



The Effect of Normative Feedback on Goal Orientation and Learning of Dart Throwing

Masoumeh Doosti^a, Afkham Daneshfar^b

^a Ph.D. Student at Motor Learning, Department of Motor Behavior and Sport Psychology, Faculty of Sport Sciences, University of Tehran, Tehran, Iran.

^b Associate Professor, Department of Motor Behavior, Faculty of Sport Sciences, Alzahra University, Tehran, Iran.

Keywords

Social –Comparative Feedback
Task Orientation
Self-Orientation
Goal Setting

Masoumeh Doosti,

Email: m.doosti@ut.ac.ir

Received: 2021/04/06

Accepted: 2021/09/27

Published: 2021/12/07

Abstract

Background: The aim of this study was to investigate the effect of positive and negative normative feedback on goal orientation (task orientation and ego orientation) and darts throwing learning in young women.

Methods: Thirty-five young women with a mean age of 22.7 (± 1.5) years were divided into 3 groups of positive normative, negative normative, and control. After 9 trials as a pretest, participants practiced 60 darts throwing trails in 2 sessions (30 throws per session, 10 sets of 3 trails) and after 24 hours, retention and transfer tests were taken and participants completed a goal orientation questionnaire in the post-test again.

Results: The results of the 3 (group) * 4 (test) mixed ANOVA showed that the normative feedback had no significant effect on reducing the bivariate variable error (BVE) of dart throwing ($P < 0.05$) and no difference was observed between the groups in the tests. However, all groups showed a reduction in radial error (RE) during the learning. Also, the participants' task orientation did not change during the experimental period, but ego orientation increased significantly from pretest to post test ($P < 0.05$). **Conclusion:** The results show that normative feedback (positive or negative) can negatively affect people's ego orientation and comparison of their performance over the others.

Introduction

Learning is a process that has a wide range of dimensions, and its depends on the conditions that consider all its aspects and, ultimately, to achieve the desired results in order to improve skills. One of the effective factors in learning motor skills is feedback. In motor learning texts, feedback is defined as all the information that is provided to a person about movement or the result of movement from various sources (internal or external)(Magill & Anderson, 2021). There is evidence that shows that enhanced feedback is not just an information function in the motor skills learning process, but also affects learning through motivational characteristics (Wulf, Chiviacowsky, & Lewthwaite, 2012). Among the types of feedback,

normative feedback is based on the principle of social comparison. This feedback includes information about comparing oneself with others or social comparisons that can affect motivation, performance, and learning. In this type of feedback, the learner is bogus aware of his or her score as well as the performance of the peer group (artificially) (Hutchinson, Sherman, Martinovic, & Tenenbaum, 2008; Smith, Louis, & Abraham, 2018). In this feedback, the person enters the process of comparison with others or some kind of social comparisons that ultimately affect his learning (Tahmasbi & Naghdi Fathabadi, 2018). Limited studies, but there are relatively agreeable results in this regard. The effects of social-comparative feedback on balance task learning showed that

individuals in both positive and negative normative feedback groups had better learning than the control group, but in the positive normative group this effect was greater (Lewthwaite & Wulf, 2010). Also, a study on a scheduling task shows that individuals in the positive normative feedback group performed better on the transfer test than the negative normative group (Wulf, Shea, & Lewthwaite, 2010). Confirmation of previous findings has also been shown to provide positive normative feedback for better retention in children's dart throw accuracy (Ávila, Chiviacowsky, Wulf, & Lewthwaite, 2012). In addition, according to studies, negative normative feedback causes a significant increase in the level of physical activity of normal and overweight people (Dehghani Firoozabadi, 2012). In one study, the effect of normative feedback on the kinematics of dart throwing accuracy of novice girls was investigated. The findings of this study showed that normative feedback affects performance only as a component of psychological motivation and this motivation does not affect the kinematic indices of maximum elbow flexion and angular velocity of the elbow in motion, but the elbow angle when releasing darts were lower in the positive normative feedback group and this group performed better than the control group (Rashidi, 2012). In this regard, some researchers have considered psychological variables in examining this type of feedback. The effect of normative feedback on motivation, implementation of badminton service skills in 10-12 years old girls showed that negative normative feedback in retention, and positive normative feedback in

transmission, had a positive effect on performance. In addition, the positive normative group had the most and the negative normative group the least motivation in the stages of acquisition and learning (Panahi Boroujeni, 2015). The effects of positive normative feedback were also confirmed in another study on children's targeting skills (Jahanbakhsh, Shafienaya, & Shetab Booshehri, 2015). Considering the self-efficacy component, the effect of normative feedback on learning generalized movement program and movement parameter timing task was studied. The results showed that people with low self-efficacy benefit more from the effects of positive normative feedback (Karimi aghdam, 2012). However, in another study of badminton service, the results show that people with high self-esteem benefit from positive normative feedback (Tahmasbi & Naghdi Fathabadi, 2018). Recent findings also show that positive normative feedback as a psychological placebo can play an important motivational function directly at the level of physiological changes to control balance and homogeneity of muscle function (Ashrafpoor Navaee, Farsi, & Abdoli, 2016).

Therefore, the role of psychological components affected by this type of feedback that affect performance seems to be important. Proper performance in comparison with others or individual satisfaction of doing a task regardless of the performance of others, is an issue that determines the goal orientation of individuals in two dimensions of task orientation and ego-orientation. Participants in sports or other progress-related areas define success in terms of task or self

(Joan L Duda, 2016). People who are task-oriented define success in terms of mastery of skills and personal development, and ego-oriented people define success in terms of superiority over others. A person who is involved in himself focuses attention on superiority over others. In this person, the display of ability is based on better performance with less effort than others. However, if a person becomes involved in a task, his understanding of normative ability is no longer relevant to him, as he tries to demonstrate his mastery and skill. Ego-orientation and task-orientation are independent structures in which individuals can be equally ego-oriented or task-oriented, or superior to one another. Competitive situations are more ego-oriented than skills-focused situations (Nicholls, 1989). Given that this psychological component is very similar in conceptual terms in terms of social comparison with normative feedback, it is assumed that individuals' goal orientation such as self-efficacy, self-esteem and motivation are factors involved in the effects of normative feedback. Therefore, this study aimed to study the role of normative feedback on learning the accuracy of dart throwing and goal orientation.

Method

Subjects

The participants of the present study were 36 female students of physical education of Alzahra University without experience in darts and all of them were right-handed and were selected voluntarily to participate in the research. According to the pre-test score of the goal orientation questionnaire, the subjects were divided

into three groups (n=12 for each group): positive, negative normative feedback and control. During the experimental period, one of participants of the positive normative feedback groups decreased. Therefore, participants including 35 people (control group and negative normative feedback: n=12 and positive normative feedback; n= 11) with a mean age of $22.7 \pm (2.53)$ years participated in this study.

Apparatus and Task

The task of this research was to throw darts. In this way, participants threw darts from a distance of 2.37 meters from the wall to the darts board, the center of which was 1.74 meters from the floor. In this study, a standard blade dart board with a diameter of 45.3 cm (unique) and three darts (Puma) were used. In order to determine the radial error (RE) and the bivariate variable error (BVE), the darts board was divided angularly; So that the 360-degree circumference of the dart plate was separated by 2.25-degree units so that with the distance of each throw from the center of the plate as a radius (r) measured with a ruler, the values of X and Y Calculate with Formula 1 and then use it to calculate the RE (Formula 2) and the BVE (Formula 3).

Formula 1: Calculate x,y

$$x = \cos \alpha \times r$$

$$y = \sin \alpha \times r$$

Formula 2: Calculate RE

$$RE = \frac{1}{K} \sum_{i=1}^K \sqrt{x_i^2 + y_i^2}$$

Formula 3: Calculate the BVE

$$BVE = \sqrt{\frac{1}{K} \sum_{i=1}^K (x_i - x_c)^2 + (y_i - y_c)^2}$$

K is the number of trials, i is the specific trial, x_c and y_c are the means of x and y, respectively.

Also, to assess the goal orientation in sports, the Task and Ego-Orientation Sport Questionnaire (TEOSQ)(Joan L Duda, 2016) was used. This questionnaire measures the type of individual goal orientation in terms of two subscales of task orientation (7 phrases) and ego-orientation (6 phrases) with a 5-point Likert scale (strongly disagree = 1 to strongly agree = 5). The scores for each subscale are equal to the sum of the scores of that subscale divided by the number of corresponding phrases. Validation of persian version of this questionnaire has been done (Shafizadeh, 2007).

Procedures

First, a questionnaire of TEOSQ was distributed among the participants. Then, the groups were matched according to the scores of both subscales of ego- oriented and task-oriented, and three groups of 12 people formed positive, negative normative feedback and control. At the beginning of the practice phase, participants were taught the correct form of darts throwing along with important task instructions, including how to take the darts, open the elbow from the front of the face to the target, and how to stand. And performed three throws as an introduction to the task. In the pre-test phase, participants performed 9 throws in 3 blocks of 3

trials with dominant hand without receiving augmented feedback. In the acquisition phase, participants in their groups performed 30 throws in 10 blocks of 3 trials per day in 2 consecutive days. During the acquisition phase, all three groups were given real feedback from each RE, measured in terms of distance from the center of the dart, after each trial; In addition, in the positive normative feedback group, at the end of each block, feedback was provided from the average group error to the participants, which showed that the average participant error was 20% less than the group error (bogus); but the negative normative feedback group, the average group error was given to the participant in such a way that the participant error was 20% more than the group error (artificially). This comparison was the responsibility of the participants and the examiner did not directly mention this difference. The final three blocks of the acquisition phase were considered as the acquisition test; retention and transfer tests were taken 24 hours later. Before the pre-test and retention, the TEOSQ in sports was completed by participants. At the beginning of each test, 3 trials were made to control the effect of warm-up decrement. At the beginning of the transfer test to increase the level of anxiety, participants were told that they would receive a cash reward if they were in the top three in their groups. It should be noted that in all stages, throws that did not reach the target were repeated.

Data Analysis

Shapiro-Wilk test was used to determine the normality of data distribution. One-way analysis of

variance was also used to compare the pretests. 3 (group) * 4 (test) mixed analysis of variance was used for each of the RE and BVE, and multivariate analysis of variance was used for task-orientation and ego -orientation. Analyzes were performed using SPSS software version 21 at a significance

level of $P \leq 0.05$.

Results

Table 1 provides descriptive information on research variables.

Table 1. Mean and Standard deviation of research variables (RE & BVE).

Group	RE (M ± SD) (cm)				BVE (M ± SD) (cm)			
	Pretest	Acquisition	Retention	Transfer	Pretest	Acquisition	Retention	Transfer
Control	11 ± 2.69	9.96 ± 1.93	11.19 ± 2.48	8.27 ± 1.81	8.69 ± 1.74	7.76 ± 1.73	9.88 ± 2.57	8.64 ± 1.8
PNF	11.55 ± 1.63	10.37 ± 1.22	11.22 ± 2.78	7.63 ± 2.59	9.6 ± 1.59	9.12 ± 1.45	9.69 ± 2.55	8.16 ± 2.71
NNF	11.54 ± 1.97	9.65 ± 1.76	10.49 ± 2.59	7.85 ± 1.52	9.77 ± 1.78	9.04 ± 2.02	8.19 ± 1.59	8.23 ± 1.73

Note: PNF= Positive Normative Feedback; NNF= Negative Normative Feedback.

The results of Shapiro-Wilk test were normal data distribution ($P > 0.05$). The results of one-way analysis of variance test did not show a significant difference in any of the variables in the pre-test stage ($P > 0.05$). The results of mixed ANOVA in RE showed that the main effect of the test was significant ($F_{(3, 96)} = 19.07, P \leq 0.001, \eta^2_p = 0.373$). However, none of the main effects of the group ($F_{(2, 32)} = 0.22, P = 0.8, \eta^2_p = 0.014$) and the interaction effect of the test and the group ($F_{(6, 96)} = 0.36, P = 0.9, \eta^2_p = 0.022$) were not significant. The results of pairwise comparisons of the main effect

of the test showed that the RE in acquisition ($P = 0.021$) and transfer ($P < 0.001$) was significantly reduced compared to the pretest. This decrease from acquisition to transfer was also significant ($P < 0.001$) (Figure 1). In the BVE, none of the main effects of the test ($F_{(3, 96)} = 2.27, P = 0.084, \eta^2_p = 0.066$), group ($F_{(2, 32)} = 0.4, P = 0.67, \eta^2_p = 0.025$) and the interaction effect of test and group ($F_{(6, 96)} = 1.79, P = 0.1, \eta^2_p = 0.101$) was not significant (Figure 2).

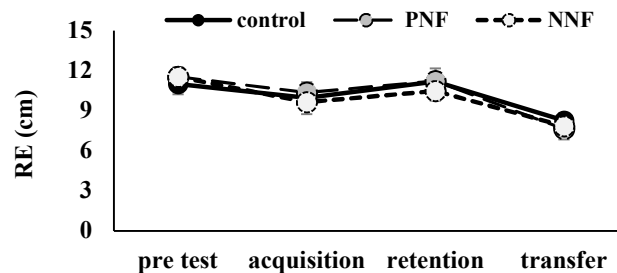


Figure 1. Mean RE

Note: PNF= Positive Normative Feedback; NNF= Negative Normative Feedback.

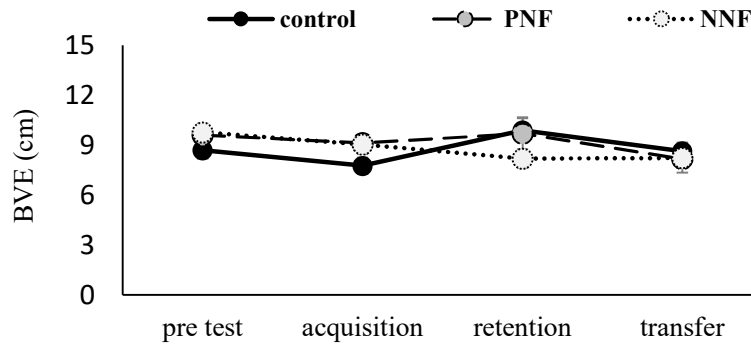


Figure 2. Mean BVE

Note: PNF= Positive Normative Feedback; NNF= Negative Normative Feedback.

Multivariate analysis of variance 3 (group) in 2 (test) was used to analyze the goal orientation data by repeating the test factor. The results of this analysis showed that the main effect of the group ($F_{(4, 62)} = 0.051, P=0.995, \eta^2_P = 0.003$). and the interaction between the group and the test were not significant ($F_{(4, 62)} = 1.956, P=0.112, \eta^2_P = 0.112$), but the main effect of the test was significant ($F_{(2, 31)} = 3.672, P=0.037, \eta^2_P = 0.192$). The results of post hoc analysis showed that the main effect of the test was significant only for ego-orientation ($F_{(1, 32)} = 6.783, P = 0.014$); in other words, ego-orientation showed a significant increase during the experimental period (Figure 3 and 4).

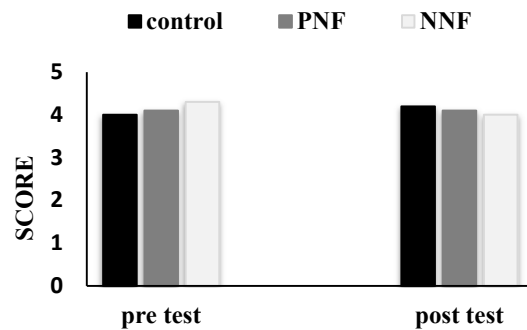


Figure 4. Mean Task-orientation

Note: PNF= Positive Normative Feedback; NNF= Negative Normative Feedback.

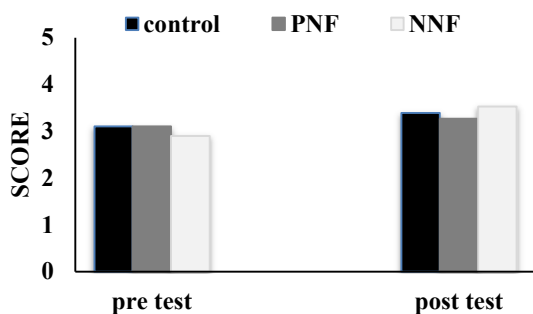


Figure 3. Mean Ego-orientation.

Note: PNF= Positive Normative Feedback; NNF= Negative Normative Feedback.

Discussion and Conclusion

The aim of the present study was to investigate the effect of normative feedback on goal orientation and dart throwing learning in young women. According to the results, there was no difference between the positive and negative normative feedback group and the control group in the performance. However, all three groups showed a significant reduction in RE in the experimental phase; however, this reduction was not observed in the BVE. The absence of differences between groups in this study is consistent to Rashidi (2012) findings that observed

the lack of effect of normative feedback on kinematic indices. Also, these results agree with the findings that normative feedback is not a learning variable (Ashrafpoor Navaee, Abedanzadeh, Salar, & Sharif, 2018). Another difference for this research is the method of calculating accuracy. In the study conducted by Rashidi (2012), accuracy was measured by scores of darts, which does not distinguish between RE and BVE.

When a skill is learned during the learning process, the four general characteristics of progress, consistency, stability, and adaptability in performance are visible (Magill & Anderson, 2021), of which consistency is of particular importance. Consistency is defined as a capacity of the human motor learning system in the similarity of performing motor skills in the trials. Lack of improvement in BVE can be attributed to the negative effects of frequent feedback; in fact, the feedback of the knowledge of result (KR) that was given to the participants exactly after each trial, persuaded them to improve their performance in each trial, and this trial causes the variability of the performance to increase significantly (Schmidt & Lee, 2019). Also, the lack of difference between the groups in both errors is in contradiction with the results that were generally differentiated between normative feedback and the control group (Ashrafpoor Navaee et al., 2016; Karimi aghdam, 2012; Lewthwaite & Wulf, 2010; Tahmasbi & Naghdi Fathabadi, 2018; Wulf et al., 2012). One of the factors that can be mentioned is the frequency of feedback provided; Studies that have shown the effect of normative feedback (Lewthwaite, 2010; Rashidi, 2012) have used fewer trials or fewer

normative feedback. It seems that the mentioned negative effects for frequently feedback (Magill & Anderson, 2017) also exist for this type of feedback. Perhaps if the frequency of normative feedback is reduced, it will have better motivational effects and give the individual the opportunity to analyze this comparison. Also, the reason for the lack of effect of normative feedback could depend on the quality of the comparison that the participants made. Because the comparison of the group error with the one's average error was left to the participant himself, and the examiner did not report that artificial difference. For this reason, the comparison may not have been performed correctly by the participants. Therefore, it is suggested that in future research, feedback be done by announcing the comparison result. Also, the other reason for this lack of difference may be related to the goal orientation of individuals; Participants in this study initially showed moderate levels of task-oriented and ego-oriented subscales. These moderate levels of goal orientation affect the effects of social comparison. Naturally, in the context of negative normative feedback, performance decline will be predictable due to increased anxiety and worry, given the characteristics of self-centered individuals who define success in terms of being superior and superiority over others; In the context of positive normative feedback, arousal from a sense of superiority over others may also impair performance on the accuracy of the throws, which requires maintaining mental focus, by diverting attention from the task to the resulting superiority (Duda, 1993).

In the goal orientation section of individuals, although there was no difference between the groups in the task-orientation and ego-orientation, but the results showed that the ego-orientation of participants increased during the experimental period. Situations that evaluate individuals and in some way lead to overt self-awareness increase performance anxiety and thus lead to individualism (Duda, 1993). The presence of moderate levels of ego-orientation and task-orientation indicators that existed in the participants from the beginning, affects the motivational and psychological effects of normative feedback. Previous studies on some psychological factors such as self-efficacy (Karimi aghdam, 2012), self-confidence (Tahmasbi & Naghdi Fathabadi, 2018), and perceived competence (Abedanzadeh, Neisi, & Navaei, 2016) showed high levels of these features benefit from normative feedback (especially positive normative feedback). If the normative comparison is desirable for the individual, it increases self-efficacy, interest in the task and positive self-reaction and ultimately performance (Hutchinson et al., 2008). This point can be considered as one of the limitations of this study.

It is suggested that future research be conducted on participants with a relative superiority in self-orientation or ego-orientation (such as skilled athletes), in order to study the psychological mechanisms of social comparative feedback in more detail.

Conflict of Interest

There is no conflict of interest.

Acknowledgment

The authors of this article thank the students of Alzahra University who participated in this study.

References

1. Abedanzadeh, R., Neisi, M. H., & Navaei, S. A. (2016). The Effect of Normative Feedback on Performance and Learning of Throwing Task : The Role of Perceived Competence. *Neuropsychology*, 2(5), 83–96.
2. Ashrafpoor Navaei, Saeed Abedanzadeh, R., Salar, S., & Sharif, M. R. (2018). The Effects of Positive Normative Feedback on Learning a Throwing Task among Children with Autism Spectrum Disorder. *Nursing and Midwifery Studies*, 8(1), 45–49. <https://doi.org/10.4103/nms.nms>
3. Ashrafpoor Navaei, S., Farsi, A., & Abdoli, B. (2016). The effect of normative feedback on balance control and Consistency of muscle function at variable task difficulty levels. *The Scientific Journal of Rehabilitation Medicine*, 6(1), 43–52.
4. Ávila, L. T. G., Chiviawsky, S., Wulf, G., & Lewthwaite, R. (2012). Positive social-comparative feedback enhances motor learning in children. *Psychology of Sport and Exercise*, 13(6), 849–853. <https://doi.org/10.1016/j.psychsport.2012.07.001>
5. Dehghani Firoozabadi, F. (2012). The effect of different types of feedback on self-esteem, physical self-concept, body composition and level of physical activity of young girls with normal weight and overweight. Alzahra University.
6. Duda, J.L. (1993). Goals: A social-cognitive approach to the study of achievement motivation in sport. In R. N. Singer (Ed.). *Handbook of research on sport psychology*. New York: MacMillan.
7. Duda, Joan L. (2016). Relationship between Task and Ego Orientation and the Perceived Purpose of Sport among High School Athletes. *Journal of Sport and Exercise Psychology*, 11(3), 318–335. <https://doi.org/10.1123/jsep.11.3.318>
8. Hutchinson, J. C., Sherman, T., Martinovic, N., & Tenenbaum, G. (2008). The effect of manipulated self-efficacy on perceived and sustained effort. *Journal of Applied Sport Psychology*, 20(4), 457–472. <https://doi.org/10.1080/10413200802351151>

9. Jahanbakhsh, H., Shafienaya, P., & Shetab Booshehri, S. N. (2015). The Effect of Normative Feedback on Throwing Aiming Task Learning in 9-11-Year-Old Children. *Journal of Motor Learning and Movement*, 7(2), 203–216. <https://doi.org/10.22059/JMLM.2015.55251>
10. Karimi aghdam, L. (2012). The effect of normative feedback on learning generalized movement program and movement parameter timing task: The mediating role of self-efficacy. Alzahra University.
11. Lewthwaite, R. (2010). Normative feedback effects on learning a timing task. *Research Quarterly for Exercise and Sport*, 81(4), 425–431. <https://doi.org/10.1080/02701367.2010.10599703>
12. Lewthwaite, R., & Wulf, G. (2010). Social-comparative feedback affects motor skill learning. *Quarterly Journal of Experimental Psychology* (2006), 63(4), 738–749. <https://doi.org/10.1080/17470210903111839>
13. Magill, R., & Anderson, D. I. (2017). *Motor learning and control: concepts and applications*.
14. Nicholls, J. (1989). The competitive ethos and democratic education. Retrieved from <https://books.google.com/books?hl=en&lr=&id=CmdUo6P9CLOC&oi=fnd&pg=PA1&ots=WvHo5EPQ03&sig=7ml-19Bvq17bFbCe5GiCNZ-gEOA>
15. Panahi Boroujeni, E. (2015). Comparison of feedback effect on successful, normative and self-control efforts on motivation, performance and learning badminton service skills in 10 to 12 year old girls. *Studies of Psychology and Educational Sciences*, 2(2). Retrieved from https://www.civilica.com/Paper-JR_SPE-JR_SPE-2-2_021.html
16. Rashidi, F. (2012). Effect of normative feedback on performance accuracy, electromyography and kinematic dart throw. Alzahra. Retrieved from <http://ganj-old.irandoc.ac.ir/articles/606285>
17. Schmidt, R., & Tim, L. (2019). *Motor Learning and Performance: From Principles to Application* (6th ed.). Human Kinetics. Retrieved from https://books.google.com/books?id=Xi-oDwAAQBAJ&dq=normative+feedback+on+performance&source=gbs_navlinks_s
18. Shafizadeh, M. (2007). Thre Study of Validity and Rrliability in The Participation Motivation Questionnaire and Task Ego Orientation Among the Secondary and High School Student of Tehran. *Rrsearch on Sport Sciense*, 4(14), 15–31. Retrieved from <https://www.sid.ir/en/journal/ViewPaper.aspx?ID=102106>
19. Smith, J. R., Louis, W. R., & Abraham, C. (2018). When and how does normative feedback reduce intentions to drink irresponsibly? an experimental investigation. *Addiction Research and Theory*, 26(4), 256–266. <https://doi.org/10.1080/16066359.2017.1359572>
20. Tahmasbi, F., & Naghdi Fathabadi, A. (2018). Mediating Role of Self-Esteem in Impact of Normative Feedback on Badminton Service Skill Learning. *Sport Psychology Studies*, 7(23), 205–218. <https://doi.org/10.22089/SPSYJ.2018.5404.1560>
21. Wulf, G., Chiviacowsky, S., & Lewthwaite, R. (2012). Altering mindset can enhance motor learning in older adults. *Psychology and Aging*, 27(1), 14–21. <https://doi.org/10.1037/a0025718>
22. Wulf, G., Shea, C., & Lewthwaite, R. (2010, January). Motor skill learning and performance: A review of influential factors. *Medical Education*. <https://doi.org/10.1111/j.1365-2923.2009.03421.x>