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Kinesthetic Understanding and Appreciation in Dance

The idea that choreographic movements communicate to audiences by kinetic transfer is a commonplace among choreographers, dancers, and dance educators. Moreover, most dance lovers can cite their own favorite examples—the bounciness of the Royal Danish Ballet, the stomping of Bharata Natyam performers, the stag leaps in the thundering Greek chorus in Martha Graham’s Night Journey, or the contagious rhythmic transfer that takes over our feet when we watch classic tap dancers like Buster Brown. The perceptual capacity for kinetic transfer was succinctly identified and theorized by John Martin. He called this capacity metakinesis. Martin was influenced by Theodor Lipps’s earlier theory of empathy. Lipps introduced his notion of empathy as a way to characterize our muscular responses to the perceived internal dynamics of inanimate objects under stress and tension, for example, weight-bearing columns and cantilevered boulders. Martin argued analogously about dance:

Since we respond muscually to the strains in architectural masses and the attitudes of rocks, it is plain to be seen that we will respond even more vigorously to the action of a body exactly like our own. We will cease to be mere spectators and become participants in the movement that is presented to us, and though to all outward appearances we shall be sitting quietly in our chairs, we shall nevertheless be dancing synthetically with all our musculature. Naturally these motor responses are registered by our movement sense receptors, and awaken appropriate emotional associations akin to those which have animated the dancer in the first place. It is the dancer’s whole function to lead us into imitating his actions with our faculty for inner mimicry in order that we may experience his feelings. Facts he could tell us, but feelings he cannot convey in any other way than by arousing them through sympathetic action.

In what follows we explore and evaluate three general challenges to the existence and significance of kinetic transfer in dance: challenges to the very possibility of kinesthetic understanding in dance, questions about the relevance of kinetic transfer to explanations of artistic communication in dance, and concerns about the relevance of kinetic transfer to evaluative questions germane to dance appreciation. We do not subscribe to every aspect of Martin’s story. Nevertheless, we think that Martin was exceedingly prescient. His speculations appear to be supported by recent research in neuroscience and psychology. We feel as a result that Martin’s comments are highly suggestive of what might be going on in ordinary dance consumers (or at least moderately informed ones). Critically, however, we do not model these contributions in terms of a discrete, stand-alone kinesthetic sense as Martin did. Rather, we argue that metakinesis and kinetic transfer refer to a general crossmodal sensorimotor perceptual capacity that contributes to our understanding and experience of actions in everyday contexts. Nor do we claim that audiences recognize and understand dance solely on the basis of kinetic transfer. Rather, we argue that this sensorimotor capacity is a contributing factor in our perceptual engagement with dance works, one of a range of tools ready to hand to choreographers and dancers for conveying information critical to the content of their works.

1. THE VERY POSSIBILITY OF KINESTHESIS

It has been alleged that it is something akin to a category mistake to suppose that dance communication is essentially and uniquely kinesthetic communication. Vision appears to be necessary
for dance appreciation. Blindfold audience members and they miss the dance. Therefore dance appreciation cannot be a matter of kinetic transfer—rather we see the dance. Of course this may be correct as far as it goes—our primary perceptual engagement with dance in ordinary contexts is visual. But it does not go very far. Consider the analogous case of hearing. Why not allow, as we are sure Martin would, that dance reception involves both vision and kinetic transfer? Consider written poetry. It would be absurd to claim that written poetry qua graphic inscription can be appreciated without seeing it. Seeing is, after all, a necessary condition for reading the poem. However, understanding some written poetry involves reading it aloud and attending to our own voice and its bodily concomitance—its cadence, its timbre, our breathing, and the full range of associated feelings. It is not absurd to suggest that appreciating written poetry may sometimes involve seeing and aurally imagining listening to ourselves or others speaking. Analogously, there should be no problem in principle in asserting that dance appreciation can involve (at least at times) the interplay of both vision and kinesthetic apprehension. Therefore the fact that dance appreciation necessarily involves visual perception does not logically foreclose the possibility that it can also be kinetic.

If this is all there were to skepticism about kinesthetic understanding in dance it would be hard to see how the position has gained such a strong foothold. But things are not so simple. The real difficulty is that kinesthesis has traditionally been defined as a contiguous as opposed to a projective sense. It is a process whereby we proprioceive our own postures and movements—it provides direct or immediate information about the current state of one’s own body as opposed to information about the states of objects and events in the proximal environment. The worry is that, as a contiguous sense, kinesthesis would limit dance appreciation to an untenable subjectivism: at best each audience member would have a distinct sense of his or her own embodied experience of a dance against which there would be no publically shareable evaluative criteria; at worst the dancer alone would have access to the kinesthetic content of that dance. In either case there would be no publicly shareable aesthetic or artistic content for dance and so no meaningful sense in which any dance could be understood as a communicative device by an audience. Skeptics argue, rather, that our understanding of the movements and actions of others is primarily a visual understanding. Vision is a projective sense. Therefore, it supports exactly the kind of publicly shareable content necessary to make sense of the function of choreographed expressive movements as communicative devices.

The general literature in neuroscience and psychology does not support the strong distinction between vision and kinesthesia that underwrites this objection. Rather, current research paints a picture of an integrated, crossmodal, projective kinesthetic perceptual capacity that engages embodied motoric, skeletomuscular, somatosensory, visual, and auditory processes. The model we propose for kinesthetic understanding and appreciation is derived from biased competition models of selective attention. These models suggest that an integrated system of crossmodal attentional networks biases perception to diagnostic cues in the local environment. Diagnostic cues are defined as minimal sets of perceptual features sufficient to enable an organism to categorize, and thereby recognize the shapes, identities, and affordances of objects, agents, and events in a given context. The rough and ready story here is that perception is something like a hypothesis testing process. Diagnostic cues culled from sensory inputs are shunted along to higher processing areas where they are matched to categorical knowledge of the structure, function, and form of objects, actions, and events. These cognitive processes are used to generate perceptual expectations about the locations of further task salient features in the visual field. Top-down projections from these higher processing areas are, in turn, used prime sensory systems to perceptual expectations, enhancing the firing rates of populations of neurons that would code for target features at expected locations and inhibiting the perception of irrelevant distracting information. Iterations of this perceptual-attentional circuit are used to generate and maintain representations of task salient aspects of the perceptual environment, including the kinematics (trajectories) and dynamics (force) of perceived movements in the case of dance and action recognition.

A corticospinal sensorimotor circuit supports premotor, motor, and somatosensory contributions to these perceptual processes in action recognition. Premotor, motor, and somatosensory areas are reciprocally connected and somatotopically
organized into parallel body maps that encode the relative position and movements of muscle groups and body parts. Each of these areas receives direct feedback from the skeletonmuscular system via independent, reciprocal, corticospinal projections. Premotor and motor areas also receive indirect feedback from muscles and skin receptors via the somatosensory cortex. In addition the circuit receives direct visual input from the superior temporal sulcus (STS), a topographically organized visual area specialized for culling biological motion cues from sensory inputs, and it is reciprocally connected to prefrontal areas associated visual spatial working memory. This broad range of functional connectivity implements a kinesthetic system that integrates sensorimotor visual, haptic, and proprioceptive information and plays a critical role in our capacity to orient ourselves to cognitively and behaviorally salient aspects of the environment.

Premotor areas are canonically involved in motor planning and preparation, processes through which representations of goals, intentions, and potential actions are transformed into motor programs that encode the kinematics and dynamics of particular movements. These concrete action representations are used to prime the skeletonmuscular system and prepare our bodies for the practical requirements of anticipated actions. Motor simulation is hypothesized to play an analogous role in perceptual contexts. Visual cues diagnostic for the kinematics and dynamics of perceived biological movements are fed into this sensorimotor circuit and matched to those somatosensory schema and motor programs that define our categorical knowledge of actions. Motor simulation is, in turn, used to generate embodied forward or predictive models of perceived actions that facilitate orienting attention to action-related perceptual change in the environment—perceptual change associated with our own movements and the goal-directed movements of others. These perceptual processes are accompanied by increased electromyographic activity in target muscles that would be involved in performing observed actions. In addition these processes enhance the activation of populations of neurons in STS associated with the perception of target biological motion. The net result is that action understanding is an embodied cognitive response—we use our own bodies to kinesthetically model diagnostic features critical for understanding and responding to perceived actions. We argue that these same cross-modal sensorimotor processes, contrary to skeptical challenges, facilitate an embodied projective perceptual understanding of the kinesthetic and expressive qualities of choreographed movements in the more abstract context of dance.

Behavioral studies using point-light displays of biological motion can be used to illustrate the scope and range of our projective perceptual capacity for kinesthetic understanding. Point-light displays are motion capture videos and animations in which all that is visible are points of light placed on the joints of target actors. All other aspects of the visual appearance of the depicted agents have been stripped from these stimuli, for example, information about facial expressions, posture, body shape, and configurations of limbs. The perceptual cues in these stimuli are, as a result, pure movement cues. Viewers easily recognize the biological motion of human and animal actors in point-light displays. This is true for simple actions, for example, walking, running, or jumping rope; goal directed actions, for example, kicking a ball; and more complex social interactions, for example, interpersonal dialogue. Furthermore, viewers readily recognize the gender, personality traits, affective states, and emotions of actors in simple actions, goal directed actions, complex social interactions, and even abstract dance movements depicted in point-light displays, for example, gender and mood from gait, emotions and social relationships from interpersonal dialogue, and emotions in dance movements. In contrast, viewers do not even recognize coherent motion in point-light displays constructed from animated abstract geometrical figures or in static point-light displays of biological actors. Nor do they recognize coherent biological motion if the lights are attached to the limbs between the joints of biological actors. Given that all other aspects of the visual appearances of actors and actions have been stripped from point-light displays, these results entail that the kinematics of coordinated joint movements are alone diagnostic cues sufficient to enable perceivers to recognize the behaviors of others and the expressive qualities of their movements.

The perception of biological motion in point-light displays is associated with heightened activation in action-specific, somatotopically coded premotor areas, as is the case in ordinary perceptual contexts more generally. Functional magnetic resonance imaging (fMRI) studies demonstrate that different, effector-specific somatotopically
mapped patterns of premotor activation are associated with the perception of hand, mouth, leg, ankle, arm, wrist, shoulder, hip, and trunk movements in both transitive (goal directed) and intransitive (abstract) contexts. Further, case study evidence demonstrates that visual form agnosia disrupts the capacity to visually recognize objects and events from their shapes, but not the capacity to visually recognize the movements and actions depicted in point-light displays or the capacity to recognize the identities of familiar individuals in ordinary contexts by their movements. In contrast, stroke damage to premotor areas disrupts the perception of coherent biological motion in point-light displays, and disrupting the same somatotopically specific premotor activity using repetitive transcranial magnetic stimulation (rTMS) interferes with the capacity of healthy patients to recognize associated movements and actions.

Single pulse TMS time-locked to the presentation of a stimulus can be used to enhance rather than disrupt target premotor activity. Here TMS is used to establish a baseline rate of electromyographic activity, or motor evoked potentials (MEP), in muscles. Subsequent variance in recorded MEPs indicates enhanced or suppressed premotor activity associated with the experimental task. Normal, healthy perceivers can easily infer the weight of a target object from both postural cues and the dynamics of isometric contractions in muscle groups associated with lifting it. These weight judgments are correlated with heightened electromyographic activity in target muscles, the strength of target MEPs varies with perceived weight, and the capacity to make accurate weight judgments is impaired by rTMS that selectively disrupts associated premotor and somatosensory areas.

Further, the capacity to infer the weight of target objects from these behavioral cues is severely impaired in patients who have lost their senses of cutaneous touch and proprioception due to degenerative diseases that selectively effect corticospinal projections to the somatosensory cortex.

Do the behaviors and capacities described in the last section constitute a form of motor perception? Yes. Although we would argue that there is no discrete kinesthetic sense, these sensorimotor processes support a capacity to successfully perceive publicly observable biological movements independent of the capacity to perceive either nonbiological movement or the static visual form of objects, agents, events, and their parts. Furthermore, this crossmodal kinesthetic capacity seems to be intrinsically embodied—the loss of haptic and proprioceptive capacities due to the deafferentation of corticospinal-somatosensory projections disrupts motor perception. This entails, contrary to skeptical arguments against the possibility of kinesthetic understanding in dance, that sensorimotor contributions to perception support a projective crossmodal sensorimotor capacity to perceive the kinematics, dynamics, and expressive qualities of patterned biological movements in others. The burden of proof, therefore, would seem to fall to the skeptic who denies this very possibility.

II. KINESTHETIC COMMUNICATION: THE RELEVANCE OF KINETIC TRANSFER

Graham McFee has argued that any form of motor perception, if such a thing could be established, would be irrelevant to explanations of dance communication. The key to McFee’s position is a set of claims about the nature of the kinesthetic exchange in perceptual contexts. On the one hand, he argues that the expressive bodily movements of an agent are involuntary and so do not embody any intention to communicate anything. On the other, he argues that even if such an intention were present, automatic sensorimotor responses do not constitute knowledge of any intention to communicate something in moving that way. Therefore he argues that, although motor perception may operate at a subpersonal level to convey subliminal information involved in the implicit social coordination of action, it cannot constitute an explicit channel of communication.

McFee’s central assumption is that kinesthesia lacks the structure necessary to explain artistic communication. Sensorimotor processes may help us see what an agent is doing, but they cannot help us understand what he or she means by doing it. The latter requires a higher-order capacity to recognize how a movement, action, or gesture is being used as a communicative device. This, in turn, requires a sensitivity to the context of the action and a capacity to analyze and evaluate the range of conventions governing the explicit choice to perform that action in that context—a capacity to recognize the movement not only as an action, but also as an action under a description...
appropriate to its context. Since sensorimotor processes are automatic causal-perceptual processes by which a perceiver involuntarily discriminates subconscious bodily cues diagnostic for the kinematics and dynamics of biological movements, he argues they do not track these kinds of cognitive variables. This problem is only exacerbated by the abstract, symbolic conventions that govern dance communication, conventions that are often far removed from the natural context of shared biological goals. McFee argues, as a result, that motor perception is irrelevant to our understanding of the content of a dance.

One glaring difficulty with this argument is that dancers do regularly and intentionally employ expressive bodily movements. Furthermore, it is not even necessary that dancers self-consciously perform in this way. The choreographer need only have the appropriate conceptual vision when he or she constructs the dance on the dancers—the choreographer need only intend to use our capacity to recognize bodily movements as expressive gestures to convey the content of the work.26 How might this work? As a general rule, artists develop formal and compositional vocabularies that work as communicative strategies because, within the context of the ordinary operations of perceptual systems, they enable audience members, viewers, listeners, spectators, and readers to recover the content of works in a range of different media. The common recognition of the success of this strategy in dance enables choreographers and dancers to intentionally use their own bodies to model and test novel choreographic strategies—a practice that presupposes that the correlations between visible postures, movements, and kinesthetic responses that they experience will be pretty much like those dance audiences will experience.

The interpretive practices and conventions governing audience engagement with dance are strong constraints on these productive practices. Cues diagnostic for the category of art that a choreographer (or dancer) intends his or her work to belong to are clues that instruct audience members how to engage the work—what to look for and where to look for it. These include sensorimotor cues diagnostic for the kinesthetic and dynamic properties of stereotyped movements unique to a dance genre, for example, classical versus contemporary ballet, modern versus postmodern dance, hip-hop, and so on. However, importantly, the artistic salience of these diagnostic cues only emerges in the context of their communicative role. Their communicative role, in turn, only emerges in the context of the shared conventions, the art critical and productive practices, that define different categories of art at a time within a community—of which kinetic transfer is one. In other words, categories of art play a computational role in our engagement with artworks that is analogous to the role played by perceptual categories in object recognition and action understanding.

What evidence do we have that the capacity for motor perception generalizes to dance contexts? Beat induction is a simple case—contagious rhythmic foot tapping in response to music and dynamic dance forms is a straightforward case of kinetic transfer. There is good evidence that sensorimotor processes play a critical role in these behaviors.27 There is also a range of familiar studies from the neuroscience of dance. Consider, for instance, Beatrice Calvo-Merino’s seminal study of perceptual differences between expert capoeira and ballet dancers. Calvo-Merino and her colleagues measured cortical activation in expert dancers from these two groups and a control group of nondancers while they watched short videos of capoeira and ballet movements. Capoeira and ballet are formally distinct but compositionally similar dance forms. Both involve leaps, spins, and duets, but capoeira is derived from martial arts movements as opposed to the thrusts and parries of fencing exercises. The study demonstrated heightened activation in premotor and parietal areas in ballet dancers relative to capoeira dancers for the observation of ballet videos. These results were reversed for capoeira dancers. Activation in this sensorimotor circuit was significantly lower for nondancers—lower than capoeira or ballet dancers in either condition—and, perhaps more importantly, there were no significant differences between the ballet and capoeira conditions in this latter group.

Calvo-Merino’s study suggests that one’s motor repertoire is a significant contributing factor in kinesthetic communication. This poses a problem for models of kinesthetic understanding and appreciation in dance.28 Many, if not the majority, of dance consumers lack the motor expertise needed to perform the movements that they perceive on the stage. A potential solution to this worry emerges from recent research demonstrating that visual familiarity with a dance genre is
MEPs. Usually familiar cultural gestures elicited enhanced MEPs in dance audiences familiar with either classical ballet or Bharata Natyam. Bharata Natyam employs a range of unique stereotyped arm, hand, and finger movements that define distinct, meaningful gestures. Ballet, likewise, employs a small set of distinct arm positions to choreograph a broad range of meaningful movements—but hand and finger positions do not vary across arm positions. Jola and her colleagues hypothesized that visually experienced observers who lacked associated motor expertise would selectively exhibit enhanced MEPs in forearm and hand muscles associated with the movements defining the dance form they were familiar with, and that the performance of controls who lacked visual experience with either dance form would be distinct from these two groups.

Visual experience was defined relative to an intention (on average realized) to attend at least five live performances per year over the previous five years. Participants watched three live solos: a classical ballet piece, a Bharata Natyam piece, and a nondance acting control piece (without voice). The performances were fully costumed and accompanied by music. Participants in the ballet group exhibited heightened MEPs in target arm, but not finger, muscles for the ballet as opposed to Bharata Natyam stimuli. The results from the Bharata Natyam group were not as clear-cut. However, participants in this group who scored high on an empathy questionnaire and so showed a strong disposition to become imaginatively involved with fictional narratives exhibited heightened MEPs in target arm muscles for the Bharata Natyam relative to the ballet stimuli (but interestingly not in hand muscles). These results are consistent with another recent study in which visually familiar cultural gestures elicited enhanced MEPs.

The role of visual familiarity in kinesthetic understanding makes sense. Human biological movement is highly constrained by our shared anatomical structure, by the limited range of dynamic movements afforded by our joints. This entails that there should be a significant degree of commonality across individual motor programs for stabilizing and controlling effector groups responsible for basic movements. These commonalities can be exploited by action understanding—novel motor programs for recognizing and understanding novel movements and actions can be cobbled together from a store of common generic motor programs for controlling joint movements. Furthermore, anatomical constraints on biologically possible motion minimize the computational load of action understanding. If we use our own bodies to model perceived actions we do not need fully articulated movement schema to interpret their consequences—anatomical constraints on biological motion are among a range of contextual cues that are diagnostic for the perceived purposiveness of actions. In the context of dance we hypothesize that the conjunction of generic motor programs for biological movements and visual familiarity with the stylistic conventions of different categories of dance and the works of different choreographers might suffice to bias perception to sensorimotor cues diagnostic for the kinesthetic and expressive content of a particular dance.

The take-home point here is threefold. First, the formal-compositional practices of choreographers (and dancers) are explicitly and intentionally directed at the production of sensorimotor cues diagnostic for the content of their works. Second, crossmodal sensorimotor processes are critical to the role these diagnostic cues play in our capacity to perceive, recognize, and understand these works. Finally, we can intend to communicate things without knowing what makes the communication possible. I may intend to move people to action by raising my voice in a certain way without understanding what makes the uptake of this information possible in others. Likewise, I can intend to illicit certain feeling states without knowing the mechanism that makes this possible. The fact that I may not understand, or even recognize, the mechanisms that underwrite my capacity to use kinetic transfer as a means for communication does not entail the these acts of communication fail to be intentional, nor does it demonstrate that understanding these mechanisms is irrelevant to explaining this form of communication.

III. SOME NOTES BY WAY OF EXPLANATIONS OF DANCE APPRECIATION

One thing we would like to make clear is that our model is not a theory of dance. Sensorimotor processes do not alone underwrite audience
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engagement with dance, nor are they unique to dance. Rather the expressive capacities of biological movements are part of a suite of formal and compositional tools ready to hand for the choreographer and the dancer. This suite of tools includes auditory and visual information diagnostic for the kinesthetic and expressive qualities of movements, for example, the musical score, the rhythm sounds of dancers movements and breathing, the appearances of the costumes and set, as well as semantic information embedded in shared art critical conventions, common art historical knowledge, and the explicit narrative structure of the dance. We argue that choreographers and dancers employ this array of formal, compositional, art critical, and narrative strategies to focus attention on sensorimotor, visual, and auditory cues diagnostic for the expressive, formal aesthetic, and semantic content of particular works.

Could motor perception constitute an aesthetic sense? This is a hard question. A range of issues about the nature of our aesthetic responses to artworks and the computational processes that might be needed to support them would need to be settled in advance of an acceptable answer. We are skeptical of anything like a unique aesthetic sensibility discretely grounded in unimodal sensory processes. Alternatively, one might argue that aesthetic responses depend on processes that integrate reward signals into context-dependent perceptual responses via the range of fronto-parietal and cortico-fugal perceptual and affective attentional networks introduced above. There is not space to pursue these issues in sufficient detail here. However, as an independent crossmodal capacity to perceive the kinematics, dynamics, and expressive qualities of patterned biological movements, as well as the dynamic shapes of moving animate bodies (as evidenced in the perception of point-light displays), motor perception supports the kinds of structured projective sensory responses skeptics about kinesthetic communication like ours is similarly a model of the processes by which we recognize the kinesthetic and expressive qualities of choreographed movements in dance. It would be absurd to say that these explanatory philosophical practices are irrelevant to our understanding of art because they do not bear any weight in questions about artistic appreciation.

We have not yet explicitly addressed concerns about the relevance of motor perception to dance appreciation. McFee argues that kinesthesia is an automatic causal process for detecting biological movements that is on par with sweating, breathing, and digesting. This kind of motor resonance is equally responsive in practice to movements that are done well or done poorly, that are appropriate or inappropriate to a context, that are intentional or reflexive. Therefore, he argues, kinetic transfer is irrelevant to dance appreciation. McFee’s claims in this regard assume that philosophy of art is primarily concerned with issues pertaining to aesthetic appreciation or aesthetic judgment. This is a view often associated with Wittgensteinians who, like their mentor, believe that psychology has little to tell aestheticians. If philosophy of art is largely about judging the good from the bad, the right from aesthetic wrongness, and aesthetic fitness from inappropriateness, then we should expect no help from the isolation of causal-psychological processes like kinesthetic transfer. These same processes will be engaged whether the dancer’s movements are graceful or inept, whether they are intended or not. Evaluative judgments are, rather, normative judgments—they involve comparing the performance of dancers and the intentional choices of choreographers against salient artistic conventions.

This Wittgensteinian objection rests on a conservative and unduly narrow conception of philosophy of art. We argue, following Aristotle, that philosophy is a matter of constructing the most encompassing understanding of a target subject. Aristotle speculated about the origins of the pleasure we take in poetry and the causal mechanisms that ground emotional responses to characters. Contemporary philosophers of art likewise speculate about both the nature of pictorial representation and the psychological mechanisms that support it independently of questions about the normative quality of those kinds of works. A model of kinesthetic communication like ours is similarly a model of the processes by which we recognize the kinesthetic and expressive qualities of choreographed movements in dance. It would be absurd to say that these explanatory philosophical practices are irrelevant to our understanding of art because they do not bear any weight in questions about artistic appreciation.

A broader view of the philosophy of dance would include ontological questions about the nature of dance, psychological questions about the range of cognitive processes that constrain the choices choreographers and dancers make in constructing their works, psychological questions about audience engagement with dance, and questions about the ways art critical conventions influence the productive and cognitive behaviors of
artists and consumers. We argue that these domains of inquiry are interconnected. The productive choices choreographers and dancers make are constrained by the success of their productive strategies in practice, by the perceptual, affective, cognitive, and evaluative responses of audience members engaged with dance. These communicative exchanges shape the way dance works are structured and are thereby a significant productive force in the generation of artistic conventions. We do not claim that this is the whole story about the philosophy of dance. However, we do argue, contra Wittgensteinian skepticism, that it is an important part of the story and that sensorimotor contributions to perception play an important role in it.

Dance appreciation is a cognitive process. It is therefore hard to imagine that an understanding of how consumers represent, transform, and manipulate information retrieved from their perceptual engagement with dance works could fail to be relevant to a complete explanation of dance appreciation. Sensorimotor cues are among a range of cues that trigger crossmodal perceptual and cognitive processes constitutive of our capacity to recognize and understanding the content of a dance work. These include cognitive processes required to match perceptual stimuli to appropriate categories in object and event recognition, affective processes constitutive of our emotional responses to these stimuli, and perceptual schema and motor programs constitutive of our knowledge of the kinematics and dynamics of perceived actions—in the case of dance, categorical knowledge of the stylistic conventions governing the productive practices and expressive content of different choreographers’ works in different genres of dance. However, sensorimotor cues are rarely, if ever, as discussed above, the sole constituents of the content of a work. Rather, they are among the tools available for artistic communication in dance. They are diagnostic cues to precisely the kinds of artistic conventions that govern normative judgments in dance appreciation. Moreover, inasmuch as kinesthetic apprehension plays a role in the detection of artistically salient relevant movements and expressive properties, acknowledging its existence and encouraging audiences to harbor it will inevitably enlarge their appreciation of dance, if only by liberating those who had been led to ignore it by skeptics.

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8. David Davies cautions philosophers of art to be circumspect in their search for support from behavioral sciences—to pay careful attention to the scope of experimental studies, to be wary of reckless generalizations, and to tread gingerly in domains where the interpretation of experimental results is itself controversial. We think this is sage advice. However, empirically minded philosophers often cobble models together from philosophical assumptions, scientific theories, and related experimental results. The goal of these practices is roughly the same as their scientific cousins—to yield testable hypotheses and predictions that might help adjudicate between competing theories about some target behavior. The history of epistemology and philosophy of mind are littered with these kinds of models, for example, the Cartesian animal spirits model for mind–body interaction or recent work in simulation theory like Alvin I. Goldman, Simulating Minds (Oxford University Press, 2006). Of course philosophers do not ordinarily conduct experiments themselves, so there is a speculative quality to the practice. But this concession is no more or less pernicious than the uncertainty that accompanies any kind of empirical
research. We acknowledge from the outset that our model is incomplete, amendable, and subject to the march of scientific progress. Nonetheless, there is a methodological virtue to this approach that is often overlooked. Our concepts of art and related practices refer to a particular class of cognitive behavior. Facts about the way these behaviors are realized are a strong constraint on the adequacy of any theory within the field. Model building of the sort we are engaged in is an attempt to ground our common concepts in the etiology of the behaviors they describe.


13. See Kilner, “More Than One Pathway.”


22. Note: weight judgments in these studies represent a form of action understanding—static postural cues and isometric contractions are diagnostic for the weight of a target object only within the context of the act of lifting it.


24. Of course this argument also depends on what is meant by both communication and explanation. But it is hard to see how facts about the biological substrate for the human capacity for communication could fail to be relevant to a complete explanation of dance communication.


26. See, for instance, the American Master’s Series PBS episode, *A Good Man*, directed by Bob Hercules and Gordon Quinn, that documents the creation of *Fondly Do We Hope . . . Fervently Do We Pray*, a dance performance choreographed by and performed by the Bill T. Jones and Arnie Zane Dance Companies at The University of Nebraska in honor of Abraham Lincoln’s Bicentennial.


32. See McFee, *The Philosophical Aesthetics of Dance*, chap. 8, pp. 185–205.

33. In this vein, it is important to note that the model we suggest does not explain the value judgments associated with dance appreciation; rather it is a model for how we recover these diagnostic cues, or how we detect some of the artistically salient properties of dance works relevant to the particular value judgments we do make in practice about particular dance works.