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Commentary

Pain while you are out of your body – A new approach to pain relief? Commentary on a paper by Hänsel et al. (2011)

Lorimer Moseley

Sansom Institute for Health Research, University of South Australia, Adelaide, Australia

A great deal of attention has been given lately to illusions of body ownership. Experiments that involve the illusory ownership over an artificial body (Blanke et al., 2002), arm (Botvinick and Cohen, 1998) or finger (Walsh et al., 2011) have revealed much about the physiological underpinnings of these illusions, including which brain areas are involved (see Tsakiris, 2010 for review). Bodily illusions occur in a range of clinical conditions, including, but not limited to, chronic pain (Moseley et al., 2008b). For example, people with complex regional pain syndrome of one arm can perceive that their affected arm is bigger than it really is (Moseley, 2005; Lewis et al., 2007), and people with back pain can feel that their back is 'missing' (Moseley, 2008a). Indeed, the large body of literature in this area has led to a proposal that a network of homeostatic and multisensory brain areas form a 'cortical body matrix' – a dynamic neural representation that integrates sensory data, from across several frames of reference, with physiological regulation of the body, and which subserves our sense of where and who, physically, we are (Moseley et al., 2011). Relevant to this is a recent paper by Hänsel et al. (2011), published in this issue, in which they investigate, in healthy volunteers, pressure pain thresholds during an out of body illusion.

Hänsel et al. assessed pressure pain threshold on the index finger under four different conditions. The experimental condition involved an established method to induce an out of body experience. By synchronous stroking on the back of both the mannequin and the participant while the participant watches a rearview of the mannequin through a head mounted display, the participant quickly feels as though they can actually sense the stroking on the mannequin and therefore, they are standing outside of themselves (Lenggenhager et al., 2007). This method of inducing the illusion can be considered a third person approach, whereas others use a first person approach by tapping the mannequin and the participant on the chest, within the first-person field of view (Ehrsson, 2007). In the Hänsel et al. experiment, there were three control conditions – asynchronous stroking of the mannequin and the participant (which does not induce the illusion) and two identical conditions but with a panel or 'object' instead of a mannequin.

The authors predicted that pressure pain thresholds would be higher during the illusion, or synchronous stroking condition, than they were during the other conditions. That is, they predicted that the illusion would have an analgesic effect. I suspect that, with more participants, the difference between the two mannequin conditions might have reached significance – the *p* value is reasonably close (0.14) – and there was a moderate correlation between the difference in an individual's pressure pain thresholds and illusion vividness scores. Notably, however, this study does not show an analgesic effect of the out of body illusion. What if it had? Could we then conclude, as the authors suggest, that identifying with the mannequin rather than the object, explains the result? Perhaps, but I don't think all other possibilities have been excluded. Simply viewing a body reduces experimental pain (Longo et al., 2009) – perhaps pressure pain thresholds would have been higher for the mannequin condition than the object condition, without any stroking at all. Alternatively, one might suggest that the analgesia resulted from the engaging effect of an out of body illusion. Could the participants just be more distracted with a more vivid illusion? Could there be a stronger draw on spatial attentional resources – toward the mannequin and away from the index finger?

What if the noxious stimulus was delivered in a manner that was coherent with the illusion? That is, what if the participant saw that the mannequin received a synchronous and collocated noxious stimulus? This might control for the spatial characteristics of the stimulus. It is reasonable to suggest, however, that there might be a stronger analgesic effect if the painful stimulus was delivered to the participant and the mannequin, because a noxious stimulus occurring 'over there' might be evaluated as less dangerous than one occurring 'here'. That noxious stimuli can be used to induce the rubber hand illusion (Capelari et al., 2009) would suggest against this possibility, but it seems worthy of investigation. This is especially true in light of recent evidence that relatively simple manipulations of multisensory cortical representation, for example by crossing the arms (Gallace et al., in press), by self-touch (Kammers et al., 2010) or by distorting visual appearance of the painful body part (Moseley et al., 2008c; Mancini et al., 2011; Preston and Newport, 2011) can have an analgesic effect. Indeed, as Hänsel et al. point out, findings such as theirs are spurning a new direction in pain research, whereby manipulations of multisensory and high-order cortical representations are being targeted as potential sources of analgesia. These are, of course, early days, but by applying established experimental paradigms, such as the rubber hand illusion or the out of body illusion, and robust experimental controls, it seems more than possible that we might discover new, inexpensive and very low risk methods of relieving pain. Time will tell.

E-mail address: lorimer.moseley@gmail.com

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