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PEDAGOGY

Combining Attentional Focus Strategies: Effects and Adherence

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Abstract

This study explored the influence of instructions that combine internal and external foci. Fifty-one subjects were randomly divided into 3 groups: internal only, external only, and a combined internal and external focus. The task was the overhand lacrosse throw for accuracy from a stationary position to a target located on a wall 6 m away. Following a 10-trial pretest, instructions were provided according to attentional focus group assignment and participants performed 8 blocks of 10 practice throws. Following a 2-day period of no practice, retention and transfer tests were performed. A significant Group × Block interaction was found, F (14, 336) = .57, indicating that the external focus group was more accurate than the combined focus group on the first and second practice blocks. This external focus benefit diminished in later trials and no significant differences for group were found for retention or transfer. Participants performed significantly better on the retention test than on the pretest. Subjects were also asked to estimate what percentage of the practice trials they actually focused on the instructions provided. Responses ranged from 10% to 95% (M = 64%), raising questions regarding how learners use instructional information.

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Typically, when a motor skill is introduced, the key elements or characteristics of the optimal movement pattern are highlighted for the learner. Often, in an attempt to assist the learner in understanding the movement requirements, this description directs learners' attention to their own body movements. This was demonstrated by Porter, Wu, and Partridge (2010), who found that 84.6% of elite track and field coaches gave instructions that focused on body and or limb movements. Numerous studies however, have indicated that this strategy should be reconsidered. Specifically, evidence suggests that learning and performance are enhanced when the learners' attention is instead directed to the effects of their movements (see Wulf, 2013, for a review).

A question of interest with respect to instructional focus is whether the external focus benefit was independent of individual differences. Wulf, Shea, and Park (2001) conducted a series of studies that examined what focus participants would adopt when given a choice and the resulting performance effects on a balancing task. On the first day of practice in Experiment 1, participants were asked to switch between an internal and external focus from trial to trial. Participants were then asked to select the focus condition they deemed most advantageous and were instructed to use it exclusively during practice the second day. No instructions regarding which focus to adopt were given during the retention test. Results indicated that of the 17 participants, 10 elected to adopt an internal focus for practice on Day 2, but no performance differences between the two focus groups were found. During the retention test however, only four participants maintained an internal focus (and one switched from an external to an internal focus) and the external group performed significantly better.

In the second experiment, more practice time was given and participants could explore the two strategies (internal vs. external focus) without restrictions. At the end of practice the second day, they were then asked which focus they perceived as more effective and were instructed to use only that strategy during the retention test. Results indicate that during practice, the total time spent utilizing each focus was similar. After the second day of practice, 16 of 20 participants elected to adopt an external focus for the retention test and this group was found to perform significantly better than their

internal focus counterparts. The authors concluded that given sufficient experience with a task, learners are able to select the strategy that leads to better performance and learning and that the benefits of an external focus do indeed appear to be independent of individual differences as hypothesized (Wulf et al., 2001).

An alternative explanation, however, may be plausible. According to models proposed by Fitts and Posner (1967) and Gentile (2000), a characteristic of the first stage of learning is to develop an understanding of a movement's requirements. Given that participants were only given eight 90-second trials in the first experiment of Wulf et al.'s (2001) study, it is possible that the participants were still trying to acquire the movement pattern needed for successful performance and felt that the internal focus would best assist them in doing so. Once an initial pattern was established and the performer moved to the next stage of learning, they were able to determine that the external focus would be more beneficial for skill refinement. The findings of Perkins-Ceccato, Passmore, and Lee (2003) lend support to this notion. In their study, high and low skilled golfers performed pitch shots under different attentional focus schedules. Half of the participants in each skill level group were first directed to adopt an internal focus, while the other half were provided with external focus instructions. Upon completion of 50% of the practice trials, groups switched their focus to the other condition. According to the results, the low-skilled golfers, who first adopted an internal focus of attention and then switched to an external focus of attention, performed significantly more consistently than their counterparts, who performed using the opposite schedule. The high-skilled golfers, however, benefited from the opposite schedule. Those who attended first to the external focus instructions performed significantly better than those focused internally. The authors surmised that "in the execution of the pitch shot, once the fundamentals have been learned well, performance will benefit more by concentrating on where to hit the shot than by attending to the action of the golf stroke that will produce the shot" (Perkins-Ceccato et al., 2003, p. 598). However, until the learner understands the "fundamentals to the extent where monitoring of the swing is no longer necessary" (Perkins-Ceccato et al., 2003, p. 599), concentrating on the target (external focus) would not be beneficial.

The results of the Perkins-Ceccato et al. (2003) study suggest a possible link between skill level and attentional focus. Given the variable rate at which individuals progress in skill development, it is also conceivable that the attentional focus adopted by the participants in Wulf et al. (2001) was a function of skill level. More specifically, the 10 individuals who elected to adopt the internal focus on the second day in Experiment 1 may still have been trying to develop an understanding of the movement's requirements. The provision of attentional focus instructions that are exclusively internal or external may not accommodate individual learning rates. Exploration of matching attentional focus to skill level, however, would be difficult as transitions between learning stages cannot be clearly delineated. Alternatively, instructions coupling internal and external foci could provide the information needed initially for the learner to determine the pattern of movement and for advancement into more automatic processing as skill level increases. Consequently, this study investigated the influence of instructions that combine internal and external attentional foci on the performance and acquisition of a novel motor skill.

Method

Participants

Fifty-one individuals (26 women and 25 men; $M_{age} = 23.5 \pm 4.37$) from a university population volunteered to participate in this study. None had prior experience with lacrosse. The study was approved by the university institutional review board, and written informed consent was obtained prior to experimental testing.

Task

The task was the overhand lacrosse throw for accuracy from a stationary position. The target was located on a wall 6 m from where the participant stood with its outside/lower boundary at a height of 1.57 m from the floor. The target was 1.27 m in diameter total and consisted of five concentric circles of equal zones. Scores were recorded according to the zone in which the ball made initial contact, with the inner circle receiving 5 points, the next zone 4 points, and so on with the outer ring receiving a score of 1. Any ball not hitting the target received a score of 0.

Procedures

The researcher used a random number table to randomly divide participants into three groups ($N = 17$), which differed in the attentional focus instructions they received: internal only, external only, and a combined internal and external focus. All participants were shown the basic technique of the overhand lacrosse throw and given three practice trials where they threw at a blank wall from a distance of 4 m. A 10-trial pretest was then performed. Following the pretest, additional instructions were provided according to attentional focus group assignment. The internal group was instructed to snap the top wrist during the throw. The external group was instructed to throw the basket (of the stick) toward the target. Finally, the combined group was cued to focus on snapping the top wrist toward the target. In addition to the verbal instructions, all groups received two demonstrations of the movement (performed without the ball).

Participants then performed eight blocks of 10 practice throws with a goal of accuracy. Attentional focus checks and reminders were given every five trials for the first 20 throws and after every 10 trials thereafter. Following a 48-hr period of no practice, participants performed a retention test consisting of three blocks of 10 throws. Next, they performed a transfer test consisting of three blocks of 10 transfer throws from a 9-m distance from the target. No instructions or reminders were given on the second day.

Attentional Focus Verification

One criticism of the research examining attentional focus is the lack of verification as to whether participants did indeed adopt the attentional focus they were directed to use. Consequently, interviews examining the use of the instructional cue provided during the acquisition phase were conducted following the study (as suggested by Wulf & Prinz, 2001) . Participants were asked two questions. First, they were asked to reflect back to the practice period and estimate the percentage of trials they adopted (focused on) the instructional cue provided. Next, an open-ended question asked participants to reflect on the times they chose to abandon their assigned cue to see if they could identify a pattern or rationale for doing so, or if they felt that it was a random occurrence.

Data Analysis

The average pretest scores for each group were analyzed in a one-way analysis of variance (ANOVA). To determine whether learning occurred, the researcher calculated and analyzed the average pretest and retention scores for each group in a 3 (Group) × 2 (Test) ANOVA. For the practice, retention, and transfer segments, the total score on each 10-trial block was calculated for each participant. The practice data were analyzed in a 3 (Groups) × 8 (Block) ANOVA with repeated measures on the second factor. The retention and transfer data were analyzed in separate 3 (Groups) × 3 (Block) repeated-measures ANOVAs. The range and mean for attentional focus verification percentages were calculated for each group, and means were analyzed using a one-way ANOVA. Correlations between percentage of time focused on instructions provided and practice, retention, and transfer scores for each group were assessed using Pearson's correlation coefficient. Alpha levels for all tests were set at $p < .05$. Finally, responses to the question that asked participants to reflect on the times they chose to abandon their assigned instructional cue and reason for doing so were examined and patterns identified according to response frequency.

Results

Pretest vs. Retention

No significant differences were found between the external ($M = 2.62$, $SD = .51$), internal ($M = 2.55$, $SD = .70$), and combined ($M = 2.26$, $SD = .83$) focus groups. A significant effect, however, was found for test, $F(1, 48) = 8.34$, indicating participants were more accurate ($p < .001$) on the retention test ($M = 3.05$, $SD = .68$) than on the pretest ($M = 2.48$, $SD = .70$).

Practice

Figure 1 shows the average performance scores for the internal, external, and combined groups for the eight practice trial blocks. A significant Group × Block interaction was found, $F(14, 336) = .57$, and Tukey post hoc analysis indicated that the external focus group was more accurate than the combined focus group on the first ($M = 2.74$, $SD = .64$ vs. $M = 1.94$, $SD = .92$) and second ($M = 2.93$, $SD = .8$ vs. $M = 2.09$, $SD = .99$) practice blocks.

Retention and Transfer

Figure 1 shows the average performance scores for the internal, external, and combined groups for three trial blocks for the retention and transfer tests. No statistical main effects or interactions were found for either test.

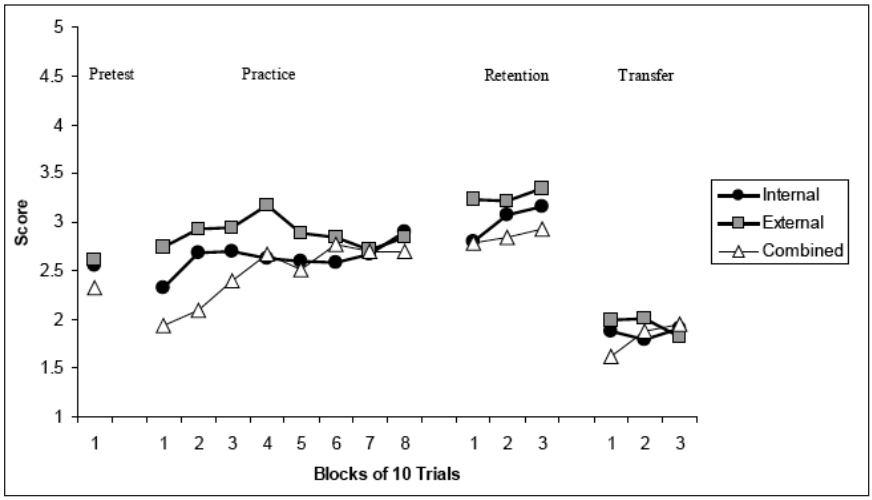

Figure 1. Average performance scores of the internal, external, and combined groups for the pretest, practice trials, retention, and transfer tests.

Attentional Focus Verification

According to self-reports, the average percentage of time focused on instructions across groups was 64% with a range of 10% to 95%. Table 1 shows group means, standard deviations, and ranges. Analysis of variance revealed no significant differences between groups with respect to percentage of time focused on instructions provided with means of 59.29%, 64.18%, and 67.06% for the internal, external, and combined groups, respectively. A significant correlation was, however, found between reported percentage of time focused on instructions and practice score for the internal focus group ($r = .529$; $p = .029$). This same relationship, however, did not exist for the external and combined groups. Furthermore, no correlation was found between instruction use and retention or transfer accuracy.

Table 1
Group Means, Standard Deviations, Minimums, and Maximums for Percentage of Practice Trials Participants Reported Focusing on Instructions Provided

Group	*M*	*SD*	Min	Max
Internal	59.29	25.18	10	90
External	64.18	15.96	30	85
Combined	67.06	16.87	30	95

Six themes emerged from the postexperiment interview question that asked participants to reflect on the times they chose to abandon their assigned instructional cue and reason for doing so (see Table 2). Thirty-seven percent reported that they stopped focusing randomly; 22% indicated that their focus on the instructions faded as the practice session progressed; 14% adopted their designated focus when an error occurred; 12% focused more toward the end of the practice session; and 10% indicated that they focused at the beginning of the practice session and subsequently when an error occurred; and 4% lost focus in the middle of the practice session but regained it toward the end.

Table 2
Frequency of Responses for Each of the Six Themes Regarding Instruction Use That Emerged by Group and Overall

Instruction use theme	Internal (*N* = 17)	External (*N* = 17)	Combined (*N* = 17)	TOTAL (*N* = 51)
Random lack of focus	6	3	10	19
Focus faded as practice session progressed	3	5	3	11
Focused when an error occurred	3	3	1	7
Did not focus in beginning but did at the end of the practice session	3	3	0	6
Focused in the beginning of the practice session and then when an error occurred	0	3	2	5

Table 2 (cont.)

Instruction use theme	Internal (N = 17)	External (N = 17)	Combined (N = 17)	TOTAL (N = 51)
Lost focus in the middle of the practice session but regained toward the end	1	0	1	2
Other	1	0	0	1

Discussion

This study examined the effects of instructions that directed learners to both their own body movements (internal focus) and the external effects of those movements (external focus). It was hypothesized that instructions combining both internal and external focus information would be beneficial as they would assist the learner in developing an understanding of the movement's requirements while allowing for more automatic control processes to occur during skill execution. This hypothesis, however, was not supported by the data. Instead, the external focus group significantly outperformed the combined group for the first two practice trial blocks. This external focus benefit seen early in practice, however, diminished in later trials, and although this group scored higher than both the internal and combined groups on the retention test, the difference did not reach a significant level. These data therefore not only refute the hypothesis regarding the combination of instructions but also conflict with previous findings of Wulf and colleagues revealing an external focus advantage.

The poorer performance of the combined group early in practice is likely indicative of additional processing demands imposed by the nature of the attentional focus instructions. These results certainly bring into question the ability of participants to focus internally on movements and externally on movement effects concurrently. This notion is supported by the attentional focus verification data. Although the combination group reported relatively greater instruction use, they also reported a more random lack of focus during the trials. This may reflect difficulty in adopting a style of focus whereby internal and external foci are coupled.

The attentional focus verification data provide additional insights into the results of this study, raising questions regarding how learners use instructional information. Although participants used the instructions provided, it is clear that they did not use them all of the time. In fact, instruction use averaged 64% overall with means of 59.29%, 64.18%, and 67.06% for the internal, external, and combined groups, respectively. Marchant, Clough, and Crawshaw (2007) reported similar findings with external instruction use at 77.14% and internal instruction use at 77.3% for participants learning a dart-throwing task and suggested that "even with specific instructional direction, participants will inevitably use their own strategies from time to time" (p. 489).

Support for the notion that participants will sometimes abandon the instructions given for their own strategies was provided by participants' responses when asked to identify when they chose not focus on the instructions given. These responses also shed light on why differences were not found beyond the second block of practice. Thirty percent of those in the external group indicated that their focus faded as the practice session progressed, while 18% indicated that they focused in the beginning of practice and then only when an error occurred. It is therefore possible that the external focus group did indeed abandon the instructions provided as practice progressed, which could also explain the lack of a significant effect between the external and internal groups.

Another interesting pattern that emerged from the self-report data was when focus was lost by the internal and combined groups. Thirty-five percent of the participants in the internal group and 59% in the combined group reported that their loss of focus on the instructional cues occurred randomly. The high percentage reported by the combined group, as indicated previously, may be attributed to the additional processing demands imposed by the combined internal and external focus instructions.

Results of the correlation analysis between the percentages of trials during which the instructions were attended to and practice, retention, and transfer scores also raise questions. These data only indicate the existence of a relationship between percentage of instruction usage and practice score for the internal focus group. No relationship was found for either the external or combined groups,

nor was there a relationship for any of the three groups with respect to retention or transfer scores. This seems to indicate that it did not seem to matter if participants in the external and combined groups used the instructions provided. If this is indeed the case, it is possible that the lack of effect between groups is due to limitations in the instructions provided. However, the ability of participants to accurately estimate the percentage of instruction usage must also be considered.

Finally, two of the six themes regarding instruction use that emerged from postexperiment interviews involved error detection/correction. These two themes were (1) focused on instructions when an error occurred and (2) focused in the beginning of practice and then when an error occurred. Comparison of the three groups on these categories revealed that the external focus group cited these two themes twice as often (35%) as the internal (18%) and combined (18%) groups. These data suggest that the external focus group utilized the instructions to guide the learning process more so than the internal or combination groups. This is interesting given that the correlation data found no relationship between the percentage of instruction use and performance for this group.

While the attentional focus verification data presented in this study is insightful, more research is necessary so that its implications can be truly understood. The findings of this study demonstrated that participants used the instructions they were given. They did not, however, use them all of the time. Given this, an important line of inquiry involves where they chose to direct their attentional focus. Furthermore, why did they choose to abandon the instructions for their own strategies and is the type of attentional focus instructions they received a contributing factor? As suggested by Marchant et al. (2007), the addition of open-ended qualitative questioning should be included in future studies so that participants' use of instructions during the learning process can be better understood. In the meantime, physical educators can prompt students to maintain their focus on instructional cues through verbal reminders.

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