describe these sensations as coming from muscles or joints, it has never been demonstrated experimentally that sensory activity initiated in the periphery is the origin of their sensory experience. Second, tics are not key to survival. It is an important aspect of the pathology in Tourette syndrome that patients experience such distress in relation to actions that are not only nonessential but also nonproductive. We do not yet understand when or how this association is made. Third, following the tic, the bothersome sensation is not eliminated, but only reduced in intensity. Finally it is not clear why tics must be performed in a particular way in order to achieve relief and diminishment of the bothersome sensations. Continued research into the circuitry that mediates both normal and pathological urges, as described by Jackson et al., will help our understanding and treatment of Tourette syndrome and other impulse-control disorders.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Interoception-related urges</th>
<th>Tic-related urges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory input from bodily organs</td>
<td>✅</td>
<td>?</td>
</tr>
<tr>
<td>Sensation reaches awareness when</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Action delayed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensation is uncomfortable</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Experience urgency and need to take action</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Action can be suppressed (second-minute), and then must occur</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Relief from discomfort with action taken</td>
<td>✅</td>
<td>±</td>
</tr>
<tr>
<td>Action is necessary to organism survival</td>
<td>✅</td>
<td>X</td>
</tr>
</tbody>
</table>

* * *

The role of consciousness in the urge-for-action

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Abstract: A neuroanatomical model of urge-for-action phenomena has been proposed based on the “motivation-for-action” network (e.g., insula and mid-cingulate cortex). Notwithstanding the sound evidence presented regarding the functional and anatomical correlates of this model, the nature of the relationship between urges and conscious awareness remains to be addressed. Moreover, this model does not seem to explain (1) how a conscious access threshold is reached, and (2) the way in which the urges are related to more general contents of consciousness.

Jackson et al. have proposed a novel model of urge-for-action. This model considers the nature and functional anatomy of urge-for-action in the context of normal life and clinical disorders. Through a meta-analysis, the authors show that there is an overlap between limbic sensory and motor neural circuits related to urges of everyday behaviors such as swallowing and tics in Tourette syndrome. The primary merit of this work is unquestionable; the authors propose an empirical and theoretical model of urge-for-action incorporating actions that do not necessarily require conscious awareness of the sensory stimulation that triggered them. Nevertheless, there are important issues that this model does not explicitly incorporate.

First, it is not clear how urge-for-action, as defined in this paper, can be a fully unconscious phenomenon. If the momentary inhibition of the action is an integral part of the definition of these urges, then that inhibition should be unconscious as well. In this paper, we find a lack of evidence on this topic, perhaps reflecting more than a mere lack of interest on this matter. Having searched the literature on unconscious inhibition of action, we found several instances in which willed intention is involved (e.g., go/no go tests in Eimer & Schlaghecken, 2002, and van Gaal, Ridderinkhof, van den Wildenberg, & Lamme, 2009). It is hard to imagine a fully unconscious inhibition of the kinds of actions considered to be representative of urge-for-action (coughing, swallowing, yawning, etc.). As long as that inhibition plays an important role in this process, we should be consciously aware of our urge-for-action as opposed to our reflexes.

The second issue concerns the nature of the relationship between urges and conscious awareness. Jackson et al. explained that the intensity of physiological afferent stimulation relates directly to the awareness of the urge’s strength during a phenomenon such as
swallowing, but it is not clear how this phenomenon could be explained by their proposed model.

Despite the straightforward relationship between insular cortex and interoceptive conscious awareness (e.g., Ibáñez, Gleichgerrcht, & Manes, 2010), this fact is not explicitly taken into account in terms of the neuronal activity of the cortical and subcortical regions considered in this model. More importantly, even if we consider that urge-for-action could be an unconscious phenomenon, it remains unclear how this model could explain the transition between urges the subject is not conscious of and those of which the subject is consciously aware. Along these lines, is it the strength of activation of the right insular cortex, the anterior cingulated cortex (ACC), or the circuit between these regions that is responsible for setting the threshold between unconscious and conscious awareness of urges? This point is far from being addressed in Jackson et al.’s model.

Finally, how could the urge-for-action model of Jackson et al. be integrated with more general models of consciousness? Current models have determined the activation of widespread cortical regions during goal-directed visual awareness (e.g., Dehaene et al., 2001) and have specified some neuronal markers for reaching the threshold of conscious perception (e.g., Del Cul, Baillet, & Dehaene, 2007). How does this urge-for-action circuit interact with more general circuits of conscious perception? Interoceptive awareness is conceptualized as the capacity of being aware of some specific content of consciousness; that is, of visceral perception (Ibáñez et al., 2010). Therefore, the authors should clarify the way in which interoceptive awareness might be related to other contents of consciousness, such as goal-directed cortical circuits underlying more general conscious perception phenomena.

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**Urges, inhibition, and voluntary action**

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**Abstract:** It is constitutive of the notion of an urge that it must precede the action it urges. For the duration of an urge to be non-zero, some process must keep the action being urged in check. Urges therefore inevitably involve inhibition of action, and perhaps conflict between action and inaction. In any event, they cannot form a critical part of the phenomenology that many argue must precede voluntary action, for if they play any part at all, it is only in situations where the action is to some degree inhibited.

The notion of “urge” has come to play a pivotal role in current conceptions of voluntary action. Curiously, it has done so without detailed exploration of the kinds of actions— involuntary or atypically voluntary—where the need to invoke it is arguably much greater, and where an understanding of its neural basis is far more plausibly within reach. And when one analyzes such actions—as Jackson and his colleagues lucidly and comprehensively do—the notion of urge that emerges is radically at odds with one that gives it a critical role in voluntary action. This is just as important a conclusion as the independent clarification of the neural substrate of urges itself.

It is surely right that urges must be dissociated from the sensations that in some cases prompt them. The urge to yawn, for example, is not plausibly any kind of sensation: One can only describe it with reference to the action it compels. What is minimally constitutive of the notion of an urge is that it is an urge to do something: it is both transitive and directed at a specific action. It is also true, as Jackson and his colleagues point out, that an urge must temporally precede the action: If it post-cedes it, we would not call it an urge, and if it parallels it in time, then it could not be an urge to perform the action because the action is already being performed. But the implication goes further. Since the urge is to perform the action, the necessary interval between it and the action during which the urge is experienced must involve inhibition of the action, for otherwise the action would be performed immediately. Inhibition is therefore an inevitable consequence of the notion of an urge.

Indeed, it is striking that the actions commonly associated with urges—both in the normal and in the pathological state—are usually of the kind that cannot be actively chosen but only withheld. One cannot actively choose to yawn or sneeze, and if one coughs or voids one’s bladder voluntarily one tends to do so pre-emptively of the normal action. To the extent to which we have control over such actions, it is to keep
action, and when we become aware of the impending action, we are able to prevent it from being released by effort of will. Effectively, this seems to be saying that stimulus–response associations exist that can give rise to actions. Consistent with this idea, the authors point out that some actions that can be associated with urges on one occasion (e.g., yawning) can, on another occasion, emerge without the sensation of an urge. The rule seems to be that if the stimulus or impending action is perceived before the action occurs, and if the action is subsequently withheld, then we experience an urge to act (unless the stimulus disappears). We can feel an itch or a “desire” to scratch and we can decide to withhold the scratch; if the itch persists, then we may develop an urge to scratch. Paradoxically, an urge to act turns out to be an intention to suppress. The action itself is triggered by some other factor in an automatic fashion.

This seems to be a very simple and reasonable interpretation that involves two interacting processes: the basic stimulus–response coupling and a supervisory system with a power to withhold the response. However, the authors then seem to pursue quite a different interpretation about halfway through the article. The turning point comes after the analysis of the first set of imaging data. Here they find common activation in anterior insula and caudal cingulate cortex during yawning and micturition. They then say that activity in these common areas is responsible for the urge to act and then causes the action, as illustrated in Figure 9. At this stage, we have lost the low-level stimulus–response coupling and all mention of inhibition. We are now told that inputs to the anterior insula produce an urge to act (not to suppress a prepotent action). This constitutes a feeling that we have to make a particular movement, which is then achieved via activation of caudal cingulate cortex.

We accept that it is difficult to decide which of these interpretations is true. What strikes us as odd is that the authors begin by emphasizing the importance of inhibition, yet end by talking about motivation to act. Would it not be simpler to suppose that stimulus–response associations exist at all levels of the sensorimotor system from spinal reflexes to striatal habits. These are all to a greater or lesser extent modifiable by a supervisory system we may equate with volitional control. An urge to act is an expression of the interaction between these systems, not a separate system itself.

References from the Commentaries


