

The Experience of Agency

Feelings, Judgments, and Responsibility

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ABSTRACT—*The experience of agency refers to the experience of being in control both of one's own actions and, through them, of events in the external world. Recent experimental studies have investigated how people recognise a particular event as being caused by their own action or by that of another person. These studies suggest that people match sensory inputs to a prediction based on the action they are performing. Other studies have contrasted voluntary actions to physically similar but passive body movements. These studies suggest that voluntary action triggers wide-ranging changes in the spatial and temporal experience not only of one's own body but also of external events. Prediction and monitoring of the consequences of one's own motor commands produces characteristic experiences that form our normal, everyday feeling of being in control of our life. We conclude by discussing the implications of recent psychological work for our notions of responsibility for action.*

KEYWORDS—agency; action; prediction; volition; monitoring

Agency refers to a person's ability to control their actions and, through them, events in the external world. We experience agency throughout our waking lives to the extent that we control the movements of our body in walking, talking, and other voluntary actions. In addition, we also feel and know that we control these events: We have a "sense of agency" to accompany the fact of our agency. Although everybody knows what agency is, psychological debates about agency have generally been controversial. Many psychologists think of agency more as an illusion or a confabulation than as a bona fide mental state. In this article, we first discuss how the human mind generates the sense of agency and how the sense of agency can be assessed empirically. We then consider how the sense of agency may malfunction and what role agency plays in the social concept of responsibility for one's own actions.

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As we perform actions in our daily lives, we have a coherent experience of a seemingly simple fluent flow from our thoughts, to our body movements, to the effects produced in the world. I want to have something to eat, I go to the kitchen, I eat a piece of bread. We have a single experience of agency—of control over these events—because our cognitive representations of the successive stages of sensorimotor control are tightly linked together (Fig. 1). Action prediction is the key mechanism underlying this coherent linkage. For example, my intention to eat something already anticipates the taste of the bread and the feeling of satiety. More generally, the "I did that" aspect of the sense of agency depends on our ability to predict what will follow from each specific motor act we perform.

“WHODUNNIT?”: EXPLICIT JUDGMENTS OF AGENCY

Several experimental studies have investigated agency by asking participants to judge whether they caused a particular sensory event. Typically, participants perform voluntary actions, in response to a cue and then receive sensory feedback about their movement, which is sometimes veridical and sometimes distorted (e.g., the spatial path of movement is disturbed, a temporal delay is inserted; see Farrer et al., 2003; Metcalfe & Greene, 2007; Sato & Yasuda, 2005; Wegner, 2003). Participants explicitly state whether they experience agency over the effect (e.g., by answering the question "did you produce the movement you saw?"). An important distinction should be made between situations in which another possible agent is present, for example a second person performing a similar movement at the same time (Tsakiris, Haggard, Franck, Mainy, & Sirigu, 2005), and situations without an alternative agent. In the former case, participants generally view a visual feedback of a hand action and must judge if they made the action or not. Judging agency is then essentially the same as recognising oneself. These studies generally find a bias to judge oneself to be the author of action. They also emphasise that agency plays a major role in distinguishing oneself from non-self, including other people.

In other studies, no alternative agent is present, and participants judge whether they caused a sensory event (e.g., a tone occurring sometime after their action). In general, greater delays or distortions

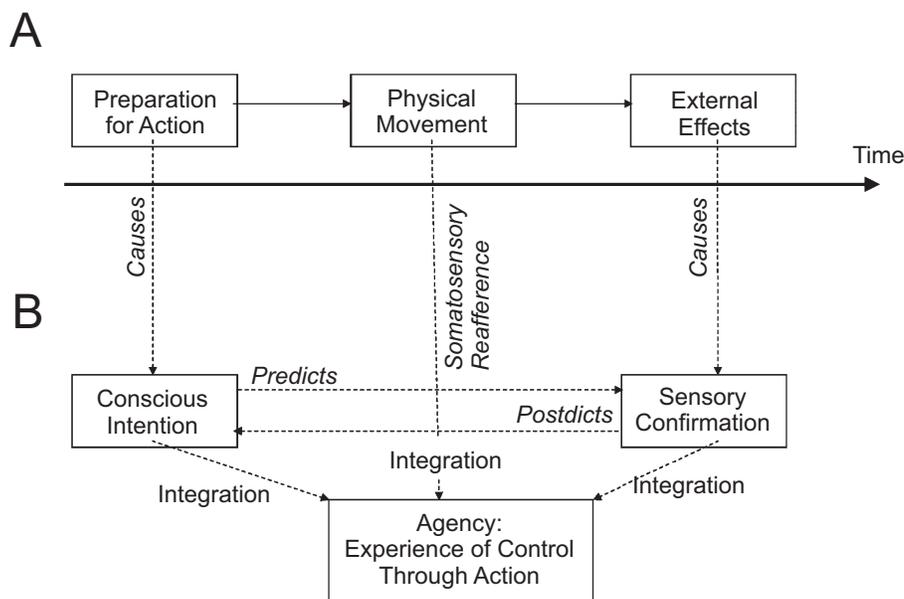


Fig. 1. Objective physical events (A) and subjective experiences (B) during action that contribute to the sense of agency. As shown in (A), actions are preceded by neural preparation, which includes motivation for action, selection of appropriate movement parameters, and activation of cortical motor networks. Physical movement of the body is signalled by the somatosensory systems (somatosensory reafference), and forms the core of our experience of action. Finally, actions are generally performed to achieve specific desired effects (goals) in the external world, which are signalled by exteroceptive perception (sensory confirmation). Preparation, body movement, and sensory effect are objective physical events that necessarily occur in strict temporal sequence. In contrast to the objective physical events that it reflects, the subjective experience of action has a strong coherence and unity. The experience of preparing an action already predicts the effect of the action; and sensory information that an intended effect has occurred is retrospectively matched with the prediction (i.e., “postdiction”).

make people less likely to experience agency over the effect. Therefore, the perception of one’s own agency depends on detecting spatio-temporal correlations between one’s actions and its effects. These same principles of spatio-temporal correlation underlie perception of causality in general, suggesting that agency is a special case of causation in which one is oneself the cause of an external event.

However, two quite different explanations have been offered for such judgments about agency. On one view (Sato & Yasuda, 2005), agency judgments are outputs from internal predictions by the motor system of what the consequences of an action are likely to be (Frith, Blakemore, & Wolpert, 2000). If there is no discrepancy between prediction and sensory feedback, then “I” am the agent responsible for this particular event. An alternative view treats agency as an inference, rather than a prediction. Thus, the mind may infer and reconstruct a path between conscious intention and effect. According to Wegner (2003), the sense of voluntary control is effectively a reconstructive illusion that one’s intention has caused an external event, analogous to Hume’s view of causation as an illusory inference from the constant conjunction of cause and effect.

FEELINGS OF AGENCY AND JUDGMENTS OF AGENCY

Synofzik, Vosgerau, and Newen (2008) drew an important distinction between the judgment of agency (JoA) and the feeling of

agency (FoA). JoA refers to explicit conceptual attributions of whether one did or did not make an action or cause an effect. A jury’s verdict, for example, is a JoA. FoA refers to the subjective experience of fluently controlling the action one is currently making, and is nonconceptual. What, then, is the link between FoA and JoA? Under normal circumstances, the FoA is a *necessary* condition for JoA, and indeed forms the evidence base for the judgment: My belief that I switched on the lights depends on my experience of reaching for the light switch. This principle fails in a few special circumstances. For example, when several people’s actions simultaneously aim to produce a single effect, a person may judge that he or she has agency over an event because he or she *thought* of making an action, even though the event was in fact caused by someone else (Wegner, 2003).

However, FoA is not normally *sufficient* for JoA. Explicit JoAs require an additional cognitive function of monitoring the effects of action. Only when I see that the lights have come on would I judge that I switched them on. This monitoring process is often unconscious: Indeed, the motor system includes specific mechanisms for predicting the sensory consequences of our own actions (Frith, Blakemore, & Wolpert, 2000).

An interesting neurological condition reveals that the experience of making an action can be dissociated from monitoring the effects of action. Patients with anosognosia for hemiplegia (AHP; hemiplegia is weakness following a stroke affecting motor

areas of the brain) deny that their affected limb is paralysed. For example, patients may assert that they performed an action using their paralysed limb, which in fact remains immobile. The patients' JoA seems to be based *only* on the feeling that they prepare appropriate motor commands for the action. Anosognosic patients seem to skip the normal stage of monitoring whether appropriate effects of limb movement actually occur (Fotopoulou et al., 2008). In AHP, the feeling of intending an action becomes sufficient for a JoA, and the effects of the intention are no longer monitored in the normal way. This suggests that effect monitoring is a specific cognitive function that normally provides the appropriate link between FoA and explicit JoA but that has been selectively compromised in these patients.

AN ALTERNATIVE APPROACH: FACT AND SENSE OF AGENCY

An important source of confusion in the literature on sense of agency comes from the nonagency control conditions to which agency is compared. Most previous studies of JoA involve comparing sensory events caused by one's own action to sensory events caused by another person's action. Therefore, these studies are really comparing first- and third-person perspectives on action feedback, rather than comparing representations of action itself.

An alternative approach involves comparing voluntary action and passive movement within a single individual. Voluntary action and a passive limb displacement may involve physically

identical movements but are different both physiologically and psychologically. Voluntary movement depends on a cascade of cognitive-motor processes within the brain's frontal lobes (Haggard, 2008): These processes give us a sense of agency over our own voluntary movement, and over the effects of our movement on the external world, while passive movement does not. Comparing active with passive movements recalls Wittgenstein's (1953/1998) question "What is left over if I subtract the fact that my arm goes up from the fact that I raise my arm?" This approach views agency as an addition to or modification of somatic experience. Experimental studies show that agency changes the experience of the body and the outside world in three ways: effects on perceived time, effects on sensory intensity, and effects on the spatial representation of the body itself.

Temporal Attraction: Agency Influences Time Perception

Action fundamentally changes the experience of time. In fact, time perception has been one of the most important indirect methods for studying agency. In one approach, participants are asked to judge the onset of voluntary actions (a key press) and of a sensory event (a tone) occurring shortly afterward. The perceived time of the action is shifted later in time, toward the ensuing tone, relative to the perceived time of an action in a baseline condition in which no tone occurs. In other blocks, participants are asked to judge the onset of tones. The perceived time of a tone that follows the participant's voluntary action is shifted earlier in time, back toward the action that caused it, relative to a baseline condition in which tone occurs without any

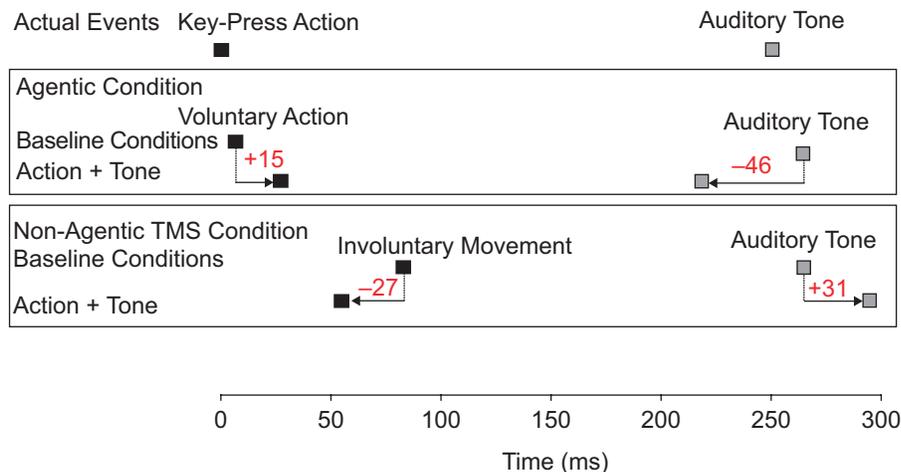


Fig. 2. Changes in time perception associated with agency. A simple key-press causes an auditory tone. In baseline conditions, participants note on a rotating clock the time at which they press the key in the absence of a tone or the time at which the tone occurs in the absence of a keypress. In agency conditions, the keypress is associated with a tone, and the perceived time of action and tone are perceived as shifted from their baseline values toward each other. The magnitude of each shift (in milliseconds, ms) is shown in red. In a nonagency control condition, the voluntary key-press was replaced by an involuntary contraction of the same muscles used to press the key (triggered by stimulating the motor areas of the brain using transcranial magnetic stimulation). This produces a perceptual repulsion (i.e., the key-press and tone are perceived as farther apart) in contrast to the shifts found in the agency condition. Data taken from Haggard, Clark, and Kalogeras (2002).

action being made. This “intentional binding” effect, shown in Figure 2, suggests that the sense of agency may involve a specific cognitive function that links actions and effects across time, producing a temporal attraction between them (Haggard, Clark, & Kalogeras, 2002). Crucially, no such effects were found for passive involuntary movements, suggesting that intentional binding is a specific marker of agency.

Sensory Attenuation: Agency and Perceived Sensory Intensity

A self-generated sensory stimulus is perceived as less intense than an identical externally generated stimulus. For example, one cannot tickle oneself (Frith, Blakemore, & Wolpert, 2000). Internal models within the motor system use internal copies of voluntary motor commands (efference copies) to predict and thus cancel or attenuate the sensory consequences of the action (Frith, Blakemore, & Wolpert, 2000). These models compare the predicted and actual sensory input during action. When there is little or no discrepancy between predicted and actual state, then one is oneself the agent. This approach can correctly discriminate between internally generated and externally produced sensory events, and can therefore ascribe agency. However, models based on attenuation treat agency as absence of externally generated perceptual experience, and not as an experience in itself. They cannot therefore explain why there is a positive experience of agency in the first place.

Agency and the Unity of Bodily Awareness

Comparisons of active and passive movement define agency as an additional component, over and above the normal experience of one’s own body. Recent evidence suggests that agency transforms the experience of the body itself. In keeping with this definition, a number of studies have compared the effects of voluntary action and passive movement on the awareness of one’s body. Agency generally enhances both spatial and temporal (Tsakiris et al., 2005) processing of proprioceptive information from sensory receptors in the body. We recently used the rubber hand illusion (Botvinick & Cohen, 1998) to show that voluntary actions produce a more coherent and unified proprioceptive representation of the body than do passive movements (Tsakiris, Prabhu & Haggard, 2006). In the rubber hand illusion, synchronous stimulation of both a rubber hand (or a video image of it) and the participant’s unseen hand produces a strong illusion that the rubber hand is part of the participant’s own body. A reliable behavioral proxy of the illusion is a shift in the perceived location of the participant’s hand toward the rubber hand. In our experiment, when the stimulation involved passively displacing the participant’s hand and monitoring the movement via a video image of the hand, the effect was confined to the individual finger that was passively displaced. In contrast, when the participant actively moved the same finger, the illusion transferred to other fingers also. Voluntary action appeared to integrate distinct body

parts into a unified awareness of the body, whereas equivalent passive stimulation produced local and fragmented proprioceptive awareness. The experience of one’s body as a unified and continuous entity across space and time may be an important component of the sense of agency (Tsakiris et al., 2005).

CHALLENGES AND FUTURE DIRECTIONS: RESPONSIBILITY FOR ACTION

Society requires that individuals are responsible for their actions and the consequences of those actions. The subjective experience of agency generally tells us when we are responsible and when we are not. Therefore, an accused’s first-person *sense* of agency often simplifies the process of establishing the facts of agency: If I clearly know that I did it, then I should plead guilty and accept responsibility rather than evade it. Equally, I may know that I did not perform the relevant action. Therefore, the social practices surrounding responsibility are closely associated with the psychology of agency.

The sense of agency is relevant to social and legal responsibility in several ways. First, abnormal sense of agency may provide grounds for diminished responsibility. In particular, our concept of responsibility assumes conscious prediction of the effect of one’s own action and full voluntary control over the action at the time it is made. Thus, diminished responsibility is sometimes recognized in cases of sleep-walking assault. This implies that real-time conscious experience of performing an action is necessary for responsibility. Further, specific conscious prediction of consequences of one’s action is often held to increase responsibility (cf. premeditated actions vs. actions made “in the heat of the moment”). People are often held more responsible for direct and immediate effects of an actions than for effects that are only distantly, unspecifically, and unpredictably related to it (Lagnado & Channon, 2008).

Judgments of whether or not individuals should be held responsible for their actions involve one of several very different questions about the person’s mental processes—questions that touch on quite different areas of psychological theory. First, one might ask whether an individual was aware of making the action. This question addresses the individual’s sense of agency, and answering it depends on knowing about internal sensorimotor signals in the brain. Second, one might ask whether the individual could have, should have, or did predict the consequences of his or her action. This question addresses the predictive match between action and effect that underlies JoA, and the answer bears on general aspects of cognitive ability, such as associative learning and intelligence. Third, one might ask whether the individual understood that the consequence of the action was wrong. This addresses the individual’s moral judgment and relates to the theory of value rather than theory of agency. In the next decades, expanding knowledge about the psychological and neural bases of agency will become increasingly relevant to neuroethics and law.

Recommended Reading

Fotopoulou A., Tsakiris M., Haggard P., Vagopoulou A., Rudd A., & Kopelman M. (2008). (See References). An experimental demonstration that motor intention dominates over sensory information about the actual effects of movement in patients with anosognosia for hemiplegia, suggesting that effect monitoring is a specific cognitive function that normally provides the appropriate link between feelings of agency and explicit judgments of agency but that has been selectively compromised in these patients.

Haggard, P., Clark, S., & Kalogeras, J. (2002). (See References). Reports a novel effect of agency on the experience of time: Voluntary action causes a temporal attraction between the perception of an action and the perception of a subsequent sensory event, an effect that is absent when a physically similar passive movement is followed by the same sensory event.

Wegner, D.M. (2002). *The illusion of conscious will*. Cambridge, MA: MIT Press. An extensive psychological exposition of the view that our behavior is generated unconsciously but that the processes that generate it may produce an illusory experience of conscious control.

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REFERENCES

Botvinick, M., & Cohen, J. (1998). Rubber hands ‘feel’ touch that eyes see. *Nature*, 391, 756.

Farrer, C., Franck, N., Georgieff, N., Frith, C.D., Decety, J., & Jeannerod, M. (2003). Modulating the experience of agency: A positron emission tomography study. *Neuroimage*, 18, 324–333.

Fotopoulou, A., Tsakiris, M., Haggard, P., Vagopoulou, A., Rudd, A., & Kopelman, M. (2008). The role of motor intention in motor awareness: An experimental study on anosognosia for hemiplegia. *Brain*, 131, 3432–3442.

Frith, C.D., Blakemore, S.J., & Wolpert, D.M. (2000). Abnormalities in the awareness and control of action. *Philosophical Transactions of the Royal Society of London – B: Biological Sciences*, 355, 1771–1788.

Haggard, P. (2008). Human volition: Towards a neuroscience of will. *Nature Reviews Neuroscience*, 9, 934–946.

Haggard, P., Clark, S., & Kalogeras, J. (2002). Voluntary action and conscious awareness. *Nature Neuroscience*, 5, 382–385.

Lagnado, D.A., & Channon, S. (2008). Judgments of cause and blame: The effects of intentionality and foreseeability. *Cognition*, 108, 754–770.

Metcalfe, J., & Greene, M.J. (2007). Metacognition of agency. *Journal of Experimental Psychology – General*, 136, 184–199.

Sato, A., & Yasuda, A. (2005). Illusion of sense of self-agency: Discrepancy between the predicted and actual sensory consequences of actions modulates the sense of self-agency, but not the sense of self-ownership. *Cognition*, 94, 241–255.

Synofzik, M., Vosgerau, G., & Newen, A. (2008). Beyond the comparator model: A multifactorial two-step account of agency. *Consciousness and Cognition*, 17, 219–239.

Tsakiris, M., Haggard, P., Franck, N., Mainy, N., & Sirigu, A. (2005). A specific role for efferent information in self-recognition. *Cognition*, 96, 215–231.

Tsakiris, M., Prabhu, G., & Haggard, P. (2006). Having a body versus moving your body: How agency structures body-ownership. *Consciousness and Cognition*, 15, 423–432.

Wegner, D.M. (2003). The mind’s best trick: How we experience conscious will. *Trends in Cognitive Sciences*, 7, 65–69.

Wittgenstein, L. (1998). *Philosophical investigations*. Oxford: Basil Blackwell. (Original work published 1953)