bags with non-dominant hand. Subjects after pretest participated in acquisition phase (180 acquisition trails as 3 sessions, each session 3 blocks of 20 attempts) and 24 hours after the end of the acquisition phase, in retention tests and 5 min after the retention test, participated in the transfer. Data was analyzed by one-way ANOVA and Bonferroni post hoc test. Results showed that all groups had significant improvements in acquisition phase. Moreover, According to the retention and transfer tests results, yoked self - control group showed significantly more learning compare with self-control ($p=0.001$) and traditional yoked groups ($p=0.001$). Finding shows that self-control condition are beneficial for motor skills learning. In addition, in learning motor skill, Time 'select the feedback received by the participants is more important than the number of received feedback.

Keywords

Yoked with Self Control, Self-Control, Throw with One Hand, Motor Learning

1. Introduction

One of the most important features of practice is the information learners receive about their attempts to produce an action. (Magill, R, 2010), Schmidt A and Timothy D lee, 2012). A practice method that has consistently been shown to have positive effects on the learning of motor skills in unimpaired participants is self-controlled practice. The advantages of this type of learning can be the possible reasons for active involvement in learning and deep processing information noting (Chiviacowsky S, Laroque de Medeiros F, Kaefer A, Wulf G, 2008) Groups that had received feedback on their request, compared to Experimenters to your liking than the group that had given them feedback, were better in retention test. (Janelle CM,

Kim J, Singer RN, 1995, Janelle CM, Barba DA, Frehlich SG, Tennant LK, Cauraugh JH, 1997, Chiviacowsky S, Wulf G, 2002, Chiviacowsky S, Wulf G, 2005, Chen, I hedrich, L, lindor, R, 2002). Also, the self-control group Reported that they have been request to KR from the result in the acquisition of motor skills of a deliberate strategy to get feedback on good efforts And more willing to receive feedback on their successful efforts (Wulf, G, Chiviacowsky, S and lewthwaite, R, 2010, Patterson t, carter M, 2010). In contrast to traditional pairing of subjects, Feedback be provided on the efforts of individual may no request feedback Provide feedback to groups traditionally paired Only be determined based on the number and timing receipt of self-control group. This makes TY group can not to request more feedback after successful efforts (Chiviacowsky S, Wulf G, 2002) also, In this group, there is no choice in timing of

receiving feedback. In other words, Subjects not receiving feedback in an beneficial learning experience (Patterson t, carter M, 2010). Therefore, Mismatch between the feedback and good potential for learning And the inability to receive feedback after successful efforts Leading to lower retention of TY group of a motor skill (Patterson t, carter M, 2010). The process of deciding upon request feedback is One of the advantages of learning in this context that the benefits of self-control but TY group deprived.

In previous research the number of KR in TY groups were similar with self-control group(Wulf, G, Chiviacowsky, S and lewthwaite, R, 2010, Patterson t, carter M, 2010) Thus, differences in retention between subjects' traditional yoked group and self-control group can be due to the decision to request knowledge of the result rather than the number of absolute feedback. In self-controlled practice conditions, learners are given control over a certain aspect of the practice conditions. Their learning is typically compared with participants in a control condition who are yoked to each self-control participant (Chiviacowsky, S, Wulf, G, Lewthwaite, R, Campos, T, 2012). In previous studies, participants in the traditional yoked group replicate the KR schedule of their self-controlled counterparts as a means of inferring the decision to receive KR and not the relative or absolute frequency of KR that was the factor underlying learning in a self-controlled condition (Chiviacowsky S, Wulf G, 2002). However, the differences in motor skill retention between participants in the self-controlled and traditional yoked conditions have been attributed to the decision to request KR rather than the absolute amount of feedback. Therefore, the purpose of this study was to examine the utility of participants in an additional control group that could control when they required KR, but who were limited in amount of KR opportunities (i.e., a yoked with self-control) this YSC group were yoked to the absolute number of KR opportunities of their self-control (SC) counterpart. (Hanssen S, Jacob Pfeiffer, Jae Todd Patterson, 2011). It was predicted that participants in the YSC group would demonstrate superior learning compared with participants in SC group in retention and transfer period due to the heightened cognitive processing demands associated with fewer opportunities to control KR compared to the unlimited opportunities of the SC group. (Hanssen S, Jacob Pfeiffer, Jae Todd Patterson, 2011).this is due to metacognition in YSC group is higher than another groups this abilities group to predict their own future recall or recognition of performed. (Simon, A, Dominic and Bjrok, A, Robert, 2001). However, there are a number of situations in which people s metacognitive evaluations have been demonstrated to be not only unreliable, but also negatively correlated with their own later performance. (Simon, A, Dominic and Bjrok, A, Robert, 2001, Hanssen and Colleagues(2011) Conduct a study to determine the effect of a new pair group(yoked with self control) That have controlling time required to feedback but with limited opportunities amount of feedback. YSC group was only in terms of feedback, coupled with self-control, but at the time of requested it Could decide (Simon, A, Dominic

and Bjrok, A, Robert, 2001). In this study predicts that yoked of self-control, fewer errors compared to traditional pairs in retention. This forecast is based on more cognitive processes, due to the decision to time of request feedback. Subjects did 4 blocks of 20 attempts pressing keys on the keyboard. The results showed subjects of self-control group on retention less error compared to traditional yoked group. These findings suggest that should pay special attention to aspects of cognitive (decision-making process) in self-control context And also in Future research can investigate the benefits of self-control condition coupled with yoked self-control groups. Furthermore, this study did not examine a sport-specific skills and This question is causing Is yoked self-control group subjects in learning a basic skill sports like throwing skills can learn self-control group is equal to or better than subjects in self-control groups and traditionally paired? In the present study we Seeks to test the hypothesis that the yoked self-control group is better than traditional yoked group and self-control group.

2. Methods

2.1. Participants and Procedures

First, participants read and signed an informed consent form, which has been approved by the local ethics board (Shahid Beheshti University). Second, participants were asked to complete questionnaires on their health prior to their inclusion in the study. Participants were 45 males with no history of neuromuscular disease All participants were right handed (assessed by the Edinburgh Handedness Inventory; Oldfield, 1971) healthy young adults, ages 18-26 years with a mean age of 21 years. Inclusion criteria were normal vision on the Snellen chart test, self-reported normal audition, and absence of any known, neuromuscular, motor and/or sensory disorders. Third, participants received a general orientation to the task. The task required them to throw a sand bag with their no dominant hand toward a target lying flat on the floor (Similar to Chiviacowsky and Colleagues, 2006). The target was located directly in front of the participant at a distance of three meters. The target included a series of then concentric rings. The center of the target had a radius of ten centimeters. Concentric circles with radii of 20, 30, ...90 and 100 centimeters were drawn around the center circle. These circle served as zones to assess the accuracy of the throws. If the sand bag landed on the center target, ten points were awarded. If the sand bag in one of the other rings, or outside the marked target, 9, 8, 7 ...1, or 0 points, respectively, were recorded. If the sand bag on a line separating two rings, the participant was awarded the higher (i.e. Better) score. After all necessary paperwork was completed, all participants received general verbal instructions indicating that the goal of the task was to throw the sand bag with their no dominant hand and strike the center of the target located in front of them. also Participants could not see the target area by a curtain which was hung in front of the target area were blocked. Following these instructions participants were

randomly assigned into 3 groups of 15 either the self-controlled, traditional-yoked group and yoked self-controlled group. Participants assigned to the self-controlled group were provided the choice to receive KR about their temporal error on completion of every acquisition trial. Participants in Traditional yoked group replicated the KR schedule of their SC counterpart. Participants in the Yoked with self-control group were provided with the same number of opportunities for KR as their SC counterparts, but controlled when they received KR (hanssen, 2011). KR was not provided during the retention or transfer phases. Subjects after pretest (1 block of 20 throw attempts Without the feedback and seeing the target) participated in acquisition phase (180 acquisition trials as 3 sessions, each session 3 blocks of 20 attempts) and 24 hours after the end of the acquisition phase, in retention tests and 5 min after the retention test, participated in the transfer.

2.2. Experimental Design and Data Reduction

Experimental groups, each of 180 separate efforts acquisition phase in 3 sessions of 3 blocks of 20 attempts (the other day) were administered. The third session of the acquisition phase was considered as a acquisition test. In the acquisition phase, all participants see were blocked the target area by a curtain which was hung in front of the target area. when they training on how to throw the bag, they were allowed to view the object. Target area was divided into four quarter-circle (half circle above and below each consisting of two parts: the left and right) And to inform of the landing points and place sand bags to the center of the target, subjects were given feedback. For example, the experimenter informed participants that score 60 and drag to the left or right and up or down relative to the center of the circle is located. If the bag landed in the region of 100 points, the participants understood that launch and landed in the center of the target. The self-control group participants were informed that they could not receive feedback about their knowledge of the accuracy launch, unless you request it. After the self-control group of 60 subjects in each session runs his own efforts, Subjects performed a similar task in pairs and in accordance with the request by the an individual's self-control feedback to the feedback was offered. then, subjects were paired in groups of yoked self-control began to run. Before the implementation attempted to exercise based on feedback requested by the self-control group It was told how much they can get the feedback received but you can set receiving time feedback. For example, if a subject of self-control feedback was requested 10 feedback His subjects were the pairs of coupled yoked self-control Before the training blocks were told 10 Feedback can be received, but time of received it can handle. The data Performance of all subjects were recorded in all efforts. 24 hours after the end of the acquisition phase, subjects such as the acquisition the subjects consisted of 20 attempts retention

test was performed without any feedback. Also 5 minutes after the retention test, transfer test was conducted at a distance of 4 meters without feedback.

2.3. Statistical Analyses

Descriptive and inferential statistics were used to analyze the data. Measures of descriptive statics such as mean and standard deviation were calculated. For analysis the pre-test, the training (acquisition), retention and transfer tests data points, Analysis of variance and also, the Bonferoni post hoc test at a significance level ($p \leq 0.05$) was used.

3. Results

Pretest results showed that the mean difference was not significant at this stage ($p=0.78$). Thus, there was no significant difference between groups in the research process.

Inferential statistical results of ANOVA and post hoc Bonferoni test results on the acquisition test, showed that difference between the experimental groups ($p=0.001$) was significant (Table 1). This means that the exercise performance of subjects in different groups was statistically significant and yoked self-control were better than self-control and traditional yoked groups.

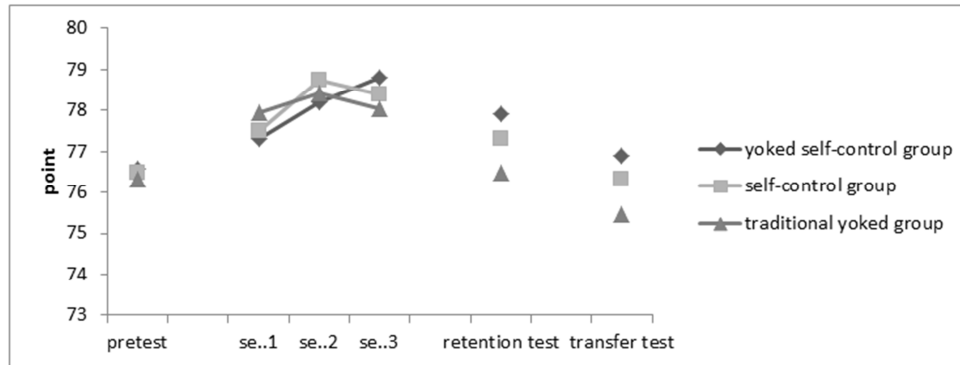
Retention test results showed that differences between experimental groups was significant ($p=0.001$). this means that people of self-control and self-control yoked were learn higher than those of traditional yoked group. Bonferoni post hoc test showed that significant differences exist between self-control and self-control yoked ($p=0.01$) self-control yoked Group outperformed of self-control in the retention test (Table 1).

The results of the transfer test showed that the difference between groups is statistically significant ($p=0.001$). This means that such retention test, subjects in self-control yoked and self-control were learning higher than those of traditional yoked. Bonferoni post hoc test indicated that significant differences existed between self-control and self-control yoked ($p=0.01$). the group of self-control yoked Outperformed of self-control in the transfer test (Table 1).

Moreover, the results of t-test between the percentage of feedback received in successful efforts (self-control group=0.56, and self-control yoked=0.57) compared to poor efforts (self-control=0.44, self-control yoked=0.43) In the acquisition phase by self-control and self-control yoked were significant ($p=0.001, t=9.1, 65.1, df=28$). In other words, these two groups tend to receive feedback on their successful efforts. While the traditional yoked group were received Feedback randomly in the successful (50/0) and weak efforts (50/0) Commensurate with function And in accordance with the self-control group. Significant difference between the percentage of feedback received to the successful and poor efforts of this group was not significant ($p=0.21, t=4.65, df=28$).

Table 1. Results of ANOVA tests on acquisition, retention and transfer (s).

Session	Degree of freedom	F	significant	η^2	Degree of freedom	session
per test	45,2	0.24	0.78	0.011	45,2	per test
Acquisition phase	45,2	21.59	0.01	0.61	45,2	Acquisition phase
Retention test	45,2	49.55	0.001	0.78	45,2	Retention test
Transfer test	45,2	68.64	0.001	0.78	45,2	Transfer test

**Figure 1.** Histograms showing the group means for points of conditions across the experimental.

4. Discussion

The aim of the present study was to investigate the effect of a new paired group on Throwing skills. The opportunity for the person making the application receiving the knowledge of the result based on feedback of the person's self control groups. Like previous studies (Wulf, g, Clauss, A, shea, c.h. and whitacre, C, 2001, Chiviakowsky, S. and mederiros FL, 2006), subjects performed the task of assimilation began throwing skills. The acquisition test findings, showed that the main effect of training was statistical significance. This means that different groups during training sessions significant improvements compared with pre-test. These results further confirm the existing theories on the role and effects of exercise on learning motor skills (Magill, R., 2010, Schmidt, Richard A and Timothy D lee (2011). The difference between groups was statistically significant at the acquisition test for self-control yoked group than self-control and traditional pairs. But there was no significant difference between self-control and traditional yoked. Retention and transfer test results showed the superiority of self-control yoked Group in throwing skills This means that based on the Bonferroni post hoc test subjects of self-control yoked were to better self-control and yoked traditional. And also, self-control group was better than traditional coupled. The results suggest a major role of self-control feedback in learning motor skills. The current results is Match with research of Janl, Kim and Singer (1995), Chen et al (2002) and Wulf et al (2002, 2005), Chiviakosky et al (2006) and many others who believe in the positive and constructive of self-control feedback on their learning (1995, Janelle CM, Barba DA, Frehlich SG, Tennant LK, Cauraugh JH,1997, Chiviakowsky S, Wulf G, 2002, Chiviakowsky S, Wulf G, 2005, Chen, I hedrich, L, lindor, R, 2002).

This study can be justified in the acquisition phase with

Zimmerman, 1990 and Estraka, 2000) research noting. That explain and interpret the performance of self-control as related to cognition and motivation And it may be argued that these processes (cognitive and motivational) involved in learning of self-control group And showed to explain the self-control of an inverse relationship between cognitive and motivational processes. In other words, self control subjects have more the motivation. They are control Their goal orientation and self-selection of the feedback received on certain specified conditions , Sense of independence and self-efficacy are more And for this reason they have a higher intrinsic motivation And make greater efforts in learning But from the perspective of cognitive Self-control means further pressure on the learner's They are based on knowledge of the task and their ability to make decisions about their learning And determine how much you choose to provide feedback? How long and how difficult the task of implementing change? When and how to ask for feedback? Thus, the inverse effects of cognitive and motivational processes in the acquisition of self control subjects resulted in similar performance is traditionally paired group subjects (Zimmerman, B,1990, Straka, G,2000), But with the creation of yoked self-control group can be eliminated This inverse relationship.(As a result of this study was to the acquisition test) and the two cognitive and motivational processes can be found With each other, through More cognitive processes in program is exclusively limited Received feedback that Leading to increased motivation To reduce false error is thrown (Hanssen S, Jacob Pfeiffer, Jae Todd Patterson, 2011). The heightened cognitive processing of participants in the Yoked self-control(YSC) group to individualized their KR schedule as a function of limited KR trials is suggested to have increased their motivation for fewer throwing errors and reduced variability (Hanssen S, Jacob Pfeiffer, Jae Todd Patterson, 2011).

At reviews retention and transfer test results can be stated Pair up with a feedback request by a group of self-control

But with of the autonomy of KR receipt Leading to higher cognitive processes in YSC group And make the strategic decision by the this group to which Make the most used amount of feedback. In addition, Based on the descriptive data in acquisition phase, Comparison of the percentages get feedback of successful attempts and in relatively poor efforts, YSC and SC subjects received feedback on the correctness of the execution (successful attempts) as the basic information to request KR emphasized. (Patterson t, carter M, 2010). While the traditional yoked group received the feedback in accordance with the by self-control function and could not receive being successful or poorly implemented. This idea is agreement with recent behavioral evidence Showed an advantage to group receiving feedback after a successful attempt compared to the than those who received feedback after unsuccessful efforts. (Chiviacowsky S, Wulf G, 2002, Patterson t, carter M, 2010, Chiviacowsky S, Wulf, G, wally, R, Borges, T, 2009, wulf, G, shea, C. H, 2004). Therefore The limited number of opportunities to get knowledge of the result of Yoked self-control in combination with get feedback after successful attempt May cause the subjects to perform movements with low error.

5. Conclusion

Present study provides several interesting results. In particular, the novel observation that decision-making process and augmented feedback processing, as set, predicts motor learning, protocols to enhance decision-making process practice should receive further investigation. to this point, self-control feedback posits increasing perceptions, competence, and relatedness should enhance high cognitive processes (Bjork, et al, 2001). Accordingly, another results that reason self-controlled feedback schedules may be successful in enhancing motor learning is because learner are given feedback when they believe it will be useful (grand et al, 2015) besides providing learner control over feedback scheduling, instructors may be able to enhance learner feedback processing by emphasizing decision-making process.

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