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Comment

## The difference between emotion and affect Comment on “The quartet theory of human emotions: An integrative and neurofunctional model” by S. Koelsch et al.

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Koelsch and colleagues have produced a fascinating model that convincingly argues for the existence of four neuroanatomically distinct systems involved in our emotions. As I understood it, the claim was that these systems build upon each other, each one introducing a new sophistication that allows a distinct class of emotional states to emerge. For instance, the hippocampus enables the generation of emotions related to long-term attachment as opposed to simple reward and punishment [1, Section 2.3.2]. However, it was uncertain why we should stop at four affect systems. Many different brain structures contribute an additional sophistication to emotional function; could there not be a class of emotions associated with each of these sophistications? How distinctive does the new function, or the new class of emotions have to be to qualify? Should we be on the lookout for neural structures associated with meta-emotions [2] or epistemic emotions [3] as well?

Meanwhile, it seems to me that the authors have not presented a theory of emotions so much as a more comprehensive theory of affect. This is because their model does not just cover standard emotions such as joy or sadness, but also covers pain and pleasure, motivational states and background arousal. These are not states that are normally covered by the term ‘emotion’ as it appears in everyday linguistic practice. This point is highlighted when the authors criticize Scherer’s model, which defines emotions as a set of changes that occur in response “to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism” [4]. The authors say that this definition fails to incorporate phasic responses, which can generate variations in subjective feelings such as ‘feeling energized’ or ‘feeling fit’ [1, Section 2.5]. However, my impression is that the two models simply have different aims. Scherer’s model aims to differentiate emotions from the wider affective life of the organism, whereas Koelsch et al. seek a model that encompasses an organism’s wider affective life. Scherer could agree that emotions can incorporate, or be influenced by phasic affects while still demanding that a stimulus appraised in relation to a concern is necessary for an emotion properly so called.

In fact even Scherer’s model is too broad to mark off emotions from motivational states like hunger. Rather, I suggest that a principled distinction between emotions and other sorts of affect requires that we recognize the additional context sensitivity of emotions. That is; emotions track the status of the organism’s concerns with respect to the wider

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temporal, modal or social context. For instance, sadness concerns a harm that has occurred in the past, where fear concerns a harm coming up in the future. In gratitude we appreciate how things might have gone badly, whereas in regret we discern how things might have gone much better. Finally, social emotions like sympathy and jealousy relate our concerns to the affective states of other people. Note that surprise counts as contextually sensitive as well, since surprise relies on the individual having expectations about the future that are violated. In contrast, states like pain, pleasure, hunger, nausea and tiredness do not require such contextual sensitivity. This is not to deny that we can't place these feelings in context, for instance, by noting the way one's hunger is gradually increasing as time passes. The point is that such sensitivity is not required for these states to perform their distinctive functions. There will simply come a point when the intensity of hunger overrides other motivational states and drives the organism to search for food.

Given these ideas, it seemed to be only when the authors introduced the hippocampus and OFC-centred structures did we have systems with sufficient complexity to generate emotional states. I was particularly interested to see the authors identify the orbitofrontal-centred affect system as not only sensitive to norms, but also to the generation of expectations. A possible response to this view is to argue that emotions such as fear, surprise and disgust may be achieved entirely without the OFC and the hippocampus. I'd be interested to learn whether or not this indicated that such states could be generated without the influence of expectations. Yet even if states that looked like fear, surprise or disgust could be generated by such systems without the influence of expectations, it is possible that such states should only be classed as simple aversions rather than emotions. That is, avoidance responses triggered by the immediate presence of stimuli such as the visual cues of a predator, loud noises or bitter tastes need not be equivalent to the emotions of fear, surprise and disgust as standardly experienced by humans. This risks descending into a mere semantic debate, but what ultimately matters about distinctions is whether they allow us to usefully organize our observations. I submit that context sensitivity is indeed a useful distinction that marks off a class of affects corresponding to the ordinary linguistic class of emotions.

One final point. The authors are interested in identifying some area of the brain where feedback from the various effector and affect systems comes together. They suggest that the secondary somatosensory cortex may be responsible [1, Section 3.2]. But why does there have to be *any* site at which the feeling information all comes together? Why can't the overall experience of an emotion simply be distributed across the brain? Is there perhaps a temptation to identify a 'Cartesian theatre' – a location in the brain at which affective consciousness will be found [5]? A stronger motivation is required than this. In particular, there only needs to be a point in the brain where it all comes together if the organism needs to collate all this information for the sake of some further function. For instance, perhaps a coordinated sense of emotional feeling is needed to conceptually identify an emotion, or to imaginatively simulate an emotion. But such functions may potentially be achieved without a representation of the entire emotional feeling (conceptualization is bound to strip away some details). At any rate, I would recommend the search for such a unified zone for feeling to concentrate on its connection with the realization of such additional functions.

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