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Letter to the editor concerning the article "Performance of gymnastics skill benefits from an external focus of attention" by Abdollahipour, Wulf, Psotta & Nieto (2015)

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Abstract

Abdollahipour, Wulf, Psotta, & Nieto (2015) recently published data in *Journal of Sports Sciences* to show that an external focus of attention promotes superior performance effects (gymnastics jump height and judged movement form score) when compared to internal or control foci during skill execution without an implement involved. While we do not contest the veracity of findings reported, nor others that have been used to support beneficial effects of an external focus of attention, in this Letter to the Editor we comment on considerable methodological limitations associated with this and previous studies which, we suggest, have resulted in serious theoretical oversights regarding the control of movement and, most crucially from our practitioner perspective, suboptimal recommendations for applied coaching practice. Specifically, we discuss the lack of consideration towards translational research in this area, the problematic nature of attentional focus cues employed, interpretation of findings in relation to other applied recommendations and coherence with mechanistic underpinning and finally, the representative nature of task involved. In summary, while (laboratory) research evidence may appear to be conclusive, we suggest that focus of attention effects are in need of more ecologically valid and rigorous testing and consideration of current coaching practices *if* it is to optimally serve the applied sporting domain that it purportedly aims to.

Keywords: Holistic cues, Imagery, Motor control, Sports coaching, Translational research

Letter to the editor concerning the article "Performance of gymnastics skill benefits from an external focus of attention" by Abdollahipour, Wulf, Psotta & Nieto (2015)

In a recent study, Abdollahipour, Wulf, Psotta, and Palomo Nieto (2015) aimed to investigate attentional focus effects in skills that do not utilise implements (e.g., a golf club) and that are evaluated on movement quality. Specifically, the task was a gymnastics vertical jump with a 180-degree turn while airborne. In similar fashion to many previous studies (see Wulf, 2013), the research design compared performances when participants employed internal, external and control (i.e., no instruction) foci. Accordingly, support was found for the constrained action hypothesis (Wulf, McNevin, & Shea, 2001) which underpins much (if not all) of this research group's data interpretation; results showed significantly higher performance scores (i.e., fewer points deducted) and jump height when employing an external focus of attention, with no differences between the internal and control group. As such, the authors claimed "*it is now clear* [emphasis added] that the attentional focus effect is independent of the type of task, in addition to its generalisability across level of expertise, age, dis/ability etc." (pp. 1811–1812). However, following critical reflection on several factors, we believe that caution must be raised when accounting for the mechanistic explanation for these findings and when proposing implications for applied coaching practice. In short, the conclusions drawn are not as 'clear' as the authors portray.

Firstly, the authors present a lack of consideration towards translational research which encourages athletes to focus on internal cues. Instead, Abdollahipour et al. (2015) focus discussion on theory and laboratory/fundamental research findings (e.g., Kal, van der Kamp, & Houdijk, 2013; Land, Frank, & Schack, 2014; Wulf, Höß, & Prinz, 1998) that have almost ubiquitously concluded that "if attention is directed towards body movements . . . skill learning is impeded relative to instructions that direct attention to the intended movement effect" (p. 1807). Such omission is a substantial oversight when contextualising attentional

focus research within representative coaching environments and the challenges it presents. In this regard, Christina (1987) stressed over 25 years ago that applied research should not in fact be viewed as subordinate and dependent on theory-driven study; therefore suppressing its importance and contribution to theory *building*. As he explains:

> Some of us fail to realize that specialized knowledge can be developed solely by applied research at Level 2 [theory developed *for* practical settings] in places where the theory-based knowledge of Level 1 [general theory *of* motor control] is not adequately advanced. . . . If we are fortunate enough to develop a new idea or hypothesis, or discover some new information from our applied research either at Level 2 or Level 3 [solution-focussed without intention of theory building], its contribution to fundamental motor learning knowledge can be evaluated by subjecting it to the rigor of controlled laboratory testing of basic research at Level 1. [There are pros and cons to the progression from applied to basic research, or the other way round. However,] in this way applied research can contribute to basic research. (pp. 37–38)

Indeed, elite-level athletes report beneficial effects from focussing on aspects of the movement (e.g., Bernier, Trottier, Thienot, & Fournier, 2015; Carson, Collins, & MacNamara, 2013; MacPherson, Collins, & Morriss, 2008; Nyberg, 2015; Orlick & Partington, 1988; Robazza & Bortoli, 1998) and, sport psychologists often employ explicit movement imagery techniques to enhance competitive performance (e.g., Carson, Collins, & Jones, 2014; Collins, Morriss, & Trower, 1999; Martindale & Collins, 2012; Wang & Zhang, 2015). Accordingly, failure to contextualise the study within current coaching/sport psychology practices, or to explain *why* athletes' perceptions are apparently wrong, surely limits the paper's ability to serve its purpose in a purportedly applied discipline.

Furthermore, individual preferences for internal foci are clearly apparent in the literature. For example, Maurer and Munzert (2013) highlight the 'familiarity' of task instructions as a factor which can influence levels of automatisation in high-level athletes. In their study of skilled basketball players, free-throw executions were more successful when implementing individually-preferred (i.e., inter-individually different) familiar versus unfamiliar foci irrespective of direction (internal or external). Moreover, 18 out of 23 players expressed a preference for an internal self-focus (e.g., fluent leg–arm co-ordination), indicating that such attentional strategies may have become essential subroutines, or sources of information (MacPherson, Collins, & Obhi, 2009), for achieving whole skill activation; that is, a *highly-associated* pattern of network activation or chunking (cf. Paivio, 1971, 1986). While the issue of preference has been addressed in other attentional focus literature with non-elite populations (e.g., Weiss, Reber, & Owen, 2008; Wulf, Shea, & Park, 2001), it has been assessed using experimenter-determined internal or external foci and *not* by providing participants autonomy to select their own attentional strategies.

Such relevance also extends to the onset of instructed attentional focus "after the half turn," where it is possible that experienced gymnasts would prepare aspects of the execution prior to ground take off in airborne skills. For example in the study by Bernier et al. (2015) one elite-level ice skater reported "during the approach to the jump, actually, I'm doing the jump in my head: I have the same sensations in my body, and I feel like I'm doing it in my upper body and hips [i.e., a whole body/holistic internal focus]." Once again, the internal focus condition in Abdollahipour et al. (2015) presents not only a task-irrelevant focus, but has the potential to be unfamiliar in that it may conflict with useful imagery that is ordinarily employed (cf. our comments in the previous paragraph).

Secondly, the nature of the instructions are problematic in their categorisation (i.e., internal and external) and operationalisation of focus. The internal focus, "While airborne,

focus on the direction in which your hands are pointing after the half turn" (p. 1809), surely constitutes a task-irrelevant instruction (cf. Winter & Collins, 2013). By comparison, the external focus instruction, "While airborne, focus on the direction in which the tape marker is pointing after the half turn" (p. 1809), is a clear outcome focus that directly facilitates the task. As such, and as was the case made by Winter and Collins, the paper presents an unfair comparison between an entirely irrelevant and an outcome-creating focus. This is, in fact, not uncommon within the attentional focus literature. For example, Beilock, Bertenthal, McCoy, and Carr (2004) asked participants to focus on the putter path direction during a golf putt, which has subsequently been found to account for only 17% of outcome variance amongst elite-level golfers (cf. Karlsen, Smith, & Nilsson, 2008). Similarly, Bell and Hardy (2009) asked golfers to focus specifically on the wrist hinge angle through impact; that is, a subcomponent at the end of a complex kinematic chain and during the fastest moment (and therefore most likely to be under higher subconscious control) during the action (cf. a European Tour golfer's comments about not attending to small movement components but instead to larger and grosser ones; Carson et al., 2013). Accordingly, it is hardly surprising that the foci most likely to generate the required outcomes are the ones that win out. In simple terms, such investigations are comparing apples with oranges.

Indeed, and in the absence of explicit instructions for the control condition (participants were left to their own devices), manipulation checks or even enquiry into participant perceptions, we are left unsure exactly what is being contrasted with what. It is entirely possible, reflecting the inter-individual preferences discussed above, that participants in the control condition used an almost random mix (between individuals) of internal and external foci.

Thirdly, the authors advise that identifying an appropriate external focus might be a challenge for athletes and coaches during skill execution when an implement is not involved;

that is, in contrast to target-oriented sports where a clear trajectory end-point can be discerned (e.g., archery). Consequently in such practical situations, it is explained that the athlete can employ a metaphor instead (cf. Wulf, Lauterbach, & Toole, 1999), which serves the *same purpose* as an external focus of attention because it provides "a mental image of the movement goal that the performer can try to produce without directing attention to body movements per se" (p. 1812). To exemplify such metaphoric thinking, the authors draw on the work of Guss-West and Wulf (2015) to describe how ballet dancers report the use of images to inform positions or moves, for instance "stretching like a star in all directions" when performing an arabesque, "climbing up a corkscrew" during a pirouette or "jumping over a lake" while performing a grand jeté. Indeed, the use of metaphor has been widely encouraged amongst sport practitioners as an effective execution strategy (e.g., Overby, Hall, & Haslam, 1998; Ruiz & Hanin, 2004). Crucially, however, we raise doubt over the mechanistic equivalence that metaphors share with an external focus of attention. According to the constrained action hypothesis:

> when attending to body movements, the performer constrains his or her motor system by using conscious control processes that interfere with automatic control mechanisms. In contrast, when attention is directed at the intended movement effect, automatic–that is, unconscious, fast and reflexive–processes are utilised, with the result that motor performance is enhanced (Abdollahipour et al., 2015, p. 1807)

When a metaphor is used, the athlete often reports translation of the entire visual image (although metaphors need not only be visual) into kinaesthetic, and sometimes auditory, sensations, or "interpretive descriptors" (Hanin & Stambulova, 2002, p. 401); thus supporting the optimal use of multisensory information in guiding a most vivid and, crucially, personally meaningful motor plan (cf. Ernst & Banks, 2002; Holmes & Collins, 2001). Therefore, it is difficult to explain how a metaphor is *not* consciously controlled by drawing attention

towards the movement form in a way that holds personal meaning to the individual (i.e., what the experience would be like when executed). We suggest that one rationale for using a metaphor, and indeed holistic thoughts, is to consciously raise awareness towards the *entire* movement as opposed to an individual component part. In this regard, the cue is more a *source of information* about the holistic execution and/or sensory consequences of the movement (MacPherson et al., 2009). Consequently, metaphoric/holistic thoughts serve to enhance memory recall of a whole skill and, buffers against the onset of maladaptive cognitions during execution (Winter, MacPherson, & Collins, 2014). Indeed, focusing on individual movement components *has* been shown to be almost inevitably detrimental to performance when compared to holistic rhythm-based cues (e.g., MacPherson et al., 2008; Mullen & Hardy, 2010). Accordingly, the crucial factor in this debate appears to be on *what* and *how* an internal focus is applied, and is dependent on the movement's organisation and level of establishment within an individual's long-term memory (see Carson & Collins, 2015).

Fourthly, the authors state in their final remarks that "for *sequences* [emphasis added] of ballet or gymnastics moves, series of external focus cues, or metaphors, *might* [emphasis added] be an effective way to enhance overall performance" (p. 1812). Not only does this conclusion hold less strength compared to a previous comment that "it is now clear that the attentional focus effect is independent of the type of task" (pp. 1811–1812), it is also inconsistent with the experimental task demands reported. As with much of the research reported in this area (e.g., An, Wulf, & Kim, 2013; Land et al., 2014), executions do not accurately represent the level of difficulty/context experienced within the performance domain (in this case a single skill element versus a sequence of elements lasting several minutes). As such, for the sample described (i.e., "experienced gymnasts," p. 1809), the task is undoubtedly simple enough as to be completed entirely under automated control

(Christensen, Sutton, & McIlwain, in press). Therefore, *any* request to focus attention on what is happening will almost inevitably prove disruptive. Furthermore, challenges experienced during competitive performances are somewhat different to those in practice; in fact, it has been suggested that some form of performance problem is almost inevitable during competitive trampolining/acrobatics (Hauw & Durand, 2007). According to Hauw and Durand's study, "results suggest a complementary conception of performance as being linked to the ability (a) to cope with problems surging up in the course of action and (b) to make sensible adjustments throughout its unfolding" (p. 182). Similarly to freeskiers in Nyberg (2015), trampolinists retain an awareness of their action sequence during on-line skill execution. These thoughts may not be computationally demanding but they may serve as an 'attentional check' and are undoubtedly internal in nature. We are led towards the initial challenge of asking an experienced driver to provide a commentary on his/her actions or even to respond verbally to a simple request such as "what gear are you in?" Once again, the point of comparison seems somewhat loaded to generate the answer required.

In highlighting these concerns, we acknowledge that such issues are nothing new in sport science research. For example, Goginsky and Collins (1996) showed how a series of methodological decisions in the design of mental practice studies could lead to outcomes supportive of one or the other of two competing paradigms at the time. Even a change in control group design led to different results. We are not suggesting that this is in any way deliberate or Machiavellian. Rather that, especially in environments which carry (or at least are supposed to carry) applied implications, a more careful and context-valid set of parameters should be applied to investigative design.

In fact, there appears to be considerable confusion around certain aspects of focus; illustrative perhaps of the inevitable shades of grey when addressing human behaviour. In a recent response, for example, Wulf herself illustrates this confusion:

> Clearly, elite athletes are typically acutely aware of their body movements. . . . Adopting an external focus does not mean that the performer is not aware of her or his body movements. (How would that even be possible?) It simply means the performer is focusing on the intended movement effect – while *preparing for the execution* of a ballistic skill (e.g., throwing or hitting a ball) or *during the execution* of a continuous skill (e.g., balancing, swimming, cross-country skiing). Adopting an external focus is related to the *planning* of the movement, but has nothing to do with the processing of intrinsic feedback or bodily awareness, or lack thereof. (Wulf, 2015, p. 4)

Does this mean that an internal focus is/should be only associated with movement preparation? Or should we accept the first statements that performers will, of course, be aware of what is happening to their body during movement execution (how could they not be?). It seems to us that various combinations of external and internal focus (of particular types as suggested by much of the literature cited in this letter) will be appropriate, for different tasks, different purposes, with different individuals at different levels and (most crucially) for different purposes. Any black and white statement on whether an internal or external focus is required seems, to us at least, impossible to call. Perhaps a more beneficial direction for research would be to delineate the circumstances under which varying proportions of foci would be optimal; as reflected in the approaches by Brick, MacIntyre, and Campbell (2014) in endurance activity (i.e., discriminating between different types of internal focus) and Carson and Collins (2011) when implementing refinements to already learnt and well-established skills (i.e., explaining that a narrow internal focus is essential to initiate the refinement process).

In summary, we have raised several issues pertaining to the study by Abdollahipour et al. (2015). We would also, however, generally extend these to other research seeking to explore attentional focus effects. Our concern is not with the veracity of findings reported,

247 rather, on methodological limitations which, we suggest, have resulted in serious theoretical
248 oversights regarding the control of movement and, suboptimal recommendations for applied
249 coaching practice. Specifically, we have discussed the lack of consideration towards
250 translational research in this area, the problematic nature of attentional focus cues employed,
251 interpretation of findings in relation to other applied recommendations and coherence with
252 mechanistic underpinning and, the representative nature of task involved. While (laboratory)
253 research evidence may appear to be conclusive, our arguments suggest that focus of attention
254 effects are in need of more rigorous testing and consideration of current coaching practices *if*
255 it is to optimally serve the applied sporting domain that it purportedly aims to.
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References

Abdollahipour, R., Wulf, G., Psotta, R., & Palomo Nieto, M. (2015). Performance of gymnastics skill benefits from an external focus of attention. *Journal of Sports Sciences, 33*, 1807–1813. doi: 10.1080/02640414.2015.1012102

An, J., Wulf, G., & Kim, S. (2013). Increased carry distance and X-Factor stretch in golf through an external focus of attention. *Journal of Motor Learning and Development, 1*, 2–11.

Beilock, S. L., Bertenthal, B. I., McCoy, A. M., & Carr, T. H. (2004). Haste does not always make waste: Expertise, direction of attention, and speed versus accuracy in performing sensorimotor skills. *Psychonomic Bulletin & Review, 11*, 373–379. doi: 10.3758/BF03196585

Bell, J. J., & Hardy, J. (2009). Effects of attentional focus on skilled performance in golf. *Journal of Applied Sport Psychology, 21*, 163–177. doi: 10.1080/10413200902795323

Bernier, M., Trottier, C., Thienot, E., & Fournier, J. (2015). An investigation of attentional foci and their temporal patterns: A naturalistic study in expert figure skaters. *The Sport Psychologist*, Advance online publication. doi: 10.1123/tsp.2013-0076

Brick, N., MacIntyre, T., & Campbell, M. (2014). Attentional focus in endurance activity: New paradigms and future directions. *International Review of Sport and Exercise Psychology, 7*, 106–134. doi: 10.1080/1750984X.2014.885554

Carson, H. J., & Collins, D. (2011). Refining and regaining skills in fixation/diversification stage performers: The Five-A Model. *International Review of Sport and Exercise Psychology, 4*, 146–167. doi: 10.1080/1750984x.2011.613682

Carson, H. J., & Collins, D. (2015). The fourth dimension: A motoric perspective on the anxiety–performance relationship. *International Review of Sport and Exercise Psychology*, Advance online publication. doi: 10.1080/1750984X.2015.1072231

Carson, H. J., Collins, D., & Jones, B. (2014). A case study of technical change and rehabilitation: Intervention design and interdisciplinary team interaction. *International Journal of Sport Psychology, 45*, 57–78. doi: 10.7352/IJSP2014.45.057

Carson, H. J., Collins, D., & MacNamara, Á. (2013). Systems for technical refinement in experienced performers: The case from expert-level golf. *International Journal of Golf Science, 2*, 65–85.

Christensen, W., Sutton, J., & McIlwain, D. (in press). Cognition in skilled action: Meshed control and the varieties of skill experience. *Mind and Language*.

Christina, R. W. (1987). Motor learning: Future lines of research. In M. J. Safrit & H. M. Eckert (Eds.), *The cutting edge in physical education and exercise science research* (pp. 26–41). Champaign, IL: Human Kinetics.

Collins, D., Morriss, C., & Trower, J. (1999). Getting it back: A case study of skill recovery in an elite athlete. *The Sport Psychologist, 13*, 288–298.

Ernst, M. O., & Banks, M. S. (2002). Humans integrate visual and haptic information in a statistically optimal fashion. *Nature, 415*, 429–433. doi: 10.1038/415429a

Goginsky, A. M., & Collins, D. (1996). Research design and mental practice. *Journal of Sports Sciences, 14*, 381–392. doi: 10.1080/02640419608727725

Guss-West, C., & Wulf, G. (2015). Attentional focus in classical ballet: Findings, a survey with professional dancers, and recommendations. *Journal of Dance Medicine & Science*, Manuscript accepted for publication.

Hanin, Y. L., & Stambulova, N. B. (2002). Metaphoric description of performance states: An application of the IZOF model. *The Sport Psychologist, 16*, 396–415.

Hauw, D., & Durand, M. (2007). Situated analysis of elite trampolinists' problems in competition using retrospective interviews. *Journal of Sports Sciences, 25*, 173–183. doi: 10.1080/02640410600624269

Holmes, P. S., & Collins, D. J. (2001). The PETTLEP approach to motor imagery: A functional equivalence model for sport psychologists. *Journal of Applied Sport Psychology, 13*, 60–83. doi: 10.1080/10413200109339004

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*, 527–539. doi: 10.1016/j.humov.2013.04.001

Karlsen, J., Smith, G., & Nilsson, J. (2008). The stroke has only a minor influence on direction consistency in golf putting among elite players. *Journal of Sports Sciences, 26*, 243–250. doi: 10.1080/02640410701530902

Land, W. M., Frank, C., & Schack, T. (2014). The influence of attentional focus on the development of skill representation in a complex action. *Psychology of Sport and Exercise, 15*, 30–38. doi: 10.1016/j.psychsport.2013.09.006

MacPherson, A. C., Collins, D., & Morriss, C. (2008). Is what you think what you get? Optimizing mental focus for technical performance. *The Sport Psychologist, 22*, 288–303.

MacPherson, A. C., Collins, D., & Obhi, S. S. (2009). The importance of temporal structure and rhythm for the optimum performance of motor skills: A new focus for practitioners of sport psychology. *Journal of Applied Sport Psychology, 21*, 48–61. doi: 10.1080/10413200802595930

Martindale, A., & Collins, D. (2012). A professional judgment and decision making case study: Reflection-in-action research [Special issue]. *The Sport Psychologist, 26*, 500–518.

Maurer, H., & Munzert, J. (2013). Influence of attentional focus on skilled motor performance: Performance decrement under unfamiliar focus conditions. *Human Movement Science, 32*, 730–740. doi: 10.1016/j.humov.2013.02.001

Mullen, R., & Hardy, L. (2010). Conscious processing and the process goal paradox. *Journal of Sport & Exercise Psychology, 32*, 275–297.

Nyberg, G. (2015). Developing a 'somatic velocimeter' – the practical knowledge of freeskiers. *Qualitative Research in Sport, Exercise and Health, 7*, 109–124. doi: 10.1080/2159676X.2013.857709

Orlick, T., & Partington, J. (1988). Mental links to excellence. *The Sport Psychologist, 2*, 105–130.

Overby, L. Y., Hall, C., & Haslam, I. (1998). A comparison of imagery used by dance teachers, figure skating coaches, and soccer coaches. *Imagination, Cognition and Personality, 17*, 323–337. doi: 10.2190/w56x-hndf-7yhl-g0tb

Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart, and Winston.

Paivio, A. (1986). *Mental representations: A dual-coding approach*. New York: Oxford University Press.

Robazza, C., & Bortoli, L. (1998). Mental preparation strategies of Olympic archers during competition: An exploratory investigation. *High Ability Studies, 9*, 219–235. doi: 10.1080/1359813980090207

Ruiz, M. C., & Hanin, Y. L. (2004). Metaphoric description and individualized emotion profiling of performance states in top karate athletes. *Journal of Applied Sport Psychology, 16*, 258–273. doi: 10.1080/10413200490498366

Wang, J., & Zhang, L. (2015). Psychological consultations for Olympic athletes' peak performance. *Journal of Sport Psychology in Action, 6*, 59–72. doi: 10.1080/21520704.2015.1037976

Weiss, S. M., Reber, A. S., & Owen, D. R. (2008). The locus of focus: The effect of switching from a preferred to a non-preferred focus of attention. *Journal of Sports Sciences, 26*, 1049–1057. doi: 10.1080/02640410802098874

Winter, S., & Collins, D. (2013). Does priming really put the gloss on performance? *Journal of Sport and Exercise Psychology, 35*, 299–307.

Winter, S., MacPherson, A. C., & Collins, D. (2014). "To think, or not to think, that is the question". *Sport, Exercise, and Performance Psychology, 3*, 102–115. doi: 10.1037/spy0000007

Wulf, G. (2013). Attentional focus and motor learning: A review of 15 years. *International Review of Sport and Exercise Psychology, 6*, 77–104. doi: 10.1080/1750984x.2012.723728

Wulf, G. (2015). Why did Tiger Woods shoot 82? A commentary on Toner and Moran (2015). *Psychology of Sport and Exercise*, Advance online publication. doi: 10.1016/j.psychsport.2015.05.006

Wulf, G., Höß, M., & Prinz, W. (1998). Instructions for motor learning: Differential effects of internal versus external focus of attention. *Journal of Motor Behavior, 30*, 169–179. doi: 10.1080/00222899809601334

Wulf, G., Lauterbach, B., & Toole, T. (1999). The learning advantages of an external focus of attention in golf. *Research Quarterly for Exercise and Sport, 70*, 120–126. doi: 10.1080/02701367.1999.10608029

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 Section A, 54*, 1143–1154. doi: 10.1080/713756012

Wulf, G., Shea, C., & Park, J.-H. (2001). Attention and motor performance: Preferences for and advantages of an external focus. *Research Quarterly for Exercise and Sport, 72,* 335–344. doi: 10.1080/02701367.2001.10608970