

Commentary

Performance monitoring reconciles intentional reasons with neural causes

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<http://dx.doi.org/10.1080/17588928.2014.951616>

Abstract: Endorsing the conceptual clarity of Nachev and Hacker, we offer an alternative perspective on intention and action that focuses on consequences instead of the antecedents of action. We propose that given many-to-one mapping of brain states to body movements, the brain processes that monitor action consequences offer a reconciliation of intentional reasons with neural causes. This proposal offers an enriched compatibilist position providing useful leverage on questions of responsibility and culpability.

The problem of voluntary action concerns understanding how mental entities like reasons derive from, or at least relate to, processes in the brain. If all actions are really caused by neurons firing and muscles contracting, then how can there be any reasons for actions? If reasons are not causes, what can there be for reasons to do? An answer to this question requires a detailed understanding of how actions arise from brain processes, as reviewed by Nachev and Hacker. However, we propose that this perspective is incomplete because actions are distinguished from mere events by explanations in terms of reasons, goals, and purposes and not just causes. Defining body movements as intentional versus unintentional depends on context. Because actions are performed to achieve goals, purposeful

actions (winks) can be distinguished from mere events (blinks) by reference to an intelligible plan. Actions have *reasons* (“I did it for...”), but events just have *causes* (“It happened because...”). Thus, particular movements may be intentional under one description but not under another (e.g., winks versus blinks).

The sense of determinism that troubles many who worry about free will is one in which causal pathways in the brain necessarily produce muscle contractions that are not free, such as the reflex. However, humans and other complex animals have higher brain processes superimposed on reflex circuits that endow us with very flexible behavior, which produce the feeling of agency. In short, we do not experience a sense of agency over reflexes because they just happen, but we do experience ownership for other body movements because they are executed to accomplish a goal.

We claim that intentional reasons can be reconciled with neural causes because of many-to-one mapping of neural activity onto cognition and behavior. This claim is demonstrated by instances in which different body movements originate from a common brain state and other instances in which the same body movement originates from different brain states (e.g., Murthy, Ray, Shorter, Schall, & Thompson, 2009). If particular body movements can arise from different brain states, then the relationship of that body movement to an intentional explanation holds by and through the content of the representation of the intention, and not the neural realization of the movement (Juarrero, 1999).

Nachev and Hacker emphasize conceptual flaws in investigations of the antecedents of action. The perspective we offer embraces the fact that body movements identified as actions are caused by neural events. What is more crucial to us is that intended movements are owned (“I did”) while unintended movements are not (“It happened”). Agency is linked to the feeling of doing born from recognizing that one is acting in the world as desired. To be found guilty of a crime an action must both cause social harm (*actus reus*) and arise from an intention to cause the harm (*mens rea*).

Our claim is validated by research describing brain networks that monitor the correspondence between consequences and desired outcomes, such as the event-related potential known as *error-related negativity (ERN)*. Research has shown that the ERN arises most directly from the medial frontal cortex, separate from motor networks, causing body movements. The ERN relates to the detection, but not necessarily the correction of errors, and occurs if a correct action is performed but the consequences are different than expected. These and related findings are regarded as evidence for an executive control system that is engaged when the environment is ambiguous and presents competing demands, when alternative consequences are uncertain, when the mapping of a stimulus onto a response is complex, or when the action is contrary to habit making performance prone to errors (Gehring et al., 2012). In short, the executive control system influences sensory and motor processes to increase the likelihood of achieving desired outcomes.

The description of the executive system of the brain parallels the description of intentional action by providing a basis for the “feeling of doing” that accompanies intentional action. The magnitude and state of activation of this self-monitoring system may offer a useful basis of distinguishing intentional actions from unintentional movements. In other words, we propose that activation in the medial frontal lobe is critical for distinguishing “I did” from “it happened.”

Social customs and the law are based on the premise that humans are agents who can make rational decisions, control their actions based on predictions of consequences, and be held responsible for their actions. Autonomous agents, biological or artificial, must forecast the future, plan ahead, and represent goals—they must have intentions. The evolution of the ability to represent goals, i.e., reasons for movements, is just what allows us to recognize actions in an environment otherwise free of reasons. With reasons come credit and blame, which, after all, is why we care about free will.

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