

## **UC Merced**

### **Proceedings of the Annual Meeting of the Cognitive Science Society**

#### **Title**

Towards a movement science of communication

#### **Permalink**

<https://escholarship.org/uc/item/4m30p56k>

#### **Journal**

Proceedings of the Annual Meeting of the Cognitive Science Society, 46(0)

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#### **Publication Date**

2024

Peer reviewed

# Symposium: Towards a movement science of communication

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**Keywords:** Movement science; Communicative action;  
Gesture

To communicate is to move. There is no way around that. If we pick up comprehensive handbooks or introductory texts in movement science (Hong and Bartlett (2008)) we see that there is very rich knowledge and tractable mathematical models about different aspects of movements. Yet, we find no chapter on communicative movements. While the field of speech motor control is a developed area on its own (Parrell and Lammert (2019)), there is no movement science of communication proper, which would include whole-body-, hand-gestural-, signed-, and inter-bodily actions.

We could then assume that this absence of a developed movement science of communication is because communicative movements are just movements. In this vein, there is no need to have a dedicated movement science of communication. However, interdisciplinary research renders this false (Pezzulo et al. (2019); Pouw and Fuchs (2022); Trujillo, Özyürek, Holler, and Drijvers (2021)). Analytically, we simply need to acknowledge that the conditions under which a movement is successful is different for communicative movement versus say object-directed actions. As Latash mentioned in his book on synergies: "meaning is the performance variable" (Latash (2008)).

A basic movement science of communication (MSoC) would generate generalizable theories of communicative movement; Generalizable in the sense that basic processes are applicable to non-human animals; Generalizable in the sense of interfacing with existing frameworks of non-communicative movements. MSoC would further be a potent theory-building powerhouse for a general understanding of how meaning arises from movements produced by biological processes. Fields that are studying communicative movements are generally from linguistics, which traditionally has minimal regard for dynamical biological systems. While a movement science of communication would try to understand meaning and communication as emerging from movement and biological systems, likely informed by perspectives of distributed languaging, radical embodied cognitive science, and biosemiotics (see e.g., Thibault (2021)).

In this symposium we will deliver four talks that showcase the different aspects of MSoC, eventually to be part of

the explanandum of a completed communicative movement science. The talks will focus on research so far, but with an explicit call for further action for the development of MSoC. As such the talks collectively gesture towards some desiderata for a movement science of communicative actions. We intend to leave a lot of room for discussion after the talks to invite a community driven approach to a new science of communication.

## **Talk 1: Biomechanic perturbations of co-vocal movement**

**(Wim Pouw)** How does matter move in a mattering way? In this talk I overview a line of research that suggests that communicative movements such as gestures can have meaning in part because of the physical constitution of movement. Specifically, I overview how physical impulses that are characteristic of human gesture are interacting with the respiratory-vocal system in a way that can explain why gesture and speech tend to synchronize. I report on recent studies on postural and muscle synergies affecting voice intensity, next to overviewing research in kinematics, in typical, non-typical (aphasia), and non-human (Siamang) subjects. In our understanding, the synchronization of the voice with gesture is in part produced through the investment of energy into the multimodal utterance, which I would argue functions as an index of embodied state of affairs.

## **Talk 2: Kinematic modulation of communicative movement**

**(James Trujillo)** Movement is a key aspect of communication, whether by conveying meaning on its own, as in the case of emblematic and pantomimic gestures or certain facial expressions, or by shaping the meaning or interpretation of multimodal language. While the movements themselves can be meaningful (e.g., a raised eyebrow, hands moving to depict an action), so too are the kinematic qualities of the movements, such as their size and temporal structure. In particular, both internal (e.g., intentions) and external (e.g., communicative context) modulate the kinematics of communicative movements (Becchio, Manera, Sartori, Cavallo, & Castiello, 2012; Holler, 2022), shaping how saliently they are produced, or how they may be segmented and/or timed in such a way as to make them easier to understand. This means that studying communicative movement requires us to consider that both internal and external factors, and their interaction, will shape the kinematic qualities of these movements. In this talk, I

will review evidence for how internal and external factors can influence communicative movements, and show that communicative movement cannot be studied in isolation from its personal and contextual embedding. Specifically, I will present work showing that 1) challenging communicative contexts (e.g., background noise) modulate the kinematics of co-speech gestures, and 2) both the general intention to communicate, as well as specific conversational intentions (e.g., asking for clarification vs expressing a certain stance), modulate the kinematics of bodily movement.

### **Talk 3: Biomechanics and semiosis in co-singing gesture**

**(Lara Pearson)** In music performance styles worldwide, vocalists tend to gesture while they sing, with the extent and forms of such body movement showing great variety. Through an overview of research on co-singing gesturing practices, including South Indian karnatak vocal performance and beatboxing, I show how vocalists make continuous bodily adjustments to both their own vocalizations and to their auditors and co-performers. A science of communicative movement provides necessary foundations for understanding the complex interactions that engender co-singing body movement. Two key factors to consider are, a) the vocalist's immediate communicative goals, which are enculturated and require contextual understanding, and b) the individual's bodily tensegrity structure (Caldeira, Davids, & Araújo, 2021) and manner of achieving biomechanical stability while vocalizing (Pouw & Fuchs, 2022). With reference to existing studies, I argue that examining biomechanics and communication in tandem can afford greater insight into individual differences and provide a more complete account of dynamic multimodal semiosis in vocal performance.

### **Talk 4: Repair kinematics of silent gestures (Šárka Kadavá)**

Language evolved as a very efficient and phenomenologically effortless communication system. Communicative breakdowns invoke a sudden awareness that smooth sense-making is disrupted. It has been argued that such breakdowns or misunderstandings are an integral part of language and how it evolves to this day (Dingemans & Enfield, 2024). In face-to-face conversations, we tend to resolve these crises interactively and, most importantly, multimodally. In co-speech gesture, the repair effort can manifest itself, for instance, as an enhancement of precision (e.g., less sloppy gesture) or change in size (Holler & Wilkin, 2011). However, there is much more to appreciate in the movement dynamics of our bodies that is shown to be informative of, for instance, pragmatic intent. In novel communication paradigms, people attempt to signal in the absence of a common language (Macuch Silva, Holler, Özyürek, & Roberts, 2020). This setting offers a unique opportunity by placing movement itself at the center of the communicative process. The talk focuses on how humans modulate the kinematic and kinetic synergies of our body to overcome breakdowns and return to equilibrium of the shared common ground, and how meaning that synergies

convey is perceived by interlocutors.

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