

Effects of Internal, External and Preference of Attentional Focus Feedback Instructions on Learning Soccer “Head Kick”

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ABSTRACT

The aim of this study was to investigate the effects of different types of feedback on learning soccer “head kick” of female adolescent. Novices performed head kick during two practice days (one week apart) for two weeks using either internal or external preference attentional focusing instructions. There was also a preference group who chooses their feedback type themselves. Internal focus feedback related with body movements, whereas external focus feedback related with movement effects. The subjects (N=64) were randomly assigned to three groups internal focus feedback group (IFF) (N=15), external focus feedback group (EFF) (N=15) and preference group (PF) (N=34). To promote learning two skill acquisition days for two weeks and one retention day was applied at initial day of third week. Technique of the skill was measured in acquisition days and targeting was measured in retention day. In technique measuring part, EFF group was significantly more accurate than IFF group, PF group was better than those two groups (PF>EFF>IFF). Similar to acquisition phase, EFF group was significantly more successful than IFF group, PF group was better than those two groups (PF>EFF>IFF) in retention phase. Acquisition and retention phase results indicated significant main effect for attentional focus feedback groups. This study results’ indicated that external focus feedback was more effective than internal focus feedback in terms of acquisition and retention of learning soccer head kick for students with limited amount of knowledge about this skill. This study also indicated that not only the source of attention but also control over to source of attention of preference was an important factor in the amount of retention.

Key words: Attentional Focus, Internal Focus, External Focus, Feedback, Motor Skill, Soccer, Head Kick.

Introduction

Attention in human performance relates to the characteristics associated with consciousness, awareness, and cognitive effort as they relate to the performance of skills. Attention can be influenced in many ways. Focus is a related term and can be thought of as the direction of one’s attention to the performance environment or to the activity¹.

“Smart” motor system supported by Wulf et al. states that motor system optimizes the control processes based on environmental outcomes and movement effects². Regarding this suggestion, Wulf and colleagues^{3,4,5} propose the *constrained action hypo-thesis* suggesting that an internal focus of attention directs individuals consciously to control their movements. This approach directly constrains the motor system by disrupting normally automatic control processes. Furthermore, an external focus, states more effective movements through more automatic control of movement processes. Several lines of evidence provide support for this theory. For example, in the study by Wulf participants balancing on a stabilometer with an external focus not only showed more effective balance performance but also faster probe reaction times, compared to participants with an internal focus⁶. Faster probe reaction times are seen as an indication of reduced attentional demands of the primary (balance) task, or greater automaticity⁷. Thus, an external focus appears to speed the learning process, resulting in higher performance levels and automatic control sooner⁸.

Some studies have previously shown that the type of information emphasized in the verbal instructions provided to individuals can significantly affect learning and following movement performance as a function of the direction of attentional focus. Particularly, it has been consistently shown that instructions with external focus of attention result with better movement execution and also better learning when it is compared to instructions with internal focus of attention^{8,9}. Such findings have been observed in sport skills^{10,11,12,13,14,15,16}.

Essentially there are two types of feedback in motor skill learning, knowledge of performance (KP) and knowledge of results (KR). KP is similar to internal-focus feedback in that statements are given to the learner such as “feet should be shoulder width apart” and “weight on the balls of your back” as in soccer. KR is similar to external-focus feedback in which the learner is given statements that refers to the result produced by the motor skill as in a head kick. Too much KP encourages the learner to focus on his/her own movements and can lead to detriments in motor skill learning. However, it is possible that frequent KR could be used to enhance motor performance if it induces an external focus of attention. Results of the study have shown that if learners receive knowledge of results feedback relative to their movement effects rather than to knowledge of performance they may learn a motor skill more effectively⁵.

The generalizability of the external focus advantage is further demonstrated by the fact that the effects have not only been shown for young, healthy adults, but also for children¹⁷.

In her study Thorn¹⁷ aimed to examine balance performance and learning in 9-12 year old children using internal and external focus of attention strategies. Results introduced that subjects who had chosen external focus feedback performed better in balance performance and learning than subjects who used internal focus feedback¹⁷.

The advantages of an external focus over an internal focus have been demonstrated in every sport context tested, thus it seems logical for instructions and feedback in any sport to direct the performer's attention to the environment or effects of the movement and not the body itself.

The studies reported demonstrate that it is important for coaches, instructors, and athletes to understand the significant effect that instructions and feedback can have on performance and learning. Also important to realize is that this effect is not only seen in more simple and basic skills such as balance but in more complex skills requiring the control of multiple muscles and several degrees of freedom. This has been specifically shown in some of the more popular sports of golf, basketball, soccer, and volleyball⁶.

The present study adds to this discussion by assessing instructional preference of novices, and the influence of such preferences on subsequent learning and performance. If Preference for specific types of attentional instruction found, this may interfere with the effectiveness of a teaching way being used and may also reflect the type of information novices are presently comfortable with. In addition, it is also very important to use specific strategies which is most useful for novices in terms of instructional information.

This study investigated effects of external focus, internal focus and preference of attention source on young girls on a novel task. Main aim was to analyze those effects on preference group which had not been analyzed yet on this special age group.

Based upon previous researches results', it is hypothesised that an external focus will be beneficial to novice's head kick performance, regardless of preference. In addition, participants will be more likely to prefer the external rather than the internal attentional focusing instructions.

Method

Sixty-four participants (64 females) took part in the present study. The mean age was 14.10 (SD = 3.78, range = 12-15). Participants were all secondary school students and they were not educated about soccer. Researcher informed the participants about procedure and aim of the study.

Apparatus and Task

The head kick in soccer was used as a task. The experiment was conducted in a garden of schools. The video camera was used to record all of the practices and retention kicks. The ball, which was used during the practices and retention test was size 4 regular ball. This size of ball's weight is 384 gram.

To examine the technique "Criteria for Movement form Evaluation" sheet which included nine criteria, was used. This form was adapted from Wulf et al., 2002 study and statements converted to soccer according to features of head kick. Two experiment trainers supported and approved the criterias of evaluation form.

Procedure and Design

There were two days of practice to teach performing the head kick in soccer. Moreover, participants' learning levels were evaluated after three weeks of the first practice day which is called retention day. To evaluate effects of the internal (n=15) – external (n=15) focus attention feedback, two groups formed. Also to determine effects of preference (n=34) of attentional focus feedbacks, an additional group was formed.

Instructions were given the participants before each practice day and the environment was adapted to warm up sufficiently. Criteria sheet has nine items. The suitable points were marked every second trial of 12 trials by. So there were six criteria sheets for each participant for each day.

The experiment was conducted in a garden of schools, which was suitable for soccer players, or sport saloons of school. The distinct of the line between instructor and participant was 3 meters due to participants' age and their physical features.

For the retention day measurement, the place was marked with colored tape, within 4 meter distance between instructor and participant. To measure kicking ability of participants 1x1 meter cardboard was designed. This cardboard had circles that they drew by the multiple of soccer ball's radius.

Statistical Analysis

The acquisition data were analyzed using a 3 (group) x 6 (Blocks) mixed design repeated measure analysis of variance with repeated measures on trial block factor. Each acquisition block was consisted of 2 individual trials. Retention trial data were analyzed using a 3 (group) x 2 (Blocks) mixed analysis of variance with repeated measures on trial block factor. Paired sample t-test was used as a follow up test to the mixed design repeated measure ANOVA. Significance level of $p < .05$ was set for all statistical tests.

Results

Acquisition Scores

The scores achieved by each of the three groups during the practice days can be seen in figure 1. IFF group was performed the lowest score at the first block and highest score at the 5th block. EFF group was performed the lowest score at the first block and highest score at the 6th block. PFF group was performed the lowest at the first block highest score at the 4th block.

Acquisition phase 3 (Group) x 6 (Blocks) mixed design repeated measure analysis of variance results produced significant main effect for block, Wilks' Lambda = .131, $F_{(5, 295)} = 77.022$, $p < .05$, $\eta^2 = .538$ which is a moderate effect according to the Cohen¹⁸, the amount of 54 % variance accounted for block effect. Block x group interaction also produced significant effect, Wilks' Lambda = .36, $F_{(10, 295)} = 13.245$, $p < .05$, $\eta^2 = .362$ which is a moderate effect according to the Cohen, the amount of 36 % variance accounted for block x group effect. The results also showed significant main effect for groups, Wilks' Lambda = .131, $F_{(1, 62)} = 32.93$, $p < .05$, $\eta^2 = .765$ which is a large effect according to the Cohen, the amount of 77 % variance accounted for groups effect.

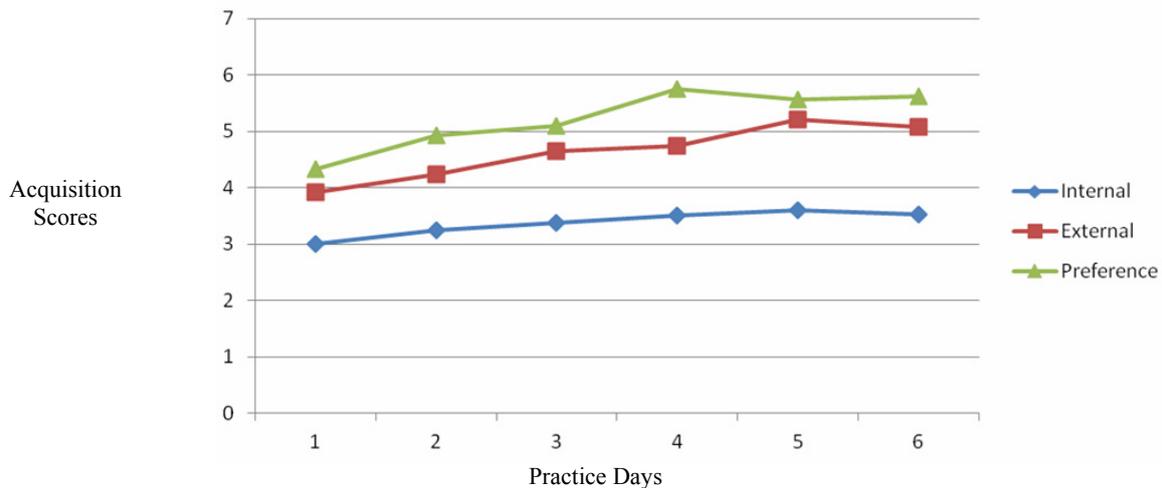


FIGURE 1
AVERAGE ACQUISITION SCORES OF THE INTERNAL, EXTERNAL AND PREFERENCE GROUPS DURING THE PRACTICE DAYS

Paired sample t-test follow up procedure showed that some of the blocks had significant differences. IFF group’s score in the first block was significantly lower than scores in the 2nd, 3rd, 4th, 5th, and 6th blocks. There was no significant difference between first block of IFF group and second, third and fourth block ($p > .05$). However, there was a significant difference between first block and fifth and last blocks ($p < .05$). There was no significant difference between residual blocks of IFF group ($p > .05$).

EFF group’s score in the first block was significantly lower than scores in the 2nd, 3rd, 4th, 5th, and 6th blocks. There was a significant difference between first block of EFF group fourth, fifth and last block ($p < .05$). Also, there was a significant difference between second block and fourth, fifth and last blocks ($p < .05$). There was no significant difference between residual blocks of EFF group ($p > .05$).

TABLE 1
MIXED ANOVA TECHNIQUE MEASUREMENT IN ACQUISITION PHASE

Source of Variation	SS	Df	MS	F	Sig of F
Between Subjects					
Groups	223.889	1	223.889	32.93	.036
Error Between	1429.239	62	23.052		
Within Subjects					
Blocks	810.982	5	162.196	77.022	.001
Blocks by Groups	184.071	10	18.407	13.245	.001
Error Within	756.159	295	2.563		

PFF group’s score in the first block was significantly lower than scores in the 2nd, 3rd, 4th, 5th, and 6th blocks. There was a significant difference between first block of PFF group third, fourth, fifth and last block ($p < .05$). Also, there was a significant difference between second block and fourth, fifth and last blocks ($p < .05$). There was a significant difference between third block of PFF group fourth, fifth and last block ($p < .05$). There was no significant difference between fourth, fifth and last blocks of EFF group ($p > .05$).

Block x group interaction’s follow up analysis results indicated that; all groups in first block showed similar performance. In the second block IFF and EFF groups revealed slightly increased performance but PFF group increased sharply. All groups results are increased slightly in the third block. In the fourth block IFF and EFF groups results are continued to increase slightly but PFF group results are increased sharply. In the fifth block IFF group results did not change. EFF group results increased and PFF group results decreased. In the last block IFF group and EFF group results decreased. PFF group results slightly increased.

Retention Scores

On the retention test, there was a general trend for further improvements in the accuracy of the head kicks. All groups had increase from first block to second one. PFF group had the highest mean in both first and second block. IFF group had lowest scores in first and last block. EFF group had moderate scores in the first and the last block.

Retention phase 3 (Group) x 2 (Blocks) mixed design repeated measure analysis of variance results produced significant main effect for block, Wilks’ Lambda = .284, $F_{(1,61)} = 54.658$, $p < .05$, $\eta^2 = .462$ which is a moderate effect according to the Cohen¹⁹, the amount of 46 % variance accounted for block effect. Scheffe test results revealed that EFF group was more successful than IFF group. Also, PFF group was more successful than EFF group. Block x group interaction also produced significant effect, Wilks’ Lambda = .982, $F_{(2,61)} = 2.857$, $p < .05$, $\eta^2 = .362$ which is a moderate effect according to the Cohen, the amount of 36 % variance accounted for block x group effect. The results also showed significant main effect for groups, Wilks’ Lambda = .131, $F_{(1,62)} = 6.39$, $p < .05$, $\eta^2 = .094$ which is a large effect according to the Cohen, the amount of 91 % variance accounted for groups effect.

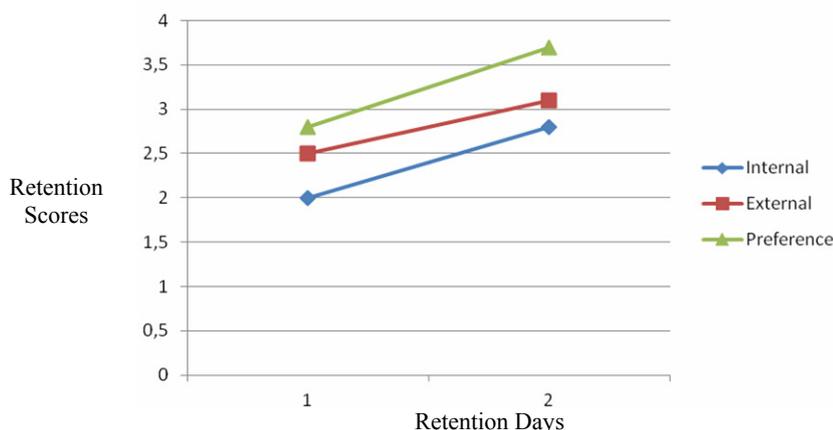


FIGURE 2

RETENTION SCORES OF THE INTERNAL, EXTERNAL AND PREFERENCE GROUPS DURING THE RETENTION DAY

Paired sample t-test follow up procedure showed that most of the blocks had significant differences. IFF – EFF and PFF groups’ scores in the first block were significantly lower than scores in the last blocks. There was significant difference between first and second blocks for all groups ($p < .05$).

Block x group interaction’s follow up analysis results

indicated that; all groups in first block showed similar performance. In the second block EFF group revealed slightly increased performance but IFF and PFF group increased sharply ($p < .05$).

TABLE 2
MIXED ANOVA PRODUCT MEASUREMENT IN RETENTION PHASE

Source of Variation	SS	Df	MS	F	Sig of F
Between Subjects					
Groups	159.236	1	159.236	6.39	.001
Error Between	1639.392	62	26.442		
Within Subjects					
Blocks	127.651	1	127.651	54.658	.001
Blocks by Groups	16.350	2	8.175	2.857	.001
Error Within	156.184	62	2.082		

Discussion

In almost any training situation where motor skills are to be learned, performers are given instructions about the correct movement pattern, or technique. Those instructions typically refer to the coordination of the performers’ body movements, including the order, form, and timing of various limb movements. Instructions that direct individuals’ attention to their own movements induce an internal focus of attention. Other type of instructions which is called as external focus of attention can be defined as directing individuals’ attention to the effect of his or her movements on the environment such as an apparatus or implement¹⁹.

In this study we tried to investigate effects of external focus, internal focus and preference of attention source on young girls on a novel task. Therefore our main aim was to analyze those effects on preference group which has not been analyzed much on this special age (12 -15) group. In addition, we asked whether there would be differential effects of type of feedback depending on the performers’ learning level.

The results showed that external focus feedback resulted in more effective performance than internal focus feedback did in terms of the acquisition of the head kick for 12 – 15 age group females. More important, findings show that the attentional

focus induced by the feedback can indeed have an effect on learning.

Metaphors or analogies could be used for the external-focus conditions. As it has pointed out earlier, one advantage of metaphors might be that they detract the performer’s attention from his or her body movements and at the same time provide a mental image of the movement goal – which presumably serves a function similar to instructions or feedback directing attention to the movement effects⁸.

The constrained action hypothesis provides a plausible explanation for our present findings, when individuals try to consciously control their movements (adopt an internal attentional focus), they tend to constrain the motor system by intervening in the processes that would “normally” regulate the coordination of their movements. Thereby, automatic control processes that have the capacity to control movements effectively and efficiently are disrupted. Likewise, conscious attempts to control movements may have interfered with novice’s kicking movements (e.g., inappropriate meeting point with the ball during kicking, insufficient force production) when an internal focus was used, leading to poorer accuracy.

According to this view, focusing attention on the movement effect promotes an automatic mode of movement control. Adopting an external focus allow unconscious, fast and reflexive processes to control the movement, with the result that the desired outcome is achieved almost as a by-product. Using the

external focus may have promoted more efficient back movements, eye following, and force production, and, therefore, superior accuracy³.

Despite soccer's widespread popularity, there seems to be a lack of investigation on the effect of attentional focus on soccer skills. There are few studies in the within literature related with this subject. Within those studies Wulf and colleagues¹⁴ had aimed to find learning effect of attentional feedback types on lofted kick in soccer.

The participants in this study were university students with some experience in soccer. Participants were required to shoot lofted soccer passes at a target 15 meters away. Accuracy points were awarded based on the center of the target and the surrounding areas. Participants were randomly assigned to one of four groups: internal-focus with 100% feedback frequency, external-focus with 100% feedback frequency, internal-focus with 33% feedback frequency, external-focus with 33% feedback frequency. All participants performed 30 practiced trials and returned one week later to perform the retention test. During the retention test no feedback was provided to any of the groups. The main finding of that study was participants who got external focus feedback were more accurate in their skill performing than participants who got internal focus feedback¹².

Ford et al., experimented with relevant and irrelevant internal focus of attention on soccer dribbling at different expertise level. From the detrimental effects that internal relevant and internal irrelevant focus of attention had on skilled players, it

can be deduced that instructions inducing an internal focus of attention on features of performance interfere with automatic processes. This interference occurs irrespective of whether those features are directly related to the task or not²⁰.

Conclusion

The findings from the present study have led to the following conclusions. Firstly, there are benefits of adopting an external focus of attention for children (12-15 years old). Afterthat, participants who were "given an external focus cue and said they used it" were better in kicking performance and learning than those participants who were "given an internal cue and said they used it". All participants who said they used an external focus cue were better in kicking performance and learning than participants who used an internal focus cue.

Additionally, Preference feedback group had better scores than Internal – External feedback group. This study also indicated that not only the source of attention but also control over to source of attention of preference is an important factor in the amount of retention. This result also confirms superior effect of external focus of feedback on learning a novel skill even under the preference condition. This information can be useful to design of learning environment (needs of learners). Giving a chance to learner about making decisions him/herself can cause differences in learning.

REFERENCES

- MAGILL R. A. *Motor learning and control: Concepts and applications*. (New York: McGraw-Hill, 2011). – 2. WULF G., MERCER J, McNEVIN N., & GUADAGNOLI MA. Reciprocal influences of attentional focus on postural and supra postural task performance. *Journal of Motor Behavior*, 30(2) (2004) 189. – 3. McNEVIN N, SHEA CH. & WULF G. Increasing the distance of an external focus of attention enhances learning. *Psychological Research*, 67 (2003) 22. – 4. WULF G, McNEVIN N, & SHEA CH. The automaticity of complex motor skill learning as a function of attentional focus. *The Quarterly Journal of Experimental Psychology*, 54A(4) (2001) 1143. – 5. WULF G., SHEA C, & PARK J. Attention and motor performance: Preferences for and advantages of an external focus. *Research Quarterly for Exercise and Sport*, 72(4) (2001) 335. – 6. WULF G, ZACHRY I, GRONADOS C, & DUFEEK JS. Increases in jump-ond-reach height through an external focus of attention. *International Journal of Sports Science & Coaching*, 2 (2007) 275. – 7. WULF G. *Attention and motor skill learning*. (Champaign, IL: Human Kinetics, 2007). – 8. ABERNETHY B, Dual-Task Methodology and Motor Skills Research: Some Methodological Constraints, *Journal of Human Movement Studies*, 14 (1988) 101. – 9. WULF G., & PRINZ W. Directing attention to movement effects enhances learning: A review. *Psychonomic Bulletin and Review*. 8 (2001) 648. – 10. WULF G., LAUTERBACH B & TOOLE T. The learning advantages of an external focus of attention in golf. *Research Quarterly for Exercise and Sport*, 70(2) (1999) 120. – 11. AL-ABOOD SA, BENNETT S. J, HERNANDEZ FM, ASHFORD D, & DAVIDS K. Effect of verbal instructions and image size on visual search strategies in basketball free throw shooting. *Journal of Sports Sciences*, 20 (2002) 271. – 12. ZACHRY, T., WULF G., MERCER, J., & BEZODIS, N. Increased movement activity accuracy and reduced EMG activity as the result of adopting an external focus of attention. *Brain Research Bulletin*, 67 (2005) 304. – 13. MARCHANT DC, CLOUGH PJ, & CRAWSHAW M. The effects of attentional focusing strategies on novice *dart* throwing performance and their task experiences. *International Journal of Sport and Exercise Psychology*, 5(3) (2007) 291. – 14. WULF G, McCANNEL N, GARTNER M, & SCHWARZ A. Feedback and attentional focus: Enhancing the learning of sport skills through external-focus feedback. *Journal of Motor Behavior*, 34 (2002) 171. – 15. FREUDENHEIM AM, WULF G., MADUREIRA F, CORREA UC & CORREA SCP. An External Focus of Attention Results in Greater Swimming Speed, *International Journal of Sports Science and Coaching*, 5(4) (2010) 533. – 16. SCHUCKER L. HAGEMANN N, BERND S, & VOLKER K. The effect of attentional focus on running economy. *Journal of Sports Science*, 27 (2009) 1241. – 17. THORN E. J. Using Attentional Strategies for Balance Performance and Learning in Nine through 12 Year Olds. A Dissertation submitted to the Department of Sport Management, Recreation Management, and Physical Education. (The Florida State University, 2006). – 18. COHEN J. *Statistical power analysis for the behavioral sciences*. Second Edition. 1988. (Hillsdale, NJ: Lawrence Erlbaum Associates), Publishers.- 19. FORD P., WILLIAMS A. M., & HODGES N.J. Online Attentional-Focus Manipulations in a Soccer-Dribbling Task: Implications for the Proceduralization of Motor Skills. *Journal of Motor Behavior*, 37(5) (2005) 386. – 20. HOSSNER EJ. & WENDEROTH N. Gabriele Wulf on Attentional Focus and Motor Learning. *E-Journal Bewegung und Training*, 1 (2007) 2. –

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EFEKTI UNUTRAŠNJEG, SPOLJAŠNJEG I PRIORITETNOG FOKUSA PAŽNJE KOD RAZLIČITIH POVRATNIH INFORMACIJA TOKOM UČENJA UDARCA PO LOPTI GLAVOM U FUDBALU

S A Ž E T A K

Cilj ove studije je bio da se ispituju efekti različitih povratnih informacija tokom učenja udarca po lopti glavom u fudbalu kod adolescentkinja. Početnici su izvodili udarac po lopti glavom tokom dvije nedjelje (dva trenažna dana u svakoj) koristeći unutrašnji, spoljašnji ili prioritetni fokus pažnje kod povratnih informacija. Postojala je, takođe i grupa koja je birala tip povratnih informacija po svom nahodjenju. Unutrašnji fokus pažnje kod povratnih informacija je bio u vezi sa tjelesnim pokretima, dok je spoljašnji fokus pažnje kod povratnih informacija bio u vezi sa efektima kretanja. Ispitanici (N=64) su nasumično podijeljeni u tri grupe sa unutrašnjim fokusom pažnje (IFF) (N=15), spoljašnjim fokusom pažnje (EFF) (N=15) i prioritetnim fokusom pažnje (PF) (N=34). Bilo je predviđeno da se u prve dvije nedjelje stiče znanje, dok je prvi dan treće nedjelje predstavljao dan za zadržavanje znanja. Tehnika je mjerena tokom dana kada se sticalo znanje, dok je završno mjerenje sprovedeno na dan predviđen za zadržavanje znanja. U dijelu koji se odnosio na tehniku, EFF grupa je bila mnogo preciznija nego IFF grupa, dok je PF grupa pokazala bolje rezultate od obje preostale grupe (PF>EFF>IFF). Slično dijelu koji se odnosio na tehniku, i u drugom dijelu mjerenja EFF grupa je bila značajno uspješnija od IFF grupe, dok je PF grupa pokazala bolje rezultate od obje preostale grupe (PF>EFF>IFF). I u dijelu za sticanje, kao i u dijelu za zadržavanje znanja, rezultati su pokazali značajan uticaj kada su u pitanju grupe sa prioritetnim fokusom pažnje kod različitih povratnih informacija. Ova studija je ukazala da je spoljašnji fokus pažnje bio mnogo efektivniji od unutrašnjeg fokusa pažnje u pogledu sticanja i zadržavanja znanja tokom udarca po lopti glavom u fudbalu kod studenata sa ograničenim znanjem kada je ova vještina u pitanju. Ova studija je, takođe ukazala da nije samo izvor pažnje, već i kontrola nad izvorom pažnje, važan faktor zadržavanja znanja.

Ključne riječi: Prioritetni fokus, unutrašnji fokus, spoljašnji fokus, povratna informacija, motorne vještine, fudbal, udarac po lopti glavom.