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The Fluency Amplification Model supports the GANE principle of arousal enhancement

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Abstract: The GANE (glutamate amplifies noradrenergic effects) model described by Mather et al. offers a neurophysiological basis for the arousal mechanism which is essential for empirical aesthetics and Gestalt processing. More generally, the core principle of perception can be interpreted as a continuous processing of competing arousal states, yielding selective amplification and inhibition of percepts to deduce the meaning of a scene.

The *GANE (glutamate amplifies noradrenergic effects) principle* described by Mather et al. offers a thorough modeling of how arousal-induced norepinephrine modulates the dynamics of information processing. Processing is directed toward high-priority, that is, salient, stimuli, leading to stronger effects on the perception and memory of these stimuli (amplification), whereas the processing of low-priority stimuli is impaired. The recently established *fluency amplification model* (FAM) (Albrecht & Carbon 2014) originating from the domain of perceptual and affective sciences builds on a very compatible mechanism. (Cognitive) fluency refers to the experienced ease with which information is processed, mostly operationalized by processing speed or ease of response generation. Typically, theories on fluency assume that the more fluently a stimulus is processed, the higher is the appreciation of this stimulus. In contrast, FAM interprets fluency in terms of saliency: Fluently processed stimuli are more unambiguous and clearer—they are better representatives of their category. As such, the more fluent the processing of a stimulus the stronger is the signal and, thus, the higher is the saliency regarding the stimulus. In the FAM we propose that this leads to an amplification of the original judgments assigned to the stimulus. For instance, the assessment of the valence of a fluent stimulus will be an amplified version of the initial stimulus valence: Positive stimuli will be valued even more, and negative stimuli will be devalued in a more intense way when being processed fluently. This was exactly what we were able to experimentally confirm for stimuli with positive versus negative valence (Albrecht & Carbon 2014). Meanwhile, the emotional assessments of stimuli with minimal saliency, in our case stimuli of undetermined valence, were not altered by fluency. Taken together, these results indicate that the saliency of a stimulus, defined as the deviation from the neutral information regarding the target scale, operates as an amplification factor for the base signal, here, the emotional value of the stimulus.

Beyond FAM, the concept of arousal can also be seen as one essential mechanism underlying amplification effects regarding judgment in general (see, e.g., Storbeck & Clore 2008). The GANE principle offers a plausible neurophysiological basis for a mostly very vaguely defined arousal mechanism that is often used in theories of cognitive sciences. For instance, arousal is purported to play an important role in the specific effects of empirical aesthetics (e.g., the misattribution of an internal state—due to unspecified arousal—toward the preference of an object). Arousal is even more influential in the general field of object recognition, where it is assumed to be the key to pooling cognitive resources to increase the probability of solving a perceptual problem, detecting a Gestalt, or recognizing an object. Muth et al. (2015) recently proposed a model explaining the connection between insights (so-called "aesthetic aha," which goes along with a sudden rise in fluency [Muth & Carbon 2013]) and preference formation. Aesthetic stimuli are often complex at first sight and difficult to process, so saying they are disfluent in he beginning. Such disfluency indicates the complexity of the perceptual problem, which, in return, signals something potentially meaningful and therefore evokes an orienting reaction plus a state of increased arousal. High arousal shifts attentional and cognitive resources toward the apparent source of complexity, giving rise to interest. Likewise, the GANE model proposes that top-down attention and perceptual features such as contrast and complexity prioritize the processing of certain stimuli over less salient ones. Further elaboration of the stimulus may indeed lead to a decrease in complexity of the visual scene (e.g., by detection of something meaningful or by clear identification of an object), which goes along with a sudden increase in fluency (Albrecht & Carbon 2014). At the same time, GANE proposes that the processing of salient information is amplified, whereas the processing of less salient information is inhibited. These processes finally result in an insight and the dissolving of arousal.

This, on the one hand, has a rewarding quality (see Van de Cruys & Wagemans 2011) independent of the initial stimulus quality: we call this sudden Gestalt-forming event an "aesthetic aha!" or "Gestalt aha!" (Muth et al. 2013); actually such an aha is also paralleled by higher liking of the Gestalt- versus the non-Gestalt-like display (Muth et al. 2013). This rewarding process points to an essential and very general mechanism of perception: to let people continuously seek meaning in visual displays. On the other hand, the rise in fluency facilitates faster and easier processing of the stimulus, resulting in a clearer representation of it, which allows for a more precise, amplified judgment in terms of the FAM. Within this scope the GANE model could help to complement the cognitively described mechanisms of Gestalt recognition by a psychophysiologic base. Even more generally, the core principle of perception can be interpreted by the GANE model as the intertwining process of selective amplification and inhibition to obtain the most clear interpretation of a given (e.g., visual) scene (Carbon 2014; Gregory 1970) and, thus, to enable the most appropriate action.

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