Reply to comment

The observability principle and beyond
Reply to comments on “Seeing mental states: An experimental strategy for measuring the observability of other minds”
by Cristina Becchio et al.

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1. Direct perception versus Inferentialism

Is it possible to directly perceive others’ mental states? Mediating the debate between Direct Perception and Inferentialism proponents would require knowing “what counts as an inference and how to tell the difference between inferential and non-inferential processing” [1]. However, few theorists have even attempted to answer the question of what counts as inference. The consequence, as noted by Spaulding [1], is that “given that neither Inferentialists nor DSP [Direct Social Perception, Ed.] proponents specify what they mean by inference, it is hard to tell what exactly each side is affirming and denying. Thus, the debate between Inferentialism and DSP is at an impasse”. Similar considerations apply to distinguishing between what is ‘observable’ versus ‘unobservable’ [2].

The motivation for the work discussed in the target article [2] was partly to reconceptualize the notion of ‘direct perception’ to make the observability of others’ mental states empirically addressable. This resulted in the proposal to reformulate ‘direct perception’ as reflecting the conditional probability of perceiving a given mental state from the observation of certain movement features.

We do not claim that this formulation resolves the issue of whether perception of others’ mental states involves inferential steps. As noted by Overgaard [3], in principle, a stimulus may contain discriminatory information about a mental state, the information may be perceptually useful, while identifying the mental state could still involve ‘inferential’ steps. This argument brings us back to the initial impasse of what counts as inference. More radically, one
could ask whether the distinction between inferential versus non-inferential processing is justified in terms of brain functioning [4]. ‘Inferential’ is sometimes taken to mean extra-perceptual (e.g., [3]). As we continue to more fully understand the continuity of perception, action, and cognition (e.g., [5]), however, distinguishing between perceptual and extra-perceptual processes is no less problematic than distinguishing between inferential and non-inferential processes [6].

2. Which mental states

Operationalization has both advantages and disadvantages. One advantage is testability. Once a concept has been operationalized, it can be tested. Several questions raised by the Commenters would be best answered by gathering empirical data. Which mental states and under which circumstances is it possible to perceive [7]? Can one perceive intentions such as pretending or deceiving? Consider the case of a person attempting to disguise her dislike for wine by pretending to drink without ingesting the beverage. Would an observer be able to notice it [8]?

The target paper [2] delineates a precise experimental strategy to answer such questions. First, one would have to quantify the specificationational information available in the pattern of behavior, e.g., to determine whether movement patterns contain information to discriminate between ‘real drinking’ and ‘pretend drinking’ (Step 1). Provided that specificationational information is available, one could then test the perceptual efficiency of this information (Step 2). Finally, one could identify the features observers use to detect pretense (Step 3) and test them through manipulation (Step 4). Unpublished data from our lab suggest that discriminating between real versus pantomimed grasps is almost automatic in human observers (see also [9]). With regards to our earlier example, there would be little surprise if we were to determine that observers can identify fake drinking.

Of course, there are questions we cannot or we do not know how to address experimentally: what must a mental state be if it can be perceived [10]? Can we discern mental states in others because their mental states cause their observable behavior or because observable behavior at least partially constitutes the mental states [11]? What must perception be if we can perceive mental states [10]?

While these questions cannot be operationalized (not using the proposed strategy, at least), we wish to acknowledge their importance as they force us consider what exactly it is that we want to know about the observability of mental states.

3. Extending the paradigm

Beyond raising questions about the nature of the mental states that one can perceive, the Commenters also identified several new directions for research. In what follows, we briefly comment on three directions we regard as especially promising.

3.1. Integrating expectations and previous experience

Information to discern others’ intentions is not merely available in the movements, but also in the context in which the movements take place [10,11]. How does the brain combine contextual information with the stream of incoming kinematic information toward a response? (see also [8,12]). Contextual cues allow expectations to form about what is likely to occur, facilitating efficient processing of expected stimuli [13]. At the same time, these cues can be distracting. For example, in the case of a table laid out for tea-time in the context of drinking tea, a person may grasp a cup with the intention of tidying up. Preliminary findings from our laboratory [14] suggest that under these circumstances, human brains incorporate context into the decision process as a dynamic bias affecting both the starting point and rate of evidence accumulation. In line with the principle that priors hold the most sway over decisions when sensory evidence is ambiguous [15], when motion conveys no discriminative intention-information, we determine intention choice via context. When motion does convey discriminative intention-information, we determine intention choice by kinematics. It will be important for future studies to examine how prior experience [12] and interaction history [8] influence the intention attribution process.

3.2. Taking a second-person perspective

Why do we perceive or strive to perceive the mental states and intentions of others [7]? Perception services agentive responses and interaction [16] – as Gallagher [10] puts it, perception is pragmatically or enactively smart. While
understanding how different kinematic features contribute to perception is important, it may be even more important to understand how they afford different responses in an interaction partner. Experiments designed according to psychophysical techniques unavoidably fail to capture this enactive aspect. One important path for future research will be to develop a second-person approach [17] to studying movement kinematics. One might implement this approach by measuring the kinematics of two agents (e.g., A and B) interacting in a real-time social encounter. Extending the modeling approach discussed in Step 3 (in this issue), one could use multivariate pattern classification techniques to capture the statistical dependencies between the kinematics of the two agents. Attempts in this direction have already been undertaken [18–20; for review see 21].

Another approach suggested by Parma et al. [22] would be to measure corticospinal excitability of action-relevant muscles under conditions in which the potential for social interaction is manipulated (for a similar manipulation, see [23]). Relating differential corticospinal profiles to the expression of specific kinematic features could provide useful insights regarding how “behavior (covertly) affords behavior” [7].

3.3. Implications for autism research

Research on autism spectrum disorders suggests that, possibly because of their own atypical movement profile, individuals with autism have difficulties using kinematic information towards discerning the intentions of those around them [24]. The exact nature of these difficulties remains vague and in need of further investigation. Forbes and Hamilton [25] suggested that the drift diffusion model (DDM) could provide a useful tool for decomposing the behavioral data obtained from individuals with autism and identifying abnormalities in the relative component processes (e.g., quality of the evidence extracted from the kinematics, amount of evidence required to trigger a response). Specifically, one could first use DDM to obtain a measure of intention-information gathered over time. After discovering that the drift rate is, say, lower in individuals with autism, one could then use Step 3 (CART analysis) and Step 4 (test by manipulation; [2]) to identify the kinematic features individuals with autism employ as a means of judging intention (see also [12]). Training the CART model on the typical population and testing it on the autistic population could offer a chance to develop a measure of between-groups similarity in the mapping of observed kinematics to the intention choice. As suggested by Thompson and Catmur [12], this approach could be further extended to capture inter-individual variability across actors and observers in both typical and atypical populations.

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References


