

Influence of attentional instructions on football juggling performance in children

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Abstract:

The success in football required to skilled control the ball. Juggling is a fundamental skill that improves leg-eye coordination. The purpose of this study was to examine the influence of adopting an external, internal, and neutral focus of attention while football juggling is performed. Twenty-two young male football players (age 10.6 ± 0.5 years) were asked to perform juggling with their dominant foot. Each participant completed three trials in each condition: under an external focus (the ball), an internal focus (foot), and a control (no attentional instruction). Three sessions were conducted in a limited zone (3x3 meters) and three sessions were conducted in an unlimited zone. Utilizing the external and internal foci resulted in a greater number of touches compared to a control condition in the unlimited zone. In turn, only the external instruction produced advantages for juggling relatively to the internal and control conditions. These results show that instructions to adopt the external focus and internal focus promoted the football-specific skills. When the findings are taken as a whole, it is clear that directing attention externally should be prioritized for motor learning and performance in children.

Key words: focus of attention, motor performance, soccer, young players

Introduction

To be effective during the match, football players have to skilfully control the ball with their feet. Juggling the ball with the foot is a fundamental exercise for the football-specific skills like dribbling or reception of the ball in children. Thus, juggling very often is used in training programmes and testing of football skills, especially in young players (Weigelt, Williams, Wingrove, & Scott, 2000; Bozkurt, & Kucuk, 2018). Generally, this exercise involves rhythmic kicking the ball with one foot while standing on the contralateral leg, as many times as possible or as many times as possible within a given time. Note to juggling also improves the perceptual-motor skills as visual anticipation (the spin and direction of the flight of the ball), balance and intra- and interlimb coordination (Tlili, Mottet, Dupuy, & Pavis, 2004).

Movements are performed fluently and efficiently when a group of muscles are well coordinated. From a motor learning perspective, the key point for the early stages of learning is to acquire a new skill by producing a correct movement pattern. Since this process is very demanding for the attention of the learner (Sullivan, Kantak, & Burtner 2008), it is common practice to facilitate learning a novel motor skill by directing the learners' attention to parts of their body or body movement's coordination (Beilock, Carr, MacMahon, & Starkes, 2002). This type of instructions promote a greater awareness of their movements, however also makes this process more conscious what may result in interfering with the automatic execution of the movement (Abdollahipour, Psotta, Palomo, & Wulf, 2017). A large of body research showed that directing an athlete's focus towards the movement of their own body during motor skill performance (internal focus of attention) disrupts motor learning and performance, whereas paying attention to the environmental effects of movements (external focus) led to better performance (Wulf, 2013). Providing the external focus instruction has been demonstrated to improve the performance of specific sports skills such as basketball free throw (Zachry, Wulf, Mercer, & Bezodis, 2005), football kick and volleyball serve (Wulf, McConnel, Gärtner, & Schwarz, 2002). For example, Zachry (2005) found an increase in accuracy in American football kick during the external focus condition compared to the internal focus. Also study by Ford, Hodges, Huys, and Williams (2009) have been suggested that focus on the ball trajectory (external) during football specific exercise was more beneficial for motor performance (movement kinematics) relatively to focus on the body in skilled and novice football player. Several other studies have shown the gains in the balance as well as the greater whole-body coordination patterns (Flores, Schild, & Chiviacowsky, 2015; Porter, Makaruk, & Starzak, 2016) when adopting an external focus of attention rather than an internal focus.

The constrained action hypothesis is proposed to explain these motor learning and performance benefits (Wulf, McNevin, & Shea, 2001). This hypothesis posits that directing attention towards movement disrupts the

automatic (i.e. non-conscious) processes of motor behaviour. This interruption in automatic control processes degrades motor performance. In contrast, focus on the results of the movements promotes automatic processing and thereby improves motor performance by more natural self-organize motor control system (Bernstein, 1996).

However, there are a few studies which have not reported positive benefits of adopting an external focus (Uehara, Button, & Davids, 2008; Zentgraf, & Munzert, 2009). Some researchers claim that when the instruction involves the main object of the motor task, external cues may be redundant in the task where the instruction refers to the task-relevant feature (e.g. hand juggling the balls) (Zentgraf, & Munzert, 2009). Moreover, the other researchers believe that an internal focus is necessary and beneficial in early learning because may provide additional information for learners (Beilock et al. 2004; Uehara et al., 2008). According to studies of football skills conducted by Bailock et al. (2004) and Uehara et al. (2008), the influence of attentional focus instructions may depend on the level skill proficiency.

In the field of the attentional foci, there are several studies that have incorporated a control condition consisting of neutral stimuli. For example, Porter, Nolan, Ostrowski, and Wulf (2010) have reported that when participants were given neutral instructions or they accomplished the task without the instruction, they achieved similar results to trials completed in the internal condition.

Tlili et al. (2004) suggested that attention is shared across two main tasks during football juggling. The first is dynamic stabilization segments of the body, and the second is dynamic stabilization the ball. This dual-task condition requires that attentional control is constantly maintained and effectively used to execute the task. Therefore, we assumed that identification of the key attentional strategies for keeping the ball under control would be an efficient way to adopt an established movement pattern for football juggling in children. Thus, the aim of this study was to examine the effects of attentional focus instructions on the performance of juggling task in young football players.

Material and Methods

Participants

Twenty-two young male players from a football academy, with a mean age of 10.6 ± 0.5 years and 3.1 years sport experience, participated in this study. Before participating in the experiment, all of them read and signed an informed consent. The research has been approved by the Ethics Committee at the university concerned.

Apparatus and task

All the tests were performed on a football field with players wearing football shoes. The limited zone (3 x 3 m) was marked with 5-cm-wide white tape, which was clearly visible by the participant while he was juggling. The ball (size 4) was used in accordance with FIFA rules.

The task required the participant to bounce the ball with his dominant leg (foot) while standing on the other leg. The ball was picked-up with the hands to start it bouncing. After that, the participant started to kick the ball up as many times as possible within 30 s with one leg, using only the instep of the leg in other to keep it in the air (Raastad, Aune, & van den Tillaar, 2016). The task was completed when the ball touched the ground or participant touched the ball the other part of his body (no instep) or left the marked zone. Each participant had three attempts. The best scores (the highest number of touches) was used for further analysis.

Procedure

During standardized warm-up (20 minutes), each participant had several familiarization trials and then performed three testing trials in each of six testing sessions. Three sessions were conducted in a limited zone and the remaining three sessions in an unlimited zone. Each session involved only one type of instruction. Using a within-participant design, participants performed each of three focus of attention conditions: external focus (EXF), internal focus (INF), and control (CON) in a random and counterbalanced order (across participants) to avoid learning effects. There were three sequences of treatment (e.g. EXF-INF-CON, INF-EXF-CON, CON-INF-EXF). Testing sessions were separated by three or four days. After the general instruction, the participant received a specific instruction for the condition. The instruction given prior to the EXF condition was to "When you are juggling, focus on the ball." The instruction for the INF condition was to "When you are juggling, focus on your foot". When participants were in the CON condition, they were simply told: "Perform the task to the best of your abilities." This instruction was designed to be neutral and not promote a specific focus of attention.

Statistical analysis

A computer program (Statistica version 13.1) was used for all statistical calculations. Descriptive statistics are presented as mean and standard deviation ($M \pm SD$). Shapiro-Wilk test of normality was applied to check if the data were normally distributed. A one-way ANOVA was performed to check for examine whether there were significant differences among the three conditions (i.e. INF, EXF, CON). Tukey's *post-hoc* tests were applied, when significant effects were observed. In the test, $p < .05$ was used as the level of significant differences. Cohen's effect-size statistics (ES) were calculated to determine the magnitude of observed differences between conditions using the following thresholds: $>.5$ =large, $.2$ -. 5 =moderate, $<.2$ =small (Cohen, 1988).

Results

The unlimited zone

One way repeated measures ANOVAs indicated a significant main effect for football juggling in the unlimited zone ($F_{2,42}=8.85, p<0.001, \eta_p^2=0.30$) – Fig. 1. The results of the *post-hoc* analysis showed that both the external and internal foci of attention resulted in a greater number of touches compared to no attentional (control) condition ($p<0.001, ES=0.43; p<0.05, ES=0.27$, respectively).

The limited zone

Results of the ANOVA also revealed a significant main effect for football juggling in the limited zone ($F_{2,42}=7.68, p<0.01, \eta_p^2=0.27$) – Fig. 2. Follow up analysis demonstrated that the number of touches in the external focus condition was higher relative to the internal and control conditions ($p<0.01, ES=0.39; p<0.01, ES=0.45$, respectively).

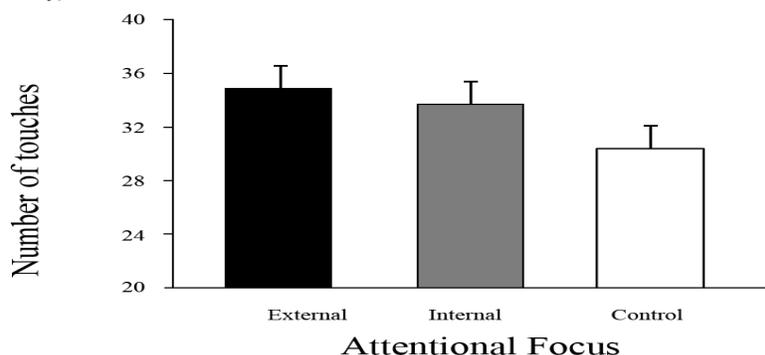


Fig.1. Mean (±SD) of the football juggling touches (or repetitions) in the experimental and control conditions in the unlimited zone

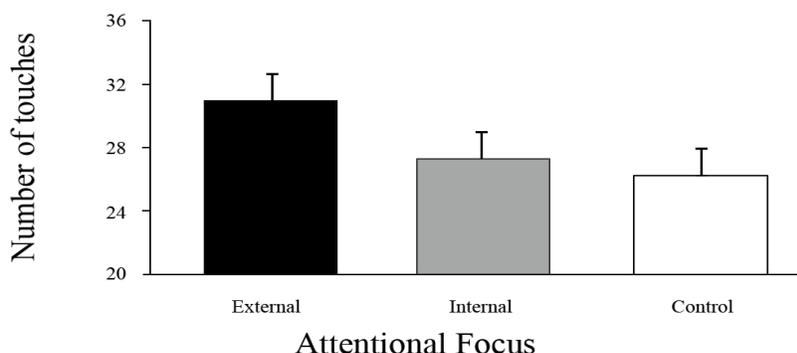


Fig.2. Mean (±SD) of the football juggling touches (or repetitions) in the experimental and control conditions in the limited zone

Discussion

The findings of the current study partially confirmed the constrained action hypothesis, showing that an external focus of attention produced a higher number of touches in football juggling in a limited zone compared with both internal and control conditions in young football players. There were no differences in a number of touches between the external and internal foci in an unlimited zone. An additional noteworthy observation from this study was the players performed the juggling more effectively while using an internal focus of attention relatively to no attentional focus (control condition).

Our results provide evidence that adopting an external focus of attention may be the preferred type of instruction to immediately increase movement effectiveness in football- specific task. Regardless of the conditions of task performance (type of zone), the external focus showed the highest gains in motor performance. It may suggest that instructions directing an individual’s attention to the movement effect produce the desired movement patterns. On this basis, we assume that the external focus of attention should be incorporated into motor learning programs in children. These observations do not support the suggestions of Zentgraf, and Munzert (2009) that external focus cues are redundant when the instruction is related to the object representing the main goal.

In accordance with previous studies (Wulf, 2013), we found that an external focus of attention resulted in better performance compared to an internal focus when players performed juggling in the unlimited zone. However, the juggling outcomes were similar for external and internal conditions in the limited zone. These results are not consistent with the assumption of the constrained action hypothesis (Wulf et al., 2001), but they are in line with those of Uehara et al. (2008) who demonstrated that both attentional foci were beneficial for

developing football skills in early stages of motor learning. They also suggested that early learners might not rely on single attentional source during skill execution, and rather switch their attention interchangeably between both the foci (external and internal) depending on the learning needs (e.g. additional information). It is also plausible that instruction inducing internal focus (“focus on your foot”) facilitated control of the ball due to more optimal movements (or position) of the foot than in no attentional condition. During motor skill learning, the main difficulties faced by the learner is how to become proficient in mastering various degrees of freedom, such as the single joints and muscles. It has been proposed that learners utilized freezing and freeing degrees of freedom (Bernstein, 1996). They initially freeze degrees of freedom in their limb to short the kinetic chains, and in consequences to simplify motor control in the early learning stages. It seems plausible that directing attention to foot help the participants of this study to adjust their movements to the task. These results suggest that advanced beginners may benefit from instructions that direct attention toward movement performance in familiar or non-complex conditions.

The fact that an internal focus of attention resulted in better motor performance in an unlimited zone, and did not enhance performance in a limited zone relative to the control condition may be caused by the amount of space for the performance of the task. Advanced beginners find it difficult to perform routine task when environmental conditions are changed (Castaneda, & Gray, 2007; Uehara et al., 2008). It is plausible that the spatial restriction of the task caused by the limited zone introduced additional task demands or increased complexity of the task (Lopes, Araújo, Duarte, Davids, & Fernandes, 2012). It has been found that an internal focus imposed a greater load on working memory than an external focus as well as that when working memory is overloaded by new information, performance may decrease (Poolton, Maxwell, Masters, & Raab, 2006). It is possible that an internal cue was not effective as external cue due to overloading of working memory during execution of the task. Those finding are in line with study by Kal, Van der Kamp, and Houdijk (2013) who found that an external focus instruction more effectively decreased attentional load.

There are two main limitations of this study. First, it is possible that the adherence to instructions was different due to the young age of the participants of this study. Future research should report degree of adherence of participants to the focus instructions. Second, we only examined the immediate effects of motor performance, therefore future studies need to involve a motor learning approach.

Conclusions

Our results extend the previous studies (Wulf et al., 2002; Zachry, 2005) by showing that, the external focus instructions increase movement effectiveness in football-specific task as well as demonstrated that an internal focus may have positive contributions to motor performance in children. Taken together, the presented findings demonstrate that it is more effective to explicitly instruct young players to focus their attention externally or on the movement of their own body during motor skill performance rather than providing no attentional instructions only. Coaches, instructors and teachers who work with young athletes should pay considerable attention to the content of instructions provided during training sessions as this directly influences how players direct their conscious attention.

References

- Abdollahipour, R., Psotta, R., Palomo, M., & Wulf, G. (2017). External focus of attention and autonomy support have additive benefits for motor performance in children. *Psychology of Sport and Exercise*, 32, 17-24. doi:10.1016/j.psychsport.2017.05.004
- Beilock, S. L., Carr, T. H., MacMahon, C., & Starkes, J. L. (2002). When paying attention becomes counterproductive: impact of divided versus skill-focused attention on novice and experienced performance of sensorimotor skills. *Journal of Experimental Psychology: Applied*, 8(1), 6-16. doi:10.1037/1076-898X.8.1.6
- Bernstein, N. A. (1996). On dexterity and its development. In M. L. Latash & M. T. Turvey (Eds), *Dexterity and its development* (pp. 171-204). Mahwah, New York: Lawrence Erlbaum.
- Bozkurt, S., & Kucuk, V. (2018). Comparing of Technical Skills of Young Football Players According to Preferred Foot. *International Journal of Human Movement and Sports Sciences*, 6(1), 19-22. doi:10.13189/saj.2018.060103
- Castaneda, B., & Gray, R. (2007). Effects of focus of attention on baseball batting performance in players of differing skill levels. *Journal of Sport and Exercise Psychology*, 29(1), 60-77. doi:10.1123/jsep.29.1.60
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Hillsdale, New York: Lawrence Erlbaum.
- Flores, F. S., Schild, J. G., & Chiviawowsky, S. (2015). Benefits of external focus instructions on the learning of a balance task in children of different ages. *International Journal of Sport Psychology*, 46(4), 311-320. doi: 10.7352/IJSP.2015.46.311
- Ford, P., Hodges, N. J., Huys, R., & Williams, A. M. (2009). An evaluation of end-point trajectory planning during skilled kicking. *Motor Control*, 13(1), 1-24.

- Kal, E. C., Van der Kamp, J., & Houdijk, H. (2013). External attentional focus enhances movement automatization: A comprehensive test of the constrained action hypothesis. *Human Movement Science*, 32(4), 527-539. doi:10.1016/j.humov.2013.04.001
- Lopes, J. E., Araújo, D., Duarte, R., Davids, K., & Fernandes, O. (2012). Instructional constraints on movement and performance of players in the penalty kick. *International Journal of Performance Analysis in Sport*, 12(2), 331-345. doi:10.1080/24748668.2012.11868602
- Poolton, J. M., Maxwell, J. P., Masters, R. S. W., & Raab, M. (2006). Benefits of an external focus of attention: Common coding or conscious processing? *Journal of Sports Sciences*, 24(1), 89-99. doi:10.1080/02640410500130854
- Porter, J., Makaruk, H., & Starzak, M. (2016). The role of vision and movement automatization on the focus of attention effect. *Journal of Motor Learning and Development*, 4(2), 152-168. doi:10.1123/jmld.2015-0020
- Porter, J., Nolan, R., Ostrowski, E., & Wulf, G. (2010). Directing attention externally enhances agility performance: A qualitative and quantitative analysis of the efficacy of using verbal instructions to focus attention. *Frontiers in Psychology*, 1, 216. doi:10.3389/fpsyg.2010.00216
- Raastad, O., Aune, T. K., & van den Tillaar, R. (2016). Effect of practicing soccer juggling with different sized balls upon performance, retention, and transfer to ball reception. *Motor Control*, 20(4), 337-349. doi:10.1123/mc.2015-0026
- Sullivan, K. J., Katak, S. S., & Burtner, P. A. (2008). Motor learning in children: feedback effects on skill acquisition. *Physical Therapy*, 88(6), 720-732. doi:10.2522/ptj.20070196
- Tlili, M., Mottet, D., Dupuy, M.-A., & Pavis, B. (2004). Stability and phase locking in human soccer juggling. *Neuroscience Letters*, 360, 45-48. doi:10.1016/j.neulet.2004.02.048
- Uehara, L. A., Button, C., & Davids, K. W. (2008). The effects of focus of attention instructions on novices learning soccer chip. *Brazilian Journal of Biomechanics*, 2(1).
- Weigelt, C., Williams, A. M., Wingrove, T., & Scott, M. A. (2000). Transfer and motor skill learning in association football. *Ergonomics*, 43(10), 1698-1707. doi:10.1080/001401300750004104
- Wulf, G. (2013). Attentional focus and motor learning: a review of 15 years. *International Review of Sport and Exercise Psychology*, 6(1), 77-104. doi:10.1080/1750984X.2012.723728
- Wulf, G., McNevin, N., & Shea, C. H. (2001). The automaticity of complex motor skill learning as a function of attentional focus. *The Quarterly Journal of Experimental Psychology*, 54, 1143-1154. doi:10.1080/02713756012
- Wulf, G., McConnel, N., Gärtner, M., & Schwarz, A. (2002). Enhancing the learning of sport skills through external-focus feedback. *Journal of Motor Behavior*, 34, 171-182. doi:10.1080/00222890209601939
- Zachry, T. (2005). Effect of attentional Focus on kinematics and muscle activation patterns as a function of expertise. (Unpublished master's thesis). University of Nevada. Las Vegas.
- Zachry, T., Wulf, G., Mercer, J., & Bezodis, N. (2005). Increased Movement Accuracy and Reduced EMG Activity as the Result of Adopting an External Focus of Attention. *Brain Research Bulletin*, 67, 304-309. doi:10.1016/j.brainresbull.2005.06.035
- Zentgraf, K., & Munzert, J. (2009). Effect of attentional-focus instructions on movement kinematics. *Psychology of Sport and Exercise*, 10(5), 520-525. doi:10.1016/j.psychsport.2009.01.006