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Comment

Regulating with imagery and the complexity of basic emotions Comment on "The quartet theory of human emotions: An integrative and neurofunctional model" by S. Koelsch et al.

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Literature, music and the arts have long attested to the complexity of human emotions. Hitherto, psychological and biological theories of emotions have largely neglected this rich heritage. In their review Koelsch and colleagues [1] have embarked upon the pioneering endeavour of integrating the diverse perspectives in emotion research. Noting that the focus of prior neurobiological theories relies mainly on animal studies, the authors sought to complement this body of research with a model of complex ("moral") emotions in humans (henceforth: complex emotions). According to this novel framework, there are four main interacting affective centres in the brain. Each centre is associated with a dominant affective function, such as ascending activation (brainstem), pain/pleasure (diencephalon), attachment-related affects (hippocampus) or moral emotions and unconscious cognitive appraisal (orbitofrontal cortex). Furthermore, language is ascribed a key role in (a) the communication of subjective feeling (reconfiguration) and (b) in the conscious regulation of emotions (by means of logic and rational thought).

Our comment is concerned with two central features of this model: language and complex emotions. With the notion of reconfiguration of the emotion percept (a) the authors aptly connect modern neurobiological theory with philosophical debate of the early 20th century (eloquently captured in a quotation by Maeterlinck[1]). As for the latter proposal (b), we agree that the role of language in emotion regulation should be highlighted [2–4], but it should also be emphasized that emotion regulation is not based exclusively on linguistic processes. Importantly, an emerging body of research suggests that mental imagery is also employed in emotional control [5–7]. Close scrutiny of emotion regulation in pre-linguistic infants might lend additional support to this idea. Evidently aware, but lacking in linguistic

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[1] Dès que nous exprimons quelque chose, nous le diminuons étrangement. Nous croyons avoir plongé jusqu'au fond des abîmes et quand nous remontons à la surface, la goutte d'eau qui scintille au bout de nos doigts pâles ne ressemble plus à la mer d'où elle sort. Nous croyons avoir découvert une grotte aux trésors merveilleux; et quand nous revenons au jour, nous n'avons emporté que des pierreries fausses et des morceaux de verre; et cependant le trésor brille invariablement dans les ténebrès [18].

[How strangely do we diminish a thing as soon as we try to express it in words! We believe we have dived down to the most unfathomable depths, and when we reappear on the surface, the drop of water that glistens on our trembling finger-tips no longer resembles the sea from which it came. We believe we have discovered a grotto that is stored with bewildering treasure; we come back to the light of day, and the gems we have brought are false—mere pieces of glass—and yet does the treasure shine on, unceasingly, in the darkness!] [19].

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skills, pre-linguistic infants might engage in a conscious, but non-linguistic means of emotion regulation before their regulatory function begins to interact with language at a later stage [2,3,8]. Research exploring this issue further could also illuminate emotion regulation processes in adults. Indeed, the use of mental imagery in emotion regulation is very compatible with the quartet theory of human emotion [1] in that emotion regulation based on mental imagery could be viewed as a pre-reconfiguration mode, i.e. a conscious "visual" processing level of subjective feelings prior to the linguistic reconfiguration stage. Thus, mental imagery might similarly 'modulate, regulate, and partly initiate, activity of [all four] affect systems' (p. 34) [1].

Complex emotions form a second vital pillar of Koelsch et al.'s [1] model. These are distinguished from "more basic" emotions (e.g. anger or fear; henceforth: basic emotions) that are featured prominently in animal models of emotion [9,10]. Such basic emotions have, however, been ascribed a clear moral function in some studies [11–13], with anger also having been proposed as an aesthetic emotion [14,15]. Similarly, music-evoked emotions, which the authors discuss in the context of complex emotions, are generally considered aesthetic emotions, too [16,17]. Overall then, this evidence shows that for certain contexts some basic emotions (or at least some of their facets) merit being considered as complex emotions. Koelsch and co-researchers [1] have already pointed out different types of disgust (e.g. moral disgust). We feel the model might benefit from shedding additional light at the complexity of basic emotions, which could easily be integrated in future versions.

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