Dancing with Objects: A Psychological and Neurophysiological Analysis

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GENERAL ARTICLE

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ABSTRACT

This article uses the psychological concept of *body schema* and the neurophysiological notion of *peripersonal space* to discuss the phenomenon of dancing bodies that wear, handle, and share objects. The author shows the complex and dynamic relationship between body and object to be central to the experience of dancing with objects, which is investigated in terms of multisensory integration, most notably in relation to proprioceptive, haptic, and tactile perception. It is posited that, although stemming from different theoretical approaches, both the psychological and neurophysiological perspectives demonstrate how the body incorporates and is incorporated by the things it moves with.

OBJECTS AND DANCE

Despite their persistent and varied uses in performance, improvisation, teaching, and training, as well as in choreography and movement research, little attention has been paid to objects in dance. Yet focusing on the use of objects reveals that wearing clothes, costumes, and footwear and the use of objects affect dancers' perception of their own bodies. The performer's relationship to an object is always grounded in its physical properties and in the subjection of both the body and the object to the laws of classical mechanics: gravity, inertia, friction, and momentum.

Mastery of the object is sought in works such as Loïe Fuller's *Serpentine Dance* (1891), Oskar Schlemmer's *Dance of Slats* (1927), Martha Graham's *Lamentation* (1930), Fred Astaire's *Royal Wedding* (1951), and Alwin Nikolais's *Masks, Props, and Mobiles* (1953). Spectacle, virtuosity, and magic have been characteristic of the use of objects in dance up to Yvonne Rainer's 1965 *No Manifesto,* as one can see in the above examples. However, objects have gone on to play a key role in the many ways that dance has been programmatically redefined since the early 1960s, being instrumental in the development of so-called undancerly dance and the convergence of performance art and dance. On this paradigmatic change, philosopher and former dancer-choreographer Maxine Sheets-Johnstone writes: "Props were no longer used in a theatrical sense. In essence, sheer physical presence, whatever its form, fleshly or otherwise, was to be fathomed and celebrated, allowed to come to life and radiate on its own" [1]. Just as choreographers emancipated dance from the imperatives of music and plot—"mickey-mousing" the musical score for example or miming a story of sorts—the connection to material objects became grounded in *somatosensation* rather than visual appearance and symbolism. The use of objects in dance has moved from scarves and sabers, canes and umbrellas, sticks and balls, and fans and boas, to ladders, fabric, chairs, clay, plywood, pillows, rocks, dirt, bricks, foodstuffs, broken glass, balloons, junk, and much else that one can find or make.

When dancers wear, hold, catch, manipulate, and carry objects or use them in dynamic actions such as slapping, stacking, swapping, throwing, squeezing, stroking, and prodding, any given posture or action will impact the body depending on both the properties of the object used and how the object is being handled, as well as how familiar the performer is with it. The shape of an object can change during use depending on its structure and its materials, in combination with the forces that come into play in its use, these changes imposing however postural and kinetic adjustments on the performer. Some objects behave in a predictable manner, others less so. Fabric, rubber, metal, and rope will each react in a variety of ways that may be difficult to control. Objects can shapeshift, either because they are like putty that changes form with gravitational pull or pressure or because they are composed of different parts. An open umbrella for example does not behave like a closed one. Size, weight, density, composition, resistance, and complexity are some of the properties that must be considered. The object is constantly imposing corporeal adjustments that otherwise would not occur. Thus, in Yvonne Rainer's *Connecticut Rehearsal* (1969), "dancers interact with cardboard boxes and pillows that are strewn around the gym in order to impede or generate the perform-

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Fig. 1. *Opération Ontologie Orientée Objet*, performance with Josée Gagnon and Abe Mijnheer, involving various objects and modified helmets, 2018. (© Marc Boucher. Photo: Annie Hunting.)

Fig. 2. *Avant-garbage*, performance with Abe Mijnheer involving wooden crutches as well as metallic and plastic discarded objects, 2019. (© Marc Boucher. Photo: Annie Hunting.)

ers' movement" [2]. The experience of any given motion is different whether an object is involved or not, making the motion more arduous, facilitating it or modifying it in terms of range, amplitude, flow, or intensity. But the object may be responsive to the movements and gestures at play, involving for example rotation, oscillation, translation, traction, compression, stretching, swinging, stroking, or striking. In addition, objects can rebound, bounce, tumble, spread, fold, glide, elongate, collapse, resist, bend, spin, flatten, harden, break, split, slide, stick, squish, crack, crumble, tangle up, and entangle the dancer. As American philosopher Alva Noë writes, "The process of perceiving, of finding out how things are, is a process of meeting the world; it is an activity of skillful exploration" [3]. The present analysis emerged from my own dance practice, in which objects have gained importance, as shown in Figs 1–4 and Color Plate B.

The object is encountered by the performer in terms of possibilities, in other words according to its *affordances*. Insofar as they are incorporated into the *body schema*, objects affect the performer's sensory perception and motor response, which inform one another, as in a feedback loop. As we see below, how one engages with the object can be understood both in terms of one's body schema and one's *peripersonal space* (PPS). I should underscore that the *haptic sense* is involved in gripping, grasping, and holding, for example, combining tactile input and motor response in a feedback loop: We can grasp an egg without breaking it because we can gauge immediately, through a feedback response between perception and action, if we are acting with appropriate force or not—not enough and the egg will slip, too much and it will crack.

BODY SCHEMA

The concept of body schema involves the integration by the central nervous system (CNS) of multisensory data that is provided not only by the body itself (through *proprioception* and touch) but by the environment as well. This integration allows the CNS, as Roll et al. write, "to build up an overall picture, which is basic to the organization of goal-directed postural and kinetic motor activities" [4]. In American philosopher Shaun Gallagher's conceptualization, the body schema "is a non-conscious performance of the body, i.e., a performance that is not an intentional object present to my consciousness. In this performance the body acquires a certain organization or style in its relations with its environment. For example, it appropriates certain habitual postures and movements; it incorporates various significant parts of its environment into its own schema. The carpenter's hammer becomes an operative extension of the carpenter's hand" [5].

The object utilized is integrated into the body schema as an active, operative performance that affects *sensorimotor functions*, not as an object of attention but as a lived "pre-reflective consciousness" that can integrate parts of its environment. Gallagher contrasts the body schema with the *body image,* the latter being an intentional object of consciousness or nonholistic representation that sets the body apart from its environment.

Another key point is that when we dance with an object, its weight adds to our own in ways that depend on the lo-

Fig. 3. *Stick Kitties*, performance with Abe Mijnheer involving modified helmets and metal tubing, 2018. (© Marc Boucher. Photo: Annie Hunting.)

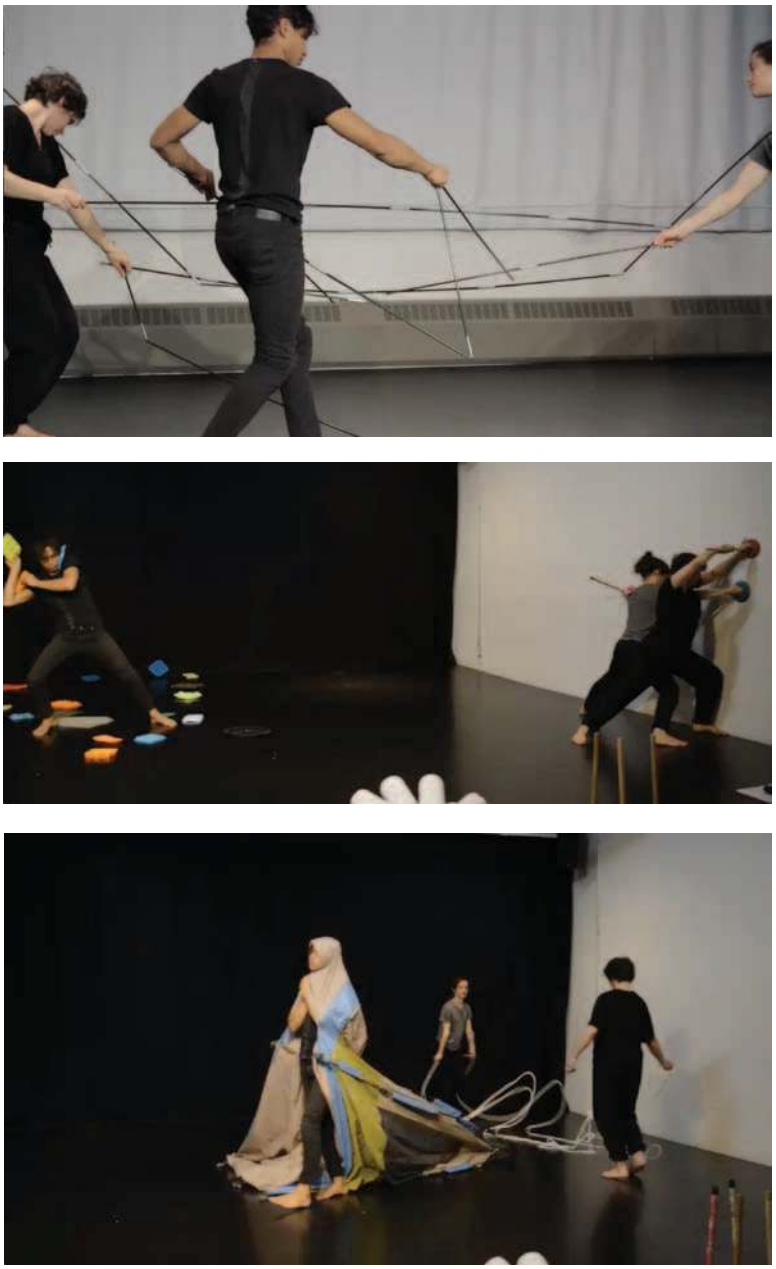

Fig. 4. *Petit poids*, performance with Karen Fennell, Miguel Palomino, and Sonya Stefan, involving small weights, foldable rods, plastic jugs, metal bowls, plastic bead strings, silicon molds, and a tent, 2019. (© Marc Boucher. Photo: Annie Hunting.)

cation and intensity of the common center of mass, which shifts constantly as motion is applied in various directions and intensities and as the "dynamic body and object amalgam," so to speak, "shapeshifts." The dancer generates the movement, but the object can also amplify it, minimize it, or deflect it, all while the object either gains or loses momentum and conversely loses or gains potential energy. A weight held above at arm's length has maximum potential energy, but if one lets the arm drop, this energy becomes kinetic and imposes postural and motor adjustments. Holding something at arm's length horizontally, rather than close to one's navel, informs us about both the object itself and about ourselves, for example, our strength and endurance.

According to how it is distributed, supported, or exchanged, weight is information, felt as effort or resistance; it is either a constraint to movement through inertia or a catalyst to movement through momentum. Weight is perhaps the most immediate and constant perception we have of ourselves, as well as of objects, whether we set them in motion or are burdened with them. Indeed, "the perception of force, effort, or heaviness relies on some of the same sensory and central mechanisms as proprioception and kinesthesia" [6]. Much could be said about other properties of objects, such as consistency, cohesion, size, shape, and so on, in terms of sensation and affordances.

PROPRIOCEPTION AND PERIPERSONAL SPACE

Proprioception contributes to the body schema, which is a "representation" drawn by the CNS to organize its postural and kinetic motor activities. Noel et al. describe a visuo-proprioceptive space located around the body in the following terms: "A large proportion of human interactions with the environment are mediated by the body and as such occur within the peripersonal space (PPS), the volume of space that surrounds and is immediately adjacent to the body" [7]. The PPS is where tactile contact with the object happens; "this space possesses peculiar multisensory properties as it is encoded by visuo-tactile and audio-tactile neurons that have body-centered or body-part-centered reference frames" [8]. The egocentric *reference frame* of these two types of *multisensory neurons* is based on either the subject's whole body or on the body segments engaged in an ongoing action, dancing usually involving the whole body as it moves through space. The PPS is where perception and action are intertwined; it serves as an "interface between perception and action in the manipulation of the environment by a part of the body" [9]. In other words, it "constitutes a privileged interface for the body to interact with nearby objects" [10] such as the ones used in dance.

Dancer and object move as a unit that can be defined objectively in terms of their mechanics and the lived embodied experience as the perception of the object merges with that of the performer's own body. Contact Improvisation dance inventor Steve Paxton writes: "[movement] even specific and unpredictable, [occurs] within a knowable field—of gravity, centrifugal force, support, and dependency" [11]. In improvised dance, a movement that is both specific and unpredictable is a "known unknown" of sorts, which occurs within a knowable field. But from the position I am taking here, the object used by the dancer also becomes an additional "known unknown" that depends upon its affordances and behavior.

CONCLUSION

The first-person corporeal experience of dancing with objects is grounded in tactile, haptic, and proprioceptive perceptions and the motor responses they elicit. There is evidence that the CNS "represents" PPS through an integrated multisensory system emerging from visuo-tactile and audio-tactile neuronal encoding. As the object is incorporated in the body schema—as an active, operative performance that affects sensorimotor functions—a temporary unit that one could call the "dynamic body and object amalgam" arises and shape shifts for the duration of the dance. The notions of PPS and body schema are closely related conceptualizations and the "amalgam" that they both describe is what the audience witnesses, i.e. "the dance," which is thus not just the expression, gesture, and movement patterns of the performer, but also the assemblage of objects incorporated into the body schema.

Acknowledgment

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Glossary

affordances—the directly perceived possibilities for action.

body image—an intentional object of consciousness, a nonholistic representation that sets the body apart from its environment.

body schema—a pre-reflective sensorimotor representation of the body that can incorporate parts of its environment. A plastic, constantly updated, organized representation of body-parts' dimensions and positions in the external space.

egocentric space—space wherein the self is the center.

haptic sense—prehension; component of touch involving retroaction between action and perception.

kinesthesia—sense of movement, of variations in muscle and tendon tension and of angles of articulations.

mickey-mousing—refers to synchronizing music with the dance.

multisensory neuron—a neuron that responds to cues from more than one sensory modality or whose responses to one modality are altered by the presence of a stimulus from another modality.

peripersonal space—a multisensory representation of proximal space involving vision, touch, and hearing.

proprioception—sense of muscle stretch and joint angle relating to muscular sensations of position of body parts, usually defined as including kinesthesia. Also understood as including sense of force (effort, tension, heaviness) and sense of change in velocity. Subserves both conscious awareness and automatic control of posture and movement.

reference frame—used by the CNS to interpret sensory information and to control movements. The *egocentric* is based on either the subject's whole body or on the segments engaged in an ongoing action while the *exocentric* is based mainly on the gravity vector and visual cues.

sensorimotor functions—all sensory and motor elements necessary for interaction with the environment.

somatosensation—proprioception, tendon force sensors, pressure sensors in the feet and other parts of the body.

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COLOR PLATE B: **DANCING WITH OBJECTS: A PSYCHOLOGICAL AND NEUROPHYSIOLOGICAL ANALYSIS**

Petit poids, performance with Karen Fennell, Miguel Palomino, and Sonya Stefan, involving small weights, foldable rods, plastic jugs, metal bowls, plastic bead strings, silicone molds, and a tent, 2019. (© Marc Boucher. Photo: Annie Hunting.) (See the article in this issue by Marc Boucher.)