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# Progress in Joint Action Research

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## A Current Trend in Cognitive Science

Joint action is an increasingly popular topic in Cognitive Science. This popularity reflects a recent theoretical trend of postulating, in one way or another, that human perception, action, and cognition are geared to enable successful coordination and communication with others. The speakers in the symposium will provide an overview of current progress in joint action research. Their contributions will address a wide range of phenomena ranging from tight temporal coordination to shared planning and discourse processes. Together, the contributions will illustrate that social constraints affect cognitive processing in a deeper sense than the more traditional notion of specific modules for social perception and social reasoning would suggest.

## Joint Action Shapes Processing in Dialogue

**Susan E. Brennan**

Language processing is typically studied as comprehension or production, in solitary contexts. Studies of language use, on the other hand, often have pairs of people performing tasks together that require them to communicate, in which they fill the roles of speaker and addressee in rapid alternation or even simultaneously. Data from such studies have tended to take the form of transcribed dialogues from

which linguistic forms are coded. But a transcript is only an artifact of the processes that generated it. What are the effects of joint action on language processing, moment-by-moment, in dialogue? I will discuss several studies that illustrate how both global and local information have the potential to affect processing, and at what grains they do so. Global information may involve some degree of mentalizing about a partner and the partner's needs or intentions; this information is available at the start of the interaction (whether in detailed or quite rudimentary form) and may or may not be updated as the dialog unfolds. Local information includes verbal and nonverbal cues that emerge during the course of the interaction and that can be construed as evidence about the state of the task or the partner; such cues may be provided intentionally or instrumentally (as a by-product of doing the task). Such cues can shape language processing in dialogue, whether implicitly (outside of awareness) or explicitly.

## The Reciprocity of Attention and Joint Action

**Daniel Richardson**

Attention is shaped by joint action, and joint action is shaped by attention. When two participants have a discussion over an intercom, their gaze coordination is modulated by what they each believe the other can see and what they believe the other knows. But conversation is not required for coordination. We found that individuals looked

at photographs differently if they simply believed that another person sat elsewhere was looking at the same images. Joint activity does not always produce joint looking, however. Incorporating results from other labs, we can see that joint action can cause attention to converge or diverge depending on subtle aspects of the task, the rewards and the relationships between co-actors. So far, I have used visual attention as marker of perceptual and cognitive processing. But gaze, perhaps uniquely, has another function. The eyes take in information, but also interact with the social world. I will conclude with new experiments showing that gaze patterns are changed by looker's belief that they are being looked at. Gaze is not just a window onto the cognitive processes of joint action, but a tool used in its construction.

### **Joint Action Coordination** **Michael Richardson**

A fundamental feature of social behavior is face-to-face or co-present physical interaction. The success of such joint-action, whether measured in terms of social connection, goal achievement, or the ability of individuals to understand and predict the meaningful intentions and behaviors of others, is not only dependent on numerous neural-cognitive processes, but also on the physical and informational processes of perceptual-motor coordination. Understanding and modeling the dynamics of these coordination processes, including how they emerge and are maintained over time, as well as how differing stable states of coordination are activated, dissolved, and transformed is therefore imperative. Here I review research aimed at uncovering the dynamics of the perceptual-motor coordination that can emerge across a range of joint-action tasks and describe a dynamical modeling strategy for capturing such coordination. I further argue that as the enactment of a shared intention or task goal, the behavioral dynamics of perceptual-motor coordination not only lawfully express the physical, informational, and neural-cognitive relations that underlie successful joint-action, but also operate to control the behavioral intentions and action strategies adopted by social situated co-acting individuals.

### **Coordination as Predictive and as Productive: Bootstrapping from Low-Level Automaticity to Top-Top Interaction** **Andreas Roepstorff**

An emerging body of research demonstrates how people, in direct interaction, become coupled along a number of dimensions: e.g., physiology, behavior, and semantics. However, once these methods are applied to more complex, goal-oriented settings, it seems that the patterns of coordination are not only synchrony and mimicry, but also more complex forms of complementarity such as in division of labor. This raises the issue of whether the same mechanisms may explain the simple and the more complex forms of coordination? I will explore the hypothesis that in a

predictive framework, the unfolding of more basic forms of coupling may support bootstrapping into higher order coordination as shared perceptions, joint action and division of labor.

### **Planning joint actions** **Natalie Sebanz**

It has commonly been thought that to perform joint actions, individuals need to plan their actions around others'. However, recent evidence suggests that individuals not only plan actions around each other, but instead plan each others' actions. I will review studies showing that co-actors 1) form representations of and keep track of each other's tasks, 2) engage in motor simulation to predict the timing of each others' actions, and 3) form action plans that specify relations between their actions, thus enabling group-level action planning. These findings not only tell us about the cognitive mechanisms of joint action, but also challenge us to rethink the role of shared intentions in joint action.

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