An extension of the Novelty-Seeking Model model: Considering the plurality of novelty types and their differential interactions with memory

(Commentary on Tal Ivancovsky, Shira Baror, and Moshe Bar)

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ABSTRACT

The novelty-seeking model suggests that novelty processes are at the origin of curiosity and creativity. However, there exist different types of novelty, each with distinctive relationships with memory, which potentially influence creativity in distinct ways. We thus propose expanding the NSM model to consider these different novelty types and their specific involvement in creativity.

COMMENTARY

The innovative novelty-seeking model (NSM) by Ivancovsky et al. states that novelty-seeking processes are at the root of curiosity and creativity. Ivancovsky et al. distinguish four phases in their NSM model. Firstly, affinity, and therefore attention to new internal or external stimuli, generates new combinations within the existing semantic knowledge network. Secondly, this new associative representation is activated, and thirdly, when the representation exceeds the salience threshold, the evaluation of its relevance takes place. Fourthly, the new relevant representations are consolidated in the semantic memory network. In this commentary, we would like to comment on the role of memory, a significant component of the NSM, since the authors stress its importance by stating that their model originates and ends in memory.

By stating that the NSM starts in memory, the authors refer to the activation of prior knowledge. However, they also mention a role for episodic memory, which appears to be unclear. By definition, detecting novelty relies on distinguishing the new from the familiar. Novelty processing is thus closely tied to prior knowledge, which is of great interest because prior knowledge forms the groundwork for determining the types of new information that need to be best consolidated in memory. Recent studies (Quent et al., 2022) have shown that the link between memory consolidation of new information and their congruency with prior knowledge is a non-linear U-shape function: highly congruent and highly incongruent information will be remembered better than less (in)congruent. Note that, for a long time, the two ends of this U-shape have been studied as two distinct fields of research: the congruency effect in memory on the one hand and the surprise effect on memory on the other.

Interestingly, information at the two extremities of the U-shape activates different brain regions at encoding (van Kesteren et al., 2012): while processing information, the medial prefrontal cortex either triggers rapid learning of schema-congruent information into the neocortex or activates the hippocampus in the medial temporal lobe to encode schema-incongruent events. However, differences in memories are also suspected at retrieval as remembering incongruent events engages the network for source memory (Brod et al., 2015). We, therefore, hypothesize

that the two ends of the U-shape are linked to different memory systems: while congruent information is supposed to be stored as semantic representations, incongruent information is thought to induce episodic memories–that are memories of unique personal past experiences with their spatiotemporal context. Even more interestingly, the two tales of the U-shape are likely to rely on different novelty types. As the current literature on novelty tends to revise terminology and identify different subtypes of what is generally understood under the term "novelty" (e.g., Bastin et al., 2019; Kafkas & Montaldi, 2018), this is another prominent point to which we would like to draw attention. Since prior knowledge determines novelty type and further modulates how novelty impacts memory (Frank & Kafkas, 2021), we believe that considering different subtypes of novelty and memory systems is relevant for the NSM.

By citing the work of Duszkiewicz et al. (2019), Ivancovsky et al. briefly evoke the existence of different types of novelty and the potential role of episodic memory. Specifically, Duszkiewicz et al. (2019) proposed that novel experiences classified as *common novelty*, which share similarities with congruent past experiences, facilitate the formation of semantic memories in contrast to experiences classified as *distinct novelty*, which have minimal connections with past experiences and result in the creation of contextualized specific episodic memories. However, we regret that these aspects have yet to be integrated further into the NSM, which primarily focuses on the semantic network and does not differentiate novelty types. Indeed, different types of novelty modulate the environment's uncertainty and memory encoding and consolidation differently (Quent et al., 2021)—the processes pointed out by the authors as cognitive underpinnings of creativity and curiosity.

Although we agree with Ivancovsky et al.'s central claim that novelty-seeking processes mediate curiosity and creativity, we call for a distinction between different types of novelty that could interact differently with curiosity or creativity and lead to memory representations of different natures. Specifically, if both common and distinct novelty are known to attract attention and thus lead to a curiosity state, their respective link with creativity may seem less straightforward. On the one hand, common novelty fits the typical situation described by the authors: the new information congruent with prior knowledge will be combined with prior semantic knowledge to fill an existing gap within the associative semantic network. On the other hand, distinct novelty, a good candidate for creativity as its high incongruence naturally provides novel original associations, is thought to induce episodic memories. Although most of the research on creativity has focused on semantic memory, researchers have recently demonstrated the role of episodic memory in creative processes (Beaty et al., 2020) as well as its interaction with semantic memory during divergent thinking (Ramey & Zabelina, 2021).

To conclude, given that semantic and episodic memory systems may be linked to different types of novelty, and given that novelty is at the heart of the NSM model, we would suggest adding the impact of episodic memory in the NSM. This addition will help increase the completeness of the model to make it generalizable to as many novelty-seeking situations as possible. This would also have implications for the consideration of clinical perspectives. Beyond psychopathology, the NSM could also address the case of brain-damaged patients with memory problems and the fact that they present decreased creativity (Duff et al., 2013).

COMPETING INTEREST STATEMENT
The authors do not have any competing interests to declare.

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