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Effect of attentional –focus of feedback and goal setting on learning of basketball set shot

Mir Hamid SALEHIAN, Amir Ghiami Rad, Jaafer BARGHI MOGHADDAM , Parvaneh IMANI and Saeed FAZLOLLAHI

Department of Physical Education, Tabriz branch, Islamic Azad University, Tabriz , Iran

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ABSTRACT

The purpose of this study was to determine the effect of frequency of feedback (internal and external) with goal setting intervention (coach setting and self- setting) for university male basketball beginners participating on learning of basketball set shot. 120 right handed male students by average 18-30 years with no knowledge of basketball were chosen randomly and by pretest shot set, matched into eight experimental groups: %50 Internal feedback with coach setting, %100 Internal feedback with coach setting, %50 External feedback with coach setting, %100 External feedback with coach setting, %50 Internal feedback with self- setting, %100 Internal feedback with self- setting, %50 External feedback with self- setting, %100 External feedback with self- setting one, each shooting a total of 10 shot after the pretest, 10 sessions of practice an acquisition test, a day off a retention test and transfer test was conducted a week later for each group. Data was analyzed by variance of 2 × 2 × 2 combined design. To compare the pre-test, acquisition, retention and transfer of variance with repeated measurements, Bonferroni test was used in case of significant differences between groups. By analyzing the proposed hypotheses at the P ≥0.05 demonstrated significant differences between frequency of internal and external with goal setting ones. The eight practice conditions suggesting that frequency of feedback (internal and external) with goal setting intervention (coach and self-setting) do not have significantly effect on acquisition and retention of basketball set shot, but significantly effect on transfer test. In this particular study, external focus of attention along with coach setting was found to be more effective than an internal focus of attention with self -setting. These results suggest that the performance in basketball set shot is enhanced by external focus attention with coach setting. The present findings add to the evidence that external focus of attention with goal setting improves sport skills learning.

Key Words: Absolute feedback, frequency feedback, extrinsic attention, intrinsic attention, Goal setting

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INTRODUCTION

A motivational tool that coaches believe improves performance of athletes is performance feedback [32]. Feedback (Knowledge of Result) has been the focus of a large body of research [1, 29] and has been central to the study of motor learning and human performance [22]. It refers to augmented feedback that comes from an external source (e.g., coach) and provides the athlete with information about the outcome of a performed skill [22, 31]. A number of studies have shown the effectiveness of motor skill learning can be enhanced considerably if the learner is given at least some control over the practice conditions [64]. One consensus in the motor behavior literature is that some amount of KR is necessary for the learning of a new motor response [22, 28, 32, 34]. The case recently investigated about the augmented feedback is the role of kind of feedback attention [35, 58]. In a number of studies conducted in the past few years, the effectiveness of instructions in motor skill learning has been found to depend largely on the focus of attention they induce [54, 53, 52, 61]. Specifically, giving learners instructions that refer to the coordination of their body movements—as is typically done in teaching motor skills—has not been shown to be optimal for learning. When instructions that induced such an internal focus of attention were compared with instructions that directed the learners' attention to the effects of their movements on the environment (apparatus, implement), thereby inducing an external focus, the latter type of instructions were consistently shown to produce more effective learning. The benefits of adopting an external focus are not only seen relative to internal focus conditions, but also in comparison to control conditions without specific focus instructions [59, 55, 17, 23]. Some researchers believed that providing KR during the acquisition of a skill (external feedback) had more influence than the subject's inherent information itself, [6, 52, 55, 57]. This suggests that an external focus enhances performance and learning, presumably because individuals are inclined to adopt an internal focus even when they are not explicitly instructed to do so. But how this information will attract the persons' attention to the optimum use of information and appropriate feedback depends on the type of its emphasis on self-movement (the internal) or the result of motion (the external) [33]. Most results about the role of attention by the type of feedback showed the external attention is more effective than internal attention [10, 24, 55, 59, 60, 66]. Although some research results have failed to note the difference between the two types of internal and external one [8 ,15].

Frequency of the external and internal feedback are another matter that is felt a need to be done. Some research except Wulf et al. (2002), were considered significantly reduced the frequency of feedback on learning of motor skills. Their result showed that in internal group, reduced of feedback frequency, leads to better learning, while in external feedback the effect is not shown. The majority of KR studies have primarily focused on the relative frequency with which KR is given to the learner, but some studies showed the high frequency of feedback provides better results; for example, Kohl and Guadagnoli (1996) carried out a research with three experimental groups found the retention of the first group (100% of KR) was better than the retention of the second group (50% of KR). Wulf at al. (1998) studied the influence of the KR frequency on learning the complex skill of skiing slalom found out that the group with 100% of KR had a better performance than the group with 50%, and group with 0% during retention tests without KR. Guadagnoli at al. (2002) compared the effect on acquisition and retention of a linear-positioning task with time requirement and two different frequencies of KR (20% and 100%), both in healthy subjects and in Parkinson's patients with clear proprioception difficulties (use of

internal feedback). The results showed that the healthy subjects of the group with the reduced frequency obtained better values in the retention stage than the healthy subjects of the group with 100% of KR; on the other hand, the Parkinson's patients did not follow the same trend, since, both during the acquisition and retention stages, the group with a 100% was better than the one with 20% of KR.

Another factor affecting the performance and learning athletic skills, is goal setting. Goal setting alone has been used as a motivational approach to enhance performance in industrial/organizational settings [19, 42] and has also been shown to be an effective motivator for improving performance in the sport setting [22]. It can be defined as understanding some favorable results and planning a series of actions to achieve those done by the motivation and focus the persons' attention to skills [12]. Goal setting is necessary to maintain or strengthen or increase motivation and evaluating research findings about goal setting, has been shown its positive effects on enhancing athletic performance skills such as basketball, tennis, bowling and ..... [5, 12, 32, 38, 39], but some studies have shown that different conditions of goal settings give different effects on the performance of athletic and motor skills [12, 18, 36]. Albright at al. (2005) utilized a goal-setting intervention to examine adherence and performance in 58 sedentary women. Results showed the "specific goal" group (10,000 steps per day) had significantly greater daily step count and significantly greater adherence to achieving their daily step count compared to the "vague goal" group (30 minutes walking most days of the week). Correa at al. (2006) examined the effects of different types of goal setting on motor skill acquisition during advanced stages of learning in 44 female volleyball players in four experimental training groups with generic goals, specific long-term goals, specific short-term goals, and as a control group. Analyses yielded no significant differences among groups, although performance increased from pre- to retention test.

Type of feedback attention and goal setting both have been studied in the various investigations separately, but few have considered the combining effects of both on sport skills. Sport theorists and researchers have suggested combining KR with goal setting to enhance athletic performance and skills of various sports such as tennis, bowling, basketball, sit up, grip strength and other physical activities [5, 11, 19, 22, 31, 39, 44, 45] and Schmidt has considered goal setting and feedback integration are much important in learning skills in sports, and emphasizing that combining of these two states can be contributed to the coaches and physical education teachers to promote more reveal the level of athletic skills. Researchers agree that it is important to continue investigations into goal setting so as to better understand how it operates in sport settings and how it influences performance in different sports [46]. Wolko at al. (1993) addressed the combined use of KR and goal setting in sport and suggested a general motivational system that includes components of behavior recordings, displaying KR, specific performance goal setting, and rewarding goal attainment .Feedback in the form of positive reinforcement has been shown to be most effective when it is directly tied to a behavior, delivered quickly, and coupled with goal setting [41].

Brobst at al. (2002) evaluated the effects of public posting, goal setting, and oral feedback on the skills of 3 female high school soccer players during practice scrimmages. Results indicated that the intervention was effective in improving performances during practice scrimmages but produced limited generalization to game settings. Timothy at al. (2006) suggested that goal

setting and timely feedback will lead to improved work performance, greater efficiency, and the establishment of more challenging goals. Wilson and Brookfield (2009) utilized a goal-setting intervention to examine the impact on motivation and adherence of three groups (a process goal group, an outcome goal group and a no-goal control group) during a six-week exercise program. Results indicated that the participants in the process goal group scored significantly higher interest/enjoyment and perceived choice, significantly lower pressure/tension, and had significantly greater adherence compared to the outcome goal and control groups.

In order to complete the previous findings we decided to examine the influence of combined types (internal or external) and feedback frequency (50% or 100%), with goal setting (coach setting and self- setting) on learning of basketball set shot in university male basketball beginners to find whether combining of these two techniques would be effective on improving beginners performance of sports skills or which method can be used in students education and Which amount of influence of the practices is better in sport skills.

MATERIALS AND METHODS

One hundred and twenty university male students (age 18-30 years), with no knowledge of basketball shooting participated in this study. They were not aware of the specific purpose of the study. All participants signed an informed consent form before the experiment. The task involved was the throwing ball toward basket from penalty line in basketball. The goal of the movement was to score the results of throwing under eight conditions. The participants were assigned randomly to one of eight experimental groups (n=15) based on their pre-test scores of 10 shooting. The eight matched groups were assigned one of eight practice conditions. All participants followed the same warm up prior to each day's practice and the shooting practice was done immediately following the five minute warm up period. On the first day of the study, all participants received the same initial instructions regarding the basket (external with 50% and 100%) with coach and self-setting and wrist (internal with 50% and 100%) with coach and self-setting. This occurred during the ten consecutive sessions of practice, but no feedback during the acquisition, retention and transfer test. Following the ten practice sessions immediately participants performed an acquisition test and after a day of rest, retention test; after a week a transfer test consisting of 10 trials with 10 seconds rest between each trial under eight conditions: 1) %50 Internal feedback with coach setting, 2) %100 Internal feedback with coach setting, 3) %50 External feedback with coach setting, 4) %100 External feedback with coach setting, 5) %50 Internal feedback with self- setting 6) %100 Internal feedback with self- setting, 7) %50 External feedback with self-setting, 8) %100 External feedback with self- setting. Testing took place in a controlled environmental conditions similar across subjects.

In order to determine the results, participants threw the ball from penalty line toward basket and scores were recorded for each trial. Descriptive statistics were calculated to report the mean performance of the eight practice groups for the acquisition, retention and transfer test scores. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 16. The criterion for significance was set using an alpha level of $p \leq 0.05$. Data was analyzed by variance of $2 \times 2 \times 2$ combined design. To compare the pre-test, acquisition, retention and transfer of variance with repeated measurements, Bonferroni test was used in case of significant differences between groups.

RESULTS

Table 1. Effect of Attentional-focus of Feedback and Goal Setting on acquisition test

Sources	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	429.21*	9	53.65	27.38	.000	.66
Intercept	3618.29	1	3618.29	1846.99	.000	.94
Pre-test	4.68	1	4.68	2.39	.12	.02
Frequency	.008	1	.008	.004	.95	.000
Feedback	320.32	1	320.32	163.51	.000	.59
Goal setting	66.31	1	66.31	33.84	.000	.23
Frequency * Feedback	13.33	1	13.33	6.8	.01	.05
Frequency * Goal setting	.03	1	.03	.01	.90	.000
Feedback * Goal setting	11.57	1	11.57	5.91	.01	.05
Frequency * Feedback* Goal setting	1.41	1	1.41	.72	.39*	.00
Error	217.45	111	1.95			
Total	160.6	120				
Corrected Total	646.66	119				

R Squared= .66 (Adjusted R Squared= .63)

As shown in table 1, p=.39 ≤ p=.05, so there is not significant difference among type of feedback, frequency of feedback and goal setting in all experimental groups during the acqusition test.

Table 2. Effect of Attentional-focus of Feedback and Goal Setting on retention test

Sources	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	392.37	9	49.04	31.59	.00	.69
Intercept	2945.95	1	2945.95	1897.96	.00	.94
Pre-test	6.91	1	6.91	4.45	.03	.03
Frequency	.63	1	.63	.4	.52	.00
Feedback	.256.71	1	256.71	165.39	.00	.59
Goal setting	97.03	1	97.03	62.51	.00	.36
Frequency * Feedback	.00	1	.00	.00	1	.00
Frequency * Goal setting	.6	1	.60	1	.53	.00
Feedback * Goal setting	22.65	1	22.65	.38	.00	.11
Frequency * Feedback* Goal setting	.14	1	.14	14.59	.76*	.00
Error	172.29	111	1.55	.09		
Total	13378	120				
Corrected Total	564.66	119				

R Squared= .69 (Adjusted R Squared= .67)

As shown in table 3, p=.76 ≥ p=.05, so there is not a significant difference among type of feedback, frequency of feedback and goal setting in all experimental groups during the retention test.

Table 3. Effect of Attentional-focus of feedback and Goal Setting on Transfer Test

Sources	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	375.80*	9	46.97	59.48	.00	.81
Intercept	2245.09	1	2245.09	2842.92	.00	.96
Pre-test	.475	1	.475	.60	.44	.00
Frequency	1.132	1	1.13	1.43	.234	.01
Feedback	248.86	1	248.86	315.13	.00	.74
Goal setting	86.83	1	86.83	109.96	.00	.49
Frequency * Feedback	4.80	1	4.8	6.07	.01	.05
Frequency * Goal setting	1.32	1	1.32	1.67	.19	.01
Feedback * Goal setting	13.69	1	13.69	17.34	.00	.13
Frequency * Feedback* Goal setting	6.88	1	6.88	8.72	.004	.07
Error	87.65	111	.79			
Total	9686	120	46.97			
Corrected Total	463.46	119	2245.09			

R Squared= .81 (Adjusted R Squared= .79)

As shown in table 3, p=.004 ≤ p=.05, so there is a significant difference among type of feedback, frequency of feedback and goal setting in all experimental groups during the transfer test.

The analysis revealed no significant difference among type of feedback, frequency of feedback and goal setting in all experimental groups during the aquisition (p=.39 ≤ p=.05), and retention test (p=.76 ≥ p=.05) (table 1 and 2). The analysis revealed significant difference among type of feedback, frequency of feedback and goal setting in all experimental groups during the transfer test, (p=.004 ≤ p=.05) (table 3).

Table 4 presents the mean differences and standard deviations for all of the variables measured in the present study. Values are given for all 8 experimental groups as a whole. The Transfer mean scores on each 8 experimental groups are shown in Table 4 by Bonferroni test. Some important results were revealed in this research as below:

1) There is a significant difference among %50 External feedback with coach setting than %50 Internal feedback with coach and self-setting, %50 External feedback with self-setting and %100 External and Internal feedback with self- setting in transfer test.
2) There is a significant difference among %100 External feedback with coach setting than %50 and %100 Internal feedback with coach and self- setting and %50 and %100 External feedback with self- setting.
3) There is a significant difference among %100 Internal feedback with coach setting than %50 and %100 Internal feedback with self- setting in transfer test.
4) There is a significant difference among %100 External feedback with self- setting than %50 Internal feedback with coach setting, %50 and %100 Internal feedback with self- setting in transfer test.

Table 4. Between group Differences in Transfer Test by Bonferroni

Groups Groups		Means differences	Std. Error	Sig.	%95 Confidence Interval	
					Lower Bound	Upper Bound
2	1	-.86	.32	.24	-1.99	.17
3		-4.46*	.32	.00	-5.50	-3.43
4		-3.60*	.32	.00	-4.63	-2.56
5		.04	.32	1	-.63	1.43
6		.86	.32	.24	-.17	1.9
7		-1.8*	.32	.00	-2.38	-.76
8		-1.46*	.32	.00	-2.5	-.43
2	1	.86	.32	.24	-.17	1.9
3		-3.60*	.32	.00	-4.63	-2.56
4		-2.73*	.32	.00	-3.77	-1.69
5		1.26*	.32	.00	.23	2.3
6		1.73*	.32	.00	.69	2.77
7		-.93	.32	.13	-1.97	.1
8		-.60	.32	1	-1.63	.43
3	1	4.46*	.32	.00	3.43	5.5
2		3.60*	.32	.00	2.56	4.63
4		.86*	.32	.24	-.17	1.9
5		4.86*	.32	.00	3.83	5.9
6		5.33*	.32	.00	4.29	6.37
7		2.66*	.32	.00	1.63	3.7
8		3.00*	.32	.00	1.96	4.03
4	1	3.60*	.32	.00	2.56	4.63
2		2.73*	.32	.00	1.69	3.77
3		-.86	.32	.24	-1.9	.17
5		4*	.32	.00	2.96	5.03
6		4.46*	.32	.00	3.43	5.5
7		1.8*	.32	.00	.76	2.83
8		2.13*	.32	.00	1.09	3.17
5	1	-.4	.32	1.00	-1/43	.63
2		-1.26*	.32	.00	-2/0	-.23
3		-4.86*	.32	.00	-5/90	-3.83
4		-4*	.32	.00	-5/03	-2.96
6		.46	.32	1.00	-0/57	1.5
7		-2.2*	.32	1.00	-3/23	-1.16
8		-1.86*	.32	.00	-2/90	-.83
6	1	.86	.32	.24	-1.9	.17
2		-1.73*	.32	.00	-2.77	-.69
3		-5.33*	.32	.00	-6.37	-4.29
4		-4.46*	.32	.00	-5.5	-3.43
5		-.46	.32	.00	-1.5	.57
7		-2.66*	.32	1.00	-3.7	-1.63
8		-2.33*	.32	.00	-3.37	-1.29
7	1	1.8	.32	.00	.76	2.83
2		.93	.32	.13	-.10	1.97
3		-2.66*	.32	.00	-3.70	-1.63
4		-1.80*	.32	.00	-2.83	-.76
5		2.20*	.32	.00	1.16	3.23
6		2.66*	.32	.00	1.63	3.70
8		.33	.32	1.00	-.70	1.37
8	1	1.46*	.32	.00	.43	2.5
2		.6	.32	1.00	-.43	1.63
3		-3*	.32	.00	-4.03	-1.96
4		-2.13*	.32	.00	-3.17	-1.09
5		1.86*	.32	.00	.83	2.90
6		2.33*	.32	.00	1.29	3.37
8		-.33	.32	1.00	-1.37	.70

DISCUSSION

The purpose of this investigation was to determine the effect of attentional-focus of feedback and goal setting on learning of basketball set shot. For that purpose, we selected feedback statements in eight experimental groups, the basketball free shot to compare the effects of frequency of internal- focus feedback that refer to the performer's body movements and external-focus feedback that refer to the basket combined with two different goal setting (coach and self-setting). The most important result of this investigation was, both the %50 and 100% KR frequency of external focus with coach setting had a significant difference in transfer test. Some information processing perspectives counter the suggestion that 100% KR frequency will maximize learning effects. In fact, recent views suggest that to some extent, when a high KR frequency is provided to the learner, some KR statements serve to guide the upcoming responses.

This view has been referred to as the *"guidance hypothesis"* [29, 30]. The guidance hypothesis implies that when participants receive a high KR frequency during acquisition, they fail to use additional memory processes, or seek additional information sources, that further contribute to memory development. In contrast, when participants are provided a lower KR frequency, this lower frequency encourages the engagement of additional memory processes during the no-KR trials. These additional memory processes, in turn, promote memory development. Therefore, based on recent perspectives of KR utilization for motor learning [30] it is predicated that a KR frequency of something less than 100% will maximize learning effects. In fact, the guidance hypothesis has been applied to transfer and/or retention results from many KR experiments investigating reduced KR frequency during acquisition [50], summary KR [30, 31], and averaged summary KR [68]. However, results from this research examining the influence of continuous concurrent feedback have not supported the guidance hypothesis, and it against the hypothesis if a high KR frequency is provided to the learner, motor learning is attenuated [30, 32]. This is especially true with participants who have had some experience with the criterion response, or under conditions in which the to-be-learned response is very simple [13] or with more complex tasks [13, 53]. For example, Lai and Shea (1999) compared a 100% KR frequency group to groups equated in their reduced frequency of KR, but differing in their KR schedules. The results showed that the reduced frequency groups did not differ from each other, but on the contrary, Badets at al. (2006) found subjects who received half the KR show greater stability in the results in the retention phase after learning.

On the other hand, when concentrating on the movements themselves, performers appear to actively intervene in the control processes, resulting in degraded performance and learning. The advantages of focusing on the outcome of one's movements might not only be important with respect to the instructions provided but might also have implications for the feedback given to the learner [35]. The predominant explanation for the attentional focus effects centers on the idea that an internal focus induces conscious control and constrains the motor system, whereas an external focus promotes automaticity in movement control *''constrained action hypothesis"* [62]. Support for this notion has been provided in previous studies [24,62]. This assumption implies that an external focus leads to a more advanced stage of learning sooner – in which performance is not only more effective, but in which movement efficiency is enhanced as well [53]. It is also interesting to note that although the emphasis is not on actual technique, players "do not need direct references to their body movements in order to acquire the correct technique" [59]. Prinz's "*action effect hypothesis*" (1997) suggests that for actions to be effective, movements need to be planned in terms of their intended outcome and the attention focused on the intended outcome of the performance of a skill will be more effective than attention focused on one's own movements. The results of this study supported those two hypotheses that an external focus was more effective than an internal focus in learning of basketball shooting. This finding appears to be parallel to several studies exploring the benefits of an external focus, including, the basketball free throw [2], the standing soccer shot and volleyball serve [59], the golf pitch shot [54].

Another factor affecting in this research was the combination of goals and KR. As some studies show both can affect self-regulation of effort and persistence by informing the individual as to the discrepancy between the goal and the performance indicated by the feedback [9]. Feedback can directly affect the choice of specific behaviors. This evaluative information is not present in goal setting without feedback. Therefore, both outcome and process feedback may add value in confirming present strategies [25]. Goals affect performance by directing attention, mobilizing effort, increasing persistence, and motivating strategy development. Goal setting is most likely to improve task performance when the goals are specific and sufficiently challenging, the subjects

have sufficient ability, feedback is provided to show progress in relation to the goal, the experimenter is supportive, and assigned goals are accepted by the individual [21]. There was improvement in learning of basketball shooting in all groups, but so much in External with coach settings were shown. As it was no any significant difference in acquisition and retention test, but a significant one in transfer test. This finding appears to be parallel to several studies exploring the benefits of combining KR with goal setting to enhance athletic performance [4, 10, 22, 42, 51].

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