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Comment

Bridges from affect to language
Comment on "The quartet theory of human emotions: An integrative and neurofunctional model" by S. Koelsch et al.

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The comprehensive Quartet Theory of Human Emotions proposed by Koelsch et al. [4] offers an exceptional synopsis regarding major developments in affective neuroscience, encompassing classical data based on animal studies as well as emotions generally classified as uniquely human. In doing so, it becomes apparent that while general anatomical grounds appear well covered mainly based on animal studies, neuroanatomical underpinnings of interactions between emotion and language may not be readily understood.

An important insight accounting for this matter is advanced by Pessoa [3], who suggests high levels of functional integration of networks of brain areas forming the basis of complex cognitive–emotional behaviors such as language. With a clear functional segregation of brain areas becoming less likely with increasing distance from sensory input, dynamic coalitions of networks of brain areas exhibit high degrees of connectivity, thus integrating the flow of information across distant neuroanatomical areas of different domains while preserving the general hierarchical architecture found throughout lower processing states [3].

To start out with feeling states, Damasio and Carvalho [2] offer an excellent illustration of how a high degree of functional integration constitutes a necessary precondition for their emergence, making clearcut localizations of particular functions difficult. They suggest rerepresentations of simpler, phylogenetically older neural body maps originating largely from brain stem areas (as have been outlined by Koelsch et al.) via projections into continuously higher, phylogenetically younger cortical tissue. This idea of grounding complex feeling states into basic, necessarily valenced deviations from essential homeostatic states is mirrored e.g. in Rolls' [5] approach, conceptualizing emotion as evolutions solution to flexibly setting goals for the organism that ultimately serve survival. Simple forms of communication of feeling states may already originate from brain stem areas and are thus to be found in phylogenetically older species as well. However, human language does not merely serve the expression of emotion but can rather be understood as evolutionary advancement of simpler forms of action selection and action planning towards highly abstract representations based on the use of symbolic code, though still following higher order goals. Accordingly, emotion constitutes a hub between sensory input and action, thus serving the same goals as the cognitive system

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in terms of action selection according to their adaptive value. Yet, as Rolls [5] suggests, McLean's reptilian brain is already equipped with a fully functioning action system, the Basal Ganglia. These may not simply be described as a reward center, but may become active in a state of processing after reinforcement associations have been learned, hence primarily initiating behavioral responses, in mammals via projections into premotor cortex and further processing. In much the same way as such implicit, stereotypical behavioral responses are based on input from the orbitofrontal cortex, this same area also projects into language cortex via outputs of the amygdala. Consequently, the received input serves goal setting and ultimately initiates action selection and action planning systems that in humans may culminate in language-related functions such as thought or speech.

A similar route may as well form the basis for the regulation of emotion based on appraisal. While processing of reinforcement value in orbitofrontal cortex may not be propositionally available, Bohrn et al. [1] could demonstrate that even highly abstract linguistic material such as proverbs activates the orbitofrontal cortex when learning of changed affective meaning is required in analogy to a reversal-learning task. This indicates that representation of affective content of linguistic material demands access to lower affect systems, thus extending functions of the orbitofrontal cortex beyond automatic cognitive appraisal. Therefore, in the same way as Damasio describes the emergence of feeling states, apparently even affective meaning of complex verbal material is grounded on phylogenetically older levels of the brain, however requiring high levels of functional integration across distant brain regions. Clearly, the investigation of high levels of functional integration may require more invasive methods as they are currently only applicable in animal studies. However, methodological developments regarding the implementation of measures of connectivity offer an encouraging outlook on the progress of human affective neuroscience.

References

[1] Bohrn IC, Altmann U, Lubrich O, Menninghaus W, Jacobs AM. Old proverbs in new skins—an fMRI study on defamiliarization. Front Psychol 2012:3. http://dx.doi.org/10.3389/fpsyg.2012.00204.

[2] Damasio A, Carvalho GB. The nature of feelings: evolutionary and neurobiological origins. Nat Rev Neurosci 2013;14(2):143–52. http://dx.doi.org/10.1038/nrn3403.

[3] Pessoa L. On the relationship between emotion and cognition. Nat Rev Neurosci 2008;9(2):148–58. http://dx.doi.org/10.1038/nrn2317.

[4] Koelsch S, Jacobs AM, Menninghaus W, Liebal K, Klann-Delius G, von Scheve C, et al. The quartet theory of human emotions: an integrative and neurofunctional model. Phys Life Rev 2015;13:1–27 [in this issue].

[5] Rolls ET. Emotion explained, vol. 22. Oxford: Oxford University Press; 2005.