Title: Enhancing performance proficiency at the expert level: considering the role of 'somaesthetic awareness'

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Date of re-submission: April 12th, 2014

Abstract

Objectives: Traditional theories of motor learning (e.g., Fitts & Posner, 1967), along with certain contemporary psychological perspectives (e.g., Weiss & Reber, 2012; Wulf, 2013), postulate that expert performers must relinquish paying conscious attention to, and/or attempting to exert control over, their bodily movements in order to achieve optimal performance. Challenging such largely unquestioned conceptual approaches, however, is an emerging body of evidence (e.g., see Montero, 2010; Shusterman, 2011) which indicates that 'somatic reflection' (i.e., a conscious focus on bodily movement) is an important mediator of continuous improvement (i.e., the fact that certain performers continue to improve their skills even after becoming experts) at the elite level of sport. The present position paper seeks to elucidate and resolve this apparent paradox concerning the role of bodily awareness in expertise. *Method:* To achieve this latter aim, we draw on empirical evidence (e.g., from research on somatic attention) and theory (e.g., Shusterman's, 2008, theory of body consciousness) to elucidate the role of bodily awareness in facilitating continuous improvement at the elite level of sport. *Results and conclusion:* In doing so, we sketch some theoretical and practical implications of Shusterman's (2008, 2011, 2012) theory of 'somaesthetics' for contemporary research on expertise in sport.

Keywords: Expertise, somaesthetics, conscious processing

Enhancing performance proficiency at the expert level: considering the role of 'somaesthetic awareness'

One of the traditionally unquestioned hallmarks of expert performance in any domain is its automaticity – the fact that it appears to occur rapidly, efficiently, and without the need for conscious control or monitoring (Moors, 2013). To illustrate the last of these characteristics, consider the research literature on peak performance in sport. According to Martin and Jackson (2008), such performance typically involves "action-awareness merging (doing things spontaneously and automatically without having to think)" (p. 146) with little or no conscious processing of technical movements. A good example of this state of mind comes from golfer Paul McGinley who revealed that after holing a six-foot putt to win the Ryder cup for Europe against the USA "at no time did I even consider the mechanics of the stroke" (cited in Kremer & Moran, 2013, p. 72). Such peak performance experiences bolster the assumption in sport psychology that conscious processing tends to impair skill execution in experts. This view is also apparent in conventional explanations for the "paralysis-by-analysis" phenomenon in sport whereby skilled performance tends to deteriorate whenever athletes try to exert conscious control over movements that had previously been under automatic control. Thus Masters (2012) suggested that paying conscious attention to the step-by-step processes involved in skill execution will disrupt 'habitual' movement and performance. Similarly, Weiss and Reber (2012) argue that problems are likely to arise 'when an athlete stops using the smooth and practiced techniques and begins to use excessive thinking and "reinvests" effort back to motor functions and one's physical problems' (p. 176). Instead, performers are encouraged to direct their attention away from their bodily movement and to adopt an external focus of attention (i.e., focusing on the effects of their movements; see Wulf, 2013, for review) in order to facilitate smooth and fluent skill execution (we return to this body of literature later).

However, challenges to these latter perspectives are increasingly apparent. In particular, two key strands of evidence from psychology and inter-disciplinary studies converge on the conclusion that sometimes (e.g., when skills break down due to injury), somatic awareness (i.e., paying attention to one's bodily movements) can actually *enhance* athletes' skill-learning and performance. This convergence may be summarised briefly as follows. Firstly, at the theoretical level, an emerging inter-disciplinary movement known as "somaesthetics" (Shusterman, 2008; 2009; 2011) has begun to investigate the role of consciousness in body awareness and skill learning. Influenced by advances in phenomenology (e.g., see the idea of "applying intelligence to the reflexes"; Sutton, McIlwain, Christensen, & Geeves, 2011) and the embodied cognition paradigm in psychology which postulates that many of the brain circuits responsible for abstract thinking are grounded in those that process sensory experience (see more detailed accounts in Glenberg, Witt, & Metcalfe, 2013; Laakso, 2011), Shusterman's (2011) theory of "somaesthetic awareness" is concerned with exploring "the differences between those occasions when heightened somatic consciousness is helpful and when it is detrimental" (p. 319) to skill-learning and performance. According to Shusterman (2008), somatic attention is helpful when "we need to correct, relearn, and adjust our habits of spontaneous performance" (p. 138). Clearly, theorists from several disciplines propose that bodily awareness is not always deleterious to performance and indeed, may be *necessary* in order to facilitate 'continuous improvement' at the elite level of sport.

Secondly, at the empirical level, research on the topic of 'skill recovery' shows that athletes who are trying to regain prior levels of high-level performance often deliberately use conscious processing strategies to refine or restore elite level habitual movements in sports such as javelin throwing, sprinting and swimming (Collins, Morriss, & Trower, 1999; Hanin, Korjus, & Jouste, 2002; Hanin, Malvela, & Hanina, 2004). In studies of this topic, researchers have helped athletes to regain or to refine habitual movement patterns by encouraging them to become *more* consciously aware of technical and kinaesthetic differences between current (problematic) and desired actions. In this regard, Carson, Collins, and Jones (submitted) recently investigated the issue of consciously-elicited technical refinement in an Olympic weightlifter. This athlete had acquired an injury through the use of inefficient technique in the two hand snatch. Carson et al. sought to heighten the athlete's *kinaesthetic awareness* of the difference between the new, more effective technique and the position (replacing the bar with a broomstick) that had caused the initial injury. Here the athlete's limb positioning was manipulated towards a more effective and less injury prone technique, thereby facilitating kinaesthetic awareness of the different feelings and positions. Clearly, these studies show that bodily awareness can help athletes to generate distinctions between kinaesthetic sensations in order to "realise the required changes" (Carson & Collins, 2011, p. 152). More generally, such refined conscious awareness may have adaptive significance. Thus, on the basis of evidence highlighting the role of the cerebellum in the conscious control of motor behaviour, Rossano (2003) concluded that "evolution has fashioned the human brain with specific systems that bring consciousness and motor control into a close relationship" (p. 209). In summary, despite recent arguments that expert performers must *relinquish* conscious attention of their bodily movements in order to achieve optimal performance (e.g., see Masters & Maxwell, 2008; Wulf, 2013), alternative evidence has emerged to suggest that deliberately paying conscious attention to specific components of movement (e.g., limb positioning) may improve and/or restore their efficiency (e.g., Gray, 2004; Shusterman, 2008). So, how can we reconcile these opposing viewpoints about the role of bodily awareness in skill-learning and skilled performance?

In an effort to resolve this confusion, this *opinion* paper draws on evidence (e.g., concerning somatic attention) and theory (e.g., see Shusterman's, 2008, theory of somaesthetics) to elucidate the circumstances in which it is beneficial to replace an external focus of attention with enhanced conscious awareness of problematic movements. The paper is organised as follows. We begin by analyzing briefly the philosophical and psychological roots of the assumption that expert performance involves the execution of bodily movements that are not consciously monitored – what Gallagher (2011) calls "performative forgetfulness of the body" (p. 305). Next, we point to the problematic nature of this assumption by drawing on evidence which indicates that skilled performers use bodily awareness when seeking to identify and refine 'attenuated' movements during practice. After that, we argue that Shusterman's theory of body consciousness may address some of the shortcomings associated with a number of influential motor control theories (e.g., Information processing approaches; Ideomotor approaches) by identifying the mechanisms that enable performers to alternate between different modes of bodily awareness or foci of attention. Finally, we sketch some practical and methodological implications of Shusterman's (2008, 2011, 2012) somaesthetics for contemporary research on expertise in sport.

What are the modern philosophical roots of sport psychology's antagonism to bodily awareness in expert performance? According to Shusterman (2008), William James cautioned against somatic awareness when one is performing well-learned or habitual movements. Specifically, he proclaimed that "heightened consciousness of the bodily means of action leads to failure in achieving our desired ends" (cited in Shusterman, 2008, p. xi). Also, according to James (1983), "habit diminishes the conscious attention with which our acts are performed" (p. 31). For James (1911), any conscious attentional focus on habitual movement and its accompanying somatic feelings is likely to disrupt skilled action: - "Trust your spontaneity and fling away all further care" was his aphorism for successful motor performance (p. 72). More recently, Merleau-Ponty (1964) postulated that spontaneity will always facilitate optimal functioning while any form of body awareness or somatic reflection will compromise smooth and efficient performance. More specifically, he insisted that spontaneous bodily intentionality is a pre-requisite for successful performance as our movement is governed by a “spontaneity which will not tolerate any commands, not even those which I would like to give myself” (p. 75).

These philosophical perspectives appear to be in line with a number of influential theories of motor skill learning (e.g., *Information processing* – IP) which emphasise the effortless and automatic nature of skilful action. For example, the IP approach has sought to explain motor skill learning with a model that portrays the performer as progressing from a *controlled*, conscious and declarative mode of information processing (i.e., at the novice stage) to a more *automatic* and proceduralised mode of processing (i.e., at the expert stage). Based on a digital computer metaphor, the mind is seen as an information processor that begins to deal with available information from the environment (input), processes this information using various operations, and eventually produces an action (output) (Schmidt & Wrisberg, 2008). Accordingly, we perceive sensory information from the external world which, in turn, is translated into a syntactic code of meaningful symbols, and processed according to a systematic set of rules (Maes, Leman, Palmer, & Wanderley, 2014). The IP approach argues that coordinated movement sequences are governed by ‘motor programs’ which are made up of mental representations which develop into plans of actions, instructions, or rules that guide the production of a skill (Bailey & Pickard, 2010). These motor programs are believed to guide skilful action in the absence of direct conscious control and are seen to represent the expression of habitual or automatic responses in a given sporting context. Although the ubiquity of IP models bears testament to their utility as a means of helping us understand skill learning, they have been heavily criticised for presenting a peculiarly disembodied account of motor skill learning (see Bailey & Pickard, 2010; Sutton et al. 2011). That is, IP models consider body movements to represent mere outcomes of these symbol manipulations and, as a result, ignore the mutual influence that perception and action exert on each other (Maes et al. 2014).

To address this latter issue, *embodied cognition* theories have sought to explain how the human body (with its perceptual and motor systems) interacts with the outside world. Within this framework of embodied cognition, the *ideomotor approach* (see Greenwald, 1970) has presented an influential explanation of the cognitive mechanisms underlying voluntary action selection (Koch, Keller, & Prinz, 2004). This theory postulates that actions are cognitively represented in terms of their anticipated sensory consequences (response effects) and that the anticipation of these latter effects may serve as a mental cue to activate the corresponding movement. This ideo-motor principle has been expressed in a number of theoretical works including Prinz's (1997) *common-coding approach* and Hommel, Müsseler, Aschersleben, & Prinz's (2001) *theory of event coding*. A considerable volume of empirical evidence supporting the ideomotor principle has emerged in studies which have examined participants' selection, planning, and initiation of simple discrete actions (e.g., speeded effector coordination in dual-task situations or choice-reaction tasks). For example, Elsner and Hommel (2001) required participants to perform key presses (which produced auditory effects) in an initial training phase. In the test phase, these effects served as imperative stimuli in a choice-reaction task. Subsequently, a response was selected more promptly when primed by its former effect tone than when triggered by the effect tone associated with an alternative response.

Do the response effects for the learning of simple discrete actions transfer to the production of relatively complex action sequences that characterize most sporting activities? Based on ideomotor principles, Wulf's *constrained action hypothesis* (see Wulf, McNevin, & Shea, 2001; Wulf, Shea, & Park, 2001) predicts that complex movements (in any sporting performance) will be more effective when planned in terms of their intended outcome or effect (i.e., with an external focus), rather than in terms of the specific movement patterns (i.e., with an internal focus). In seeking to explain this effect, Wulf (2013) postulated that an internal focus of attention "induces a conscious type of control, *causing individuals to constrain their motor system by interfering with automatic control processes*" (p. 91, our italics). Accordingly, Wulf and her colleagues recommended that athletes should adopt an *external* focus which requires attending to the effects of one's movement on the environment (e.g., the trajectory of a tennis ball as it leaves one's racket). This latter focus of attention is believed to facilitate a more automatic mode of control and has also been found to improve both movement effectiveness (e.g., accuracy in hitting a target) and movement efficiency (i.e., outlay of energy, or of time and energy) amongst novice and skilled performers in a wide variety of skills and tasks (e.g., Bell & Hardy, 2009; Lohse, Sherwood, & Healy, 2010; Lohse, Wulf, & Lewthwaite, 2012; Schücker, Hagemann, & Strauss, 2013).

It should be noted, however, that some researchers have contradicted Wulf's claim that an internal focus of attention will inevitably disrupt skilled performance and learning. For example, Oudejans, Koedijker, and Beek (2007) argued that an *internal focus* of attention may "be indispensable when an athlete seeks to replace a suboptimal technique by a more optimal one in order to reach a higher level of performance" (p. 41). Unfortunately, most ideomotor accounts have focused solely on manipulating exteroceptive (feedback delivered by visual, auditory, tactile, and olfactory pathways) or remote effects in their experiments. Accordingly, Wulf's constrained action hypothesis (and ideomotor theories more generally) have yet to adequately explain how performers appear capable of maintaining performance proficiency by using 'interoceptive feedback' (which is delivered by proprioception including kinaesthetic feeling of the movement) to alter and control bodily movements during training. For example, Nyberg (in press) found that elite freeskiers learn how to discern (i.e., through 'focal awareness') their rotational velocity to such an extent that they "know whether they will be able to perform the trick the way it was intended without adjustments, or whether they will need to make adjustments during the flight phase" (p. 7). Also, in a naturalistic investigation of the attentional foci adopted by elite golfers during training and competition, Bernier, Codron, Thienot and Fournier (2011) found that elite golfers adjusted their attentional focus (i.e., moving back-and-forth between focusing on bodily movements and the effects of their actions) across training and competitive situations. Clearly, a reliance on an external focus of attention is not enough to maintain performance effectiveness at the elite level of sport. Instead, elite performers would appear to avoid excessive 'proceduralisation' because they must be able on demand to deliberately access and "strategically re-route any semi-automated routines" (Sutton, 2007, p. 769).

Similarly, performers have little choice but to reinvest conscious attention owing to the 'sudden volatile transformations' (Bissell, 2013, p. 122) that appear to afflict our habitual movements. In fact, anecdotal reports abound of elite performers having to change habitual behaviours in order to maintain performance proficiency. For example, Bernhard Langer, the two-time Golf major champion, changed his putting stroke on a number of occasions in an attempt to combat the 'yips', a movement disorder which represents perhaps the most volatile form of habit disruption. Despite anecdotal evidence pointing to the volatility of habitual behavior (e.g., Bissell, 2013; Eden, 2013), and empirical evidence that elite athletes may employ conscious attentional strategies to successfully refine their 'attenuated habits' (e.g., Hanin et al. 2004), the received wisdom in sport psychology is that consciously attending to habitual movement *impairs* skilled performance (Poolton & Masters, 2010; Wulf, 2012). To illustrate, Wulf (2012) warns against the reliance on 'traditional' instructional methods – namely, those that involve declarative feedback on body movements as well as those that make 'intuitive sense' to coaches. As previously discussed, Wulf (2012, 2013) claims that instructions or feedback relating to body movements will always prove deleterious to motor learning and performance. Likewise, others have taken a critical stance when evaluating the role of ‘traditional’ methods of instruction which may encourage body awareness. For example, Poolton and Masters (2010) argued that “sensations of imbalance, tension or loss of rhythm detected by a player can easily become signposts that direct the player towards swing adjustments that are consciously controlled” (p. 121). Instead of focusing internally, these latter researchers encourage performers to divert attention away from their limb movement and, instead, focus on the environmental effects on their actions (e.g., in baseball we may focus on the trajectory of a ball once it has left our bat).

If a coach subscribes to certain lines of thought (e.g., see Wulf’s 2012, 2013, argument above) that emphasize the debilitative nature of bodily awareness then how does he or she go about solving an elite athlete’s problematic or ‘attenuated’ habit? It seems highly improbable that encouraging the athlete either to ‘trust’ their spontaneity or to adopt an external focus of attention will help the expert performer who, for example, may be experiencing disruption to performance proficiency because of an unintended change in their technique (e.g., see Carson et al.). If a continued reliance on focusing on the effects of one’s actions (i.e., thereby avoiding any focus on bodily movement) proves to be ineffective then how should the expert performer seek to address problematic movement patterns? According to Shusterman (2008) ‘we cannot simply trust our habits to correct themselves through unconscious trial and error or through eventual evolutionary adjustments’ (p. 13). In fact, to act spontaneously or to remain focused on the effects of our actions will ‘simply reinforce these bad habits and the damage they cause’ (Shusterman, 2008, p. 169). For example, an elite golfer who wishes to increase the distance she hits the ball is unlikely to do so merely by focusing on some distal action effect (as proposed by proponents of ideomotor approaches) like the trajectory of a ball. Instead, she would be required to alter and improve her bodily movements (e.g., increase shoulder turn) in order to generate greater club-head speed and thereby produce the desired effect (i.e., increased distance). Unfortunately, continuing to focus on the effects of one's actions may represent a form of 'end-gaining' which contributes to distorted 'sensory appreciation' and diverts our attention from the needed 'means-whereby' the action could be performed properly.

On such occasions, it seems reasonable to speculate that the inefficient or affected habit must be brought under the control of consciousness so that the coach can help the athlete regain the 'old' desirable technique or refine and acquire a new optimal movement pattern (Carson & Collins, 2011). As Shusterman puts it, "the unreflective action or habit must be brought into conscious critical reflection (though only for a limited time) so that it can be grasped and worked on more precisely" (2009, p.135). It is these arguments which have raised our concern that traditional motor learning theories, and some contemporary psychological perspectives, have failed to fully consider the potentially functional role that conscious bodily awareness may play in maintaining performance proficiency/facilitating skill advancement at the expert/elite level.

We propose that researchers require a theoretical framework that can explain how skilled athletes are capable of flexibly allocating their attentional resources in order to refine problematic bodily movement. Accordingly, we believe it may be of value to consider Shusterman's (2008, 2009) model of body consciousness which emphasises the *interchanging phases* or *stages of learning*. Specifically, Shusterman's perspective may help researchers understand better how performers can use conscious bodily awareness in a manner which facilitates performance effectiveness. In line with traditional motor learning theories (e.g., Fitts & Posner, 1967) and contemporary psychological skill acquisition perspectives (e.g., Beilock, Carr, MacMahon & Starkes, 2002; Gray, 2004), Shusterman (2008) acknowledges that reflective action (i.e., conscious awareness of bodily movement) is generally the most effective way to learn and perform at the novice level. As previously noted, this stage of learning appears to require conscious and critical bodily attention during on-line performance of a motor task. However, traditional motor learning theories posit that once we move beyond this learning stage there is no need to explicitly attend to what our bodies are doing. It is on this matter that Shusterman's (2008) viewpoint appears to differ significantly from those of traditional motor learning and some current sport psychology researchers. To explain, Shusterman (2008) urges us to consider the role that critical self-attention may play after the learner has reached an automatised or habitual state of performance. For Shusterman, this is a critical issue to consider as "the learning process is never entirely complete" (p. 138). Shusterman (2009) argues that reflective body consciousness is necessary for correcting bad habits and achieving more efficient control of our movement. Here he suggests that we must know what we are doing with our bodies in order to understand how we can correct our problematic movements and more effectively do what we wish to do with them. In clarifying this outlook, Shusterman (2008) confirms that he is not advocating that we consciously attend to all of our actions – that would be both impossible and detrimental to performance. But, when our habits prove defective (e.g., due to injury) Shusterman (2009) suggests that careful attention to our bodily means (and attendant feelings) of action is necessary to "either acquire new habits or refine or reconstruct our habitual modes of action" (p. 138) and that this process necessitates the redirection of conscious attention to our somatic behaviour.

Interestingly, there is evidence to suggest that motor learning theorists are beginning to adopt similar perspectives concerning the potentially functional role bodily awareness may play at the elite level of sport. For example, Beilock and Gray (2007) acknowledged that "skill-focused attention may not always be detrimental to well-learned performances" (p. 432) and that conscious attention may be required to rectify problematic bodily habits/movements. This may be necessary when the performer needs to alter performance processes to achieve a different outcome rather than to maximise real-time performance (Beilock & Gray, 2007, p. 432). The authors argue that on such occasions it is necessary to slow down and ‘dechunk’ habitual movements. Here, the overall movement pattern may be broken down into separate steps or ‘chunks’ with the intention to address the problematic component of movement. This process will inevitably require the performer to ‘reinvest’ conscious attention in an effort to deliberately and consciously alter the ‘attenuated’ movement. For example, a coach may engage an athlete in a program of ‘associative training’ by using strategically placed mirrors to help develop awareness of the difference between the old (undesirable) movement and the new (desirable) movement (Shusterman, 2008). Here, the coach might manipulate the performer’s limb movement into the desired position and encourage them to associate different visual ‘forms’ with different proprioceptive feelings. Next, the performer is likely to use this proprioceptive feel for the new position (e.g., shorter backswing in golf) as they seek to consciously alter the ‘attenuated’ movement and acquire this new backswing position. Note, at this stage, there is only a focus on the movement itself and no reference to any distal action effects.

Shusterman (2008, 2011) presents a compelling argument concerning the functional role bodily awareness may play in improving our self-use and the efficiency with which we perform habitual movements. However, such perspectives have yet to be incorporated within a general theory of motor skill acquisition (Gray, 2004). As discussed earlier, an idea consistent across a number of skill acquisition theories is that the acquisition process occurs in a unidirectional manner (i.e., moving from the cognitive to the associative to the procedural stage). In contrast to this latter perspective, however, Shusterman’s (2008) theory of body consciousness is cyclical in the sense that the maintenance of effective movement requires the individual to alternate between these various stages. That is, if the performer acquires an ‘attenuated’ habit then he/she will be required to move from a procedural (i.e., automatic) mode of performance to a cognitive mode so that conscious attention can be devoted to the alteration or refinement of the problematic movement. Interestingly, this perspective is in line with Sutton et al.'s (2011) recent account of the nature and role of mindedness and thought in *embodied* action. To illustrate, Sutton et al.'s 'applying intelligence to the reflexes approach' (AIR) seeks to explain how embodied skills can be influenced by thinking and awareness and argues that "genuine expertise often requires the rapid switching of modes and styles within the performance context" (p. 93). For these researchers, skilful action relies on a *mindedness* that "facilitates the dynamic flexibility of attention, allowing it to be allocated freely and in a way that best meets contingent contextual demands" (Geeves et al. 2013, p. 3). Much like Shusterman's argument, Sutton et al. claim that embodied action, on certain occasions, must be open to the influence of explicit knowledge or specific memories. When confronted by context-specific challenges (e.g., inefficient movement) in the training context, the performer can not rely entirely on spontaneous or non-cognitive responses but, instead, may use cue words or 'instructional nudges' as "verbal components of multi-modal embodied routines to distribute intelligence, coordinating or often re-setting and re-chunking patterns of movement" (p. 93).

Additional evidence has emerged to suggest that movement through different stages of learning may not occur in the sequential and straightforward manner predicted by traditional theories of skill acquisition. For example, Gray (2004) found that expert baseball batters who experienced a slump in performance (i.e., an unexpected and prolonged period of poor performance), increased the amount of skill-focused attention they dedicated to performance in order to re-gain control of key actions. In attempting to explain this phenomenon, Gray (2004) suggested that the batter attempts to break out of the performance slump by cognitively modifying the component steps of skill acquisition. By contrast, when performing proficiently, skill-focused attention is replaced by the proceduralised (i.e., automatic) execution of action. Interpreting these results, Gray argued that "expert performers may continuously cycle back and forth between these stages depending on the current level at which they are performing" (p.52). Furthermore, Gray suggested that "perhaps it is as important for an athlete to learn strategies for moving quickly and effectively from the cognitive to procedural stage (i.e., techniques for acquiring new procedural knowledge) as it is to achieve that level in the first place" (p. 52). Similarly, Ericsson's *deliberate practice framework* proposes that expert performers seek to counteract automaticity, and thereby avoid 'arrested development', by remaining within the 'cognitive' and 'associative' stages by "developing increasingly complex mental representations to attain higher levels of control of their performance" (2006, p. 687). Both Gray and Ericsson's argument appear to be in line with Shusterman's concept of *interchanging phases* or *stages of learning*. Indeed, by drawing on the arguments of Gray (2004), Ericsson (2006) and Shusterman (2008) we suggest that somatic consciousness may play a crucial role in helping expert performers 'cycle back and forth' between these stages of learning – thereby helping to promote movement proficiency and to maintain performance effectiveness. More generally, Rossano (2003) has argued that "expertise requires deliberate practice. Deliberate practice requires consciousness" (p. 230).

Central to Shusterman's theory is the notion that the learning process does not suddenly stop once we have learned to habituate movements. Instead, learning is a continual process which is underpinned by a somaesthetic awareness of how we may improve our movement proficiency. As previously noted, such bodily awareness is important not only for learning new skills but also for "identifying, analyzing, and rectifying our problematic bodily habits" (Shusterman, 2008, p. 13). In downplaying the practical value of bodily consciousness, we are concerned that researchers have ignored the deliberate, and indeed conscious, manner in which expert performers actively seek to improve their current performance level (see Ericsson, 2006). Fortunately, a number of researchers have begun to consider the various ways in which elite athletes use bodily consciousness in their sporting actions. For example, Breivik (2007, 2013) has argued that a key feature of skill improvement amongst expert performers concerns the athletes' desire to learn 'new and better techniques' and that this approach is "deliberate, conscious, and planned, which also characterises the activity itself" (p. 127). Furthermore Ravn and Christensen (2013) found that an elite golfer sought to optimise her performance proficiency by consciously refining her technique during training. The authors argue that continuous improvement requires the athlete to 'experiment with and research their moving body' and that the "unexamined body would simply not be worth moving" (Ravn & Christensen, 2013, p. 2). These emerging findings indicate that by constantly seeking and constructing practice situations that challenge their current level of performance, the expert athlete actively seeks to avoid the "arrested development associated with automaticity" (Ericsson, 2003, S.73). To help facilitate this process we argue that somaesthetic awareness may play an important role in helping us to identify the precise features of our movement that require refinement or improvement.

Having drawn extensively on Shusterman's (2008, 2009, 2011) work we believe it is important to consider the *applied consequences* of promoting an increase in bodily consciousness amongst skilled performers. *First*, we argue that athletes' must be somatically aware of their movement in order to identify that a problematic bodily habit has arisen. It is important to note that such an approach would not involve constant conscious surveillance of individual components of their overall movement pattern but rather a 'proprioceptive feel' of what they are doing. This requires athletes to be generally aware of whether their movement is causing discomfort *or* an outcome that is far removed from what they would normally expect. Here we are advocating the use of bodily awareness by athletes in paying heed to their movement and recognising when it is causing them pain, discomfort, or consistently undesirable outcomes. This approach might actually help elite athletes to resist the kind of automation which a number of theorists ascribe to the highest levels of expertise, and address their concern that "trusting the body alone to take over will lead to arrested development" (Sutton et al. 2011, p. 95). Indeed, in line with Shusterman, we argue that it is only through such focused awareness can we learn to identify the bodily movements that are compromising the efficient execution of our desired movements and determine how we may "make the movement more successfully and with greater ease and grace" (2008, p. 166). Unfortunately, as outlined earlier, a continued reliance on spontaneity (or an external focus of attention) is unlikely to help us achieve this latter outcome.

Second, once the technical problem has been identified (either by the athlete or the coach), correcting the 'attenuated habit' necessitates the reinvestment of on-line attentional control in order to refine or alter the problematic bodily movement. To help us accomplish such an aim, Shusterman (2008) suggested that we require a systematic method for the reconstruction of habit through the guidance of what he refers to as 'constructive conscious control' (p.193). We believe that Carson and Collins (2011) FIVE-A model of technical refinement may provide expert performers with such a system. Indeed, as alluded to earlier, a central feature of Carson and Collins' model is the emphasis placed on the role conscious bodily awareness plays in addressing and correcting problematic movements. For example, once a coach has identified the specific aspect of technique which requires alteration the authors recommend that the problematic movement is called into *consciousness* and compared against the desired new technique. This approach aims to create 'noise' in the motor system by requiring the athlete to make sudden changes in their movement. Accordingly, the generation of a new movement pattern serves to make a clear distinction between the *inefficient technique* and the *desired technique* thereby driving the change process and preventing a return to the previous inefficient movement pattern. Once the new movement has been successfully automated, a coach should assure his or her athlete that there is no need for further modifications.

Of course, it would be remiss of us to ignore the possibility that consciously altering these habitual movements may hamper performance effectiveness in the short-run (Beilock et al. 2002). Indeed, Beilock and Gray (2007) suggest that reconstructing certain aspects of technique may involve slowing down and dechunking previous execution procedures, potentially resulting in a period of sub optimal performance. Supporting this latter idea, anecdotal evidence suggests that technical change can be a complicated process and that it may take some time before an expert performer can successfully alter what may have been a long-established movement pattern. Tiger Wood's struggles in the wake of the technical changes he made to his golf swing during the 2011 season provide a striking case in point (see Eden, 2013). In considering this issue, Carson and Collins (2011) outlined a number of psychosocial factors which may have an important influence on whether or not technical change is successfully accomplished. For example, they argue that a coach must ensure that the athlete is *committed* to and *trusts* the prescribed change so that they 'buy into' the entire process. Furthermore one could argue that during the initial stages of the technical change process, the expert performer may wish to confine his/her attempts at altering these movements to the training or practice ground until the new and desirable movement has been successfully automated (Nicholls, Holt, Polman, & James, 2005). Until such technical changes have been incorporated within the overall movement pattern, the expert performer may be required to deploy various psychological strategies to divert attention away from to the yet-to-be proceduralised movement during on-line competitive performance.

One strategy for attentional redeployment is the adoption of a global/holistic cue word (Gucciardi & Dimmock, 2008: Mullen & Hardy, 2010). This approach would involve two steps. First, performers would consciously focus on the new, desired technique during training or practice sessions. In addition, during competitive performance, they would divert their focus of attention away from the yet-to-be automatised movement (i.e., which still requires an internal focus) and instead, focus on the external effects (i.e., trajectory of a struck ball in golf) of their actions. Of course, we recognise the difficulty performers may face when switching back-and–forth between *reflective* and more *unreflective* modes of consciousness. Unfortunately, until the new movement has become automatised and can be guided by spontaneity, a period of sub-optimal performance seems a likely by-product of the technical change process. A coach/sport psychologist may play a crucial role at this juncture by emphasizing the need for the athlete to remain patient and to place trust in the technical change process (Carson & Collins, 2011). Hopefully, with continued deliberate and constructive practice, conscious attempts to refine and alter one's inefficient habitual movements will lead to performance benefits as skill execution begins to 'more closely mirror desired outcomes' (Beilock & Gray, 2007, p. 432).

It is also necessary to identify the methodological approaches that may be best suited to addressing the questions raised by Shusterman's model of body consciousness. Unfortunately, laboratory investigations which seek to identify reproducibly superior performance under standardized conditions (see Ericsson & Ward, 2007) are unlikely to help us identify the mechanisms which allow performers to alternate between different modes of attentional processing over the course of a competitive season/career. In seeking to address this latter issue, researchers may wish to use naturalistic investigations (involving observations and interviews) or explore athletes' phenomenological insights through the use of stimulated recall (SR) interviews. Bernier, Codron, Thienot and Fournier (2011) used a combination of these approaches in a study which examined the attentional foci adopted by elite golfers in training and performance contexts. Having filmed participants in a training session and during a competitive event, self-confrontation interviews were used to stimulate recall (whilst watching a video recording) of the thoughts the performer was processing. Participants were shown sequences involving an action (e.g., a shot), a preparatory behaviour (e.g., the pre-shot routine), and the step following an action (e.g., walking to the next shot) and were urged to express their thoughts during each sequence. Rather than providing an explanation of how they solved the task or a summary of the general strategy they adopted, performers merely expressed their thoughts during each sequence. Findings revealed that these elite golfers alternated between internal and external foci of attention across the preparatory, execution and evaluative stages of training and competitive performance. Naturalistic investigations appear to offer researchers a potentially fruitful means of exploring the attentional switching mechanisms that seem to characterise ‘continuous improvement’ in elite sport.

An important aim of the current paper was to outline and discuss recent anecdotal and empirical evidence which suggests that our habitual movements are not immutable and that they may, on occasion, require conscious alteration. We believe that such evidence calls into question traditional (e.g., Fitts & Posner, 1967) and contemporary (e.g., Wulf, 2013) skill learning perspectives that we should rely on ‘unthinking spontaneity’ or external foci of attention in facilitating the smooth and efficient execution of skilled movement. However, in line with a number of contemporary philosophers (e.g., Breivik, 2013; Montero, 2010; Shusterman, 2008), sport psychologists have begun to consider the functional role consciousness may play in facilitating movement proficiency at the elite level of sport. For example, some authors have suggested that “*some* conscious processing is permitted providing it does not ‘overwhelm’ attentional resources” (Carson & Collins, 2011, p. 149) and that a performer may occasionally need to alter proceduralized knowledge that has been “judged to be unproductive on the basis of *cognitive self-regulation* of his actions” (Gray, 2004, p.52). These converging perspectives represent a significant shift in thinking and open up the possibility that consciousness may not represent the disruptive force traditionally portrayed by many sport psychologists and motor learning theorists. However, despite these new perspectives sport psychology has yet to devise a theory which recognises the value of both *reflective somatic/bodily consciousness* and *spontaneous, unreflective bodily perception and performance*. This paper has argued that Shusterman's (2008) theory of body consciousness may be useful in helping researchers achieve this latter aim. Building on Shusterman's (2008) work, future researchers may wish to construct a typology as a first step in attempting to explain how the effects of specific types of conscious processing (e.g., conscious control, conscious monitoring, somaesthetic awareness) on movement and performance proficiency are likely to be moderated by skill level, performance situations (training or competition) and by the distinctive demands of sports (e.g., whether they are object-related sports such as golf or non-object related sports such as running).

We wish to conclude by recognising the difficulty performers may face in switching between reflective (e.g., internal foci) and more unreflective (e.g., external foci) modes of bodily awareness. However, we have drawn on Shusterman's work to argue that such an approach is necessary for two specific reasons. *First*, the learning process is never entirely complete and elite performers appear to actively seek new ways of improving both their movement and performance proficiency (see Ravn & Christensen, 2013). Somaesthetic reflection may play an important role here by first allowing the performer to identify the inefficient movement pattern and then helping him/her to consciously attend to its alteration or refinement. *Second*, the apparent fragility of our habitual movements means that we have little choice but to devise creative solutions in order to address these disruptions. A reliance on an external focus of attention will not be enough to maintain our performance proficiency if our habitual movements are dysfunctional in some way. Instead, we must seek effective ways of using constructive conscious control to help us refine, alter and thus improve our 'attenuated' habits. Only then may athletes relinquish conscious control of their bodily performance and allow somaesthetic awareness to guide their new movement and, hopefully, help them to achieve new levels of excellence.

References

Bailey, R., & Pickard, A. (2010). Body learning: examining the processes of skill learning in dance. *Sport, Education and Society*, *15*, 367-382. doi: 10.1080/13573320902809047

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*, 6-16.

Beilock, S. L., & Gray, R. (2007). Why do athletes choke under pressure? In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of Sport Psychology*, *3rd Ed.* (pp. 425-444). Hoboken, NJ: John Wiley & Sons Inc.

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., Codron, R., Thienot, E., & Fournier, J. F. (2011). The attentional focus of expert golfers in training and competition: A naturalistic investigation. *Journal of Applied Sport Psychology*, 23, 326-341. doi: 10.1080/10413200.2011.561518

Bissell, D. (2013). Habit displaced: The disruption of skillful performance. *Geographical Research*, *51*, 120-129. doi: 10.1111/j.1745-5871.2012.00765.x

Breivik, G. (2007). Skillful coping in everyday life and in sport: A critical examination of the views of Heidegger and Dreyfus. *Journal of the Philosophy of Sport*, *34*, 116-134. doi:10.1080/00948705.2007.9714716

Breivik, G. (2012). Zombie-like or superconscious? A phenomenological and conceptual analysis of consciousness in elite sport. *Journal of the Philosophy of Sport*, *40*, 85-106. doi:10.1080/00948705.2012.725890

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., & Jones, B. (submitted). A case study of technical change and rehabilitation: Intervention design and multidisciplinary team interaction.

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.

Eden, S. (2013). Stroke of madness: How has Tiger Woods managed to overhaul his Swing three times? Retrieved from http://espn.go.com/golf/story//id/8865487/tiger-woods-reinvents-golf-swing-third-time-career-espn-magazine

Elsner, B., & Hommel, B. (2001). Effect anticipation and action control. *Journal of Experimental Psychology: Human Perception and Performance*, *27*, 229-240. doi: 10.1037//0096-1523.27.1.229

Ericsson, K. A. (2003). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine*, *79*, S70-S81.

Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. In K.A. Ericsson, N. Charness, P. Feltovich, & R.R. Hoffman (Eds.), *Cambridge handbook of expertise and expert performance* (pp. 685-706). Cambridge, UK: Cambridge University Press.

Ericsson, K. A., & Ward, P. (2007). Capturing the naturally occurring superior performance of experts in the laboratory toward a science of expert and exceptional performance. *Current Directions in Psychological Science*, *16*, 346-350. doi: 10.1111/j.1467-8721.2007.00533.x

Fitts, P.M., & Posner, M.I. (1967). *Human performance*. California: Brooks/Cole Publishing Company.

Gallagher, S. (2011). Somaesthetics and the care of the body. *Metaphilosophy, 42*, 305-313. doi: 10.1111/j.1467-9973.2011.01686.x

Geeves, A., McIlwain, D. J. F., Sutton, J., and Christensen, W. (2014). To think or not to think: The apparent paradox of expert skill in music performance. *Educational Philosophy and Theory*, *46*, 674-691. doi:10.1080/00131857.2013.779214

Glenberg, A. M., Witt, J. K., & Metcalfe, K. (2013). From the revolution to embodiment: 25 years of cognitive psychology. *Perspectives on Psychological Science, 8*, 573-585. doi: 10.1177/1745691613498098

Gray, R. (2004). Attending to the Execution of a Complex Sensorimotor Skill: Expertise Differences, Choking, and Slumps. *Journal of Experimental Psychology: Applied, 10*, 42-54.

Greenwald, A. G. (1970). Sensory feedback mechanisms in performance control: with special reference to the ideo-motor mechanism. *Psychological Review*, *77*, 73-99. doi: 10.1037/h0028689

Gucciardi, D. F., & Dimmock, J. A. (2008). Choking under pressure in sensorimotor skills: Conscious processing or depleted attentional resources? *Psychology of Sport and Exercise, 9,* 45-59. doi.10.1016/j.psychsport.2006.10.007

Hanin, Y., Korsus, T., Jouste, P., & Baxter, P. (2002). Rapid technique correction using old way/new way: Two case studies with Olympic athletes. *The Sport Psychologist, 16,* 79-99.

Hanin, Y., Malvela, M., & Hanina, M. (2004). Rapid correction of start technique in an Olympic-level swimmer: A case study using old way/new way. *Journal of Swimming Research, 16*, 11-17.

Hommel, B., Müsseler, J., Aschersleben, G., & Prinz, W. (2001). Codes and their vicissitudes. *Behavioral and Brain Sciences*, *24*, 910-926.

James, W. (1911). *On vital reserves: The energies of men. The Gospel of relaxation*. Retrieved from http://archive.org/details/onvitalreserves02jamegoog.

James, W. (1983). *The Principles of Psychology*. Cambridge, MA: Harvard University Press.

Koch, I., Keller, P., & Prinz, W. (2004). The ideomotor approach to action control: Implications for skilled performance. *International Journal of Sport and Exercise Psychology*, *2,* 362-375. doi:10.1080/1612197X.2004.9671751

Kremer, J., & Moran, A. P. (2013). *Pure sport: Practical sport psychology* (*2nd edition*). London: Routledge.

Laakso, A. (2011). Embodiment and development in cognitive science. *Cognition, Brain, Behaviour. An Interdisciplinary Journal*, *4*, 409-425.

Lohse, K. R., Sherwood, D. E., & Healy, A. F. (2010). How changing the focus of attention affects performance, kinematics, and electromyography in dart throwing. *Human Movement Science*, *29*, 542-555. doi: 10.1016/j.humov.2010.05.001

Lohse, Wulf, & Lewthwaite, 2012

Maes, P.-J., Leman, M., Palmer, C., & Wanderley, M. M. (2014). Action-based effects on music perception. *Frontiers in Psychology*, *4*, 1008. doi: 10.3389/fpsyg.2013.01008

Masters, R. S. W., & Maxwell, J. (2008). The theory of reinvestment. *International Review of Sport and Exercise Psychology, 1*, 160-183. doi: 10.1080/17509840802287218

Masters, R. S. W. (2012). Conscious and unconscious awareness in learning and performance. In S. M Murphy (Ed.), *Handbook of Sport and Performance Psychology* (p.131-153). New York: Oxford University Press

Martin, A., & Jackson, S. (2008). Brief approaches to assessing task absorption and enhanced subjective experience: Examining 'short' and 'core' flow in diverse performance domains. *Motivation and Emotion*, *32*, 141-157. doi:10.1007/s11

Merleau-Ponty, M. (1964). Signs. Translation Richard C. McCleary. Northwestern University Press.

Montero, B. (2010). Does bodily awareness interfere with highly skilled movement? *Inquiry*: *An interdisciplinary Journal of Philosophy*, *53*, 105-122.

Moors, A. (2013). Automaticity. In D. Reisberg (Ed.), *The Oxford handbook of cognitive psychology* (pp. 163-175). Oxford: Oxford University Press.

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

Nicholls, A. R., Holt, N. L., Polman, R. C. J., & James, D. W. G. (2005). Stress and coping among international adolescent golfers. *Journal of Applied Sport Psychology, 17*, 333-340.

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

Oudejans, R. R. D., Koedijker, J. M., & Beek, P. J. (2007). An outside view on Wulf's external focus: Three recommendations. *E-Journal Bewegung und Training*, 1, 41-42.

Poolton, J., & Masters, R. (2010). Discovering Golf's innermost truths: A new approach to the teaching the game. *Annual Review of Golf Coaching*, *1*, 119-123.

Prinz, W. (1997). Perception and action planning. *European Journal of Cognitive Psychology*, *9*, 129-154. doi:10.1080/71375255

Ravn, S., & Christensen, M. K. (in press). Listening to the body? How phenomenological insights can be used to explore a golfer's experiences of the physicality of her body. *Qualitative Research in Sport, Exercise and Health*. doi:10.1080/2159676X.2013.80937

Rossano, M. J. (2003). Expertise and the evolution of consciousness. *Cognition*, *89*, 207-236.

doi:10.1016/S0010-0277(03)00120-3

Schmidt, R. A., & Wrisberg, C. A. (2008). *Motor learning and performance: A situation-based learning approach*. Champaign, IL: Human Kinetics.

Schücker, L., Hagemann, N., & Strauss, B. (2013). Attentional processes and choking under pressure. *Perceptual and Motor Skills*, *116*, 671-689.

Shusterman, R. (2008). *Body consciousness: A philosophy of mindfulness and somaesthetics*. Cambridge University Press: Cambridge.

Shusterman, R. (2009). Body consciousness and performance: Somaesthetics east and west. *The Journal of Aesthetics and Art Criticism*, *67*, 133-145. doi: 10.1111/j.1540-6245.2009.01343.x

Shusterman, R. (2011). Soma, self, and society: Somaesthetics as pragmatist meliorism. *Metaphilosophy*, *42*, 314-327.

Shusterman, R. (2012). *Thinking through the body: Essays in Somaesthetics*. Cambridge University Press: Cambridge.

Sutton, J. (2007). Batting, habit and memory: the embodied mind and the nature of skill. *Sport in Society*, *10*, 763-786. doi: 10.1080/17430430701442462

Sutton, J., Mcilwain, D., Christensen, W., & Geeves, A. (2011). Applying intelligence to the reflexes: Embodied skills and habits between Dreyfus and Descartes. *Journal of the British Society for Phenomenology*, *42*, 78-103.

Weiss, S. M., & Reber, A. S. (2012). Curing the dreaded “Steve Blass disease”. *Journal of Sport Psychology in Action*, *3*, 171-181.

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

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. (2007). *Attention and motor skill learning*. Champaign, IL: Human Kinetics.

Wulf, G. (2012). How elite coaches' experiential knowledge might enhance empirical research on sport performance: A commentary. *International Journal of Sports Science and Coaching*, *7*, 423-426.

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