

Improvisation in dance and embodied cognition. An enactive semiotic perspective on thermoception

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ABSTRACT

In contemporary dance scholarship, improvisation is a privileged site for examining the relationship between embodied cognition and meaning-making. From the perspective of “enactive semiotics” (Paolucci 2021), improvisation cannot be reduced to a purely individual expressive flow, but must be understood as a situated practice in which the body functions as an agent capable of exploring and actualizing movement potentials within a material, social, and cultural environment. Within this theoretical framework, this article extends the semiotic analysis of improvisation through the study of Gaga dance practice, introducing a largely underexplored experiential dimension: thermoception, understood as the set of sensations of heat and cold that traverse and modulate the moving body. Through an analysis of Gaga’s metaphorical and pedagogical language, the article shows how verbal imagery activates thermoceptive awareness, thereby reorganizing sensorimotor dynamics in real time during improvisation. In this account, thermoception does not function as a mere physiological background condition, but as a regulatory and generative dimension of embodied meaning-making. It participates in the co-emergence of physiological dynamics, affective attunement, and expressive and interpretive processes, operating as an active variable in the microgenesis of movement in improvisational performance.

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Introduction

At the dawn of the 21st century, Bruno Latour urged us to regard the human body as an interface. In *How to Talk About the Body? The Normative Dimension of Science* (2004), Latour describes the human body as something that is progressively acquired, depending on the elements with which it enters into relation. He proposes a 'pathological' conception of the body, understood as capable of being affected and transformed by the relations in which it is involved. Rather than conceiving the human body as a stable and 'fixed' entity,¹ we should instead perceive it as an interface that learns to be influenced by different material interactions. The body, in other words, is not a generic preformed starting point from which experience unfolds, but the effect of a series of relations that structure its descriptive and experiential possibilities, as it is constantly 'engaged' in a process of material and aesthetic exchange.²

In line with the notion of the body as an interface proposed by Latour, Tim Ingold's concept of 'enskilment' (2000) describes a form of 'understanding in practice,' in which exposure to specific sensory stimuli enables, over time, the ability to distinguish things on the basis of subtle cues that an inexperienced subject might even fail to notice. In the literature on sensory enskilment developed from Ingold's attention to embodied modes of knowledge, numerous examples emerge: from the acquisition of the dexterity required to modulate pressure, rhythm, and intonation in cello performance (Sennett 2008), to the development of auditory capacities such as the recognition and classification of urban soundscapes and technological signals (Bijsterveld 2019), and visual capacities such as training the gaze to detect patterns, anomalies, or morphological qualities in specific contexts (Grasseni 2004).

A specific form of sensory enskilment is offered by contemporary dance practices³, particularly through improvisational exercises within the Gaga technique. Gaga is a movement language developed by Israeli choreographer Ohad Naharin in the 1990s, which is fundamentally a somatic practice aimed at amplifying bodily

¹ As Elisabeth Grosz suggests, among others, in *Notes Toward a Corporeal Feminism* (1989), the human body is never given once and for all, but instead takes shape as an open-ended process, shaped by biological, cultural, and political forces that continually redefine its limits and possibilities.

² In relation to the *Material Engagement Theory* developed by Lambros Malafouris (2013), mind and matter are not separate entities but instead co-emerge through practices of interaction. From this perspective, cognitive processes are not located exclusively in the brain but are distributed across the dynamic circuits that link subjects, environments, and objects. Material engagement thus describes the way in which human action and thought take shape through continuous exchange with things, the so-called 'thinging.'

³ By 'contemporary dance' we refer here to a heterogeneous set of choreographic practices developed since the second half of the twentieth century, which emphasize approaches and techniques centred on somatic awareness, relational engagement with the environment, and sensory experimentation, such as contact improvisation or somatic practices (for example Feldenkrais or Body-Mind Centering). Within this context, contemporary dance can be understood as a privileged field of sensory enskilment, in which the body is progressively trained to perceive, modulate, and differentiate subtle qualities of movement and sensation.

sensitivity and reorganizing the perceptual experience of movement.⁴ Gaga classes operate through a series of verbal instructions, mainly conveyed in the form of evocative imagery, which guide attention toward micro-sensations, variations in gestural intensity, dynamic qualities, and relationships between different parts of one's own body and that of others. Guided improvisation, a central element of Gaga practice, opens up an exploratory mode of choreographic action through which the body gradually learns to be 'affected' by increasingly subtle stimuli, developing sensory discrimination capacities that were previously latent. As occurs during improvisational sessions, the expressivity of the dancing body is conditioned by the articulatory possibilities of the body itself, which become progressively available to the dancer.⁵ In Gaga practice, the subject is constantly required to modulate movement in response to internal feedback (proprioception, balance, muscular tension and elasticity) and external cues (atmospheres, sounds, the presence of others), activating a circuit between perception, listening, attention, and action.⁶ The dancer's body thus emerges as a site of ongoing negotiation between sedimented habits and emerging potentials, between consolidated motor schemas and new gestural patterns generated through interaction with the instructor's prompts. In this perspective, Gaga improvisation practice is a peculiar 'technique of the body' (Mauss 1934) which, when practised, can reorganize perceptual thresholds and expand the repertoire of motor possibilities and thereby reinforcing Latour's idea of the body as a dynamic and porous interface, continually redefined by the relations in which it is embedded.⁷

⁴ Gaga is structured into two distinct tracks: Gaga/dancers, which constitutes the daily training of members of the Batsheva Dance Company and is now also taught to other dancers in Israel and abroad, and Gaga/people, which is open to the general public and accessible to anyone, of any age, without the need for prior experience.

⁵ The idea that improvisation draws on a bodily repertoire that is built over time is shared by several theoretical perspectives. Susan Leigh Foster (1995) describes the dancer's body as a dynamic archive of motor patterns and expressive possibilities sedimented through practice, which are reactivated and reorganised in the improvisational act. Similarly, André Lepecki (2006) emphasises that improvisation is not pure spontaneity, but a field of emergence in which already learned bodily traces surface, while Maxine Sheets-Johnstone (1999) highlights the kinesthetic and processual nature of movement, understood as embodied knowledge unfolding in time. From this perspective, the body can be understood as a living archive, whose possibilities progressively expand through experience and practice.

⁶ This article combines a theoretical analysis of Gaga practice with a phenomenologically informed examination of its experiential dimension. The description of Gaga classes draws on the author's first-person experience as a practitioner of Gaga, developed during his work as a dancer at the Friedrichstadt-Palast in Berlin, where he participated in several Gaga classes led by a certified Gaga teacher invited to work with the company in 2021. This experiential dimension is employed as a phenomenological entry point into the structures of bodily experience elicited by the practice. The aim is to investigate how specific pedagogical devices – particularly verbal instructions, attentional exercises, and sensory explorations – configure conditions for embodied meaning-making.

⁷ By 'technique of the body' we refer here to a set of practices, techniques, and *dispositifs* that intervene in the formation and modulation of bodily capacities, shaping the ways in which the body perceives, moves, and relates to its environment. The classical reference is Marcel Mauss, who in his essay *Les techniques du corps* (1934) defines body techniques as the ways in which people, society by society, make use of their bodies in habitual and socially conditioned ways. From this perspective, the body is never purely natural, but always already culturally formed through incorporated habits, codes, and forms of education.

1. Reactivating thermoception

In contemporary debates on dance, improvisation has emerged as a privileged site for investigating the relationship between embodied cognition and processes of signification (Carmona 2018; Lindberg Marin, and Silverman 2021; Ravn and Høffding 2022). Recent contributions in aesthetics and semiotics have further emphasized that improvisation should be understood as a process in which meaning is progressively negotiated through bodily, material, and relational constraints (Bertinetto 2013; De Luca 2017). Drawing on the perspective of ‘enactive semiotics’ (Paolucci 2021), according to which semiosis arises from dynamic processes of coupling between organism and environment,⁸ this contribution seeks to extend the semiotic analysis of improvisation in dance by introducing a hitherto underexplored dimension: thermoception, namely the set of sensations of heat and cold that traverse and modulate the moving body.

In the context of Gaga technique, improvisation appears as a radically situated yet guided practice,⁹ in which the dancer is constantly solicited by a dual dynamic: on the one hand, the verbal stimuli of the teacher, which function as semiotic devices capable of orienting attention and configuring fields of perceptual-motor possibilities; on the other, the emergence of internal micro-sensations – among which thermoception – that constitute the immediate terrain on which such stimuli are actualized in the dancer’s movements. Indeed, participants are invited to shift their focus toward weight, joints, skin, internal organs, and flows of energy. Instructions accumulate layer upon layer: a dancer may simultaneously attend to the sensation of the feet on the floor, the expansion of the spine, the elasticity of the flesh, and the circulation of heat through the body. Rather than functioning as representations to be translated into movement, these instructions operate as constraints that reorganize perception and action. From this perspective, the dancer does not merely execute or interpret instructions but operates as a ‘semiotic agent’ that continuously translates, modulates, and reorganizes movement on the basis of the sensory anchoring provided by its experiential situation (see Kimmel 2012; Kimmel and Hristova 2021). Meaning therefore neither precedes action nor resides solely in the teacher’s language but co-emerges within the dynamic circuit linking verbal enunciation and embodied

⁸ The notion of ‘enactive semiotics,’ developed by Paolucci (2021), is situated at the intersection of pragmatist semiotics, embodied cognition, and enactivism, and is based on the idea that signification is not the result of processes of symbolic encoding and decoding, nor a prior mental representation of action, but rather the situated and dynamic emergence of forms of meaning within the structural coupling between organism and environment. From this perspective, semiosis becomes a relational and processual event that takes shape in the bodily, perceptual, and material practices through which an organism coordinates itself with its environment.

⁹ While this interplay between verbal cueing and embodied sensation is not exclusive to Gaga and characterises many contemporary dance pedagogies based on improvisation and somatic attention (see, e.g., Sheets-Johnstone 1999; Batson and Sentler 2017), Gaga places a distinctive emphasis on the continuous generation of movement through richly metaphorical verbal instructions addressed to dancers’ immediate sensory experience.

experience: guiding ‘phrases’ are immediately grounded in proprioceptive configurations (including thermoceptive ones) that orient and inform improvisation. The result is an ‘experiential semiotics’ (Helbo 2016) in which movement becomes a generative site of meaning, and in which – following Sheets-Johnstone (2019) – the relation between lived experience and conceptualization should not be understood as a process of translation, but rather as a situated and guided structural co-emergence.¹⁰ As the author recalls, this approach can be traced in the pages Jean Piaget devotes to ‘practical or sensory-motor intelligence,’ which he seeks to describe in terms of a ‘logic of action’ (1970: 41-46), namely a form of organization of meaning that is not grounded in abstract representations, but in operative schemes emerging from the interaction between perception and movement. Sensory-motor intelligence does not constitute a preliminary or inferior stage with respect to symbolic thought, but rather a constitutive mode of meaning production rooted in embodied action. It is precisely from this conception of sensory-motor intelligence as an embodied organization of meaning that it becomes possible to shift attention toward specific perceptual modalities within improvisational practices, and in particular, toward thermoception.

Within anthropological theories of the senses, sensory studies, and social phenomenology – among the very few domains that have attempted to articulate a qualitative approach to the bodily sensation of heat and cold – thermoception has been conceptualized as a specification of touch, capable of extending both within the human body and across its peripheries in a ‘trans-frontier’ manner (Potter 2008; Vannini and Taggart 2014). Thermoception has primarily been the object of studies on tactile sensation. Thermoception does not exist as a distinct sensory domain; rather, it has become a field of inquiry heavily dependent on its primary sense, touch. This dependence of thermoception on touch has likely prevented it from becoming an autonomous field of study (Galimberti 2023). In effect, this has led to a tendency to analyze thermoception mainly within somatosensory processes, often obscuring its potential as a specific and independent domain of investigation, capable of more deeply exploring the unique dynamics of heat perception, particularly in relation to the interaction between percept and environment. Indeed, we perceive the heat of fire at a distance, the warmth of the sun, and we are affected by cold drafts in the corner of a room – all forms of thermoception distinct from

¹⁰ This shift toward an ‘experiential’ or embodied semiotics is part of a broader contemporary rethinking of meaning theory, which has progressively challenged structuralist and computational models of semiosis as systems of abstract encoding and decoding (Zlatev 2012). Building on the dialogue between semiotics, phenomenology, and enactivism, meaning is increasingly conceived as emerging from situated practices of experience, in which perception, action, and interpretation are co-implicated levels of a single sense-making process.

‘tactility’ in the strict sense, derived from direct bodily contact, such as the warmth of our skin when we blush, or the pressure we feel when handling objects. This ‘haptic’ element¹¹ appears at the experiential and phenomenological level to be fundamentally different from direct tactile experience. This experiential difference between concrete, proximal, mechanical touch (which can reveal – and indeed does reveal – temperature as an object property) and the broader haptic experience of perceiving the heat or cold ‘trace’ of a source at a distance provides a criterion for distinguishing touch from thermoception.¹²

What the continuity between touch and thermoception can teach us, however, is that, as a tactile perceptual modality, thermoception cannot be switched off: I cannot silence thermoception (as I might by closing my eyes or covering my ears), because I am always being touched by heat and cold, and there is no way to deactivate the concrete effects of this connection. In this sense, thermoception is a highly salient sensory modality from the point of view of lived experience, because every environment, object, or event warms us or cools us, and it is difficult not to notice this effect. However, unlike touch and all other sensory domains, thermal sense simultaneously produces information and transformation: when I touch an ice cube and perceive its coldness, that very coldness is already making me colder in return. Although no perceptual information is ever neutral (Merleau-Ponty 1945),¹³ it would be difficult to conceive of a situation in which, by touching a rough surface, I become rougher, or in which the sweetness of food makes me sweet. Perceiving a thermal action always implies being affected by it, because it reflects what is happening directly to the body. For this reason, thermoception, more than other sensory modalities, can be deceptive. Our cutaneous

¹¹ The term ‘haptic’ in contemporary visual culture, designates a mode of experiencing images that exceeds pure optical vision and involves a dimension of sensory proximity, intensity, and ‘quasi-contact’ with the visible. In this perspective, developed by authors such as Laura U. Marks, the haptic refers to a regime of the gaze that moves close to the surfaces of images, privileging texture, granularity, and perceptual affectivity over perspectival distance and traditional optical representation. In studies of human-machine interaction, however, the haptic takes on a technical-operational meaning, referring to haptic feedback systems that return sensations of force, vibration, or resistance to the user’s body, making the digital dimension physically experiential and incorporated into action. A polyphonic notion thus emerges, in which the haptic oscillates between an aesthetic-perceptual experience of the image and the technological infrastructure of mediated sensoriality, while being united by the idea of a form of knowledge that passes through embodied modes of contact rather than exclusively visual ones.

¹² Moreover, thermoception is inherently plural and interconnected with other sensory systems. In fact, the specificity of thermoception lies in the fact that it involves several physical mechanisms simultaneously (Fulkerson 2014): it provides awareness of and regulation over our internal body temperature, it works in tandem with the tactile system to inform us about the environmental qualities of our surroundings, and it plays a critical role in our experience of physical pain caused by extreme heat and cold stimuli.’

¹³ Maurice Merleau-Ponty develops a theory of perception no longer understood as a passive process of recording objective data, but as an embodied mode of openness to the world. In *Phénoménologie de la perception* (1945), Merleau-Ponty shows how perceiving is intrinsically intertwined with the subject’s corporeality: every perceptual act already implies a pre-reflective relation between body and world, in which what is perceived also modifies, however minimally, the lived condition of the perceiving subject. In this sense, perception is never a neutral access to external properties, but an event that simultaneously involves and transforms the perceiving body.’

receptors, when exposed to a heat source, perceive the coldness of a subsequent source differently than they would in its absence. Heat and cold leave a trace of their effects that persists over time and shifts our perception. It is a familiar experience: if I spend time touching a cold object, I adapt to that condition, partially inheriting its coldness. This leads me to perceive as warmer a body that I would otherwise have judged as merely lukewarm, to put it euphemistically. The same occurs in reverse. Thermoception is thus a 'sense with a highly subjective nature' (Antunes 2016: 10).¹⁴

Although thermoception borders precariously on subjectivism (Starosielski 2021), there is a wide range of metaphors that draw upon it. Why do we describe enthusiasm as 'burning,' lovers as 'burning with desire,' a murderer as 'cold-blooded,' a reactive person as 'hot-tempered,' or a prolonged period of geopolitical tension under the threat of nuclear catastrophe as the 'Cold War'? Or again, why do we say that 'things are about to heat up,' and why are 'hot zones' those characterized by conflict and instability (See Garcia 2025)? As Gaston Bachelard (1964) argues, 'metaphors are not simple idealizations that take off like rockets only to reveal their insignificance by exploding in the sky' (109). Rather, they are semiotic systems that are concretely grounded in sensory experience.¹⁵

The central hypothesis of this paper is that thermoception functions as an active semiotic variable in the regulation of improvisational practices, contributing to the modulation of gestural qualities, attentional regimes, and interactional dynamics. I argue that, far from being a merely physiological datum, bodily heat participates in processes of meaning attribution by orienting motor choices and shaping the expressive configurations that emerge during action. This contribution aligns with recent research approaches that conceptualize improvisation as a form of joint action and emergent coordination (Sebanz, Bekkering, and Knoblich 2006; Ravn 2020). I will argue that thermoception does not simply constitute a perceptual background of action, but rather functions as a genuine enactive resource capable of continuously orienting and reorganizing the field of improvisational experience.

¹⁴ The phenomenon described recalls the famous 'buckets of water' experiment discussed by John Locke in *An Essay Concerning Human Understanding* (1690). Locke invites the reader to immerse one hand in hot water and the other in cold water and then place both in a vessel of lukewarm water: the same water will be perceived simultaneously as cold by one hand and hot by the other. This example is used to show that sensible qualities are not objective properties of things, but relational effects that depend on the condition of the perceiving body.

¹⁵ Drawing on cognitive linguistics (Lakoff and Johnson 1980), metaphor is conceived as a mechanism through which abstract domains are understood in terms of schemas grounded in bodily and sensory experience. From this perspective, expressions such as 'warm,' 'cold,' or 'burning' do not merely describe physical states, but organize complex semantic fields – emotional, political, and relational – revealing how language is deeply intertwined with embodied modes of perception.

2. The dancer's body-as-instrument

Paying attention to the body – or, using Thomas J. Csordas's (1993) formulation, 'somatic modes of attention' – through thermoception is inherent to and deeply embedded in the identity of professional contemporary dance communities. More precisely, such attention does not constitute a merely individual disposition, but rather an acquired competence that becomes sedimented through shared practices and regimes of practical and perceptual training. In the study of contemporary dance, dancers learn to attune to their bodily sensations and to acquire sensory competencies within a system of embodied practices and gestural exercises that continuously stimulate salient 'sensorimotor associations' (Noë 2004).¹⁶ These associations configure an embodied practical knowledge that enables the dancer to orient themselves in a fine-grained way within their field of bodily experience.

It is enough to consider warm-up exercises, which precede every choreographic practice, designed not only to increase the body's internal temperature, but also as a set of bodily practices aimed at optimizing the dancer's perceptual-motor availability, improving bodily performance during practice, and preventing injuries (Alter 2004; Wyon 2010). During the warm-up, skin temperature rises and sweat begins to cover the body while internal heat is released into the surrounding air; muscles gradually become more mobile, making deeper stretching possible. From a physiological standpoint, such transformations involve a reorganization of blood circulation processes, thermal conduction, and neuromuscular activation, all of which directly affect the quality of the dancer's action. Moreover, being too cold during classes or rehearsals is often associated with a potential cause of injury (Potter 2008), as it limits muscle elasticity and neuromotor responsiveness (McGowan et al. 2015). Above all, however, the warm-up implies the idea that one's embodied instrument is 'ready for use' in relation to the subsequent improvisational practice. For a dancer, the sensation of heat achieved through the warm-up phase corresponds to a feeling of internal energy, physical readiness, and 'embodied presence' (Sheets-Johnstone 2011).¹⁷

¹⁶ Alva Noë's enactivist approach (2004) is situated within the broader framework of embodied and situated cognition theories, proposing a conception of perception in terms of a form of 'exploratory activity' of the subject in the world. From this perspective, perceiving means implicitly mastering a set of sensorimotor contingencies, that is, practical regularities linking variations in sensory input to the body's possibilities for movement and intervention in the environment. Perception is therefore an active skill, grounded in bodily practice and in the learning of action-perception patterns. Noë developed these reflections in direct dialogue with artistic and performative practices, working closely with dancers and choreographers and using dance as a privileged domain for empirically exploring the implications of his theory of active perception.

¹⁷ In the phenomenology of movement developed by Sheets-Johnstone, presence corresponds to a dynamic quality of embodied living: a being-present that manifests itself in kinesthesia, in tonal modulation, and in the flow of movement itself; a form of pre-reflective and situated attention in which the subject is fully immersed in their own doing, sensitive to variations in intensity, rhythm, and direction of their body in relation to the environment. In dance practice, such a condition emerges as a mode of active and immediate presence, in which perception and action coincide and are co-generated in movement.

Indeed, dancers are trained to strategically perceive their own action possibilities, recognize them, and exploit them on the fly.

Following the developments of the theory of ‘affordances’ (Gibson 1979)¹⁸ in an enactive key (Chemero 2009; Rietveld and Kiverstein 2014), I argue that such action possibilities emerge from a dynamic coupling between the dancer’s lived body in the first person and their own ‘body-as-instrument’¹⁹: the dancer’s body is their working instrument. From this perspective, affordances designate what the body can do here and now, depending on its momentary state (tonic, perceptual, thermoceptive). They are therefore not simply ‘given,’ but are continuously modulated and made salient within the course of action: they emerge, transform, and are selected within the flow of improvisation. It is precisely as a sensitive and self-organizing system that the dancer’s body-as-instrument renders available affordances that are actualized through an embodied knowledge integrating perception and action. Dancers’ routines enable them to negotiate gestures, steps, and practicable configurations, aided by their knowledge of nodal points – physiological constraints, motor habits, and perceptual orientations that converge – where the elements of improvisation can more easily take root. Thus, the dancer’s body can be understood as a sensitive and adaptive system that, through self-perception, regulates in real time the thresholds of possibility, constraining and enabling specific movement trajectories and expressive configurations. Thermoception –understood here as, among other things, an index of physical readiness and bodily presence to itself – functions as a regulatory parameter that helps calibrate the intensity, amplitude, and sustainability of gesture.

Thermal sensations are deeply embedded in the dancer’s bodily history, including years of training, warm-up practices, and affective memories associated with exertion, fatigue, physical contact, and the presence of others. As such, they participate in the constitution of regimes of meaning that inform both the emergence of movement and its expressive dimension. If thinking and acting in dance can be understood as the manipulation of sensible differences within a culturally regulated practical apparatus (Rietveld and Kiverstein 2014), thermoception contributes to this process as a modulating factor that shapes possibilities for action and strategies of

¹⁸ The concept of ‘affordance,’ introduced by James J. Gibson in *The Ecological Approach to Visual Perception* (1979), designates the action possibilities that the environment offers to an organism in relation to its bodily and perceptual capacities. From this perspective, perceiving already means orienting oneself toward action: what is apprehended is not a representation of the world, but its “practicability” in relation to the motor and sensory possibilities of the subject.

¹⁹ The expression ‘body-as-instrument’ should not be understood in a purely metaphorical or external sense, but rather as indicating a deep process of incorporation between the dancer and their body, which functions as a sensitive and operative medium of action. The body constitutes a kind of ‘second skin’ through which movement takes shape and meaning, in a way that is analogous to the relationship between a musician and their instrument or an athlete and the equipment they use. However, unlike these cases, the body is not an object separate from the acting subject but coincides with it: it is both instrument and condition of experience. In this sense, the dancer does not ‘use’ the body, but rather acts through it, within a dynamic circuit in which perception, action, and awareness continuously co-determine one another.

embodied signification, thereby offering an original perspective on the relationship between dance and cognition. In this sense, thermal perception can be understood as a form of ‘affective attunement’ (Stern 1985) that orients the quality of movement and the relation to the environment and to other bodies.

This phenomenological and descriptive work on thermoception is particularly delicate because it leads us into regions of experience that appear pre-egoic: ‘vasodilation and vasoconstriction are not experienced as such, but as a general unfolding and folding, revealing and closing of the (bodily) self, and both are involuntary [...], which confirms the pre-personal dimension of perception’ (Diaconu 2024: 58). From this perspective, the pre-subjective primarily refers to a set of molecular, biological, and metabolic processes that constitute the very condition of possibility of embodied experience (Foerster 2021).

Thermoception, in particular, can be read as the sensible manifestation of thermodynamic and regulatory dynamics operating at an infra-representational level but having direct effects on the organization of movement.²⁰ It is precisely from this level that Gaga somatic practices prove particularly relevant. Gaga practice can thus be understood as a technique of guided re-emergence, in which the teacher’s verbal instruction functions as a semiotic trigger that solicits and orients perceptual and experiential processes already unfolding at a pre-reflective level. Verbal cues – often metaphorical, evocative, or synesthetic – activate the dancer to explore sensory configurations (including thermoceptive ones) that become immediately operative in the generation of movement. Such instructions function as soft constraints that orient the improvisational flow. Language thus operates as a modulatory device: it channels attention and amplifies specific perceptual thresholds, rendering certain affordances of the dancer’s body-as-instrument more salient than others.

A dynamic of co-emergence therefore arises in which language, perception, and movement are articulated within a single operative circuit: the teacher’s voice intervenes at a pre-conscious and pre-intentional level, while the dancer responds by translating these evocations into kinetic trajectories of improvisation. It is precisely within this circuit that dance improvisation – and in particular that produced within Gaga practice – can be conceived as a paradigmatic case of enactive semiosis, in which improvisational practice emerges from the interaction of biological constraints, sensorimotor modulations, and semiotic orientations, without being reducible to any of these levels taken in isolation.

²⁰ Desiree Foerster (2021) develops an aesthetic perspective that can be described as ‘metabolic,’ in which sensory experience is conceived as emerging from bodily processes of energy transformation, regulation, and exchange with the environment. Within this framework, the body is not a static entity but a dynamic system traversed by biochemical and thermal flows that constitute the pre-reflective level of experience. Foerster’s metabolic aesthetics thus sits at the intersection of phenomenology and the life sciences, insisting that perception and the production of meaning are rooted in infra-subjective and material processes that precede the formation of the conscious ‘I,’ while nevertheless constitutively shaping its modes of experience and action.

3. The thermal metaphors of Gaga practice

Imagine a culture in which a discussion is seen as a dance, participants are seen as performers, and the goal is to perform in a balanced and aesthetically pleasing way. In such a culture, people would view arguments differently, experience them differently, carry them out differently, and talk about them differently. (Lakoff and Johnson 1980: 5)

George Lakoff and Mark Johnson (1980) argue that the recognition of meaning is an essential event in human capacities for understanding, and current studies in 4E cognition²¹ consider structures of rationality, including logical thought, as dependent on processes that organize bodily experience through imagination, evocation, and recollection. The poetic ‘scenarios’ of Gaga challenge the participant’s capacity for embodiment, requiring them to respond to images and to surrender to kinesthetic experience through multitasking and through the multiple layers of already present non-verbal experience that are to be elicited.

Gaga practice involves the articulation of somatic knowledge and the ability to attune to one’s own bodily listening together with the teacher’s voice.²² I argue that Gaga improvisational practice stages a form of ‘enactive semiosis’ that integrates perception, action, and signification. It is precisely as a sensitive, self-organizing, and mobile system that the dancer’s sense of self – especially in its agentic dimension²³ – co-produces itself together with the surrounding environment, which is primarily constituted by the intrusion of the teacher’s voice. Through the evocation of continuously shifting elements, the Gaga teacher’s voice ‘inclines’ and ‘disposes’ the dancer’s body to introduce signifying stimuli that simultaneously trigger choreographic reconfigurations of

²¹ The expression ‘4E cognition’ (Gallagher 2023) refers to a set of contemporary approaches in cognitive science that conceptualize the mind as Embodied, Embedded, Enactive, and Extended. From this perspective, cognition is not an exclusively internal and representational process, but emerges from the dynamic interaction between body, environment, action, and artifacts. Thought is therefore grounded in embodied experience (embodied), situated in ecological and social contexts (embedded), co-constructed through action and perception (enactive), and often distributed beyond the boundaries of the biological body through external tools and devices (extended). These approaches challenge the classical separation between mind and world, proposing a view of rationality as a distributed and situated process, deeply intertwined with the sensorimotor and imaginative modalities of experience.

²² In this contribution, the analysis focuses on the experiential and individual dimension of the dancer within Gaga practice. However, it is important to emphasize that Gaga is configured as a collective and shared form of movement, in which perceptual, attentional, and kinesthetic dynamics always emerge within a plural context that simultaneously involves multiple participants within the same field of action.

²³ In philosophical and cognitive science contexts the expression ‘sense of agency’ refers to the pre-reflective feeling of being the agent of one’s own actions; that is, the lived experience of control and initiation with respect to one’s movements and intentions. This notion, developed particularly in cognitive science and phenomenology of embodiment, does not coincide with an explicit or narrative awareness of the self, but rather with an immediate and embodied level of self-recognition of action-in-progress. The sense of agency thus emerges from the dynamic integration of motor, perceptual, and predictive processes, and can be modulated by the bodily, environmental, and relational conditions in which action unfolds (see Gallagher 2012).

movement. A certain idea of ‘materialist embodiment’ generates a rich lexicon of images and metaphorical devices – funnels, pulleys and bellows, vital fluids, contact, affect, and passion – that attempt to account for the dynamism and processual nature of the living body, since the Gaga score is designed to capture the fluid character of the living body (see Vassileva 2016). Often, these semantic references introduced by the teacher are related to phenomena or elements with a strong thermoceptive component: ‘lava,’ ‘magma,’ ‘boiling spaghetti.’

During Gaga training, skin and flesh are activated and explored in numerous creative ways: ‘connecting to cutaneous sensitivity,’ ‘feeling the skin at a molecular level,’ ‘melting the flesh,’ ‘engaging the flesh to grasp the bones.’ As David Howes (2018: 227) reminds us, thermoception depends on our largest sensory organ, the skin, itself a complex system that is ‘both object and subject, enveloping and porous, visible and perceptible.’ Far from being a static boundary, the skin constitutes a site of continuous exchange, in which inside and outside co-emerge in always partial ways, intrinsically open to constant renegotiation: a ‘deep surface’ (ibid.), traversed by forces that operate simultaneously from the inside out and from the outside in.²⁴ Thermoception, therefore, rarely concerns only the perceived qualities of an object or internal variations in temperature. Rather, it is an accumulation and exchange of energies, a constant flow between self and environment.²⁵ The sensation of heat is pervasive, diffuse, and often inseparable from other forms of exposure; it blurs the distinctions between self and environment:

We learn to love our sweat, we discover our passion for movement and link it to exertion, we uncover the power of our imagination; we become more attentive and recognize the importance of energy and information flowing through our bodies in all directions; we discover the value of soft flesh and the sensitivity of the hands, we learn to connect to rhythm even in the absence of music; we remain aware of others in the room and realize that we are not the center of everything. We explore multidimensional movement, we take pleasure in the sensation of burning in our muscles, we become aware of our explosive power and at times we deploy it. (Vassileva 2016: 79)

²⁴ Traditionally conceived as a casing that separates an organic interior from an environmental exterior, the skin is instead described by an author such as Marjolein Oele (2018) in terms of an active, porous, and transformative threshold. The skin does not simply delimit the subject but constantly places it in relation with what it encounters. According to Oele, describing the skin in terms of an interface means emphasizing the creation of a site of encounter that cannot be reduced to a geometrically measurable space, whose agentive capacity is not exhausted in the outcome of mechanical interactions imposed by the components interfacing within it.

²⁵ In line with the proposals of Stacy Alaimo (2010), thermoception can be understood in ‘transcorporeal’ terms, that is, as a perceptual modality that traverses and destabilizes traditional boundaries between body and environment. From this perspective, bodily processes are not contained within an isolated subject, but are constituted through continuous exchanges of matter, energy, and environmental agents that inextricably bind the living being to its ecological context. Thermoception, as an experience of thermal flow and ongoing regulation between inside and outside, thus becomes a paradigmatic case of such interconnection, in which sensing is always already a being traversed by environmental forces.

The verbal images proposed by the Gaga teacher do not function as simple descriptive instructions, but as devices for reorganizing experience, capable of activating sensorimotor schemas and fields of intensity that guide action. In this way, Gaga's performative narration operates as a continuous bridge between phenomenological and semiotic approaches to movement and gesture: drawing on personal memory, bodily sensations, and mental imagery occurring 'here and now,' and translating them into verbal expression.

In this framework, thermoception can be understood as an enactive semiotic variable insofar as it participates in the very constitution of the signifying field: it is not simply a perceived content, but an operator that modulates thresholds of relevance, orients bodily inferences, and contributes to the selection of available affordances. Gaga practice makes this process particularly visible because it establishes a tight circuit between metaphorical enunciation, sensory activation, and movement production, showing how meaning emerges from a continuous co-regulation between language and body. In this sense, Gaga offers a paradigmatic case in which thermoception ceases to function as a background physiological *datum* and instead becomes a proper semiotic parameter, capable of shaping the microgenesis of gesture and the situated construction of meaning. The 'cross-pollination' (Vassileva 2018) between words and movements thus constitutes the operative principle through which Gaga practice articulates language, perception, and action within a single dynamic field of sense production. Verbal images function as activation devices that continuously reorganize the body's readiness for action, modulating intensities, thresholds, and directions of movement. Temperature, in particular, emerges as a crucial dimension of this process: the sensation of muscular burning becomes a condition for accessing bodily mobility itself, enabling transitions from states of stillness to sudden kinetic explosions (jumps, extensions, or particularly daring poses). From this perspective, thermoception, along with the evocative metaphors of the Gaga teacher that constantly invoke it during improvisational practice, participates in a significant and original way in constructing the very possibilities and impossibilities of movement.

Conclusions

This article has examined the role of thermoception in dance improvisation from the perspective of enactive semiotics, arguing that thermal perception should be understood as an operative component of embodied meaning-making. Rather than functioning as a passive background of action, thermal perception participates in the continuous regulation of attention, the calibration of affordances, and the emergence of movement possibilities. From this perspective, thermoception contributes to orienting the dancer's exploratory in improvisational activity.

The analysis of Gaga practice shows how verbal instructions acquire their effectiveness because they reorganize the dancer's perceptual field and make specific sensorimotor configurations available for action. Thermoceptive awareness is therefore part of the regulatory processes through which bodily experience becomes semiotically productive. This suggests that the study of improvisation may benefit from a more systematic consideration of thermal perception alongside proprioception, kinaesthesia, and other modalities that have traditionally occupied a central place in embodied approaches to dance. Rather than simply constituting an additional sensory modality to be incorporated into existing models of embodied cognition, thermoception appears as one of the regulatory dimensions through which the field of affordances itself is continuously reorganized during improvisation. More generally, understanding thermoception as an enactive semiotic variable opens new avenues of analysing how bodily regulation and meaning production co-emerge within situated artistic practices, where perception does not merely accompany action but actively participates in its organization.

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