

SHORT COMMUNICATION

An external focus of attention is a *conditio sine qua non* for athletes: a response to Carson, Collins, and Toner (2015)

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ABSTRACT

In this invited response to a Letter to the Editor by Carson, Collins, and Toner (2015), I comment on various issues raised by the authors. I highlight the broad range of tasks and dependent measures used in studies comparing the effectiveness of external versus internal foci of attention. These studies – many of which involved sport skills – have consistently found performance or learning benefits when an external focus was adopted. There is no convincing evidence that performers' preferences, or their familiarity with a certain focus, have a moderating effect. Anecdotal evidence reported by coaches who have compared the two types of foci is consistent with research findings. An external focus presumably promotes functional connectivity and contributes to goal-action coupling.

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Since the late 1990s when we first demonstrated that an external focus of attention on the intended movement effect is more effective for motor performance and learning than an internal focus on body movements (Wulf, HöB, & Prinz, 1998), the number of published reports that have shown the advantages of an external focus has presumably reached triple digits. Nevertheless, I suspect it is tempting for some to question the generalizability of findings which suggest that the approaches they have used over many years may be non-optimal for improving their athletes' performance. I have previously responded to, and defused, issues regarding the attentional focus effects that were brought up by some authors (Wulf, 2016). Therefore, I will keep my responses to the latest points raised by Carson, Collins, and Toner (2015) relatively short.

It is interesting that, in their letter to the Editor, the authors cite Christina (1987) – "If we are fortunate enough to develop a new idea or hypothesis, or discover some new information from our applied research ..., its contribution to fundamental motor learning knowledge can be evaluated by subjecting it to the rigor of controlled laboratory testing of basic research" – as this is exactly how the line of research comparing internal versus external foci came to life and fruition. Starting with the very obvious advantages of adopting an external focus I experienced in windsurfing, subsequent laboratory studies confirmed those experiential findings (Wulf et al., 1998), as did many other studies conducted over the following years (for reviews, see Wulf, 2007, 2013). The argument "that focus of attention effects are in need of more ecologically valid and rigorous testing" (Carson et al., 2015) is surprising to me. Which other line of research has shown similarly consistent results across a wide range of skills? External focus benefits have been found for tasks ranging from simple force

production (e.g., Lohse, Sherwood, & Healy, 2011) to wild water kayak racing (Banks, Sproule, Higgings, & Wulf, 2015). Other sport skills used in those studies include basketball shots, volleyball serves, sprinting, discus throwing, weightlifting, golf shots, high jump and long jump, to name a few. Measures of performance have included accuracy, consistency, maximum force production, EMG activity, movement speed, heart rate, spare attentional capacity, etc. (for a review, see Wulf, 2013). I continue to maintain that *it is now clear* that the attentional focus effect is generalisable.

Case studies in which an athlete improves with – I would say *despite* – an internal focus, and which do not include comparisons with external foci (e.g., Carson, Collins, & Jones, 2014) provide *no* evidence for the relative benefits of an internal focus. Conclusive evidence can be provided only through experiments that include different types of attentional focus instructions (e.g., internal, external) that are comparable in terms of the information they provide and the actual locus of attention. This was the case in the study by Abdollahipour, Wulf, Psotta, and Palomo Nieto (2015) that Carson et al. (2015) made the centre of their critique. Gymnasts were asked to perform a 180-degree turn and to focus on the direction in which a marker on their chest (external focus) or their hands (internal focus) were pointing after the turn. The hands crossed in front of that marker, so the two foci were comparable. (As we mentioned in the paper, we could have asked participants to focus on the chest itself, but we would expect a similar pattern of results.) If focus familiarity and performers' preferences were important, why did our instructed external focus result in increased jump height as well as superior movement form relative to the control condition in which the gymnasts were free to adopt their familiar and preferred focus? And why did the control

condition and internal focus condition produce similar and non-optimal performances (similar to many previous studies; see Wulf, 2013)?

Interviews with athletes suggest that they indeed use various internal or external foci (e.g., Guss-West & Wulf, *in press*; Stoate & Wulf, 2011), often as a result of coaching instructions (Porter, Wu, & Partridge, 2010). Yet, as the findings by Abdollahipour et al. (2015) show, performers' chosen foci (control condition) are not always optimal. Furthermore, experienced athletes (swimmers) who reported using an external focus in a control condition were found to show more effective performance than those who focused internally in the control condition (Stoate & Wulf, 2011). Therefore, it would be unwise to leave athletes to their own devices and assume they will find the focus that is optimal for them. Coaches should use their expertise to suggest appropriate external foci for the skill, skill level or the specific motor "problem" that needs to be fixed. Moreover, coaches should make their athletes aware of the benefits of adopting an external focus. Experienced athletes, who have already developed a good feel for the correct movement pattern, will recognise deviations from it and will be able to find their own external focus to make desired adjustments to their technique. For example, depending on what the issue is, a golfer may decide to focus on hitting the ball squarely, the swing path, desired ball trajectory and spin.

When athletes report the use of internal foci, it is often due to prior instruction over the course of their career. Any performance benefits with preferred foci, some of which may be internal in nature, over instructed external foci (Maurer & Munzert, 2013) are most likely due to performers' expectancies (Lohse & Sherwood, 2011) and temporary. If given alternative, comparable external focus suggestions, athletes will undoubtedly start to see the benefits. In one nice piece of evidence of how athletes benefit from a change in instructional cues, Christina and Alpenfels (2014) showed in two experiments that skilled golfers learned to change their swing path more effectively with external relative to internal focus instructions. Also, performers are not oblivious to their improvements. Experience of superior performance with an external focus has been found to result in increased self-efficacy (e.g., Pascua, Wulf, & Lewthwaite, 2015; Wulf, Chiviacowsky, & Drews, 2015) – which might initiate a virtuous cycle of further improvements (Wulf & Lewthwaite, 2016).

Most people who work in practical settings (including sports, physical/occupational therapy, music, performing arts) can immediately relate to the external focus advantage based on their own performances or those of their clients. Many practitioners, including golf or gymnastics coaches, physical therapists, musicians and others, who have compared instructions related to body movements with those that promote an external focus report immediate benefits. Others already used external foci in their teaching and coaching practices, based on their experience, before they became aware of the research findings. For instance, golf coach Kendal McWade creates *tasks* with specified outcomes that produce the desired motion, rather than teaching a certain technique by referring to body movements (McWade, 2015). Golf coach Steven Orr has had remarkable success with improving the movement form of

skilled golfers by promoting an external focus (Orr, 2015). Similarly, Clare Guss-West, a renowned ballet teacher and choreographer, has long used a holistic approach to classical ballet in which she makes use of images to elicit movements, instead of attempting to influence dancers' movement coordination per se. She now systematically applies external focus cues in her work: "In my practical teaching and coaching work with such companies as Finnish National Ballet or Ballet de L'Opera du Rhin, professional dancers are attracted to the simplicity of the systematic application of an external focus and to the global nature of the benefits experienced," and "in a pedagogic context with Opera de Paris-Opera Université, The Royal Academy of Dance, or L'Ecole Superieure de Danse Cannes et Marseille my experience is that an integrated external focus approach to training and performance promotes an immediate, palpable global movement cohesion in professionals, beginners and elderly dancers alike" (personal communication, September 17, 2015).

I maintain that there is no room for internal foci. Instructions directing attention *away from body parts, or self, and to the intended movement effect* have consistently been found to have an enhancing effect on performance and learning. Even one- or two-word differences in the instructions – "your feet" versus "the markers" (on a platform in front of the feet) on balance tasks – have differential effects on learning (e.g., Wulf et al., 1998). We have therefore argued that an external focus plays a dual role by (a) reducing a focus on the self and (b) directing attention to the task goal (Wulf & Lewthwaite, 2010, 2016). Recent neuroscientific findings suggest that, by suppressing off-task and self-focused attention that is supported by the so-called default mode network (Buckner, 2012; Buckner, Andrews-Hanna, & Schacter, 2008), an external focus promotes functional connectivity and thereby contributes to what we have called *goal-action coupling* (Wulf & Lewthwaite, 2016). Functional connectivity refers to temporal linkages between spatially distinct neural regions or networks that occurs relative to task performance and learning (Di & Biswal, 2015; Friston, 2011; Fox et al., 2005) and is related to higher levels of motor skill (e.g., Ito, Matsuda, & Shimojo, 2015). We (Wulf & Lewthwaite, 2016) suggested that an external focus suppresses off-task and self-focused attention, buffering learners from these impediments to optimal performance (McKiernan, Kaufman, Kucera-Thompson, & Binder, 2003). Continuing to rely on "practitioner wisdom" and ignoring strong evidence for the advantages of an external attentional focus provides a disservice to athletes.

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