Behavioral and Brain Sciences

# Once more with feeling: On the explanatory limits of the GANE model, and the missing role of subjective experience.

--Manuscript Draft--

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| **Manuscript Number:** | |
| **Full Title:** | Once more with feeling: On the explanatory limits of the GANE model, and the missing role of subjective experience. |
| **Short Title:** | Once more with feeling |
| **Article Type:** | Commentary Article |
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| **Abstract:** | We applaud Mather, Clewett, Sakaki, and Harley's model that emphasizes the neurobiological pathways by which affective arousal tunes attention and memory. This commentary offers a friendly discussion of several potential limitations of the theory. We suggest the model is strong when predicting task driven demands, but is limited when predicting the impact of individual biases, interpretations, and experiential feelings. |

**Target Article Authors:** Mara Mather, David Clewett, Michiko Sakaki, and Carolyn W. Harley

**Commentary Word Count:** Abstract (59), Main Text (1000), References (218), Entire Text (1356)

# Once more with feeling:

# On the explanatory limits of the GANE model, and the missing role of subjective experience.

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**Abstract:**

We applaud Mather, Clewett, Sakaki, and Harley's model that emphasizes the neurobiological pathways by which affective arousal tunes attention and memory. This commentary offers a friendly discussion of several potential limitations of the theory. We suggest the model is strong when predicting task driven demands, but is limited when predicting the impact of individual biases, interpretations, and experiential feelings.

**Main Text:**

In their target article, Mather, Clewett, Sakaki, and Harley introduce an impressively broad neurobiological model of the role of affective arousal in directing attention and memory. Rather than discuss the many strengths of the GANE model, our commentary offers a friendly discussion of some limitations of the model and the missing role of subjective experience.

One concern is the predictive utility of the model. The model can account for a variety of effects, but fails making clear a priori predictions for attention and memory effects. One reason why it lacks predictive utility is the reliance on *salience*. The use of salience falls victim to a circular argument, because salience often depends on confirmation from the results (self-dependent justifications; Hahn, 2011). Such circularity hampers theory prediction because salience concedes vagueness as it becomes defined post-hoc or through task-demands. For instance, imagine that participants were asked to attend to a central fear face and ignore surrounding faces. One study used neutral faces as distractors and found better

attention/memory for fear faces, but another study used angry faces as distractors and found better attention/memory for angry faces. The vagueness of saliency allows for both studies to support the model (saliency determined by task demands and stimuli, respectively); yet, a naïve researcher would fail to make these distinct predictions with the GANE model. Thus, the model can account for various effects, but fails to make clear, deductive predictions (such circularity plagued the depth of processing approach, Craik & Lockhart, 1972).

The model also does not address predictions based on individual differences. If we compared memory for task-dependent salient stimuli (snakes) in the face of distractors (spiders), at a group level, people may show better memory for snakes than spiders. However, would this be true for each individual? Probably not. Spider-phobics may remember the spider rather than the snake. Therefore, can the model accurately predict when task-demands or individual biases will have a greater impact on attention/memory? Moreover, can this model be extended to predict attentional/memory biases linked with various mental health disorders (depression, anxiety, ADHD)?

Attention and memory are treated objectively in the model, but both are often susceptible to subjective experiences. False memory studies demonstrate such vulnerabilities (Loftus, 1975; Roediger & McDermott, 1995). For instance, people learning a list of words (bed, pillow, wake…) that are highly related to a single, non-presented word (sleep) often falsely recall the non-presented word *sleep*. Payne and colleagues (2002) stressed participants prior to a false memory task, and they found that false memories and cortisol levels were positively correlated.

Does the current model make such a prediction? Based on the review, one would predict a decrease in false memories because NE enhances the signal (presented words) and reduces the noise (non-presented words). But such a prediction would not be supported. Therefore, does the model only reduce noise for perceptually-based stimuli? Alternatively, how does the model explain subjective experiences (i.e., associative and conceptual processes) gaining saliency? Where would NE hot spots arise within the brain when false memory effects are present?

Finally, the GANE model is a neurobiological account of affective arousal. Not surprisingly, then, the model focuses exclusively on this component of arousal. We suggest that in doing so the model fails to consider the important role played by the subjective-experiential component of arousal and associated implicit attributions.

According to an affect-as-information approach, affective arousal serves as experiential information by signaling importance or urgency (Clore & Huntsinger, 2007; Storbeck & Clore, 2008). Any source of affective arousal can modulate judgment, attention and memory as long as it is implicitly attributed to or associated with an object of judgment, current attentional focus, or memory.

Research by Zillmann (Cantor, Zillmann & Bryant, 1974) demonstrates that cues of affective arousal are easily transferred or misattributed from one source to another. In this research participants experienced high arousal via exercise and were then shown an erotic film. Highly aroused participants rated the film more positively. However, this effect vanished when

participants' attention was called to the true source of their arousal. Although both groups experienced the same pattern of neurophysiological change from arousal, arousal only influenced judgments for participants who misattributed the source of their arousal to the film.

Dutton and Aron's (1974) classic bridge study further illustrates the role of implicit attribution in the influence of affective arousal on judgment. In this study male passersby were approached by an attractive woman interviewer administered a questionnaire either on an unsteady, high-arousal suspension bridge or a stable, low-arousal bridge. Once finished with the questionnaire, the interviewer offered to explain the experiment in more detail at a later time. She then handed the men a piece of paper with her phone number written on it, and encouraged them to call if they had any questions. The investigators found that the men approached by the attractive interviewer on the unsteady bridge were more likely to call her than those approached on the stable bridge. The men on the unsteady bridge misattributed their feelings of arousal caused by the bridge as a reaction to the interviewer, thus intensifying feelings of attraction to her.

The bridge study raises an interesting question for the GANE model. The model argues that arousal should enhance memory for mental representations currently active at the moment arousal is induced. In the bridge study arousal begins on the bridge, but ultimately the attractive woman gains attention. According to the GANE model will arousal enhance memory for the *scary bridge* or the *attractive woman*?

In summary, research on misattribution of arousal suggests that neurobiological change elicited by the experience of affective arousal is not necessarily the driver of its effects on many outcomes. Rather the experiential information about importance and urgency carried by affective arousal and the implicit attribution of arousal are crucial.

**Coda**

We want to end by emphasizing that the criticisms offered here are in the spirit of improving the GANE model. Indeed there is much to like about the model and we agree more than disagree with much of it.

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