



Comment

## Does sensorimotor communication stabilize commitment in joint action?

### Comment on “The body talks: Sensorimotor communication and its brain and kinematic signatures” by G. Pezzulo et al.

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Received 16 January 2019; accepted 24 January 2019

Available online 28 January 2019

Communicated by J. Fontanari

Pezzulo and colleagues [11] present a comprehensive overview of empirical research on sensorimotor communication (SMC), and develop a systematic theoretical framework to provide structure and direction to that research. At the core of this theoretical framework is a working definition of SMC as ‘a signal that has a dual nature, and which combines a pragmatic action (e.g., offering the glass) and a communicative action (e.g., express politeness).’ This is a broad definition; most research on SMC to date (e.g. Sacheli et al. [14]; Vesper & Richardson [17]; Pezzulo & Dindo [10]) has focused on a narrower range of cases than that picked out by this definition. In particular, the forms of SMC that have been investigated most extensively have two further characteristics (discussed below) which are not required by Pezzulo and colleagues’ working definition. In the following, we will elucidate these further characteristics and consider how they enable SMC to facilitate coordination and to stabilize commitment in a broad range of everyday joint actions.

The first characteristic that we have in mind is that, in many cases of SMC, an action is performed *in such a way as* to fulfil a communicative function over and above its pragmatic function. In other words, it is not just that one and the same action serves a pragmatic and a communicative function, but that it serves the communicative function in virtue of serving the pragmatic function in a particular way. For example, in reaching to lift one of two sides of a table that we want to move together, I may exaggerate the arc of my movement to one side and thereby indicate to you which side I intend to lift. Or, in setting the table down again, I may exaggerate my deceleration as we approach the floor and thereby enable you to predict when I am going to release the table. These actions are pragmatic insofar as they improve the chances of achieving our goal, and they do this *because* they communicate my future movements to you.

Thus, features of actions – such as movement trajectory [17], velocity profile [5], and grip aperture [14] – can be modulated such as to disambiguate the goals of those actions, or to provide additional information about their timing or about the manner in which they will be performed (e.g. with how much force). This helps to illuminate how SMC can support coordination in joint action – namely, by reducing uncertainty about how and when agents are going to

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DOI of original article: <https://doi.org/10.1016/j.plrev.2018.06.014>.

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perform their contributions to joint actions (e.g. Leibfried, Grau-Moya & Braun [4]). By modulating my trajectory to indicate which side of the table I will lift, I make it easier for you to select a complementary action (i.e. grasping the other side). In exaggerating my deceleration as I set my side of the table down on the floor, I make it easier for you to predict when I am going to release it, and to time your own release accordingly.

In addition to facilitating coordination in joint action, we would like to suggest that there is also a further way in which forms of SMC with this characteristic can support joint action – namely, by stabilizing *commitment* to that joint action. To see why, consider the following. By communicatively modulating features of my action to facilitate coordination, I invest extra effort in the joint task, which makes it easier for you to do your part of the joint action. This investment of effort can be seen as a signal that I am committed to the joint action, and therefore unlikely to abandon it. Thus, as well as reducing uncertainty with regard to the pragmatic goal of my action, SMC can also reduce your uncertainty about my intention to persist in the joint action [6]. This increases the chances that you will persist with the joint task when it is difficult or otherwise effortful, thereby stabilizing your commitment to our task.

Moreover, my effort investment may also stabilize commitment by eliciting a sense of commitment from you towards me [7,8]. If so, SMC of this kind may facilitate joint action by encouraging you to reciprocate my effort investment – i.e. upon recognising my effort investment, you may feel committed to reciprocating. We make this suggestion in light of recent studies suggesting that one agent’s investment of effort in a joint action is sufficient to elicit a sense of commitment on the part of their partner: an agent will persist for longer on a boring or effortful task if they believe that their partner has invested a high degree of effort in that task [16,2,1]. Indeed, this suggestion is also consistent with a hypothesis that has recently been offered with respect to the mechanisms by which prosocial attitudes and behaviour are boosted by a particular form of coordination, namely sensorimotor synchronization [12, 13]: by synchronizing with me, a partner indicates her willingness to invest effort in adapting to me [9], which may elicit a sense of commitment to reward that effort investment by acting in that partner’s interests [3].

In the table-moving example we have been considering so far, SMC has a second characteristic that is not required by Pezzulo and colleagues’ working definition: the communicative action is *about* the pragmatic action, in the sense that the communicative action signals something about the pragmatic action. Thus, exaggerating my trajectory to the right side of the table provides information about the goal of my current action, and exaggerating my deceleration as I put the table down onto the floor provides information about the timing of that action. Might forms of SMC that do not have this characteristic also serve to signal or elicit a sense of commitment? Quite possibly. To signal or elicit a sense of commitment, it may be sufficient to modulate my movement such as to make my effort salient without providing any additional information about my goal. For example, I might bend down further than necessary when lifting the table in order to emphasize its weight, or more generally, carry heavier objects at a lower height than lighter objects [15]. In these cases, the content of the communicative signal does not provide information about the goal or the timing of the action, but does bear upon my attitude towards the joint action and my relationship with my partner.

Thinking about cases like these raises the interesting possibility that some cases of SMC may actually be detrimental to joint action. In particular, SMC may sometimes *undermine* commitment to a joint action rather than stabilizing it – for example, when one agent intends for her partner to notice that she is investing extra effort in producing SMC, *and her partner is aware that she intends for her extra investment of effort to be noticed*. This might undermine the SMC’s stabilization of commitment because one may recognise that one’s partner’s effort investment is, in part, designed to manipulate one, and agents typically prefer not to be manipulated by others. Suppose that I am concerned that you will soon abandon our task of moving tables from one room to the next. I might invest extra effort to do my part in such a way as to make the coordination as smooth as possible, and to make you feel committed to sticking with it until we have moved all the tables. But this could backfire if you see through my intention – you may instead see my extra effort investment as an attempt to manipulate you into reciprocating.

To sum up, consideration of the effects of SMC on commitment gives rise to a range of novel questions for further research: Do senders and receivers differentiate between cases where extra effort is invested to facilitate coordination and cases where it is invested merely to signal or elicit commitment? Do senders strategically invest effort when it is likely to be noticed and to stabilize commitment? Are receivers wary of such manipulative strategies? We hope that further research will shed light on these questions, and that linking research on SMC with research on commitment may provide useful constraints and new directions for both areas of research.

## Acknowledgements

This work was supported by a Starting Grant from the European Research Council (nr 679092, SENSE OF COMMITMENT) and by a Prize from the Leverhulme Trust.

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