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## Sensory ecologies: the refinement of movement and the senses in sport

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### ABSTRACT

Sport is centrally concerned with the human body. Those concerns focus on how bodies move materially in space and in time. In this article, we develop our concept of “Sensory Ecology” to elucidate how one might come to develop and understand the creation of specialist bodily knowledge found in sport. Sensory ecologies are produced through the refinement of enskilled movement of bodily materials in specific spatial and temporal confines. To understand the embodied knowledge that athletes learn, it is crucial to ensure the connections between a body and its environs, the body-in-the-world affirmed via sensory interactions, and the information generated from those interactions are maintained in any research on embodiment, being-in-the-world, and the self. The body, its senses, and its surrounding environs simply cannot be separated from one another. Therefore, a sensory ecology sits in these intersectional coming-togethers of space, time, and material made manifest through the sensing of bodily movement. Throughout this article, we discuss the material of bodies and their sensing of spatialities and temporalities by arguing that our concept of “Sensory Ecology” provides a means for exploring the cultural specificities of sensing the moving and sporting body in particular and ways of being more generally.

### KEYWORDS

Sensory ecologies; bodies; movement; space; time

The unifying factor across all work on the senses, sport, and movement is the common universality of the human body. Without the human body as the object, seat of perception, and self, there is no intelligence to experience, ponder, and comment on the senses of movement and motion in sporting contexts. At the base of the development of these specialized sensoria that shape the ways in which athletes sense their bodies’ spatialities and temporalities is a material reality regarding the universality of the body’s matter. The universality of the human body is more limited than what might be surmised at first glance. That everyone exists as a material body is universal, that everyone has sensory systems, of varying compositions, qualities, and degrees, is also universal. What is not universal is the manners in which sensory systems are organized and interconnected and the ways in which they are then used. While the vast majority of human beings have vision, hearing, and touch, how groups of people and even individuals see sights, hear

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sounds, and feel texture, temperature, humidity, and other tactile sensations are in no way universal. They are socially and culturally constructed, inscribed into and on the human body via lived experience.

Sport invariably necessitates the movement of part, if not all, of one's physical being. To engage in sporting activity is to move one's body through specific spatial and temporal constraints. How one develops these enskilled movements is contingent upon learning how to sense the movements of one's body in relation to the body's surrounding space and time. The development of these precise sets of sensory expertise are not created through each sensory medium in isolation but in concert with each other and the body's spatial and temporal surroundings to develop a specific sensory ecology. Drawing on Bateson's invocation of ecology (Bateson 2000), meaning the patterns, information, and ideas embodied in material forms, is vital for understanding a particular action "as part of an ecological subsystem called context and not as the product or effect of what remains of the context after the piece which we want to explain has been cut out from it" (Bateson 2000, 338). These manifest ecologies are thus each organism using its body to materially sense its spatiality and temporality. The "emplacement of the sensing subject in a particular environment" (Howes 2019, 20) highlights the need for greater consideration of how such sensory ecologies manifest.

### Sensory ecologies

We simply cannot separate the body, its senses, and its surrounding environs from one another. Understanding the senses in an ecological manner means ensuring the connections between a body and its environs, the body-in-the-world affirmed via sensory interactions and the information generated, remains embedded in the contexts in which sensory information is produced. In this manner, a focus upon the senses cannot separate them into convenient boxes (i.e. smell, taste, touch, pain, sight, hearing, kinesthesia) nor can they be lumped together in some synesthetic relation where information incoherently blurs together. Rather, our senses are ordered into spectrums of relational possibility that allows us to engage with the world. The rich experience of our environments and our bodies is made manifest through how we learn to privilege and prioritize certain senses over others senses. We initially come to understand our senses and the ways of sensing the world through particular cultural, historical, psychological and environmental filters. A "western" sensory complex privileges vision and hand-eye coordination over other sensorial modes while another complex sensory ecology privileges kinesthesia, balance, or auditory perception over others (Geurts 2002).

A sensory ecology sits in these intersectional coming-togethers of space, time, and material made manifest through the sensing of bodily movement. Thus, sensory ecologies are produced through the refinement of enskilled movement of bodily materials in specific spatial and temporal confines. These ecologies are made through dedicated "techniques of the body" (Mauss 1973) that require specific refined movements of specific parts of the body that are combined to produce whole body movements in different kinds of spaces. Bodily motion of steps, kicks, arm strokes, strides, and breaths are all sensed and assessed to develop knowledge of how "well" one moves through space in relation to a material or temporal standard (Alter 1992; Downey 2005). Indeed, certain sports, gymnastics, figure skating, and martial arts, for example, incorporate assessment of

“correct” form and movement as a central part of any such competition. Athletes’ concerns over how “effective” or “aesthetic” their movements are do not just apply to those sport at the elite level. While these forms of embodied knowledges are produced through repeatable combinations of technological and sensorial information at the elite level, concerns over how the production one’s bodily movement is made manifest forms the very basis of all sporting activity.

The developmental trajectory of movement practices in sport mainly focuses on novices’ entrainment of movement as embodied potentials for becoming “elite athletes.” A presumption about elite athletes is that their bodies and their senses are exceptional in comparison to the rest of us mortals. The dominant narrative of elite athletes is that these individuals are gifted with incredible biological characteristics like astonishing reflexes, astounding hand-eye coordination, instinct, and precision and power in their actions. Such individuals are “gifted” with natural abilities at the extremes of human capabilities, thereby reducing their exceptionality to a biological variance. The implication of such a presumption is that such individuals have preternatural senses enabling them to do what practically everyone else cannot. Such a position denies the simple reality that the vast majority of their actions are not “instinctual” or “natural” but learned, including how these athletes sense their bodies and their bodies’ enskilled movements. This enskillment of movement is “the patient transformation of the novice, the change of his or her muscles, attention patterns, motor control, neurological systems, emotional reactions, interactive patterns, and top-down self-management techniques” (Downey 2010, S36). Quite simply, the making of an athlete through transformative processes echo the transformation of an eighteenth century peasant into a foot soldier as outlined by Foucault (1977). The enskillment of movement is more than repetitive neurological and motor systems of bodily techniques, however. Enskillment occurs in the sensed techniques of the body in specific environs: what are, in effect sensory ecologies. Such ecologies are, of course, further informed and shaped by cultural histories and norms.

Sensory ecologies do not emerge, though, until a temporal aspect is incorporated into those movements in space. Baserunners must get to the bag before a thrown ball. Distance runner, swimmers and speedskaters all move against an unseen yet all too real standardized measure of time. Sport practitioners, even children and youth, learn relatively quickly to accurately predict how long it will take them to perform a certain set of actions. Speed skaters are able to feel their way around the oval, embodying the rhythmic ticking of the stopwatch, feeling the difference in the ways in which their bodies move adding or reducing milliseconds per lap. Youth swimmers accurately predict how fast they will swim a certain race on a given day to within a second or two. Budding baseball players learn to sightlessly clock the motions of opponents fielding a ball and throwing to first base against their own progress along the basepath.

To learn such movements and techniques requires a refinement of their own sensoria, the ways in which individuals sense not only the world around them but spatial and temporal passage through the sensing of their bodies’ movement. The refinement of these senses necessitates detailed focus upon material and immaterial aspects of surrounding environs. The development of such skills involves banal processes resulting in what is often identified as “excellence” The production of “excellence” requires banal processes of repetitive motion (Chambliss 1989). Excellence of movement and performance is not down to simple genetics even though some athletes do have statistically

outlier phenotype characteristics, such as larger feet or longer arms for swimmers. Thus, athletes learn to sense their bodies in differential spatialities and temporalities. Indeed, those spatialities and temporalities manifest in their very bodies. How movement informs our sensory ecologies, generating novel sensory capacities and novel capacities for forms of movement, in turn, refines simultaneously the foci and detail of each sense used to move one's body and refines not just movement but being (Hofstadter 2007). In short, the refinement of one's sensory ecology facilitates the development of more refined movements.

## Material bodies

The body is a consciously produced social object that is literally developed, and sometimes (re)constructed, through the organic and mechanical sensing of it in motion: a body's velocity, direction, its coordination of its parts and dynamic energetic systems (respiratory, muscular, circulatory, and others), as well as its coordination in conjunction with other bodies, technologies, and machines are all underpinned by the sensory capacities of a body. The focus of athletic training is to effect material changes in the body, from changes in musculature and blood chemistry (as measured in sport science), to the ease, pace, and regularity with which precise, coordinated movements are achieved. These changes follow general trajectories over years of repetitive practice giving rise to moments in which the body should sense its changes in pace, in space, in time, in composition, and in relation to its immediate environs. These sensory ecologies are the cumulative effects of training.

Bodily movements in sport are cultivated as honed physical skills specific to that sporting endeavor. All athletes, to greater or lesser degrees, run, whether for training or for competition. How and why they run is specific to each sport and the athlete's needs at that moment in time. Although running often forms part of athlete training, athletes in each sport learn to run in a particular manner. That learning may be ad hoc or it may be highly technical, but the specificities of how to run, and of sporting practices more generally, are not dependent upon the culture in which the sport takes place but on the sport itself. These embodied knowledges cut across cultural boundaries and are specific to the activity. Even so, those cross-cultural physical acts still generate culturally specific bodies and meanings to those movements.

Such culturally specific stylistic differences were noted by Marcel Mauss (1973) in his elaboration of habitus almost a century ago. Of course, numerous other scholars have considered how bodies are shaped by culture. Bodies, their materials, and how they all are sensed are informed by cultural norms, mores, and values embodied in what Mauss called habitus. Through most of the intellectual history of the body, the body was imagined as a universal biological bedrock upon which social edifices were built. (Shilling 2005; Turner 2006). More recent works challenging the simplicity of such ontological assumptions situate the sensing body at the locus of human engagement in the world (Lock 2017, 2018; Lock and Farquhar 2007). Additionally, phenomenologically informed works directly address the bodiliness of the human experience (Csordas 1993; Geurts 2002; Jackson 2017). These shifting emergent epistemologies of the body transform the ontological body into active, material matter that manipulates its world. These more recent epistemologies emphasize the ways in which "objects to come into being – and disappear

with the practices in which they are manipulated” (Mol 2002, 5) bracketing practices with inert material objects. A parallel theoretical development regarding the body is the New Materialist approach (Coole and Frost 2010) that concentrates on the politics of gender and embodiment. In relation to sport itself, the emergent Physical Cultural Studies proponents (Newman, Thorpe, and Andrews 2020b) advocate for understanding matter as “setting power in motion” (Newman, Thorpe, and Andrews 2020a, 17) with relations of power between and amongst materials as constituting and reproducing of bodies. Unfortunately, scholarly applications of New Materialist theory to the study of sport rarely attend to the phenomenological or sensorial aspects of bodily engagement in the world unlike anthropologically driven Materialities focused works (Attala and Steel 2019) outlined above. Accordingly, the body is not simply inert flesh: it is part of whilst simultaneously engaged with the world.

The development of our concept of sensory ecologies travels in these epistemological channels that emphasize the fleshy and physical materials of the body as well as the ways in which the body comes into being through relationships with human and nonhuman entities: the “body-as-matter” (Attala and Steel 2019). Their focus upon the dual perspectives of sensing one’s own embodied movements and of others’ observations of those movements highlights the sensual interplay of sport (Carter 2008). The methods of sensing sporting movements produce, affirm, and inculcate specific values, including in many cases, values of a transnational modernity, while simultaneously reifying, reinforcing, and resolving ways of sensing one’s place in the world.

### **Sensing spatialities**

Sport occupies a significant locus in our social and physical environments. As sites for socialization, learning, entertainment, and recreation, sport incorporates both the spectacular and mundane socio-cultural processes of life. Yet, the spatiality of the body has received uneven attention in social theory, especially when sport is thrown into the mix. When space is a central focus, it tends to be in regards to the topographies of sporting environments (Bale 1994; Silk, Andrews, and Thorpe 2017, 321–388) through which bodies move instead of bodies shaping and defining the spaces that surround them through sensory awareness of movement. Space is not an inert abstraction external to our being, it is actively created through our bodily engagement in the world (Eichberg 1998, 47–86; Lefebvre 1991; Low 2017). In short, the concentration has been on how sport constrains and shapes bodies and their movements, and not on how bodily movement creates and extends the spatiality of the body. The body, however, extends into surrounding space defining the areas of movement in concert with other bodies who create that space using materials and their own bodies (Downey 2005). The senses’ involvement in complex constructions of sociospatial formations is not just the sensing of bodily movement; it entails bodily movement in preexisting spatial relations informed by social hierarchies of power. The body’s senses enable body-centered measures of the world beyond the body itself, but how such ecologies are made is inextricably entangled in existing power relations in each society. Sensory ecologies draw upon ideas found in feminist critiques of gendered, spatialized knowledge thereby locating a sensing body in a complex mesh of material, social, and temporal weaves (Butler 2011; Haraway 1988;

Young 2005). Attending to these ecologies takes such analyses beyond the symbolic to consider how space itself is formed through the body's interlocutions.

One of the hallmarks of modern sport is the creation of dedicated sporting spaces, from the football pitch to the baseball diamond, the hockey rink and swimming pool (Bale 1994; Darbon 2014). Standardized spaces such as these have strong regulating effects that demand bodies move using specific ways at certain times. Stadia, training facilities, gyms, locker rooms, and other dedicated sporting spaces all demarcate, regulate, and control bodies spatially in similar ways (Eichberg 1998; Vertinsky and Bale 2004). Stadia, for example, control the movement bodies throughout their complex spatialities well beyond the athletes on the playing field. Spectators' movements are also spatially constrained in a number of ways (Bale and Moen 1995; Gaffney 2008). In training, athletes learn to employ specific techniques of the body according to particular spatial and temporal constraints of standardized spaces through the refinement of the body's sensory apparatuses to the point that space is measured via embodied time by literally embodying the rhythmic ticking over of the stopwatch, feeling the temporal difference of milliseconds in the ways in which their bodies move. Quite simply, the artifice of a playing field, gym floor, swimming pool, or ice sheet develops refines learned movements into taken-for-granted patterns of natural movement. "How the body inhabits space (and time, for that matter) can be seen more clearly by considering the body in motion because movement is not content with passively undergoing space and time, it actively assumes them, it takes them up in their original signification that is effaced in the banality of established situations" (Merleau-Ponty 2012, 105). That is, the relationship between the creation of sporting spaces and moving sporting bodies is more complex than the simple regulation of movement. Changes in speed, strength, and proprioception are not in space nor in time, but rather, paraphrasing Merleau-Ponty (2012), we would say that this changing body is of space and of time. Together this entanglement of body/time/space manifests as temporalities of everyday existence, experienced through our sense perceptions of movement in the world.

### **Sensing temporalities**

Sport not only enacts distinct spatialities, it also enacts distinct temporalities that suspend while simultaneously affirm the dominant worldview. We tend to think of time as being in constant motion and space as immobile. Time moves through and around us, but we move through and in space. Time is perceived as something external to our being, that affects our being. Space is also external to our being, but we occupy space, move through it and are enveloped in it yet also separate from it. We mold and shape our spaces, but we rarely think of our selves as being able to move through, never mind actually generating, times. We create the spaces and times of our beings through sensing our movements. It is through our movements that our environs come into being (Carter 2018). Our sensing of our movements in space and time generates distinct spatialities and temporalities. How we sense time becomes a measure of our being even as those temporalities are ones that we ourselves create.

A temporality is an enacted combination of actualized and potential pasts, presents, and futures made manifest through embodied social acts (Gell 1992). It has been argued that cultures have different dominant orientations in time. Time in "traditional" cultures

have generally been characterized by a dominant (political, ethical, cultural etc.) orientation to the past. “Modern” times, whether socialist or capitalist, are oriented toward an anticipated future toward which society “progresses” (Appadurai 2013; Eliade 1971). “Postmodern” times, however, are supposedly characterized by a dominant orientation toward the present. Distinguishing between past, present, and future is more than a matter of “observing” distinctions that are “given.” In fact, distinguishing between temporal modes can be analyzed as a form of social action connected to specific social actors (Bevernage and Lorenz 2013). How temporal orientations change – and whether they simply succeed each other, coexist, compete, cooperate with each other, or dismantle or support one another – has not been analyzed in depth, however. Nor has the multiple, shifting temporalities that can intersect life been extensively studied. Careful attention to changes in time, rather than merely over time, are needed simply because the body marks time, tells time, feels time, and enacts its own time. Bodies move forward through time, as in the progression from childhood to adulthood, but they also move backward in time. To remember the socially and culturally constructed ways in which one learned to move, perhaps recalling ways one can no longer move, as well as ways one wishes they could move are indicative of this sort of temporal movement.

Sport quantifies time to create a standardized unit of measure either for determining the standard duration of a game or as an arbiter of the competition (Darbon 2014). Training programs operate on a temporal logic of linear progression, that is, of gradual improvements over time, and of punctuated moments, readying bodies for novel capacities prior to competition. Overlying these temporalities, long-term athlete development programs are designed to capitalize on critical developmental moments (Lloyd and Oliver 2012). Further, athletes participating in sport, and spectators viewing sporting events, experience time in novel ways (Laviolette 2011). Sporting events typically create a timeless *jouissance*, a pleasurable suspension of time. The immediacy of any such event and its immersion in the “now” generates a flattening of the relationships between past, present and future. In these events, time is not sensed; rather, sporting bodies assume a position within an abstract “real-time” (Woodward 2013). Such a temporality is thoroughly embedded in modernist presumptions about the body and being, rendering time a natural phenomenon that is applied to bodies. For athletes, the experiences of “being in time” in days of Olympic competition, for example, reveals a conceptualization of time and temporalities external to bodies. One is “in time,” much as one is “in space,” and those temporal and spatial regimes are imposed upon bodies rather than generated through human activity.

Nonetheless, athletes operate under a temporal incongruity that oscillates between the belief in and the logic of modernity and the embodied knowing and acting of enskilled movements. Yet, there are no considerations as to how those self-same bodies influence, never mind actually construct, those times and spaces. Each moment of a physical movement is not obliterated or forgotten but rather generates a link in our present perceptions “between a here and a there, between a now and a future” (Merleau-Ponty 2012, 141). Athletes carry their pasts into the present and cast these toward futures. Modern sport flattens time, compressing past, present and future into singular co-eval moments. This flattening of time via honed bodily perception feeds such “sporting times.” Consequently, the accretion of movement manifest in athletes’ bodies, through years of training, generates these complex temporalities. While atomistic measures of time – and subjects moving in

time – no doubt form an important part of sport, time must be attended as to how it is also sensed and experienced. Sporting bodies count time, tell time, feel time, and enact time.

The embodiment of time is paramount for the creation of temporalities because the perception of a body's movements exists in relation to other bodies and spaces. Translating the sensory stimulus of another's movement through one's own sensorium into a "kinaesthetic formula for acting" (Downey 2010, S28) necessitates taking into account the intention of another's movements as well as input from their environs. As infants, as children, and as novices in about any aspect of life, we must overcome challenges when engaging our senses in new ways. When older, this necessitates addressing the "unconscious patterning, unexamined inhibition, and corporeal reservations that are only apparent when challenged by new kinaesthetics" (Downey 2010, S27). Paying attention to the ways in which the enskilled movements of sporting practices are learned can illuminate the various ways we sense the spaces and temporalities of our being we inhabit, including our bodies, whether these are indicated via the seconds and milliseconds while lapping a speed skating oval or swimming pool, the steps along basepaths and running routes, the everyday rhythms of the body, or the arching trajectories of maturing from child to adulthood. Sporting practices prove especially effective in producing new and refining existing enskilled movements. Ultimately, the spatiality and temporality of our environs we inhabit coalesce into our sensory ecologies in that inform our being-in-the-world.

Learning the sensory ecology of one's interlocutors requires the incorporation of multiple sensoria so as to combine and reshape our own sensory modalities in conscious ways (i.e. attempting to adopt gestures, postures, hesitations, facial expressions, and bodily orientations) in the hopes of making sense of other cultures' sensory ecologies (Howes 1991). Bodily activities all enact different sensory perceptions of time, space, and motion. Specialized sensorial education is not found solely in sport. It is integral to related activities like dance (Dalidowicz 2015; Potter 2008) or yoga (Jain 2014), in artistic and craft pursuits, (Sennett 2008, 149–178), and even in professions such as journalism (Boyer 2016) or science (Myers 2015). The creation of specialist bodily knowledge occurs through the ability to sense and enact shifts in temporalities and spatialities when one is engaged in such movements. Doing so is a requirement for every individual to comprehend that one is not alone in the world. Social and cultural contexts, of course, shape the ways in which people know their bodies and the world by sculpting the foundation of sensorial experiences. They frame how we sense, which senses we privilege over others, and what constitutes a sense and way of being in the world. By taking account of our bodily materiality, the materials we interact with in physical movement practices, and what meanings those materials are ascribed in particular locales, we are better able to comprehend the vast array of sense perceptions our interlocutors hold that may differ from our own. Sensory ecologies therefore provide theoretical frameworks for traversing embodied ontologies. Attending to these ecologies is one such avenue for exploring the cultural specificities of sensing the moving and sporting body. The conglomerate of sensing the movement of bodies allows the further examination of concepts of time, space, place, and motion as they are incorporated into our sensory ecologies and thus our very being.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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