

Contents lists available at [SciVerse ScienceDirect](http://www.sciencedirect.com)

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

When dyads act in parallel, a sense of agency for the auditory consequences depends on the order of the actions



John A. Dewey*, Thomas H. Carr

Michigan State University, East Lansing, MI 48824, United States

ARTICLE INFO

Article history:

Received 26 September 2012

Available online 5 January 2013

Keywords:

Sense of agency
Forward model
Mental causation
Joint action

ABSTRACT

The sense of agency (SA) is the perception of willfully causing something to happen. [Wegner and Wheatley \(1999\)](#) proposed three prerequisites for SA: temporal contiguity between an action and its effect, congruence between predicted and observed effects, and exclusivity (absence of competing causal explanations). We investigated how temporal contiguity, congruence, and the order of two human agents' actions influenced SA on a task where participants rated feelings of self-agency for producing a tone. SA decreased when tone onsets were delayed, supporting contiguity as important, but the order of the agents' actions (lead, follow, or simultaneous) also mattered. Relative contiguity was the main determinant of SA, as delayed tones were usually attributed to the most recent action. This was unaffected by contingencies between the two actors' actions (Experiment 2), showing that contiguity has a powerful influence on SA, even during joint action in the presence of other cues.

© 2012 Elsevier Inc. All rights reserved.

1. Introduction

Usually people can discriminate the perceptual consequences of their own actions from other perceptual events caused by events in the external environment or other actors. The phenomenology of intentionally causing things to happen has been dubbed “the sense of agency” (SA), and is defined as a subjective awareness of being the willful initiator and controller of a thought, action, or sensory event ([Gallagher, 2007](#); [Jeannerod, 2003](#); [Synofzik, Vosgerau, & Newen, 2008](#)). There has been a recent upsurge in research investigating how SA develops when people perform tasks alone. In this article, we investigate SA for a shared task, in order to determine what information people use to disambiguate which of the two actors' actions was actually responsible for causing the effect. In particular, we ask how the relative timing of two actors' motor inputs (leader or follower in our experiments) influences SA judgments about the occurrence of a subsequent auditory effect.

[Bayne and Levy \(2006\)](#) drew three distinctions that are important to deconstructing SA. SA can refer to (1) the phenomenology of ‘mental causation’, or the sense that physical movements are caused by prior or concurrent mental states called intentions; (2) the phenomenology of authorship, or the sense that ‘I’ caused something to happen, as opposed to an external agent or force; and (3) the phenomenology of effort, for example using willpower to delay gratification for strategic long-term gains ([Metcalfe & Mischel, 1999](#)). The current study falls into the second category, the phenomenology of authorship, and in our treatments, SA should be interpreted as synonymous with sense of authorship unless otherwise noted.

* Corresponding author.

E-mail address: deweyjoh@msu.edu (J.A. Dewey).

1.1. Determinants of SA

Wegner and Wheatley (1999) provided a theoretical framework for thinking about SA when they proposed three prerequisites, which they named the principles of priority, consistency, and exclusivity. The principle of priority refers to temporal contiguity between the cause and effect, and we will call it “contiguity”. It is well known that an appropriately short delay between successive stimuli supports the perception of a contingency between those stimuli. For example, participants are more likely to agree that their own key press produced a tone if the tone occurs immediately following the key press, compared to conditions with delays of 200–600 ms (Sato & Yasuda, 2005) or several seconds (Shanks, Pearson, & Dickinson, 1989) between the key press and tone. A similar phenomenon appears in judgments about causality in perceived events such as collisions between two objects (Michotte, 1963).

The principle of consistency refers to the conceptual congruence between the predicted and actually observed effects of actions. For example, self-generated auditory and visual effects are more likely to be incorrectly attributed to external sources (“not me”) if the frequency or form of the effect is different from what was expected (Farrer, Bouchereau, Jeannerod, & Franck, 2008; Sato, 2009; Sato & Yasuda, 2005). These findings are also in agreement with another prominent account of SA, the forward model hypothesis, according to which SA arises from a comparison of the predicted and actually perceived effects of voluntary actions (Blakemore, Wolpert, & Frith, 2002). Early descriptions of how internal forward models could account for SA emphasized sensory prediction based on the efferent motor commands issued to produce the actions. There has been much recent discussion over the extent to which SA depends on early sensorimotor processes, and how this type of information may get integrated with other perceptual and cognitive processes to determine explicit judgments of self-agency (e.g. Pacherie, 2008; Synofzik et al., 2008). Nonetheless the idea of a comparison between predicted and perceived consequences of an action remains central to all accounts.

Lastly, the principle of exclusivity states that SA is also modulated by the presence or absence of competing causal explanations. Although the effects of exclusivity on SA have been less studied than those of temporal contiguity or congruence, Chapter 4 of Wegner (2002) describes accounts of table-turning, a type of spiritual séance in which participants place their hands on a table and wait for rotations supposedly representing communications from the dead, and the Milton Bradley Ouija board game, as two examples where ambiguity as to which actor is causing what effect appears to contribute to a loss of SA.

Given that people must frequently coordinate their actions with others in their daily activities, exclusivity is frequently violated in dyads or group settings when multiple actors work side-by-side (Knoblich, Butterfill, & Sebanz, 2011). For example, if two hunters at a shooting range fired their guns at the same target at nearly the same time, the principle of exclusivity predicts that both would experience a reduced SA for taking down the target. However, few studies have directly studied the impact of exclusivity on SA or its relation to other cues.

One recent exception was a study by Couchman, Beasley, and Pfordresher (2012), who studied SA for sequences of auditory effects with various degrees of alterations, as well as whether there was an alternative possible causal agent. Couchman et al. (2012) found that altered auditory effects disrupted both performance and SA, consistent with other studies showing impacts of contiguity and congruence on SA. However, performing in a “duet” condition in which the participant viewed a confederate of the experimenter playing at a second piano keyboard had little effect on participants’ SA for the auditory sequences, so exclusivity appeared to have little impact. In another study, van der Wel, Sebanz, and Knoblich (2012) investigated how SA emerged during skill learning in individuals and dyads. Participants performed a haptic coordination task which involved swinging a pendulum back and forth at a fixed pace either alone or with a partner. After each trial participants were asked how strongly they had felt in control. There were two phases, each of which involved performing the task either individually (I) or jointly with a partner (J). Agency ratings during phase two were influenced by objective performance, but also by the context in which the task had initially been learned. Specifically, participants who learned the task with a partner but performed individually during phase two (JI) experienced a large increase in SA. Interestingly, a corresponding decrease in SA was not seen for the IJ group. Taken together, these two studies suggest that violations of exclusivity sometimes but not always influence SA, depending (at least) on initial learning conditions and the strength of other cues.

In summary, although some previous studies have implied violations of exclusivity while participants performed single-player tasks (e.g. Sato, 2009; Sato & Yasuda, 2005; Wegner & Wheatley, 1999), none have systemically explored how SA is influenced by what another human actor did while also taking into account when he or she did it. The purpose of the present study was to investigate how violations of exclusivity influence SA depending of the order in which the competing actions are performed. Returning to the two hunters example, it is intuitive that SA (here, a perceptual judgment that one’s own shot was responsible for knocking over the target) should be maximally ambiguous if the hunters fired their guns exactly simultaneously. But what if there was a minor discrepancy in the timing of the shots? How would this influence each hunter’s SA for hitting the target? Previous studies have shown that increasing the delay between a self-generated action and its effect can weaken SA (e.g. Sato & Yasuda, 2005). However, there is evidence that people also form predictions about the timing and expected consequences of other people’s actions (Graf et al., 2007; Ramnani & Miall, 2004; Wilson & Knoblich, 2005). One of the driving questions motivating the present study was, in a situation where an effect could be plausibly attributed to either of two actors, would each actor’s SA be influenced only by the delay between their own action and the sensory effect, or would the timing of the other actor’s action also have an influence?

Download English Version:

<https://daneshyari.com/en/article/10458377>

Download Persian Version:

<https://daneshyari.com/article/10458377>

[Daneshyari.com](https://daneshyari.com)