



The Effect of Motivational and Informational Role of Feedback on Bilateral Transfer of Force Control Task

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Abstract

Background: Considering the role of bilateral transfer in the learning of motor skills, especially at the time of injury, attention to the factors that will enhance bilateral transfer, is important.

Introduction: The purpose of this study was to investigate the effect of feedback on bilateral transfer of force control task.

Method: Thirty-six students were randomly assigned to three groups; feedback on successful trials, feedback on unsuccessful trials and self-control feedback groups. The feedback on successful trials group received KR for the two most effective trials in each block, the feedback on unsuccessful trials group, received KR for the two least effective trials in each block. And, self-control feedback group was provided with feedback whenever they requested only two trials. One day after the acquisition phase, participants performed a bilateral transfer test with another hand.

Results: The results showed that all groups had significant progress, but there was no difference between groups in the acquisition phase ($P \geq 0.05$). The results of bilateral transfer showed that the group that received feedback on successful trials had the best performance ($P = 0.02$) and There was no significant difference between the self-control feedback group and the feedback on unsuccessful trials group ($P \geq 0.05$).

Conclusion: As feedback on successful trials is motivational and leads to increased self-efficiency and higher activation of certain areas in the brain, it is likely that the resulting motivation positively influenced axonal guidance and led to the accelerated transfer of the cognitive and motor components via Corpus Callosum and, in this way, improved learning in the untrained hand.

Introduction

Information exchange between the two hemispheres of the brain is done through the pons and the corpus callosum (Magill & Anderson, 2007; Gagnoli & Kohl, 2001). The corpus callosum, as the largest neural pathway, connects the two hemispheres of the brain and provides the context for the transfer of cognitive and motor components of the task by connecting identical regions of the two hemispheres (Bund, 2007;

Magill and Anderson, 2007). Doing exercise with the symmetrical organ of the body not only results in greater success in the field of sports but also provides the opportunity to transfer some of the gains obtained as a result of the training of a healthy organ with an injured one at the time of injury. Ultimately, it reduces the athlete's performance (Hosseini et al. 2014).

In terms of the amount of transfer between two organs, Weeks (2003) and Morton et al. (2001)

reported the same transfer between two hands; whereas Kumar and Mandal (2005) and Stöckel et al. (2007) showed that the transfer is asymmetric and more information is transferred from the non-superior hand to the superior one. Similarly, the results of Stöckel et al. (2011) study on 11- to 14-year-old individuals' acquisition of two throwing skills, one of them needed precision and the other required throwing power, showed that those tasks requiring high spatial precision are learned better after initial training with the non-superior organ. Naguchi et al. (2009) results on pursuit-rotor task and Stöckel and Weigelt's (2012) results on the task of throwing with the maximum amount of power also indicated asymmetric transfer; however, transfer from the superior hand to the non-superior one, had more information in comparison with transfer from the non-superior hand to the superior one. As can be seen, most researches in this field have focused on examining the transition from non-superior hand to the superior one, and vice versa, as some studies emphasize symmetric transfer and others emphasize asymmetric one. The reason for these inconsistencies seems to be differences in the characteristics of the tasks and their requirements (requiring accuracy, speed, or power). Since the results of research in this area indicate the impact of the two-way transfer on improving motor learning (Liu and Wrisberg, 2005), consideration of factors that can increase the rate of two-way transfer without considering symmetric or asymmetric transfer is an issue which has received less attention but is of crucial importance.

Force control, or in other words, precision in power generation, are essential components of many motor skills (volleyball service, basketball free throw, dart throwing, billiards, tennis kicks, etc.) that require learning. One of the factors affecting motor learning is the augmented feedback provided at the end of the implementation (Schmidt & Lee 2005), the content of this feedback can have a motivational or informational role (Ahmadi et al., 2011; Badami et al., 2011) and cause the increase of learning in some ways (Salmoni et al., 1984; Schmidt, 1991). Similarly, research-based on positive psychology suggests that feedback on successful efforts (using the motivational role of feedback) to activate specific areas of the brain affects the learning of effective motor skills. (Nieuwenhuis et al., 2005). Chiviawsky & Wulf (2007), Zeidabadi et al. (2010) Badami et al. (2011) and Ahmadi et al. (2011) also found that providing feedback on successful efforts motivates one to increase motor skills learning. However, the hypothesis of Leitron and Roscoe (1980) states that when learning a skill, especially at the beginning of learning, the focus on what is being done correctly is not sufficient and the experiences one obtains from error correction is of particular importance. Thus feedback on unsuccessful attempts (using the informational role of feedback) to create error correction experience is also effective on implementation progress (Quoted in Magill & Anderson, 2007). The results of research by Gadagnoli & Kohl (2001) and Barney & Lee (2007) showed that feedback on unsuccessful

attempts leads to error analysis by the subject and ultimately increases motor skills learning.

Another type of feedback that deepens the processing of information increases the force of error estimation creates autonomy in the individual, meets the needs of the subject and provides the basis for improved performance and motor learning by reducing frequency is self-controlled feedback (Chiviakowsky et al. 2005). Since feedback is given to the subject in this method at the request of him/her, self-controlled feedback can also have a motivational or informational role or the motivational and informational effects of feedback simultaneously (Zeidabadi et al. 2010). In this regard, Wulf's (2007) results in the bean bag throw task in children and Bund's (2007) results in the non-superior hand tennis ball throw task indicated better performance of the feedback self-controlled group.

However, a review of conducted researches on feedback shows that virtually none of the research in this area addresses the effect of feedback type on the amount of two-way transfer that contributes to accelerating the learning process, especially in conditions of superior organ injury. The use of this strategy seems to be neglected for several reasons, including lack of knowledge of trainers, limitation of training time and lack of research in this area. Therefore, the present study seeks to answer the question: Which of the control tester feedbacks (feedback on successful and unsuccessful attempts) and self-control increase the information transfer process between the two hemispheres and lead to more bilateral transfer in the task of force control?

Method

Research Method

Subjects: The research method was quasi-experimental. The statistical sample of this study consisted of 36 eligible male subjects (non-athlete, right-handed and having no history of injury in both hands) with the age range of 23-25 years. Subjects were divided into three groups of 12 members: feedback on successful attempts, feedback on unsuccessful attempts, and self-control feedback.

Data Gathering Tool: Electric dynamometer (ED-100N YAGAMI) with a reliability of 0.82 which was used to evaluate the accuracy of force generation.

Implementation Method: At first, subjects were randomly divided into three groups according to the maximum force produced by their non-superior hand (left hand). After becoming familiar with a dynamometer, a pretest was performed to determine the absolute error (accuracy in control) between the groups at the beginning of the study to ensure that the groups were identical. During the acquisition phase, each group practiced 15 kg of force production with their non-superior hand in 12 batches of six attempts. It is noteworthy that subjects were not able to see the dynamometer not only during the acquisition phase but also throughout the whole process of research. In each trial batch, only two of the six trials received feedback (KR) -feedback frequency 33%. After 3 trials, members of the feedback on successful trials group received feedback on the trial which had the nearest value to 15 kg (good trial), members of the

feedback on unsuccessful trials group received feedback on the trial which had the farthest value from 15 kg (weak trial); subjects of the self-controlled feedback had the option to request two feedbacks at their own choice. 24 hours after the acquisition phase, the two-way transfer test using the superior hand (right hand) was performed. Then, the transition phase with producing 20 kg of force was performed in s-member batches and without feedback.

Statistical tests:

To calculate the mean and standard deviation of the descriptive statistics and to ensure the normal distribution of the scores, the Kolmogorov-Smirnov test was used. To analyze the data during

the acquisition phase, inter-intragroup analysis of variance -3 (group) \times 12 (block) -with repeated measures in the last factor was used. One way ANOVA and Tukey post hoc tests were used to analyze the data in a two-way analysis of variance ($P \geq 0.05$). Data were analyzed using SPSS 23 software.

Results

Descriptive characteristics such as age and maximum strength of the subjects are presented separately, in terms of research groups, in Table 1. It is noteworthy that in the feedback on the unsuccessful group, we faced a decrease in subjects because one of the subjects did not participate in the posttest.

Table 1. Mean and standard deviation of age and maximum strength of subjects.

Groups	Number of Subjects	Age	Hand Power
Feedback on Successful Trials	12	24.91 \pm 1.08	39.25 \pm 4.26
Feedback on Unsuccessful Trials	11	24.90 \pm 1.22	40.18 \pm 5.96
Self-controlled	12	24.00 \pm 1.04	40.33 \pm 5.06

The results of one-way ANOVA showed that there was no significant difference between the age and strength of the subjects in three groups ($P \geq 0.05$). The results of the Kolmogorov-Smirnov test and Levin test showed that the distribution of data was normal at all stages of the test and the homogeneity of variances was also preconditioned ($P \geq 0.05$). The results of one-way analysis of variance in the pre-test also showed that there was no statistically significant difference between the study groups in the error rate in force control.

The results of intra- and inter-group effects of repeated measures analysis of variance in the

acquisition phase are reported in Table 2. Because of the results of Mitchell's test and the non-confirmation of the default sphericity ($P > 0.05$), the Greenhouse-Geisser statistic was used.

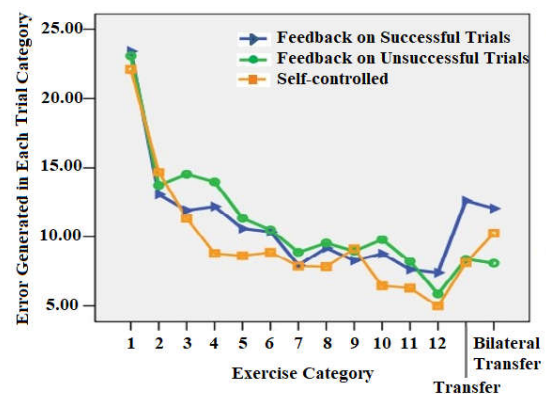


Figure 1. Mean absolute error of experimental groups in the acquisition, transfer, and two-way transfer stages.

Table 2. Results of the intra-group effects of variance analysis with repeated measures in the acquisition phase.

Statistical indicators Source of Changes	Squares Sum	Freedom Level	Squares Mean	F Value	P-Value	Effect Size
Training Blocks	7468.81	5.08	1469.41	28.66	0.001*	0.47
Block*Group Interaction	249.33	10.16	24.52	0.47	0.90	0.02
Group (Feedback)	234.41	2	117.20	2.14	0.13	0.11

Results of analysis of variance with repeated measurements at the acquisition phase (Table 2) show that the effect of training blocks is significant ($P \leq 0.001$), but feedback effect, the interaction effect of training blocks and feedback at acquisition phase were not significant ($P \geq 0.05$). This means

that although the groups have made significant progress in the acquisition of force control, this improvement occurred equally in all three groups and there was no significant difference between the groups in the acquisition of force control tasks.

Table 3. Results of one-way analysis of variance in two-way tests and two-way transfer.

Statistical indicators Source of Changes	Squares Sum	Freedom level	Squares Mean	F Value	P-Value	Effect Size
Inter-group	142.50	2	71.25	10.11	0.001*	0.38
Intra-group	90.67	2	45.33	4.25	0.02*	0.21
Error	225.53	32	7.04	-	-	-

The results of one-way analysis of variance in two-way transfer and transfer tests (Table 3) show that there is a statistically significant difference in both of two-way transfer test ($P = 0.02$) and transfer test ($P = 0.001$) between research groups Feedback on Successful Trials, Feedback on Unsuccessful Trials and Self-controlled feedback). The results of the Tukey post hoc test showed that both groups of feedback on successful trials and self-controlled feedback have the same performance and were

much better than the feedback on unsuccessful trials group ($P \leq 0.002$).

The results of the Tukey post hoc test in a two-way transfer test also showed that there was a significant difference only between the feedback group on the successful trial and the feedback group on the unsuccessful one ($P = 0.01$); no significant difference between other groups was observed ($P \geq 0.05$).

Discussion and Conclusion

The purpose of the present study was to investigate the impact of feedback on successful and unsuccessful attempts and self-control feedback on the two-way transfer of task control tasks. In other words, the present study sought to answer this question: Which of these three types of feedback can create more two-way transfer? The

findings of the present study showed that all three groups had significant improvement in the learning of force control during the acquisition phase. Also, progress in all three groups was almost the same and there was no significant difference between groups. No significant difference between the groups during the acquisition phase seems to depend on the directional and temporal effects of

feedback, as the directional effect of feedback is so strong that different feedback modes cannot demonstrate their superiority over each other during the acquisition phase. However, after a rest period and the elimination of temporary effects, the differences between groups will be better understood (Wulf, 2007). Therefore, the findings of the present study are in line with many of the researches conducted in this area, including the results of Chiviawsky and Wulf (2002, 2005 and 2007), Zeidabadi et al. (2010) and Fazeli Shoar et al. (2016). Wolf et al. (2005) also stated that there is no significant difference between the effects of self-controlled feedback and feedback with external control during the acquisition phase. Friedrich and Mandel (1997) stated that, from a cognitive perspective, self-control means more pressure on the learner because the sense of responsibility of the subject becomes greater in this way. Also, the learner in this feedback must control multiple decisions and degrees of freedom, which increases cognitive pressures and divides one's attention capacity between learning and self-control processes. Therefore, these contrasting effects of cognitive and motivational processes during the acquisition phase on the self-controlled learner, leading to a similar performance to the control group. The comparison of the groups in the transfer test also showed that the two groups of feedback on successful attempts and self-controlled feedback were significantly better in force control than the feedback group on unsuccessful attempts. It should be noted that the purpose of performing the pre-test of the two-way

transfer test, in addition to comparing the groups was to ensure that learning was performed in the non-superior hand. This finding is consistent with the results of Chiviawsky and Wolf (2002, 2007), Chiviawsky et al. (2009), Zeidabadi et al. (2010), Badami et al. (2011), and Ahmadi et al. (2011) who depicted that giving feedback after successful trials, in comparison with giving feedback after unsuccessful trials, causes better learning. Ilies & Judge (2005) also stated that Alice and Jage (2005) stated that subjects who receive positive feedback choose higher-level goals in comparison with the negative feedback, which enhances their learning and improves their motor performance. Feedback seems to play a role in successful efforts and improves the performance of the group by encouraging the learner to repeat the correct move (Chiviawsky & Wulf, 2007). On the other hand, the findings of the present study are inconsistent with the results of some studies that have shown that providing feedback after the poor trial is more effective for learning (Wright et al., 1997; Barney et al., 2007). The results of the present study are also inconsistent with the guidance hypothesis that states that feedback is important when there is an error in execution. The guidance hypothesis focuses explicitly on the information characteristics of feedback and underestimates the motivational effects of feedback, while motivational factors may be responsible for the superiority of feedback after successful attempts over ones after unsuccessful attempts. Since repeating a successful pattern of movement is probably easier than correcting the

pattern of error that was attempted in the previous trial, subjects appear to prefer feedback after successful attempts. (Chiviawosky et al., 2009; Chiviawosky & Wulf, 2007).

On the other hand, research results show that self-control subjects are more likely to seek feedback after their good efforts (Chiviawosky & Wolf, 2002). Therefore, self-control feedback facilitates learning for several reasons, including motivational factors, enhancing learner confidence and confidence in the ability to perform the task, actively engaging in the learning process, deepening information processing, and discovering motor strategies (Chiviawosky & Wolfe, 2002; And Wolf, 2005), as the combination of these factors has made this group superior to the feedback group in unsuccessful attempts.

Also, the results of the two-way transfer test showed that the mean error of all three groups in force control by the right hand (untrained) was significantly lower than the pre-test, which indicates a two-way transfer from the non-superior hand to the superior one. The hand is superior. Therefore, the results of the present study are in line with those of Kumar and Mandal (2005) and Liu and Wriesberg (2005), Haaland & Hoff (2003) and Stöckel and Weigelt (2012). The results of intergroup comparisons in the two-way transfer test to determine the role of three types of feedback (on successful attempts, on unsuccessful attempts and self-controlled feedback) in facilitating the two-way transfer process showed that a statistically significant difference exists only between two groups of feedback on successful attempts and

feedback on unsuccessful attempts and the superiority belongs to the group of feedback on successful attempts. These findings indicate that feedback on successful efforts leads to better learning, which is in line with the results of the studies of Chiviawosky and Wulf (2007), Badami et al. (2011), Ahmadi et al. (2011), Komeili et al. (2011) and Zeidabadi et al. (2010); this type of feedback also facilitates better two-way transfer. In the context of two-way transfer, cognitive explanation relies on the theory of elements such as Thorndike's assertion that what is transmitted is important cognitive information that is relevant to how it is done. The control explanation, referring to the intrinsic and extrinsic aspects of generalized motor program theory, and the fact that alteration in the muscles involved (as physical aspects) does not necessarily lead to altered motor program, suggests that the learned motor program causes movement by muscles which have not been involved in skill implementation. Hicks et al. (1983) also stated that at least some of the two-way transfer is accomplished by the transfer of the kinematic components of the task between the two hemispheres (cited by Magill and Anderson, 2007). Based on the findings of the present study, it appears that feedback on successful efforts is likely to make the group of feedback on successful efforts have a better performance with their untrained hand than another group; especially the group of feedback on unsuccessful trials; this work is done through facilitating the transfer of cognitive components of "what to do", helping to create a more efficient movement program, and creating

conditions for more motor component transfer through the corpus callosum between the two. Nieuwenhuis et al. (2005) stated that providing feedback to successful efforts increases motor skills learning by activating specific areas of the brain and engaging the subject more actively. Providing feedback after successful efforts, by demonstrating that the move is correct and encouraging repetition of the correct move, not only reduces unexpected changes and adjusts the pace of the movement (Chiviawosky & Wolf, 2007); but also increases the motivation of the subjects to select higher-level goals (Ilies & Judge, 2005). Therefore, it seems that a combination of these factors leads to more successful motivational learning and a two-way transfer in the feedback on the successful trial group. In addition to the above-mentioned points and given that feedback on successful trials is motivating (Chiviawosky et al., 2009), this motivation seems to have contributed to axonal guidance and has accelerated the transfer of cognitive and motor components through the corpus callosum and improved the performance of movement in the opposite hand. Based on the findings of the present study, it is suggested to educators and occupational therapists to improve the process of two-way transfer and individual learning by using feedback during successful training, especially when the athlete or patient is injured.

References

1. Hosseini, Seyyed Majbati; Sohrabi, Mehdi; Fouladian, Javad. (2014). "Evaluation of bilateral symmetry of cognitive and motor components in

Football foot kick". *Motor behavior.* (16). Pp. 180-169.

2. Fazeli Shoar, Maryam; Zeidabadi, Rasool; Estiri, Zahra. (2016). "The Role of Trait Anxiety in Feedback Effectiveness of Successful and Unsuccessful Efforts on Learning the Control of Task Force." *Studies in Sport Psychology.* No. 18, Volume 8, 182-165.

3. Ahmadi, P., Sabzi, H. A., Heirani, A., & Hasanvand, B. (2011). The effect of feedback after good, poor, good poor trials, and self-control conditions in acquisition and learning of force production task. *Facta Universitatis-series: Physical Education and Sport,* 9(1), 35-43.

4. Badami, R., Vaez Mousavi, M., Wulf, G., & Namazizadeh, M. (2011). Feedback after good versus poor trials affects intrinsic motivation. *Research quarterly for exercise and sport,* 82(2), 360-364.

<https://doi.org/10.1080/02701367.2011.10599765>

5. Bloom, J. S., & Hynd, G. W. (2005). The role of the corpus callosum in interhemispheric transfer of information: excitation or inhibition? *Neuropsychology Review,* 15(2), 59-71.

<https://doi.org/10.1007/s11065-005-6252-y>

6. Bund, A. (2007). The ambivalence of self-controlled (motor) learning: A model-guided psychological analysis. In *European Workshop on Movement Science-Book of Abstracts* (pp. 88-89). Sportverlag Strauß.

7. Barney, J. G., & Lee, T. D. (2007). Learning effects of self-controlled, best-trial, and worst-trial feedback schedules on an interception task. *Journal of Sport & Exercise Psychology,* 29.

8. Cote, P. C., & Patterson, J. (2007, February). Bilateral transfer of motor skills in dance. In *Research quarterly for exercise and sport* (Vol. 78, No. 1, pp. A15-A15). 1900 association drive, reston, va 22091 usa: amer alliance health phys educ rec & dance.

9. Chiviawosky, S., Wulf, G., Wally, R., & Borges, T. (2009). Knowledge of results after good trials enhances learning in older adults. *Research Quarterly for Exercise and Sport,* 80(3), 663-668.

<https://doi.org/10.1080/02701367.2009.10599606>

10. Chiviawsky, S., & Wulf, G. (2005). Self-controlled feedback is effective if it is based on the learner's performance. *Research quarterly for exercise and sport*, 76(1), 42-48.
<https://doi.org/10.1080/02701367.2005.10599260>
11. Chiviawsky, S., & Wulf, G. (2002). Self-controlled feedback: Does it enhance learning because performers get feedback when they need it? *Research quarterly for exercise and sport*, 73(4), 408-415.
<https://doi.org/10.1080/02701367.2002.10609040>
12. Chiviawsky, S., Godinho, M., & Tani, G. (2005). Self-controlled knowledge of results: Effects of different schedules and task complexity. *Journal of Human Movement Studies*, 49(4), 277-296.
13. Chiviawsky, S., & Wulf, G. (2007). Feedback after good trials enhances learning. *Research Quarterly for Exercise and Sport*, 78(2), 40-47.
<https://doi.org/10.1080/02701367.2007.10599402>
14. Du Toit, P. J., Kruger, P. E., De Wet, K. B., Van Vuuren, B. J., Joubert, A. M., Lottering, M. L., & Van Wyk, G. J. (2006). Transfer effects of eye-hand co-ordination skills from the right to the left cerebral hemispheres in South African schoolboy rugby players. *African Journal for Physical, Health Education, Recreation and Dance (AJPHRD)* 12(1):41-49.
<https://doi.org/10.4314/ajpherd.v12i1.24707>
15. Guadagnoli, M. A., & Kohl, R. M. (2001). Knowledge of results for motor learning: relationship between error estimation and knowledge of results frequency. *Journal of motor behavior*, 33(2), 217-224.
<https://doi.org/10.1080/00222890109603152>
16. Haaland, E., & Hoff, J. (2003). Non-dominant leg training improves the bilateral motor performance of soccer players. *Scandinavian journal of medicine & science in sports*, 13(3), 179-184.
<https://doi.org/10.1034/j.1600-0838.2003.00296.x>
17. Ilies, R., & Judge, T. A. (2005). Goal regulation across time: the effects of feedback and affect. *Journal of applied psychology*, 90(3), 453.
<https://doi.org/10.1037/0021-9010.90.3.453>
18. Kumar, S., & Mandal, M. (2005). Bilateral transfer of skill in left-and right-handers. *Laterality: asymmetries of body, brain, and cognition*, 10(4), 337-344.
<https://doi.org/10.1080/13576500442000120>
19. Komeili, R. Vaez Mosavi, S.M., and Aslankhani, M.A. (2011). "Comparing the effects of self-determined vs prespective feedbacks on accuracy and consistency of performance in a linear movement task ". *International conference of sports science and recreation (ICSST, 2011)*.
20. Liu, J., & Wrisberg, C. A. (2005). Immediate and delayed bilateral transfer of throwing accuracy in male and female children. *Research quarterly for exercise and sport*, 76(1), 20-27.
<https://doi.org/10.1080/02701367.2005.10599258>
21. Magill, R. A., & Anderson, D. I. (2007). *Motor learning and control: Concepts and applications* (Vol. 11). New York: McGraw-Hill.
22. Morton, S. M., Lang, C. E., & Bastian, A. J. (2001). Inter-and intra-limb generalization of adaptation during catching. *Experimental Brain Research*, 141(4), 438-445.
<https://doi.org/10.1007/s002210100889>
23. Nieuwenhuis, S., Slagter, H. A., Geusau, V., Alting, N. J., Heslenfeld, D. J., & Holroyd, C. B. (2005). Knowing good from bad: differential activation of human cortical areas by positive and negative outcomes. *European Journal of Neuroscience*, 21(11), 3161-3168.
<https://doi.org/10.1111/j.1460-9568.2005.04152.x>
24. Noguchi, T., Demura, S., Nagasawa, Y., & Uchiyama, M. (2009). Influence of measurement order by dominant and nondominant hands on performance of a pursuit-rotor task. *Perceptual and motor skills*, 108(3), 905-914.
<https://doi.org/10.2466/pms.108.3.905-914>
25. Stoeckel, T., Hartmann, C., & Weigelt, M. (2007). Effects of bilateral practice on the acquisition of complex sport skills: A basketball study with school children. *ZEITSCHRIFT FÜR SPORTPSYCHOLOGIE*, 14(3), 130-135.
<https://doi.org/10.1026/1612-5010.14.3.130>
26. Stöckel, T., Weigelt, M., & Krug, J. (2011). Acquisition of a complex basketball-dribbling task in school children as a function of bilateral practice order. *Research Quarterly for Exercise and Sport*, 82(2), 188-197.
<https://doi.org/10.1080/02701367.2011.10599746>

27. Stöckel, T., & Weigelt, M. (2012). Brain lateralisation and motor learning: Selective effects of dominant and non-dominant hand practice on the early acquisition of throwing skills. *Laterality: Asymmetries of Body, Brain and Cognition*, 17(1), 18-37.
<https://doi.org/10.1080/1357650X.2010.524222>
28. Salmoni, A. W., Schmidt, R. A., & Walter, C. B. (1984). Knowledge of results and motor learning: a review and critical reappraisal. *Psychological bulletin*, 95(3), 355.
<https://doi.org/10.1037/0033-2909.95.3.355>
29. Schmidt, R. A. (1991). Frequent augmented feedback can degrade learning: Evidence and interpretations. In *Tutorials in motor neuroscience* (pp. 59-75). Springer Netherlands.
https://doi.org/10.1007/978-94-011-3626-6_6
30. Schmidt, R. A., & Lee, T. D. (2005). *Motor control and learning* 4th ed, 207-242.
31. Weeks, D. L., Wallace, S. A., & Anderson, D. I. (2003). Training with an upper-limb prosthetic simulator to enhance transfer of skill across limbs. *Archives of physical medicine and rehabilitation*, 84(3), 437-443.
<https://doi.org/10.1053/apmr.2003.50014>
32. Wulf, G. (2007). Self-controlled practice enhances motor learning: implications for physiotherapy. *Physiotherapy*, 93(2), 96-101.
<https://doi.org/10.1016/j.physio.2006.08.005>
33. Wulf, G., Raupach, M., & Pfeiffer, F. (2005). Self-controlled observational practice enhances learning. *Research Quarterly for Exercise and Sport*, 76(1), 107-111.
<https://doi.org/10.1080/02701367.2005.10599266>
34. Wulf, G & Shea, C.H. (2002). "Principles derived from the studies of simple motor skills do not generalize to complex skill learning". *Psychonom Bull Rev* 9, PP:185-21.
<https://doi.org/10.3758/BF03196276>
35. Wright, D. L., Smith-Munyon, V. L., & Sidaway, B. (1997). How close is too close for precise knowledge of results? *Research Quarterly for Exercise and Sport*, 68(2), 172-176.
<https://doi.org/10.1080/02701367.1997.10607994>
36. Zeidabady, R., Amery, E. A., Sheikh, M., & Motesharreyi, M. E. (2010, July). Comparison Feedback after Good and Poor Trials in Self-Control and Instructor-Control Condition in Acquisition and learning of Force-Production Task. In *JOURNAL OF SPORT & EXERCISE PSYCHOLOGY* (Vol. 32, pp. S138-S138).