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Flow, Choke, Skill. The Role of the Nonconscious in Sport Performance

1. Embodiment and Background: Philosophy and Psychology on the Sporting Field

Do expert athletes rely preferably on conscious or nonconscious¹ mental processes in order to peak their sport performances? Today, this question is passionately debated by sport psychologists and cognitive scientists. Given the elusive nature of the notion of consciousness, it could hardly be answered without simultaneously addressing some interrogatives that are exquisitely normative in nature or that importantly involve philosophical clarification: what truly is consciousness, and what does make an experience conscious? What is the relationship between conscious and nonconscious behaviors? Providing a definitive answer to these questions is well beyond the scope of this chapter, which only aspires to concretely illustrate how the question on peak performances and the question on the nature on consciousness are intertwined and need to be addressed together. That is why this chapter will not simply assume that the philosophical clarification of the notion of consciousness is a prerequisite to understand peak performance; it will also show that, in turn, an empirical understanding of the psychological conditions that enable peak performance can significantly enrich our philosophical understanding of consciousness. In order to do this, it will examine the cognitive systems and psychological processes that allow professional sportsmen and sportswomen to excel on the field.

Some philosophers might be tempted to ask what is authentically philosophical, if anything, in an investigation on the cognitive architecture underlying the conscious experience of expert athletes. Philosophical inquiry has often tended to investigate consciousness exclusively as a metaphysical category, a fundamental property or principle identified by the conditions of its actual or counterfactual existence within the logic of possible worlds,

¹ In describing nonconscious psychological processes, I will assume a classical tripartition. All the cognitive processes and information that are accessed by the system at the subpersonal level, without them explicitly informing the phenomenal experience (as they are outside the field of one's conscious awareness/attention), are called *nonconscious*. The domain of the nonconscious comprises two subsets: *subconscious* dynamics (cognitive processes and bodies of information that currently are not, but that in principle can be and could have been consciously accessed at the personal level, if the cognitive agent directed its attention on them); and *unconscious* dynamics (cognitive processes and bodies of information that are not, and that in principle cannot, be accessed by consciousness, as structural limitations or intrinsic incompatibilities in the cognitive architecture prevent the cognitive agent from consciously accessing them at the personal level).

conditions that in turn are to be inferred through a priori reasoning (for example: Lewis 1980; Searle 1995; Chalmers 1996). However, another genuinely philosophical approach is possible, one that investigates the experiential nature of consciousness in real-life scenarios, exploring how situated cognitive agents interact with their world-environments, and how the patterns of this interaction concretely shape the modes of their awareness (Zahavi 2005; Gallagher & Zahavi 2008; Marbach 2010; Thompson 2014). The reflection offered by this chapter is inspired by the general terms of such approach: instead of *assuming* consciousness as the mysterious fulcrum of transcendent forces or as an illusion to be dispelled, the goal is to *discover* consciousness as a mundane phenomenon coherent with the scientific accounts of the mind, with the naturalistic view that the human psyche is immanent and incarnated, and with the evidence that mental activity is intrinsically intentional, relational, and social.

This approach presupposes a deep entanglement between one's cognitive performances and the normative dimension of her conscious experience, and searches for a systematic correspondence between the phenomenological and the functional dimension of the mind. This correspondence appears with particularly compelling evidence when we observe the negative modulations of one's consciousness, i.e. the distinctive experiences of unawareness or distraction that, in a specific range of situations, can predict a decrease (or, more surprisingly, as we shall see, an increase) of one's cognitive abilities. Real life cases (in particular, those related to the challenges faced by professional athletes) show that manipulating one's consciousness state modifies her cognitive performances. This suggests that between phenomenal consciousness and mental function there actually is deep causal codependence, and not only extrinsic correspondence.

Why is the psychology of sportsmen and sportswomen particularly significant for a general inquiry into consciousness? Insofar our cognitive systems are most heavily tested by challenging sport competitions and demanding psycho-physical training, sport and performance psychology - the scientific discipline that studies the cognitions, the emotions, and the motivations of the athletes - can tell us a few important things about the fundamental architecture of the mind, and especially about the power of its nonconscious components. Sport became a strikingly fecund domain of inquiry for both philosophical psychologists and cognitive scientists: a privileged perspective to study the limits and the potential of the mind "in action" is offered by the empirical examination of the feats of ability accomplished by sportsmen and sportswomen. During these performances, humans are requested to take the most out of cognitive faculties like perception, motor control, action planning, and decision in complex, possibly fast-changing, real-life scenarios. Sport performance allows us to observe these cognitive faculties under a magnifying lens because it exposes them when they are both extraordinarily developed, nearing the edge of human perfection, and extraordinarily under stress, nearing the edge of exhaustion and collapse. Cognitive science can use the lens provided by sport psychology to infer the nature of the mental resources needed by well-trained humans to accomplish their superior feats of ability, but its goal is to

generalize these observations in order to model the fundamental normative dimensions that define the skillful abilities of all humans.

It is remarkable that the psychologists and the cognitive scientists who work on sport seem naturally inclined towards embodied cognition theory and tend to embrace at least its most general and fundamental tenet (Varela, Thompson, Rosch 1991 and Wilson & Foglia 2011): that the processes involving body and environment importantly contribute to shape and scaffold higher forms of cognition. More specifically, this means that perception and action, considered as dynamic forms of coupling with the environment, participate in judgment and decision not less than the information internally stored by or produced in isolation within the central nervous system (see Beilock 2008; Holt & Beilock 2006; Beilock & Holt 2007; Gray 2014). These tenets resonate deeply with the ecological doctrines that distinctively contributed to the theoretical foundation of sport psychology (Gibson 1979).

In fact, the performances by expert athletes, in revealing the deep integration and mutual presupposition of perceptual experience, action, and adaptive intelligence, illustrate in the most compelling way the embodied and situated dimension of the cognitive mechanisms that govern skill learning and ability. With regard to the theme of this chapter, referring to the embodied view of cognition is somehow inevitable for an inquiry into the powers of the nonconscious mind, not only by reason of the huge influence that the embodied theory exerted on philosophy of mind and cognitive science during the past thirty years, but also because this perspective has inspired the most influential philosophical approaches to skill and performance, some of which characterized by a frankly anti-intellectualist (Fridland 2014) and anti-representationist stance (Dreyfus 2002; Hutto & Sanchez-Garcia 2007).

The characterization of skill and expertise provided by the first theorists of embodiment (Dreyfus & Dreyfus 1980) was in substantial accord with the most classical works in sport psychology (Fitts & Posner 1967): experts paradigmatically deliver their skillful performances in the form of unreflective action (i.e. through automatic routines), and expertise itself can be developed only when complex action patterns are automatized (i.e. when they become less demanding in terms of cognitive control). It is only when conscious control and explicit decision are replaced by well-trained habitual responses that the most effective and fastest results become possible. It is in these circumstances that, according to the aforementioned theorists of embodiment, the body shows its own intelligence, a skillfulness that is more primordial than the intellectually and verbally educated intelligence: it is when a pre-reflective and pre-noetic intelligence takes over that the body shows its inherent capability to effectively attune and respond to the worldly contingencies without relying on rules of thumb, conceptual models, rational inferences, explicit instructions, or intellectual representations. Importantly, sport psychologists have ascertained that automated behaviors, despite being produced without explicit control or reflection, are nonetheless adaptive, i.e. richly flexible, dynamic, and not stereotyped (e.g., Beilock et al. 2002a, 2004, 2008; Beilock and Gonso 2008). Correspondingly, various philosophers – interested in the notions of “habit” or “pre-reflective intelligence” – have

characterized skill as an intelligent form of unaware or semi-aware responsiveness to the material and perceptual contingencies in which the body is embedded (Dreyfus 2002, Kelly 2002, Rietveld 2008, Brownstein 2014).

According to these theorists, what makes fluid and quickly adaptive the live action of an expert is the fine-grained arrangement of its dynamic elements and its transient dynamics into a highly coherent, and temporally unitary system (Silva et al. forthcoming; Araújo, Davids, Hristovski 2006). The principles that guide and shape skillful action are complex, holistically interconnected, and truly intelligent because situated against a background of tacit know-how that the experts can *use* skillfully but can hardly be explicitly *aware of* (Radman 2012). According to this view, the cognitive preconditions of skillful action sit on this irrepresentable background and are infinite: a bottomless abyss of implicit knowledge that is ingrained within the very structure of the living body but that exceeds human verbalization and conceptualization (Wheeler 2008; Dreyfus 2012; Cappuccio and Wheeler 2012). Is this background the real source of the power of the nonconscious? In order to understand if this view is correct, it is useful to discuss the theoretical principles of embodied cognition and their applications to the practical cases addressed by sport psychology.

2. Flow, Choke, and the Phenomenology of “Trying too Hard”

I have already mentioned that one of the questions most often debated by the sport psychologists is whether the best sport performances can be achieved through conscious or (at least partly) nonconscious modes of perception and action (e.g., Breivik 2013). In other words, the question is whether sport skills are facilitated or rather disrupted by explicit attention and aware control. At a first glance, this question seems to pose a dilemma: on the one hand, many sport practitioners find obvious that acting while simultaneously reflecting on their ongoing performance is detrimental and disrupts both action and reflection, probably because they require two different and, to some extent, competing or even mutually exclusive forms of engagement; on the other hand, certain sport practices also suggest that an athlete has to be completely present to her actions, remaining focused and avoiding distracting thoughts, if she wants to perform at the best of her capabilities. Is it the excess then or rather the *lack* of awareness that damages the most our expert abilities? Is it convenient for an athlete to try to dedicate more or less attentional resources to the execution of her actions in order to succeed? From the point of view of the aprioristic definitions of consciousness often favored by philosophers, these two options are antithetical and mutually exclusive, and that is why philosophers have often tended to oppose them categorically. In truth, a careful examination of the actual relation between conscious awareness and performance, as it emerges in the concrete experience of the athletes, allows for other, more nuanced, solutions.

Optimal performance is usually associated with a particular psychological condition called “flow” or, colloquially, “the zone” (Jackson and Csikszentmihalyi 1999). Flow is described by practitioners as a sustained

state of absorption into their skillful performance, a condition of moderate arousal and enjoyment in which challenging tasks are accomplished without apparent effort (Swann 2016). Some studies suggest that the experience of flow actually correlates to an objective increase of the performance level (Swann et al. 2016). Although not universally endorsed, the conviction that flow is more easily achieved under conditions of implicit or semi-conscious attention is a very old and influential one (often associated to east-Asian doctrines, see Slingerland 2014). In fact, the belief that the “effortless” phenomenology of flow is typically accompanied by nonconscious cognitive processing is linked to two somewhat commonsensical notions: that conscious awareness is involved whenever we are “trying hard” to achieve optimality, and that “trying too hard” tends to reduce one’s capability to act skillfully.

For a long time, the notion of “trying too hard” has been characterized as “overthinking”, and it was often associated with the folk psychological assumption that “thinking” and “acting” are reciprocally exclusive types of mental acts (Dreyfus and Kelly 2001). Recently, this contrastive dualism has been criticized for being too vague to help scientific enquiry (see Cappuccio 2015, in particular Christensen, Sutton, & McIlwain 2015). On the other hand, “trying hard” can be understood in a very different way, as “over scrutinizing one’s own performances”, i.e. an excessive focus on movement execution (Carr 2015). This connotation resonates with a different view that is well represented in sport psychology, and that has received support by a large set of bodies of evidence, including both anecdotal testimonies (Swann et al. 2012), experimental data (Beilock and Carr 2001), and comprehensive theoretical models (Wulf 2013).

The current debate on skill acquisition and disruption is informed by the urge to combine the applied know-how of the practitioners with the scientific knowledge of the cognitive systems, and this is why today, more than ever before, the study of skill and expertise is (and must be) a multi-disciplinary endeavor, involving competing coalitions of sport psychologists, philosophical psychologists, and various types of cognitive scientists. It doesn’t focus on the opposition of reflection (thought) and performance (action), but invests in more sophisticated distinctions to critically evaluate the role played by nonconscious processing in peak performance. The progress in this field of research inevitably led to various diverging interpretations of this role.

The competition between different interpretative options becomes fierce when they try to explain the debilitating phenomenon commonly called “choking under pressure”, or “choking effect”, or just “choke” (Beilock 2011), which in many respects represents the antithesis of flow, and a key element to understand flow itself. Choke, feared by many sportsmen and sportswomen as one of the most dangerous threats to their professional activity, is usually construed as the expert athletes’ incapability to successfully perform actions that would otherwise be routine due to psychological factors such as stress and tension. According to Baumeister (1984), it is associated with a paradox many practitioners are familiar with: the situations that over-emphasize the expectation to produce excellent results are those that most likely bring about

below-standard performances. This phenomenon is related to a multifaceted complex of cognitive, motivational, and emotional dynamics that have been studied largely, but ultimately without consensus, by sport psychologists (Hill et al. 2010; Mesagno 2013). Even if the scientific definition of choking may vary significantly across different schools (reviewed by Christensen, Sutton, McIlwain 2015), and there is no universal agreement about its nature and causes, researchers have tended to focus on the allocation of attentional resources and on the role played by conscious and nonconscious processing as key causal factors in the manifestation of choking (Jackson & Beilock 2008).

While other explanatory narratives certainly exist (e.g., Carr 2015; Sutton et al 2015; Jordet 2010; Mesagno, Harvey & Janelle 2012; Mesagno and Hill 2013), three competing models of choking are particularly relevant to our discussion on consciousness: *distraction* (Wine 1971), *overload* (often conflated with distraction), and *self-monitoring* (Beilock and Carr 2001) theories. They impute the negative effects of choking to the intrusion of external competing attentional stimuli, the overflowing of internally available computational resources, or the disruption of fluid habitual motor routines, respectively. Note that, while the causes indicated by these models may tend to overlap, at least in part, it is indispensable to distinguish them conceptually: in fact, distraction is not necessarily caused by overload, whose origin and phenomenology are, in turn, different from self-monitoring.

While certain qualitative studies have been influential (Sutton 2007; Hill and Shaw 2013), most of the scientific debate of the last fifteen years orbits around the lines of experimental research that Sian Beilock, Tom Carr, Gabriele Wulf, and their fellow colleagues have conducted on the habitual skills that choking disrupts. The empirical results obtained by in-lab experimentation have provided some compelling arguments in favor of the third model of choking, a broad constellation that comprises all the self-monitoring theories, including preeminently “self-focus”, “execution focus”, and “explicit control” theories. These empirical results have exposed the limits of the distraction and overload models (without entirely ruling out), and have corroborated the claim that poor performances in experts are associated with conscious processing, or at least the particular form of consciousness involved in the explicit control of one’s own component movements. The most important arguments favoring the self-monitoring theories of choking over the competitors are four.

First of all, various authors (following Beilock and Carr 2001) maintain that distraction theories are inconsistent with the fact that choking typically occurs in conditions of focused attention (when the athletes try to maintain total concentration on their task), while it normally doesn’t affect experts in conditions of split attention (as in concurrent dual tasks, such as performing a golf putt while being asked to simultaneously recognize a given tone).

Secondly, they argue that cognitive overload theories can’t account for the fact that choking doesn’t normally affect experts who perform in fast action conditions (under speed instructions of the kind “putt as quick as possible”),

while self-paced action conditions (under attention instructions such as “putt only when you think you are ready”) typically increase their chances of choking (Beilock, Bertenthal, McCoy, & Carr 2004). In turn, self-monitoring theories account for the poor performances by the experts in the dual task conditions in which the secondary task demands attentive analysis of the primary motor tasks (e.g., “tell when the swing movement is finished”), or under attention instructions that stress the component processes of the performance (e.g., “keep the knees bent”).

Thirdly, self-monitoring theories can better explain the skill-level specificity of choking: split attention and fast action conditions have a negative effect only on the expert athletes that perform well-practiced sensorimotor skills, while the novices typically exhibit an inverted pattern of skill disruption, as they experience a drop in their performance exactly under the conditions that don’t damage the experts (i.e., dual-tasks that involve neither self-monitoring nor speed instructions). On the contrary, distraction and heavy cognitive loads affect the novices like (or possibly more than) the experts.

Last but not least, the theories based on distraction and overload struggle to explain why distractors and multiple tasks are consistently and successfully used in the therapeutic interventions on athletes that are particularly prone to choke. Despite the higher cognitive burden, the performance of the athletes is improved by any expedient that forces them to stop overscrutinize the details of their own movements, redirecting their attention to external foci (Jackson et al. 2006; Wulf and Su 2007).

Taken together, these correlations can be used to argue that the disruption of the fluid course of familiar automatized routines is due to self-monitoring (or, more precisely, to “execution focus”, as elucidated by Carr 2015), which is the reason why choking is often defined also as “paralysis by awareness/analysis” (Jackson and Beilock 2008). The main assumption underlying their theory is that performance anxiety typically solicits self-monitoring in the athletes during competition; self-monitoring, in turn, is likely to disrupt the continuous flow of automatic action by breaking its holistic and highly organic structure into an unnaturally segmented, mechanic array of inflexibly juxtaposed, discrete kinematic components.

However, this explanation is not universally accepted. Various objections have been raised against the self-monitoring theories of choking: to begin with, not everybody acknowledges a necessary causal link connecting anxiety to self-monitoring and self-monitoring to a consistent decrease in performance (e.g., Montero 2014, 2016, in press). Second, it has been pointed out that the small decrease in performance artificially produced in laboratory may have little or nothing to do with the catastrophic effects engendered by choking during real life competitions, and that the data collected by the experimenters lack ecological validity, as the laboratorial setting inevitably fails to reproduce the pressure-filled environment in which choking typically occurs (Jordet 2010, Christensen, Sutton, McIlwain 2014). Third, it has been noted that explicit control is not only possible but indispensable to successfully complete many sport tasks, and that attention to one’s own movements is necessary to

effectively strategize and take appropriate decisions during complex interactive sport activities (Sutton 2007).

These objections, in particular the third one, accuse the self-monitoring theory of choking of assuming a simplistic notion of expertise, one that emphasizes the velocity and fluidity of routine skillful actions executed in familiar situations but doesn't recognize that expert skills are also characterized by superior capabilities of decision-making, problem-solving, and creative improvisation in problematic or unfamiliar situations (Carr 2015, Cappuccio 2015). In order to assess the applicability of these objections, it is useful to identify and circumscribe the specific contribution offered by nonconscious processing to embodied cognitive performances.

3. The Role of the Nonconscious

Whatever opinion one has about flow or choke, it should be quite uncontroversial that a significant component of the cognitive activity necessary to expert athletes for carrying out their sport tasks is done at a nonconscious level. The stimuli subconsciously processed by the athletes on the field play a very important role for their sport tasks. There are cases in which subconscious stimuli affect performance level more than if they were explicitly perceived.

For example in soccer, during penalty kicks, the position of the goalkeeper on the goal line affects the penalty taker's choice of the direction in which he will send the ball (penalty takers typically choose to send the ball in the goal area that is least reachable by, i.e. farer from, the goalkeeper). Masters, van der Kamp, & Jackson (2007) has shown that the preference for a side or the other is stronger when the penalty taker is not consciously aware that the goalkeeper's position is displaced on one side of the goal line, i.e. when the length of displacement from the middle point is long enough to be subconsciously processed by the penalty taker as significant for his task, but not sufficiently long to trigger awareness. The length of the displacement must be small and must be perceived subliminally in order to affect the decision of the penalty taker. One reason could be that, if the displacement of the goalkeeper on the goal line were so salient that the goal taker became aware of it, then the goal taker would have reasons to think that the goalkeeper is intentionally assuming that position to influence the penalty taker's direction choice, strategically soliciting him to send the ball in a predictable direction. This kind of conscious considerations may trigger in the penalty taker explicit inferences capable of neutralizing the otherwise subliminal effect of the solicitations provided by the cue.

But what happens when subliminal cues compete with more supraliminal ones? To clarify whether implicit information exerts an intrinsic influence on the decisions of the experts, a follow-up study (Noël B, van der Kamp, Memmert 2015) has ascertained that subconsciously accessed perceptual information about the asymmetric disposition of the goalkeeper on the goal line can affect the penalty takers' decision of the goal side in a "rather pervasive" way also when "many supraliminal sources of information" are

available. In these cases, the key variable is whether the expert is acting automatically or deliberately monitoring his own actions. In this experiment, “implicit influences of the goalkeeper’s position on goal side selection were consistently overridden by the (conscious) perception of the direction of the goalkeeper’s dive [...] only if the penalty takers deliberately monitored the goalkeeper’s action and the goalkeeper committed early enough for penalty takers to respond.” This means that the actions of the experts can be flexible and adjust to the context when decisions about the environment are taken nonconsciously, as experts have a remarkable capability to extract rich and useful information from implicit cues when they are performing without self-monitoring.

This result is confirmed by another study, Bocanegra and Hommel (2014), which infers that explicit monitoring is useful only within a circumscribed scope: cognitive control is beneficial for challenging tasks or in unpredictable situations, but is overall detrimental for routine activity, which tends to be more flexible and adaptive if executed automatically. The authors maintain that “top-down control can impair and interfere with the otherwise automatic” actions, making behavior less efficient. This is especially true of contextual scenarios that are appropriate to the execution of routine actions, i.e. environmental circumstances that provide the agent with sufficient familiar information to easily predict the consequences of his actions and hence “behave on autopilot based on automatic processes alone”.

To test this hypothesis, the subjects of this study were asked to perform a decision task responding to various visual stimuli that varied in various features, including shape, size and color. Unbeknownst to the volunteers, the color feature always predicted the correct response. The task was replicated in easy (familiar) conditions in which decision tended to occur automatically, without explicit reflection, as well as in challenging/unfamiliar scenarios that prompted explicit attention. The statistical distribution of successful and unsuccessful trials has shown that the subjects subconsciously picked the useful information from the color and unwarily used it to solve tasks, but only when the subjects were not dedicating too much attention on the decision, namely in the “easy/familiar” condition of the task. On the contrary, when the subjects were “exerting mental control in a predictable situation, when automatic response was enough” their performances were impaired, suggesting that “the unneeded mental effort appeared to interfere with what is a perfectly adequate automatic performance.”

This result seems to support the belief that automaticity, the capacity to perform effectively and take decisions without explicit control or reflection, not only statistically correlates to expert performance; actually it causally contributes to the mechanisms of expert behavior, enabling more accurate and efficacious performances. But this leaves open a question of a normative kind (stressed for example by Gottlieb 2015), concerning what behavior can legitimately be considered “skillful”: is adaptive automatic behavior just a prerogative and a distinctive mark of skillful expertise (i.e., is it only a sufficient condition to be considered an expert, a feature precluded to inexperienced agents); or is it the case that adaptive automatic behavior is also a necessary

and constitutive condition of skillful expertise, in the sense that the capability to subliminally manipulate implicit information offered by predictable task environments is one of the prerequisites of expert action? In order to answer this question I will examine the notion of consciousness involved in skillful performances, first introducing and then following the interpretative grid proposed by Birch et al. (in press).

To counter the intellectualist view that sporting skills are not cognitive, Birch et al. (in press) defends the claim that the sensorimotor activities involving a deep dynamic integration of neuronal and bodily processes, like playing basketball, are not less cognitive and intelligent than a purely contemplative and static task such as solving an equation. Two traditional dogmas must be rejected in order to rediscover the unjustly underestimated embodied dimension of cognition: “the first is the belief that sporting skills are not knowledge; the other is that sporting skills go on (or should go on) without consciousness.” Against these dogmas, Birch and colleagues argue that many embodied activities are properly cognitive and intelligent insofar they involve *knowledge* and *consciousness*. Knowledge itself, according to Birch and colleagues, can be characterized as a defining characteristic, or even a particular form, of consciousness. As such, it pervasively informs the performances of the experts.

4. Defining Consciousness: 9 Dimensions

Birch et al. (in press) considers misleading and rejects the view that sees skillful activity as necessarily nonconscious: while some self-paced closed disciplines put a higher stress on the perfect repetition of standardized sensorimotor schemata, without involving high levels of active control and decision, in all sport disciplines consciousness is a key element for a perfectly executed performance. Building importantly on the philosophical reflection advanced by Breivik (2007, 2013), Birch et al. (in press) defends this claim analytically, arguing that all the defining features of consciousness are actually preserved in skilled action and even during repetitive routine performance. Skillful action involves both *access* (or “psychological”) *consciousness* (“a mental state which plays a causal/functional role in the production of behavior”) and *phenomenal* consciousness (“how it feels” and “what is it like” to have a certain experience), in accord with the famous distinction introduced by Block (1995). Phenomenal consciousness is the distinctive characteristic of the subjective qualitative mental states experienced by all beings having a body and inhabiting a world (as opposed to “robots or zombies”).

The key functional features of psychological consciousness, on the other hand, are captured by eight dimensions: *awakeness* (which demarcates conscious states from unconscious ones like sleep and coma); *introspection* (the capability to monitor and interrogate both one’s own internal states, such as emotions, and physical states, like body posture and motion, including proprioception and enteroception); *reportability* (representing in declarative terms events and features of one’s experience); *self-consciousness* (the sense of one’s personal identity, as distinct from the others’); *attention* (the

active and selective allocation of cognitive resources for processing on-line stimuli. It can be wider or narrower, focused or split, etc.); *awareness* (i.e. the sensibility and responsiveness to trigger stimuli. Unlike attention, it is a passive and general, i.e. non-selective, form of promptness); *voluntary control* (one's sense of agency, involving both sense of initiation and sense of control); and finally *knowledge* (which includes the capabilities of adaptation, explanation, and prediction that allow the agent to efficaciously deal with familiar and unfamiliar situations based on stored information and previous experience).

Each of these nine dimensions is represented to some degree in the typical skillful performance. Most, if not all, of them are indispensable to sporting activities.

1. Athletes certainly are *phenomenally conscious* when they perform. Their first-hand experience involves qualia, i.e. the private mental states that characterize as intrinsically subjective our percepts, feelings, sensations, and emotions during intense physical training or performance exactly like during any other moment of our lives. In particular conditions, athletes are not fully aware of how the environment affects them (e.g., subliminal cues), or they are not capable to fully report on tasks they were immersed in; and yet, this doesn't prove they are not phenomenally conscious, as their performance was always subjectively oriented and colored by a distinctive ego-centered experience (e.g., certain moods or emotions such as arousal, fear, discomfort, fun, or a complex blend of them). The performance certainly "felt" in some particular way, qualitatively irreducible to its verbal description.

The study of skillful performances offers good arguments in favor of the real (as opposed to epiphenomenal) status of qualia: not only qualia color in a particular manner the athlete's personal experience; they also modify the subpersonal cognitive processes in the athlete's mind. As reminded by Birch et al. (in press), this view is well represented in cognitive neuroscience: Edelman (1992, 135-136) doesn't only claim that phenomenal consciousness accompanies automated action; it also contributes to its success, exerting an effective causal impact on "discriminating sensory perceptions" and subsequently on "action and behavior, whether we are able to report it or not."

The intrinsically qualitative dimension of the athlete's experience is not a supplementary but a constitutive and causally relevant component of the cognitive processes that allow optimal attunement of an agent with her world. This explains why all of the eight functional dimensions of psychological consciousness are involved during the skillful performances. Their systemic dynamic integration would be harder to explain if we didn't factor in phenomenal consciousness, in that the functioning of the athlete's mind as a highly coherent unitary system is unintelligible without the unifying factor represented by his personal experience.

2) Revisiting the features of psychological consciousness previously mentioned, Birch et al. (in press) notes first of all that the athletes are certainly *awake* when they perform, as they don't seem asleep or in a trance.

3) Also, athletes often need to *introspect*, as they must be capable of monitoring their body, for example comparing their posture with a pre-given model of their movements (or a choreography) to correct the position and the kinematic of the body parts; also, they may need to control their internal states and attend their own psychophysical condition in order to detect when emotions, feelings, and somatic sensations deviate from an optimal standard, enacting appropriate compensatory or regulatory responses (for example when they are reaching the dangerous edge of physical exhaustion, sensorial overload, or emotional meltdown).

4) Definitely, athletes can *verbally report* about their performances (for example, football players interviewed after a match), providing elaborate descriptions of specific aspects of their behaviors, decisions, and the circumstances that motivated them.

5) They appear *self-conscious*, as they interact with inanimate objects, the other athletes, and the people in the audience in ways that suggest the stability of their personal identity and the structural persistence of their self.

6) As for *attention*, Birch et al. (in press) admits that it can be modulated in very different ways through different sport disciplines (“focused, selective, spotlight, integrating, divided, alternating etc.”): the type, the amount, and the robustness of the needed attentional resources may vary significantly between tasks; however, the authors exclude that any sport discipline could ever be successfully practiced by players affected by severe lack of attention, probably because this would prevent concentration.

7) *Awareness* is also inalienable from the experience of an expert player because, regardless of the depth of her absorption into the task at hand, and her capability to isolate herself from external contingencies, she is still sensitive and responsive to a broad perceptual horizon contextually dependent on her action possibilities. Such tight relation to the context is key to stay tuned with the continuous changes in the experiential flow while remaining in ‘the zone’.

8) Regarding the *voluntariness* of the actions executed by sport people, the authors remark that they “are certainly not random or lucky”; rather, they are the result of well-formed intentions. Even when an agent is not entirely aware of the action she is going to perform, its movements spawn from an act of volition (as opposed to being merely reflexive).

9) Last but not least, Birch et al. (in press) argue that sporting skills embody a rich form of knowledge characterized in procedural and not declarative terms, i.e. an operative know-how that informs the body’s flexible adaptivity to the environment. Unlike the traditional cognitivist approaches, the embodied view of cognition maintains that this knowledge is less accurately characterized in propositional terms than in terms of *motor intentionality*: this concept, developed at first by phenomenologist Maurice Merleau-Ponty, refers to a non-representational form of directedness, or “aboutness”, of the mind that makes it possible for a situated agent to directly perceive the world as a rich

landscape of meaningful possibilities of interaction (Merleau-Ponty 1945. See Dreyfus 1996 for a discussion of its contemporary relevance). Unlike other forms of cognition, the knowledge incarnated by motor intentionality is not normed by conditions of satisfaction, in that this knowledge is not about possessing a more or less accurate representations of the external world, but conditions of improvement, which define how our actions deviate from an optimal standard, i.e. a certain implicit balance with the world that is only tacitly sensed, never fully represented (Dreyfus 2002).

While this kind of embodied knowledge is usually associated with automaticity, Birch et al. (in press) finds that this association needs to be clarified: the know-how enacted by the body through its motor intentional attunement with the world relies on subpersonal cognitive mechanisms (like those localized in our premotor cortex) that work in an automatic way, i.e. without explicit decision being possible or necessary; but that doesn't mean the agent is compelled to act in a certain way when she is guided by motor intentionality, as motor intentionality (unlike the reflexes that are pre-programmed by the genes or hardwired in the system through associative mechanisms) is a relational and dynamic knowledge involving all the aforementioned elements of consciousness. This is fundamentally different from an automatic predisposition to deliver fixed responses.

5. The Other Side of the Story: Nonconscious Modulations of Conscious Awareness

I believe this analysis is essentially accurate in revealing how the main components or features of consciousness, conceptually identified by philosophers, are present in the experience of the athletes. But the conclusion presented by Birch et al. (in press) invites an additional interpretative effort to recognize the specific role played by legitimately nonconscious dynamics during skillful activities.

Birch et al. (in press) seems to reduce subconscious or semiconscious experiences, qua personal experiences, to the positive realm of consciousness: the point maintained by the authors is that, even when we drive home with "automatic pilot" (to use the famous example by Armstrong 1981), we are *not entirely* (and certainly *not reflectively*) *aware*, but we clearly live the qualitative circumstances of driving as a subjective experience. We are still - at some level - aware of the situation, and more or less ready to respond to sudden changes; consciousness of the road conditions may be in its minimal form, but it never completely abandoned us.

While I agree with this positive account, I wonder whether it would be satisfactory if we didn't complement it with an empirically and phenomenologically accurate account of the negative modulations that specifically characterize consciousness during automatic skillful action. Consciousness is present in both reflective and autopilot driving, but is it equally present in both of them? Conscious engagement in automatic skillful action involves a different, negative or privative, dimension. It is a particular form of absence and disengagement that makes it possible to characterize

the distinctive phenomenology of this experience, which is both qualitatively (it feels differently) and functionally (it works differently) irreducible to experience of positive presence associated with fully aware and reflective driving.

The expert's experience and the novice's are paradigmatically different in this respect, as the novice's certainly includes the fully aware and reflective dimension of action, but hardly involves the automated and reflective one. Could we ever capture the specificity of the minimally articulated form of consciousness associated to the absorbed performances of expert athletes, if we excluded negative attributes and privative notions such as diminishment, absence, or disengagement? As I believe the answer to this question is negative, my proposal is to stop treating automatic action as a zombie-like mechanical procedure, considering it instead as a phenomenological chiaroscuro in which explicit and implicit intentional acts are intertwined, forming a complex patchwork of foreground and background knowledge that can be fully, only partially, or not at all accessible at the personal level, in different degrees and at a different times (refer to the dynamic model of background knowledge first proposed in Cappuccio & Wheeler 2012). This involves a particularly nuanced pattern of features that usually we associate either to full awareness or to unconsciousness, respectively. Their dynamic interplay can be recognized examining once again the nine characteristics of consciousness indicated by Birch et al. (in press).

To begin with, athletes absorbed in their skillful performances are certainly *awake* (1) and vigilant, but a more interesting question is whether their state of wake is qualitatively and functionally the same when they are not absorbed in their performance. Without suggesting that their condition were in any significant sense comparable to a kind of 'trance', or a blind repetition of mechanical routines, we cannot underestimate the specificity of their particular way of being awake either. This specificity is attested by the fluctuations in the performance levels that an expert athlete experiences when the modes and the targets of her attention vary.

For example, we know that the condition of flow importantly correlates to three factors: skill level (Catley and Duda 1997, Engeser and Rheinberg 2008, Jackson 1996), performance, and experience, meaning that expert athletes are more likely than novices to achieve a condition of deep absorption and maximize the benefits of this condition during challenging tasks. The phenomenological specificity of this experience is the reason why many experts believe that flow consists in a peculiar modulation of consciousness: flow increases the success rates in expert sport performance because the cognitive functions recruited for the task at hand are contingent upon the sub- or semi-conscious processing typically favored by flow. Hence, from a cognitive point of view, being awake while "in the zone" is very different from being just generically awake.

6. Introspection and the attentional focus effect

The specificity of this condition is reflected by the particular limitations typically suffered by the athletes' capability of *introspection* (2) during peak

performance. Importantly, these limitations seem *an enabling condition* to achieve peak performance: obviously, athletes can introspect during their performances, in the sense that they never lose their sheer capability to monitor their postures, movements, and their internal states; but athletes don't exert their full introspective potential when they produce top performances, or when they simply want to be efficacious in their sport activity. The empirical evidence supporting this claim is abundant.

I am referring to the “attentional focus effect”, largely documented by the experimental activity conducted by Gabriele Wulf and her colleagues (Wulf, Shea, & Park 2001; Wulf & Su 2007; Wulf, Lauterbach, & Toole 2009; Wulf 2013), and replicated by several other research groups. This comprehensive body of empirical data corroborates a theory of attention that distinguishes between internal and external foci. The attentional focus effect model goes hand in hand with the theory of choking as “paralysis by awareness/analysis” or “explicit monitoring” and seems to back it, although there are differences. The model essentially claims that attending the constitutive elements of one's performance (paradigmatically observing the components of her own actions) usually brings about substandard outcomes. Attention to “internal foci” (typically one's own body parts, or aspects of one's movements) damages the precision and the coordination of her actions even when they are just familiar routines. On the contrary, paying attention to “external foci”, like the immediate transformational effects of one's action, or their physical targets, doesn't reduce the quality of one's performance and in many cases can actually help improve them, offering a dynamic indicator that co-varies with one's actions without being a component of these actions.

This is useful to strategically regulate one's own action or stabilize her posture and movements in an indirect manner, without needing to directly attend internal elements of one's performance. The paradox captured by this theory is that the best way to adjust or correct one's action is to avoid attention to the action itself, exploiting features, processes, or events that are produced by or predicted from one's action. They provide all the information necessary to update one's movements without directly attending them. This theory and its variants discourage coaches and trainers from using instructions that explicitly describe (or even mention!) body parts, movements, and postures; rather, it suggests focusing on the expected outcomes and the immediate effects of one performance, or on indirect instructions intended to facilitate their achievement.

When it is indispensable to refer to internal components, the internal focus theory recommends the use of metaphorical descriptions or other means of analogical representation (practically in accord with implicit learning theory: Master 1992; Komar et al. 2014). If the athlete's attention is recurrently – possibly unintentionally and compulsively – being drawn by internal foci, then an intervention based on distractors and secondary tasks, to direct the attention away from the internal foci may be necessary. Such form of intervention proves highly beneficial to mitigate the choking effect (Wulf et al. 2002). According to Wulf (2016a, 2016b), the model can be generalized to all kinds of expert activities in reason of the robustness of the attentional foci

effect and its very high replicability across very different sport disciplines and typologies of tasks. Moreover, Wulf maintains that this effect is independent of the individual characteristics of the agents (e.g., age, gender, disability) and of their skill level (unlike the phenomenon of choking by awareness/analysis/self-monitoring, which clearly correlates to expertise and automatization).

While the large amount of empirical data in support of this model cannot be ignored, its universality has been questioned by the psychologists and the philosophers who defend a different interpretation of attention in skillful performance. Toner, Montero, & Moran (2014) and Montero, Toner & Moran (in press) have questioned the internal/external focus distinction as ill-defined. In particular, the apparent vagueness and extreme variability of the notion of external focus would confound the domain of applicability of the theory: external focus seems to indicate alternatively the immediate effects of an action (scoring a goal), an external object or perceptual cue, a quality ("speed, tempo, going fast, swimming hard") of the action, or its metaphorical representation; however, particular features or metaphorical descriptions of an action count as internal, if they refer to a particular isolated body part or movement, as opposed to the movement of the whole body: for example, "focusing on the angle of one's wrist and focusing on one's wrist and hand taking the shape of a candy cane, for example, would both count as internal foci since they identify isolated bodily parts" (Montero, Toner & Moran, in press). Also, Montero and colleagues impute "contradictory" claims to Wulf (2016), such as the claim that "adopting an external focus does not mean that the performer is not aware of her or his body movements" (p. 337), apparently contradicting the claim that 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*". Montero, Toner & Moran (in press) deem these claims contradictory in that they indicate that "an external focus both allows and excludes an internal focus (bodily awareness)".

This contradiction might be only apparent. In truth, it is not impossible to systematically interpret the two claims by Wulf within the general theoretical framework of control theory, in a way that makes them reciprocally compatible and that doesn't contradict the attentional focus theory: it is perfectly possible for a forward system to control the on-line action simply trying to reduce the mismatch between the sensorial effects actually produced in the system by the action and the on-line prediction of these effects generated in accord with the system's expertise in producing that kind of action. The system doesn't use detailed information about the execution of the action itself, because an excess of information could impair the on-line capability of adjustment by abnormally over-intensifying the sensitivity of the prediction-matching system, which in turn would generate a cascade of false-errors capable to inhibit the correct execution of the planned movements. That is why, according to the model presented by Clark (2015, pp. 218-220), Predictive Processing theory is consistent with the attentional focus effect.

Like the metaphors used in implicit learning, the predictions generated by the system to anticipate the effects of its own actions vicariate the role of an internal focus by replacing it with an external focus. A confirmation of this

intuition is offered by the fact that neuro-bio-feedback systems are effective in accelerating training and peaking performance in tasks that require high levels of concentration (as in marksmanship, see Berka et al. 2012). The reason is exactly that such system allows the agent to adjust her actions without directly attending them: the system, through portable dynamic EEG technology, receives information from the brainwaves of the agent and, as soon as it registers high levels of relaxation and deep concentration (as in flow), uses tactile feedback to make the agent aware that it is the best time to shoot. The shots executed in these circumstances are in fact statistically more successful. The agent is trained to try to reach and maintain the optimal mental state that the EEG system is programmed to detect; the subject modulates the responses of the system with his sheer will until the conditions for an optimal performance arise. The agent corrects his execution without introspecting (without focusing on his current internal state), simply relying on an indirect representation of the internal state calculated by the artificial system. Attention has an internal focus only in an indirect, mediated, and delayed sense: the human agent alone (unlike the EEG system that is specifically designed for this purpose) wouldn't be naturally capable to directly monitor her own brain state. The prediction of the optimal brain states at the same time informs and is produced by the execution of her actions, and no internal focus is ever directly targeted in this closed feedback action loop.

A different objection against the attentional focus effect theory comes from Sutton (2007). The accurate analysis of the reports by cricket batters provided by this study highlights that self-monitoring and attention to component movements is not just possible and likely to happen on the field without apparent decrease; it is also indispensable to allow the professional players to correctly adjust their posture and maximize the effectiveness of their actions. This qualitative study contributed to undermine the myth that expert athletes don't (*and can't, qua experts*) consciously control the component processes of their actions: it provided theoretical ground to critically discuss the maximalist interpretations of the self-monitoring theory of choking (i.e., those interpretations that see self-monitoring and explicit control as necessarily and ultimately detrimental to all kind of skillful activities, as suggested by Dreyfus 2002).

At a first glance, this seems sufficient to question the universal validity of the attentional focus effect theory: certain sport tasks (such as swimming, see Swann 2016), because of their closed nature, are benefitted from the explicit awareness of one's posture and the kinematic components, especially for those actions that, in order to be optimized, need very precise trajectories and fine-grained mechanical adjustments that can neither be automatized, regardless of the amount of experience acquired, nor controlled through indirect strategies based on external foci or metaphorical representations. While this is true, it might not be enough to exclude the existence of a tradeoff (perhaps just a minor one) between self-monitoring and quality of the execution, as per attentional focus theory. It is possible, in fact, that the execution of certain types of tasks receives both a benefit and a damage from attending internal foci, and that the benefits happen to be higher or more visible than the costs. If that is the case, then a general disruptive effect due

to the attentional focus might still be present, although it would be largely exceeded – and therefore masked - by the concurrent benefits produced by the finer control, involving a more precise coordination brought about by explicit monitoring.

The existence of a general disruptive effect on performance due to the explicit control of one's own actions cannot be excluded a priori if we consider only tasks that cannot be carried out without such explicit control, as there would be no valid term of comparison (control condition) to measure the corresponding performance decrease. On the contrary, various experiments show that the negative effect engendered by internal foci is perspicuous regardless that the task had been carried out with or without self-monitoring (i.e., automatable tasks that don't strictly rely on body awareness; actions that don't require fine adjustments in the posture or calibration of the movements against a pre-given model). This is the kind of setting that allows to systematically measure the decrease in performances (see Wulf 2016a, 2016b).

In this kind of setting, introspective consciousness (at least the kind of introspection that targets internal foci) is still systematically correlated to substantive decreases in performance. For the purposes of our analyses, this means that the sense of body awareness of an expert athlete who performs successfully relying on his automated embodied routines is modulated in a specific negative way – one that naturally tends (or has been exercised) to avoid or reduce introspective attention.

7. Reportability, Attention, Awareness

Limited capabilities of introspection imply limited capabilities to *verbally report* (3) on one's actions. In fact, the reports provided by the experts, in comparison to the novices', suggest a less accurate and a coarser-grained capability of recollecting information about events and features experienced by experts absorbed in the execution of their tasks (even if at least some of this information was obviously accessed and processed, probably subconsciously, during the task). This effect has been documented systematically over different disciplines, is particularly evident in closed self-paced tasks, and its intensity seems positively correlated to skill level.

Beilock, Wierenga, & Carr (2002) uses the expression “expertise-induced amnesia” to indicate the impoverished episodic memory experienced by experienced athletes: they display a generally reduced “declarative accessibility”, i.e. a lower “openness to introspection and report”. This phenomenon justifies the inference that the experts don't primarily rely on declarative forms of cognition to execute their routine tasks, especially when the sporting task doesn't require the use of working memory, i.e. the kind of memory that specifically manipulates declarative representations: various experiments show that the cognitive system is not overloaded by secondary tasks that use working memory, if the primary task is a sport task that doesn't involve working memory either (e.g., Beilock & Carr 2005; Beilock et al 2006). This separation is accounted for by “dual-process” theories that postulate the

fundamental autonomy of the different cognitive sub-systems that, respectively, use and don't use working memory (Furley, Schweizer, & Bertrams 2015).

Expertise-induced amnesia doesn't contradict the well-known fact that experts can typically produce copious, rich, and articulated commentaries about their own performances (or the others', as done by TV sport commentators): skilled players, rather than relying on the precision of their episodic memory, exploit their superior familiarity with the discipline (procedural memory) to imaginatively reconstruct the circumstances of their actions by elaborating on minimal recollections. This way, experts find it easier to compensate for the lack of precise factual information about the occurrence of particular events during the task or about the presence/absence of particular features associated with their performance.

How are *attention* (4) and *awareness* (5) specifically modulated in the experience of expert athletes? The answer is not simple, as it largely depends on the kind of task and the training done to maximize one's performance. Attention can be more or less narrowly funneled during the sport task – depending on the nature of the sport discipline itself, and whether the task is closed or interactive, self-contained or continuous, self-paced or synchronized to other agents or events. In any case, the attentional field of the athlete is shaped by the way he concretely inhabits the scenario of his performances, including first of all his expectations about the perceptual environment and the prospects opened by his previous performative knowledge. It is necessary to point out that such know-how, in turn, depends importantly on his direct familiarity with the typical circumstances of the performance, on the motoric and perceptual habits that he has developed through his training, and ultimately on the way his embodied adaptive dispositions (including a primordial background of purely reflexive reactions, emotions, and visceromotor sensations like pain) have been molded by the repetition of previous trials.

Each way of engaging in interaction with the world brings about its own specific manners of attending to it and perceiving it. Different practical stances and goals literally change how athletes subjectively see, hear, and feel things: for example, the size of a baseball seen by a batter depends on how well he hits (Witt & Proffitt 2005), and the diameter of a golf hole is seen larger by golf players when they put successfully (Witt et al. 2008). Similarly, the perception of the width of the gap between two goal posts varies with the facility the football has been kicked between them (Witt & Dorsch 2009). Durgin et al. (2012) and Firestone (2013) have questioned the interpretation of these results, claiming that these effects do not depend on an actual modification of one's perceptual patterns, but on retrospective biases only. However, Witt (2015) and Foerster, Gray, & Cañal-Bruland (2015) have convincingly argued that perception of the action itself, not the judgment about the performance's outcome, is specifically affected by the agent's performative expertise. These experiments manipulate perceptual feedback to dissociate the perceived outcome of one's performance from the objective quality and precision of the performance: this way, they have proven that a subject's tendency to perceive

larger-than-real-size targets correlates only to the higher quality and precision of his performance (which in turn depends on the depth of his absorption into the task and, of course, on his skill level), not on the perceived outcome of his performance.

Expert athletes don't see the world like a general agent would see it; their senses are fine-tuned to pick only the information that is relevant to their tasks, information that is intrinsically characterized in an interactional, practical, and motoric way. Both Gibson's theory of affordances (1979) and Merleau-Ponty's theory of motor intentionality (1945), mentioned by Birch, Breivik, and colleagues, efficaciously account for the cognitive mechanisms underlying these empirical results: what makes the experts expert is exactly that they see opportunities for action and practical occasions that invite intervention or careful response, where average observers can only see pragmatically neutral, objective, uncharacterized environments. Neuroscientific investigation confirms both the phenomenological intuition and the ecological principles behind this concept. For example, the discovery of canonical neurons explains why the perception of affordances in the environment (e.g., graspable objects) builds on the capability to execute the corresponding actions (precision grasp): the perceptual system recruits the competences stored in the repertoire of goal-oriented motor actions that is encoded in the premotor cortex of humans' and monkeys' brains (Fadiga et al. 2000; Rizzolatti & Umiltà 2013).

This specific calibration of the perceptual system, regulated by the motoric proficiency in particular classes of goal-oriented skills, implies that the attentional resources available to the system are recruited selectively, in accord with the ongoing modulation of one's state of conscious awareness, which in turn depends on the task at hand and the subject's practical familiarity with it (see premotor theory of attention, Craighero et al. 1999; Rizzolatti & Craighero 2010). This selectivity suggests that consciousness in expert athletic performance is characterized by a negative or privative dynamics, as it is modulated through a task-specific or goal-specific type of obstruction or redirection of the available global attentional resources. The creation of areas of disengagement and unawareness is a byproduct of this filtering process: while the senses of the athletes are receptive to external, even distant, unanticipated stimuli, and ready to nonconsciously process them, their zone of awareness is curved to filter out the percepts that are irrelevant to the success of their goal-oriented motor activity.

8. Self-consciousness, Volition, and Knowledge

If motoric expertise and skill level modulate perception, then they are likely to modulate self-perception too. This is documented by the diminished sense of self-consciousness (i.e., decreased awareness of self and of social evaluation) reported during flow by 30% circa of the athletes, most often combined with other perceptual modifications such as transformation of time (Swann et al. 2012, p. 13. See also Jackson and Marsh 1996). Why do athletes suppress self-consciousness? One of the reasons might be that, in order to achieve flow state, athletes have to replace the negative thoughts

with positive feelings of fulfillment. And the fear of the judgment of the others can be one of the most disruptive thoughts (Mesagno, Harvey, & Janelle 2012).

In fact, it is well-known that the kind of awareness of oneself solicited by social evaluation (intended as explicit judgement about oneself, or reflection on the possible opinions or beliefs of others) is often detrimental to one's performance and undermines flow: in particular, stereotype threat can significantly affect performances by prompting negative thoughts that undermine confidence and weaken motivation. Even just mentioning negative stereotypes can disrupt performance (Beilock et al. 2006; Beilock 2011). This is either because recurrent thoughts overload the cognitive system (saturating the working memory) or because they prompt reflective tendencies that increase the chances of compulsive self-monitoring. In either case, successful athletes have reasons to avoid social judgment in order to prevent negative self-thoughts.

Self-consciousness is related to performance also in other ways: i.e. not only thinking of the judgments of the others can be detrimental; also observing their poor executions. In various sports, especially team-based, expert players are prone to contagion effects that can be explained – for example - in terms of emotional or motoric resonance between players. One player performance is affected negatively or positively by the unsuccessful or successful performances of the other players. Different models try to explain the cause of contagion: for example, it may depend on the (de)motivation arising from the general mood of the affiliated players (Moll, Jordet, Pepping 2010); or on the fact that the observer's motor system is primed in specific ways when it is recruited to internally simulate the observed actions of others (Ikegami & Ganesh 2014); or on motivational mechanisms related to the natural tendency to preserve consistency between one athlete's beliefs about himself, about the other players, and about the quality or value of their respective skills (as in Fritz Heider's Balance Theory, see Cartwright and Harary 1956). In any of these cases, the self-conscious dimension of one athlete is directly modulated by the interactions between team-players. A psychological link between the actions of the subjects involved in a match exists, and produces remarkable effects during intense competitions, when attention to one's own and the others' performances is dramatically increased by the psychological pressure. The boundaries of one's consciousness are not autonomously defined, but depend by the presence of the others.

This idea is consistent with the "shared manifold hypothesis" in social neuroscience (Gallese 2007): regardless of what we are doing, our brain constantly simulates the behavior of the surrounding agents. Specific brain areas (motor, emotional) become selectively active not only when an agent executes an action or experiences a certain emotion, but also when perceives other agents executing the same action or experiencing the same emotion. This strengthens the idea that team players reciprocally coordinate through an intersubjective network of resonating brain activities. When they successfully attune to one another, they create a supra-personal system of cognitive interactions.

This hypothesis is not enough to believe that the boundaries of one's self-consciousness could be transcended by intersubjective resonating brain processes: one's subjective experience remains fundamentally, irremediably ego-centered (Zahavi 2005). It remains, in some sense, not entirely communicable. But this hypothesis certainly invites us to abandon a solipsistic way of understanding consciousness as the isolated prison of personal identity: identity is not the effect of a self-contained system, but a relational phenomenon structurally open to the experience of the others, and emerging from a network of conscious interactions. This dynamic is even more marked during challenging skillful activities, when the emotional and cognitive attunement between agents is key, for the better or for the worse, in determining the outcome of their individual actions in a collective context.

Sense of agency, another key feature in the phenomenology of self-consciousness, is also peculiarly modified in skillful activities. Sense of agency is crucial because our capability to experience our own actions as voluntary or involuntary (8) depends on it: according to control theory, the feeling of being an agent, i.e. the one who intentionally initiated a certain movement, derives from a comparison of the sensory predictions generated when a motor command is sent to initiate an action with the sensorial feedback actually produced by the execution of that action. This is how the system distinguishes between endogenous and exogenous movements, informing the agent at once about the actual origin of the ongoing changes in the perceptual flow and about the boundaries between internal and external world (e.g., it tells me whether the room seems spinning because my body is rotating or because the walls are actually moving around me).

Now, there is evidence that sense of agency is qualitatively modified during situations of flow involving deep absorption. While the athletes' capability to identify the actions that they have voluntarily started is not substantially modified (unlike in schizophrenic patients), the subjective experience associated with this function is modulated in a characteristic way. Expert athletes – especially in disciplines that emphasize fast reactivity and appropriate responsiveness to an opponent's actions, like martial arts - often describe their movements as springing spontaneously, seemingly without explicit intention or active volition, without thought or decision being necessary or possible: a situation in which the difference between activity and passivity, moving or being moved, seems to dissolve.

The essence of this phenomenon is paradigmatically epitomized by martial artist Bruce Lee's famous statement: "I do not hit, it hits all by itself" (whose speculative meaning, clearly influenced by traditional Taoist doctrines, is developed in his sport and philosophical treatises. See Thomas 2005). But a similar subjective characterization also emerges from the self-reports produced by expert athletes when asked to describe the phenomenological specificity of their engagement in situations of flow (Swann 2016). One of the most common phenomena, reported by almost 75% of the athletes is "action-awareness merging" (i.e., total absorption, or "feeling completely at one with the activity" during the flow state).

A recent study with elite golf players (Swann et al 2016), documents that flow corresponds both to a feeling of calm/relaxation and a sense of total control, often described in terms of semi-automaticity of movement, effortlessness, and enjoyment. The athlete often describes her attitude in this condition in terms of “letting it happen”, as opposed to more effortful modes of engagement defined as “making it happen”, an expression that indicates an increased sense of alertness and effortful control. The complete awareness of the intense challenge faced by the athlete during flow, combined with the high level of performance typically achieved in this condition, results in a positive sense of exceeding one’s expectations and “surfing” problematic contingencies with ease. Crucially, this condition is experienced as a feeling of relief, a mitigated sense of effort and a greater capability to rely on automatic subconscious routines that don’t require voluntary decision and reflection.

Sense of agency and voluntary action don’t disappear in this condition (the subject is still aware of being in charge), but their experiential valence is modified: the subject does not experience his involvement as a way to transform the situation, but as a way to respond to it, compensating the contingencies to find a balance with them. Volition (or intention) is not an antagonistic force emanated from the core of the self to oppose the world and alter it according to a plan; rather, volition is encountered during flow as an effect, a surface tension that vibrates through the dialectic of internal and external forces, emerging from the encounter of trained predispositions and challenging contingencies.

Last but not least, also knowledge (9) is distinctively modulated during flow: motor intentionality certainly constitutes a kind of knowledge, as pointed out by Birch et al. (1996); however, Merleau-Ponty (1945) also points out that it differs at root from conceptual knowledge. The know-how embodied by motor intentionality is never entirely accessible by aware consciousness, not even through careful introspection (Kelly 2000, 2002). For example, Merleau-Ponty famously noted that experienced stenographers perfectly know where to find each key on a keyboard while they are typing, but wouldn’t be able to indicate the overall disposition of the keys in a diagram of the keyboard if asked to do so. This dissociation between a “spatiality of situation” (mapping the environment in terms of opportunities for action) and a “spatiality of position” (mapping the environment in terms of objective metric relations) is confirmed by clinical neuropsychology, which has documented how brain damages that affect the capability to execute particular goal-oriented actions don’t necessarily affect the capability to conceptually decompose those actions into neutral geometrical elements, and vice-versa. This dissociation has been variously interpreted, for example through the two visual pathways theory (Milner & Goodale 2008). The fact that two different systems superintend these two different types of knowledge can explain why we intuitively know how to manipulate objects and how to recognize the environmental circumstances that afford their manipulation, even if our capability to report on our motor-intentional dispositions is disturbed. In fact, explicit judgement through a declarative stance involves an a posteriori reconstruction that can

and often does rely on motor-intentional competences, but that is not motor-intentional in itself.

This explains why athletes are not always capable of telling “how they did it”, especially when their motor-intentional abilities (silently stored as bodily readiness to act) made them capable to improvise new actions and unexpected strategies that are not reducible to the verbal instructions or models received during training. If these two types of knowledge are not always equally accessible (because motor intentional schemata are not available to analysis through conscious control and introspection), this is not only because the two systems were contingently separated; it may well be that there is a radical incommensurability between the two kinds of information encoded as motor intentionality and as cognitive intentionality, respectively. While know-that is based on detached, explicit representation of facts, know-how is intrinsically interactional and non-contentful in nature, i.e. devoid of propositional or figurative content; the former’s normative structure is defined by conditions of satisfaction, the later by conditions of improvement (Dreyfus 2002).

Due to its fundamentally non-representational nature, motor intentionality cannot be reduced to a collection of facts or bits of information expressed in a declarative format; motor intentionality builds on a direct practical and interactive acquaintance with the world, and emerges on a holistic, unquantifiable background of bodily and material preconditions that are essentially ‘transcendent’, i.e. always exceeding our possibilities of verbalisation and conceptualisation. If this picture is correct, then, although motor intentionality scaffolds the higher levels of our cognitive engagement with the world (verbalisation, conceptualisation), and provides the embodied root of our intellectual categories, there would be no assurance that motor intentional knowledge could ever be entirely accessible through conscious awareness, reflection, or introspection (and, even if it was accessible, that would happen only reconstructively, a posteriori). That is why, even if deploying intellectual faculties can certainly help during sport performance, higher forms of cognition and explicit thought are never enough to accomplish excellent results and cannot replace embodied expertise.

9. Conclusions

I think the analysis of the components of consciousness proposed by Birch et al. (in press) efficaciously proves that athletes are not zombies without qualitative experiences or automata deprived of decision, reflection, or control. Both the phenomenology of consciousness (at the personal level) and its functional components (at the subpersonal level) play a crucial role in the mental life of athletes when they engage with challenging tasks. We can consider this role as legitimately “cognitive”, in that it importantly involves embodied forms of cognition and emotional and practical intelligence.

At the same time, a careful analysis of performance under pressure and skilful activity in a flow state reveals that consciousness and its functional components are modulated in highly specific ways, with a complex interplay of

background and foreground elements. This specificity reveals some important features of the basic architecture of our minds, including how we acquire and deploy complex sensorimotor skills governed by embodied forms of intelligence (e.g., motor intentionality). These basic forms of cognition are intelligent because allow rich and flexible forms of adaptive behaviour and very fine-grained capabilities of perceptual discrimination, practical categorization, and responsiveness to context; at the same time, our analysis confirms that these forms of basic cognition are largely or fundamentally automatic and pre-reflective. Not only in the sense that they operate at a subpersonal level through the work of mechanisms situated well below the level of our consciousness, as correctly maintained by Birch and colleagues; but also in the sense that, whenever consciousness is involved in skilful performances, the fundamental features of conscious experience are specifically modified or partly suppressed. When the best performances have to be achieved, some particular forms of our awareness are adumbrated or selectively filtered to minimize attention to oneself and maximize the allocation of resources to the goals or expected consequences of the agent's actions, in order to increase her readiness and boost her reactivity to the circumstances.

I hope I have been able to persuasively argue that, studying the cognitive processes underlying the performances of the athletes, it is necessary to take seriously both the fact that athletes are aware and conscious and the fact that their conscious awareness during peak performance is characterised by the selective suppression or attenuation of particular patterns of perception and attention.

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