Is there a purely biological core to pain experience?

Mark D. Sullivan\textsuperscript{a}, Stuart W. Derbyshire\textsuperscript{b}

Davies et al.\textsuperscript{2} challenge the notion that brain imaging may ultimately replace self-report as a more reliable and objective measure of pain.\textsuperscript{11,12} We agree that pain is fundamentally subjective with self-report providing the most complete and reliable access to another's pain.\textsuperscript{a} We share the authors' concern that the more ambitious expectations for brain imaging will have negative clinical, legal, and social consequences. Because we agree with these points, we will focus on our differences.

Davies et al. argue that brain imaging approaches to pain have failed to account for the fundamental core of pain, which they call "ouch." Ouch is produced by a biological on/off switch that allows or blocks "the core of the pain experience." Thus, ouch is most easily understood as the experience and expression that accompanies reflex withdrawal in response to a noxious stimulus. This is raw, immediate, and not yet elaborated as the more complex experience of pain. This idea of ouch recalls the debate about the minimal necessary neurological apparatus for pain experience and whether aversive behaviors in those without a fully developed cortex can be interpreted as "pain."\textsuperscript{1,5} Ouch might bridge the distance between an experience of nothing and an experience of pain, with ouch being dependent on activity in subcortical rather than cortical circuits.

The exact nature of ouch and the neurological switch that triggers it remain ambiguous. In their first sentence, Davies et al.\textsuperscript{2} claim that ouch is a "fundamental expression of pain," which implies that ouch is a pain behavior. In their second paragraph, they claim that ouch is "the feeling that something hurts," which implies that ouch is an experience. They also argue that ouch is separate from the classic 3 dimensions of the pain experience proposed by Melzack and Casey: sensory-discriminative, cognitive-evaluative, and motivational-affective. This implies that ouch is not a sensory quality, nor a cognitive evaluation, nor a motivational state, which leaves ouch as not much at all. It seems unlikely that such an empty experience will provide insight into clinical pain and chronic pain, which are both characterized by a rich and complex subjectivity.

As an aversive expression, ouch must involve the motor system. Aversion is not a sensory quality in the sense that it is not a representation of something out in the world. It is the drive to withdraw and protect. It is more a motor than sensory phenomenon. As an expression of aversion prompting withdrawal and care seeking, the ouch provides a public and adaptive aspect to pain and thus provides survival value.\textsuperscript{10} The neural system necessary for ouch might be considered an evolved "switch" that must be on for pain to be possible. People who do not develop peripheral nociceptors or have abnormal ion channels, or who have damage in specific insula and parietal regions, never experience pain from injury. Such individuals may lack the ouch switch and typically suffer terrible injuries and premature death.\textsuperscript{3}

Activation of the ouch switch, however, does not guarantee pain experience. Research from Davis's own laboratory demonstrates that our minds spontaneously wander from pain to other salient phenomena. "Despite the intrinsic salience of pain, dynamic communication of pain-related and attention-related brain networks enables us to spontaneously ‘tune’ pain in and out."\textsuperscript{13} Understanding pain in terms of the all-or-nothing reflex ouch does not provide for this variable salience of pain. It is to our great advantage to experience pain consciously such that we can quality pain's intrinsic salience in terms of the myriad of other experiences and actions that are salient to our survival and thriving. As a conscious sensorimotor percept, pain can be synthesized with and modulated by many other considerations relevant to the survival and thriving of the organism.\textsuperscript{6}

Understanding ouch as an aversive behavior enables it to be easily tied to an evolutionary guided neural switch, but does not easily tie it to pain subjectivity. Davies et al.\textsuperscript{2} seemingly resolve this by allowing ouch some fundamental experiential content, the feeling "that something hurts." However, if ouch is allowed, even the most minimal of experiential content, then it becomes a subjective experience with all complexities of subjective experience. Even minimal experiences are experienced as parts of ongoing experience, as being of a certain kind, and as carrying a certain meaning. A person in pain accesses and feels their pain through a language and conceptual apparatus, which is borrowed from others and is negotiable according to conventions that exist beyond the individual and his or her neurons.

Consequently, it seems that finding a neurological switch associated with ouch may meet with the same problems of trying to locate the subjectivity of pain in neural tissue. The effort to locate pain in neural tissue is problematic because pain is both biological and social.\textsuperscript{8} It is biological because there seems to be a minimally necessary nervous system for pain to be possible. It is social because the threat posed by noxious stimuli is modulated by the presence of others who may or may not offer assistance and understanding. Because pain is expressed, it has a public face, which allows it to be shaped by social forces relevant to our safety and happiness. Thus, pain ceases to be entirely private, expressed in an unknowable biological code, and becomes subjective and social. Even the responses of infants to immunization are modified by maternal response.\textsuperscript{7} If the pure ouch is not apparent in this simplest of clinical pain situations, we doubt it will be clinically helpful in more complicated clinical and chronic pain situations.

Davies et al. suggest that "ouch" might be simpler than pain. However, if "ouch" is stripped of all subjective content, then it remains difficult to connect with pain. If "ouch" has subjective content, then it will have a shared, social component. Trying to find
that social component in neural tissue is like looking for wisdom in
the words of a book. Words and books might convey wisdom, but
it is a mistake to think that the very printed word contains wisdom.
Wisdom, like pain, needs a subject to experience and express it.

Conflict of interest statement
M. D. Sullivan has received grant support from the Opioid REMS
Program Companies and served as a consultant for Janssen and
Relievant. The other author has no conflicts of interest to declare.
Both authors have contributed equally to this manuscript.

Article history:
Received 25 August 2015
Accepted 1 September 2015
Available online 8 September 2015

References
2015;38:86–95.
consciousness in the nervous system: an action-based synthesis. Behav
Brain Sci In press. doi: http://dx.doi.org/10.1017/S0140525X15000643.
maternal and behavioral measures of infant pain: the relative contribution
17:146–56.
[9] Sullivan MD, Cahana A, Derbyshire SWG, Loeser JD. What does it mean
[10] Sullivan MJ. Toward a biopsychomotor conceptualization of pain:
[11] Tracey I, Bushnell MC. How neuroimaging studies have challenged us to
based neurologic signature of physical pain. N Engl J Med 2013;368:
1388–97.