ORIGINAL INVESTIGATION (ARTIGO ORIGINAL)

THE EFFECTS OF FOCUS OF ATTENTION INSTRUCTIONS ON NOVICES LEARNING SOCCER CHIP

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Abstract

UEHARA, L. A.; BUTTON, C.; DAVIDS, K. The effects of focus of attention instructions on novices learning soccer chip. Brazilian Journal of Biomotricity, v. 2, n. 1, p. 63-77, 2008. Research has suggested that instructions that direct the learner to focus on the movements of their body parts are typically less effective than instructions that focus on the environmental effects of the movement during motor skill acquisition. However, it has been argued that effects of instructional focus depend on the skill level of participants and influential constraints such as whether the learners are predominantly goal oriented. The present study compared the effects of internal and external focus of attention instructions on two groups of novices during acquisition of a soccer chip skill. Twelve adult participants practiced chipping a ball with their non-dominant foot over a barrier towards a circular target. An internal focus instruction group (IFIG) received instructions throughout practice directing them to attend to the coordination of their body parts. An external focus instruction group (EFIG) received instructions referring to the effect of their movements on the environment. Results from both outcome (ball landing position accuracy and consistency) and qualitative movement form data were consistent, showing that participants of both groups improved their performance and were able to retain the skill after a two day break ($p < 0.05$). However, there were no significant differences between the groups for either outcome score or for the qualitative analysis, suggesting that internal focus instructions and external focus instructions were equally beneficial. These findings suggest that novices with no previous experience of a skill switch interchangeably from one type of attentional focus to another regardless of

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prior instructions. Future investigation needs to determine sensitive skill related criteria that can be used to identify the stage of learning of participants.

Keywords: focus of attention, novices, stage of learning, two-dimensional, soccer chip

Introduction

Practitioners often use instructions to teach and refine motor tasks at all levels of skill (Hodges & Franks, 2002), especially instructions that direct the learner to focus on the coordination of a body movement (WULF et al., 1999). However, a considerable body of empirical work conducted largely by Wulf and colleagues (for overviews, see WULF, 2007; WULF & PRINZ, 2001) has shown that instructions to learners should direct learners to focus away from coordination of the body movement (internal focus instructions), towards the effect of the movement on the environment (external focus instructions). In other words, external focus instructions are more beneficial for learners than internal focus instructions when practicing motor skills.

Wulf et al. (1988) first reported the efficacy of external focus instructions in two skill acquisition studies where novices, who had no prior experience of the tasks, learned how to perform multi-articular movements. In the first study, the goal of the task was for participants to stand on a platform of a ski-simulator and to rhythmically move it in the transverse plane as far as possible by making slalom-type movements. An internal-focus group was instructed to focus on exerting force on their feet when performing the task (i.e. internal focus instructions). An external-focus group was required to focus on exerting force on the wheels of the ski simulator (i.e. external focus instructions). A control group did not receive any instructions. Results showed that the external focus group performed the action better across two days of practice than the internal focus group. Intriguingly, results showed that the internal focus instructions group was not only less proficient than the external focus instructions group but also less proficient than the control group which had not received instructions.

In their second study, Wulf et al. (1988) examined whether the differential effects of the internal and external focus conditions were replicated with a different task, balancing on a stabilometer. The participants' goal was to remain in balance, keeping the platform in a horizontal position, for as long as possible during each 90-s trial. The internal focus group was instructed to focus on their feet while attempting to balance. The external-focus group was instructed to focus on two red markers on the platform of the stabilometer. Again the external focus instructions led to more effective learning than the internal focus instructions as evidenced by improved balance performance in the external-focus group. These findings have been replicated and extended in further studies involving the acquisition of a basketball free throw (AL-ABOOD et al., 2002), a bimanual hand-circling task (HODGES & FRANK, 2000), a supra-postural task (MCNEVIN & WULF, 2002), a standing balance task (SHEA & WULF, 1999), a biceps curls task (VANCE et al., 2004), golf-chipping (WULF et al., 1999), volleyball serving (WULF et al., 2002), tennis forehand (WULF et al., 2000), and soccer kicking (WULF et al., 2003).

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A constrained-action hypothesis (CAH) has been postulated to explain the focus of attention effects (e.g. MCNEVIN et al., 2003; WULF et al., 2001a; WULF et al., 2001b). This hypothesis proposes that when performers focus on their body movements (internal focus attention), they interfere with automatic control process that would normally regulate the movement. On the other hand, when performers focus on the effect of the movement (external focus attention), they allow the motor systems to naturally self-organise (see WULF et al., 2001). This proposition has been confirmed in three different tests investigating muscular activity, reaction time under dual-task conditions, and the frequency of motor adjustments (for an overview, see WULF, 2007). However, it has been argued that the CAH is too vague and does not provide a concrete explanation for the learning benefit seen under external instruction (MAURER & ZENTGRAF, 2007), neither does it adequately explain how internal focus instructions degrades learning (MÜLLER, 2007). Furthermore, it involves the juxtaposition of ideas (automaticity and self-organisation) from two diametrically opposed theoretical frameworks (cognitive science and dynamical systems theory) in an uneasy conceptual alliance that has not been adequately tested (DAVIDS et al., 2007).

Despite the wealth of evidence summarised above, the generality of the external focus benefit when acquiring a motor skill has been recently brought into question (e.g., BEILOCK et al., 2004; BEILOCK et al., 2002; MAXWELL & MASTERS, 2002; PERKINS-CECCATO et al., 2003; POOLTON et al., 2006). Using a golf putting task in two experiments, Poolton and his colleagues (2006) found no differential effects between the attentional focus groups. In a different task (balancing on a wobble board), Maxwell and Masters (2002) have also found no differential effects between internal and external focus attention groups during acquisition and learning. They concluded that learners tended to switch between attentional focus as a strategy to achieve their task regardless of the instructional strategy used with the learners.

One of the main weaknesses of existing work on focus of attention in instructional constraints is the failure to precisely specify the skill level of participants, with the ‘catch-all’ term learners being used to describe most experimental groups (see WULF, 2007; DAVIDS et al., 2007). Some studies have suggested that the effects of attentional focus instructions may depend on the skill level of participants, and on the nature of the instructions provided. For instance, in a soccer dribbling study (BEILOCK et al., 2002) and in a golf putting study (BEILOCK et al., 2004; BEILOCK et al., 2002). Beilock and her colleagues examined the effects of attentional focus on the performance of skilled and less skilled participants under the following conditions: skill relevant task (i.e. the foot for soccer and arm for golf: internal focus of attention) or skill irrelevant task (i.e. word monitoring: external focus of attention). While the internal attention focus instruction did not affect the performance of the less skilled participants, the skilled participants performed better under the external focus attention condition compared to the internal focus attention condition.

Perkins-Ceccato et al. (2003) obtained further support for the interaction between attentional focus and skill level. They investigated the effects of internal and external focus instructions on the performance of skilled and less

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skilled golfers when performing a chip shot. Their results showed that attentional focus did not affect chipping accuracy, but it affected outcome variability. That is, while the less skilled golfers performed more consistently under internal than external focus instructions, the skilled golfers performed more consistently under external than internal focus instructions. These findings support the proposal that the effects of attentional focus and skill level also interact to influence performance consistency.

Beilock et al. (e.g., 2004; BEILOCK et al., 2002) and Perkins-Ceccato et al. (2003) explained their results by using the de-automisation of skill hypothesis. This hypothesis suggests that attention to an external focus might be more beneficial for experienced learners than novices because the level of automisation is different. That is, as the level of motor skill increases, the need to focus on the step-by-step process involved in skilled performance decreases because the component of the skill becomes proceduralised in long term memory (see ANDERSON, 1982). When one's attention is refocused on those proceduralised components which run under high levels of automisation (i.e. reduced levels of conscious control), a disruption in the control system occurs which leads to decrements in performance (see BERNSTEIN, 1996).

The present investigation was undertaken to examine the relationship between participants' skill level and focus of attention instructions when learning a new motor skill. For this purpose we used Newell's (1985) model of motor learning to specify that participants were still at the novice (coordination) stage of learning rather than being advanced learners at the control stage. We investigated the effects of internal and external focus of attention instructions on novices at the very early stage of learning when acquiring the soccer chip kick skill. These learners were still engaged in assembling the basic pattern of movement coordination to achieve a task goal. Contrary to much previous research (e.g., WULF, 2007) it was expected that an internal focus of attention in instruction would be more beneficial than external focus instructions at the coordination stage of learning because these learners are seeking to assemble a basic pattern of coordination between relevant body parts. We expected that an internal focus would enhance learning by directing these early learners towards an appropriate movement solution to satisfy the task goal.

Material and Methods

- Participants: Twelve novice, right-footed participants (10 males, 2 females), aged between 18 and 26 years (M = 21.2 years; SD = 2.0 years), volunteered to participate in this study. All participants were considered to be novices at the task because they had never played soccer on a regular basis and they had never received formal instruction in the sport. All procedures were conducted according to the ethical guidelines of the University of Otago Ethics Committee and all participants provided consent before taking part in the study.

- Task: The participants' task was to chip a stationary soccer ball (Federation Internationale de Football Association – "FIFA" regulation size 5) with their non-dominant foot (left foot) over a barrier towards the centre of a target. This task

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was chosen because it is a context-specific skill (CLARK, 1994). Therefore, without soccer experience, it is unlikely that learners would be able to adapt the basic movement pattern of kicking into a chipping skill (HORN et al., 2005). Also, this type of multi-articular task involves multiple biomechanical degrees of freedom. Therefore, it offered the opportunity to investigate not only performance outcomes but also changes to movement form as a consequence of practice (CHOW et al., 2007).

- Apparatus: The experiment took place in a gymnasium. The barrier was placed 4 m from the ball starting position and consisted of one metal pole transversely attached to two metal posts. The height and length of the barrier was 50 cm and 200 cm, respectively. The target was marked on the floor with brightly coloured electrical tape and consisted of a circle 80 cm in diameter. The centre of the target was 8 meters away from the ball starting position. A zone of 320 cm in diameter was marked around the target. The purpose of this zone was to facilitate analysis of performance outcomes. A cross shaped like a plus sign "+" was created from the centre of the target to divide the target and zone areas into four quadrants. These areas were coated with white chalk to pinpoint the location of the ball's landing position. A measuring tape was used to record the vertical and horizontal location of the centre of the ball's landing position (x and y coordinates) relative to the centre of the target. These coordinates were used to calculate the dependent variables radial error (accuracy) (cm) and variable error (consistency) (cm).

A digital video camera was positioned on the left lateral side of the kicking leg of the participants to record their kicking movements during the pre, post and retention tests. The video footage was used for the movement form evaluation. An Astroturf mat was placed on the start position of the shots to minimise friction between the sole of the kicking foot and the floor. A pilot study had shown that the majority of the participants found it more comfortable to kick the ball on the Astroturf surface than on the wooden floor. Participants were required to position themselves within the Astroturf area at a marked distance of 127 cm almost directly behind the ball.

- Procedure: Participants were randomly assigned to either the internal focus instructions group (IFIG) or the external focus instructions group (EFIG). This resulted in two groups of 6 participants per group (5 males and 1 female in each group). The IFIG received only internal focus of attention instructions which consisted of statements referring to their body coordination movement. The EFIG received only external focus of attention instructions which consisted of statements referring to the effect of their movements. To control the amount of information provided, the instructions for both groups were similar in content. Further, metaphors were used in the instructions for the EFIG because as Wulf et al. (1999) pointed out, metaphors may help performers to focus their attention towards the movement effects. The instruction statements for the IFIG and EFIG are listed in Table 1.

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Table 1 - Internal and external focus of attention in instructions.

IFIG	EFIG
Place your right foot next to the side of the ball	Next to the side of the ball place your non-kicking shoe
Lift back the heel of your left foot and then quickly bring your foot forward and	Imagine holding a shovel in your kicking shoe and sharply hit the bottom of the ball with it and
with the lower part of the foot, sharply kick the bottom of the ball	as if passing the ball to another player try to make the ball fly spinning backwards

Each participant was tested individually. Before the beginning of each experimental session, participants were required to warm up sufficiently (i.e., light exercises and stretching). In the first experimental session, each participant was firstly provided with basic information about soccer chip skills. They were informed that the soccer chip is the technique used to loft the ball over an opposition defender or over an opposition goal keeper. They were also, informed about the task goal which was to kick the ball with their left (non-preferred) foot over the barrier and try to hit the centre of the target area. Then, participants received five familiarisation trials in which they kicked the ball, without the barrier, to an experimenter located 6 m away (a distance different than the distance of the tests). Following the familiarisation trials, participants performed the pre-test consisting of 6 trials. Finally, after a 5-minutes resting period, participants performed 30 trials for the first acquisition period.

One day after the first experimental session, participants performed the second acquisition period consisting of 30 trials. At least five minutes of resting period was provided and subsequently the post test of 6 trials was performed. The retention test of 6 trials was performed two days after the post test. There were no instructions given during the retention tests. However, instructions were given at the beginning of each acquisition period and the participants were required to re-read the instructions after every fifth shot. Also before the beginning of the first acquisition period, the experimenter demonstrated the soccer chip once to each participant.

- Dependent Measures and Data Analysis: In order to provide a global measure of performance and learning, two outcome scores (radial error and variable error) were calculated. To measure changes in coordination patterns, the movement form of each participant was evaluated.

Outcome Scores: Radial Error (cm) and Variable Error (cm)

On each trial, x and y coordinates of the centre of the ball's landing position from the centre of the target were measured in centimetres. These coordinates were used to calculate the radial error (calculated as the hypotenuse of the triangle made from the distances x and y) and variable error. Then, the mean radial error

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and mean variable error for each participant and for each test period were calculated. The mean radial error represents the mean accuracy (cm) of the shots of each participant and the mean variable error represents the mean consistency (cm) of the shots of each participant. These two dependent variables (accuracy and consistency) were calculated based on the following formulae suggested by Hancock, Buttler, and Fischman (1995):

- Radial error = $(x^2 + y^2)^{1/2}$
- Variable error = $\{(1/k)\sum_{i=1}^{k} [(x_i - x_c)^2 + (y_i - y_c)^2]\}^{1/2}$
    - Where x_c is the average of x coordinates and y_c is the average of y coordinates. The x_i and y_i are the coordinate values for each ith trial.
    - k = number of trials

Attempts that did not clear the barrier or landed outside of the zone were considered fouls, including:

1. balls that cleared the barrier but landed outside of the zone
2. balls that hit and cleared the barrier but landed outside of the zone
3. balls that went under the barrier
4. balls that hit the barrier and did not go over it, therefore landed outside of the zone

To prevent missing values from biasing the data analysis, values of 400 cm or –400 cm were attributed to the fouls (these values are the distance between the centre of the target and the barrier). Positive or negative values were given according to the ball's eventual landing position (x and y coordinates).

Qualitative Analysis: Movement Form Evaluation

The quality of movement of each participant for each test trial was assessed on the basis of a number of criteria listed below:

1. Does the participant correctly place the right foot next to the side of the ball?
2. Does the participant show sufficient lifting back of the heel of the left foot (the kicking foot)?
3. Does he or she sufficiently accelerate the kicking foot forward until hitting the ball?
4. Does he or she correctly use the lower frontal part of the foot to kick the ball?

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5. Does he or she sharply kick the ball without moving the thigh forward too much?

6. Does the participant adopt the correct stance?

(Criteria for movement form evaluation adapted from Lees & Davids, 2002)

Two independent soccer coaches, both qualified with a New Zealand Soccer coaching license, assessed the quality of the soccer chip and awarded a score between 0 and 15, with the highest score indicating perfect performance. The data of all 12 participants together were used to calculate the correlation (Pearson Correlation) between the scores of the two coaches for each test period. The correlation between the two movement form raters was 0.738 for the pre test, 0.836 for the post test, and 0.773 for the retention test. In order to verify the reliability of these correlations Cronbach's Alpha was calculated. Cronbach's Alpha was 0.794 for the pre test, 0.899 for the post test, and 0.832 for the retention test. For each test period Cronbach's Alpha was over 0.7 which is considered excellent. Thus, the mean point scores of each participant for each test period and for each group were calculated and then the score of each coach was averaged.

- Statistical Analysis: T-tests were performed for each dependent variable at the pre-test stage to certify that the groups were not different to begin with. All the outcome scores and movement form scores were analysed with 2 (attentional focus instructions: internal x external) x 3 (test periods: pre x post x retention) analysis of variance (ANOVA) with repeated measures on the last factor. A Sidak test was used to assess between-mean differences for significant ANOVA effects.

Results

- Outcome Scores

Radial Error or Accuracy (cm)

There were no significant difference between pre-test accuracy scores, t_{10} = 0.770, p = 0.459. ANOVA revealed that a main effect existed for the test periods, F (2, 20) = 14.53, p = 0.001. Post hoc analysis showed that, on an average, the participants improved the accuracy of their shots by exhibiting a significantly lower error rate in the post-test (M = 238.3, SD = 128.2) and in the retention test (M = 219.6, SD = 91.0) than in the pre-test (M = 373.0, SD = 124.0). The interaction between groups and test periods was not significant, F (2, 20) = 0.091, p = 0.913. Further, ANOVA revealed no significant difference between groups, F (1, 10) = 0.576, p = 0.466. These results indicated that both groups improved their accuracy equally in performance and learning (see Table 2). However, it was observed that participant 6 of the IFIG did not improve the accuracy of his/her shots, showing a higher error rate in the post-test (M = 271.4) than in the pre-test (M = 185.2). Further, a considerable range of pre-test score existed for both groups (IFIG: SD = 88.8; EFIG: SD = 155.2) (see Table 2).

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Table 2 - Participant mean radial error (cm) and group means and SD radial error as a function of instructional conditions (IFIG and EFIG) and test periods (pre, post, and retention).

Instructional Conditions and Test Periods						
	IFIG			EFIG		
Participant	Pre	Post	Retention	Pre	Post	Retention
1	338.8	147.9	121.0	409.2	242.8	185.3
2	408.3	187.2	176.1	256.6	199.8	111.5
3	314.7	155.4	160.3	565.7	172.2	246.4
4	418.6	340.6	262.6	189.1	68.1	191.1
5	404.1	187.1	337.1	420.5	321.6	246.8
6	185.2	271.4	170.8	565.7	565.7	426.7
Group M	344.9	214.9	204.6	401.1	261.7	234.6
Group SD	88.8	75.6	79.8	155.2	170.7	106.4

Note. Each group had six participants.

Variable Error or Consistency (cm)

There were no significant difference between pre-test scores, $t_{10} = 0.407$, $p = 0.693$. ANOVA revealed a main effect for test periods, F (2, 20) = 9.71, p = 0.001. Post hoc analysis showed that the participants improved their consistency by exhibiting a significantly lower error rate in the post-test (M = 261.1, SD = 94.8) and in the retention test (M = 231.9, SD = 93.7) than in the pre-test (M = 340.5, SD = 83.7). The interaction between groups and test periods was not significant, F (2, 20) = 0.335, p = 0.719. Further, ANOVA revealed no significant difference between groups, F (1, 10) = 0.149, p = 0.707. These results provide further support that both groups improved their consistency score equally in performance and learning (see Table 3). However, once again it was observed that participant 6 of the IFIG did not improve the consistency of his/her shots, showing a higher error rate in the post-test (M = 309.5) than in the pre-test (M = 241.2). The range of pre-test score for both groups was again considerably high (IFIG: SD = 65.7; EFIG: SD = 104.2) (see Table 3).

Qualitative Analysis: Movement Form Evaluation

There was no significant difference between the groups at pre-test, $t_{22} = 0.115$, $p = 0.909$. The qualitative analysis revealed similar findings to the accuracy and consistency scores. For example, the interaction between groups and tests periods was not significant (F (2, 20) = 0.990, p = 0.349), further, there were no significant difference between groups (F (1, 10) = 1.35, p = 0.272). Once more a main effect for test periods existed, F (1.1, 10.8) = 14.78, p = 0.02. Participants improved their soccer chipping skills by exhibiting significantly improved movement form in the post-test (M = 7.1, SD = 2.4) and in the retention test (M = 7.7, SD = 2.2) than in the pre-test (M = 4.0, SD = 1.9) (see Figure 1).

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Table 3 - Participant mean variable error (cm) and group means and SD variable error (cm) as a function of instructional conditions (IFIG and EFIG) and test periods (pre, post, and retention).

	Instructional Conditions and Test Periods					
	IFIG			EFIG		
Participant	Pre	Post	Retention	Pre	Post	Retention
1	319.2	219.6	125.5	448.5	279.1	238.9
2	418.6	252.6	198.6	240.1	207.4	104.7
3	273.0	211.4	225.2	400.0	213.4	300.9
4	368.3	356.8	340.8	198.5	61.1	196.5
5	361.4	230.1	312.6	417.6	392.4	335.4
6	241.2	309.5	77.5	400.0	400.0	326.0
Group M	330.3	263.3	213.4	350.8	258.9	250.4
Group SD	65.7	57.8	102.6	104.2	128.1	89.2

Note. Each group had six participants.

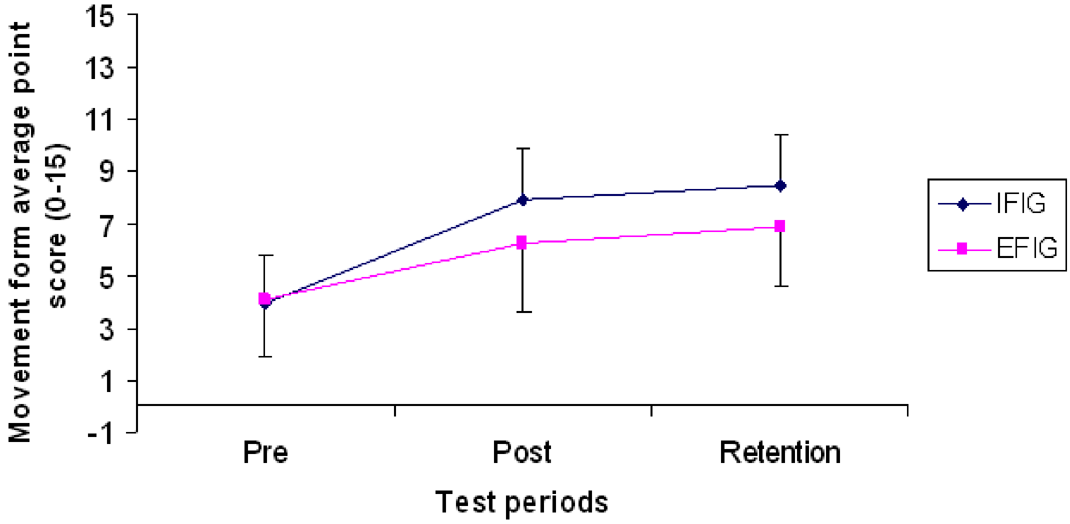

Figure 1 - Movement form average point score (0-15) for the internal focus instruction group (IFIG) and external focus instruction group (EFIG) for each test period (pre, post, and retention).

- Percentage of Clearance and Fouls

The percentage of shots that cleared the barrier and the percentage of shots that did not hit the target and zone areas (fouls) are summarised in Table 4. For the IFIG, clearance of the barrier decreased slightly across the test periods from 88.9 % in the pre-test to 86.1% in the post-test and 86.1% in the retention test. The number of fouls, however, greatly diminished across the test periods from 52.8% in the pre-test, to 25% in the post-test, and 22.2% in the retention test.

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These data indicated that participants changed their strategy after the acquisition periods where height clearance was achieved less often but the number of shots on the target increased. The EFIG typically adopted a different performance strategy in which the percentage of successful clearance chips increased as well as the percentage of the number of fouls decreasing across test periods (Clearance chips: from 61.1% in the pre test to 77.8% in the post test, and to 88.9 % in the retention test; Fouls: from 63.9% in the pre test to 36.1% in the post test, and to 27.8% in the retention test).

Table 4 - Percentage of shots that cleared the barrier (clearance) and percentage of shots that did not hit the target and zone areas (fouls) as a function of instructional conditions (IFIG and EFIG) and test periods (pre, post, and retention).

	Instructional Conditions and Test Periods					
	IFIG			EFIG		
	Pre	Post	Retention	Pre	Post	Retention
Clearance	88.9	86.1	86.1	61.1	77.8	88.9
Fouls	52.8	25.0	22.2	63.9	36.1	27.8

Note. This is the total percentage of clearance and fouls (see Methods: Outcome Scores section for an explanation of shots considered as fouls).

Discussion

The purpose of this study was to determine the effects of internal and external focus of attention instructions on novices during the acquisition of a soccer chip skill. Since it was proposed that the participants were at Newell's (1985) coordination stage of learning (confirmed by pre-test scores), we expected that internal focus instructions would be more beneficial than external focus instructions. The results from analysis of both outcome scores (accuracy and consistency) and movement form showed that the participants of both groups improved their performance and learning after two acquisition periods. However, contrary to what was expected, no significant differences between the groups for either outcome score or for the qualitative analysis were found. In other words, the present study revealed that both groups benefited equally from their respective attention focus instructions. These findings suggested, as Maxwell et al. (2002) have proposed, that early learners switch their attention from one focus to another interchangeably. In their study they also found no differences between treatment conditions (internal and external) and throughout a post-experimental verbal report. They concluded that their participants did not rely on one single source of focus of attention and switched their attention according to the task demand despite the repeated reminders to maintain a specific focus.

Although the results of the present investigation showed no differential effects between the groups, the data did reveal some potentially illuminating differences between the groups. For example, although not statistically significant the internal focus instruction group achieved a higher movement form compared to the external focus instruction group (see Figure 1). Perhaps these findings would

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be more robust with a larger sample size and with a longer acquisition period. In addition, the lack of improvement in terms of kicking accuracy and consistency during the acquisition period for participant 6 of the internal focus instruction group may have diminished the overall performance of the internal focus group (see Table 2 and 3). These findings provide some support for previous studies that have shown that directing learners towards an internal focus would be more beneficial than an external focus (e.g. BEILOCK et al., 2004, 2002; PERKINS-CECCATTO et al., 2003).

Interestingly, the two groups appeared to adapt the trajectory of their kicks in different ways. After practice, the IFIG participants seemed more intent on hitting the target rather than clearing the barrier consistently, whereas the EFIG learners tended to clear the barrier more often but with less overall target accuracy (see Table 4). It is likely that the external focus instructions encouraged the learners to attend more directly to the characteristics of ball flight, whilst the internal focus learners were more directly concerned with overall goal achievement (i.e., accuracy). Whilst these subtle differences in learning strategies did not manifest in different performance data they are nonetheless interesting findings for pedagogists to draw implications from.

Despite our best efforts to obtain pure samples, it is important to note that both groups may have been composed of individuals at different stages of learning. That is, the groups may have consisted of a mix of complete novices at Newell's (1985) coordination stage of learning, and advanced beginners at Newell's (1985) control stage of learning. Looking closely at the data it appears that participants 1, 3, 6 from the IFIG and participants 2 and 4 from the EFIG seemed to be more advanced learners compared to the lower scores of the others participants. This observation was supported since at pre-test the sub-group of more advanced learners scored more points compared to the other participants (see Table 2 and 3). It should be noted that currently there is no direct or sensitive measure of skill advancement which might have been used to verify this observation and this would be worthwhile topic for future research (CHOW et al., 2007).

These observations are important, because theoretically, we would expect that novices at the coordination stage would be more likely to benefit more from internal focus of attention instructions emphasising movement dynamics than external focus of attention instructions. As noted earlier, novices at the coordination stage of learning are learners who are still engaged in assembling basic functional movement coordination patterns to achieve a task goal (NEWELL, 1985). Therefore, internal focus attention instructions would have been expected to enhance more successfully performance and learning because it would help performers to adjust the movement dynamics of the pattern coordination during the discovery of basic solution. On the other hand, advanced beginners or novices at the control stage of learning are learners that have already assembled the basic functional movement pattern which they then need to adapt to different environmental conditions (NEWELL, 1985). Therefore, learners at this stage would benefit more from an external focus emphasising movement outcomes. That is, external focus instructions would be more beneficial than internal focus instructions because they would help performers to

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understand the effects of varying (or controlling) the basic patterns of movement on performance. Therefore, it is suggested that in the present study a mixture of complete novices and advanced beginners may have cancelled out the effectiveness of internal focus instructions.

Conclusion

Overall, the present study adds to the current state of knowledge by reporting that both attentional focus instructions (internal and external) seem equally beneficial for early learners performing a soccer chip skill. Contrary to some previous work (e.g., see WULF, 2007), no beneficial effects were observed for external focus of attention instructions over an internal focus of attention. This study suggests the need to develop appropriate selection criteria of participants according to their stage of learning. Future investigations will need to address this issue by devising for use a sensitive selection criterion that can reliably determine the precise stage of learning of the participants. This objective may be achieved by assessing participants' stage of learning via a within-task criterion included as part of the pre-test/familiarisation trials. For instance, if participants achieved more than 10% in the pre-test, they should be excluded from participation in a coordination stage group. Further, a qualitative analysis of the movement coordination assessed by a professional coach in the area may help to determine novices in their respective stage of learning.

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