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Review Article

Dependent Memory in Vinaya, Music, Recitation of Suttas and Rituals

Sumedh Thero*

Chief Priest and Founder, Sumedh Bhoomi Buddha Vihar, Dr Ambedkar Park, India

***Corresponding Author:** Sumedh Thero, Chief Priest and Founder, Sumedh Bhoomi Buddha Vihar, Dr Ambedkar Park, India.

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Abstract

It is likely that further advances may be made through the use of individual based models that allow individuals to make truly context-dependent decisions. Further studies that identify disturbance effects at multiple levels – behavioral, physiological and metabolic - 118 - – are likely to improve understanding of disturbance impacts. Finally, I believe that more study of the behavior of people in wildlife areas is likely to offer new insights into how to manage conflicts between humans and wildlife. This aspect of human disturbance research is currently largely neglected, but must be considered a crucial part of the equation. When one encodes a memory, they not only record sensory data (such as visual or auditory data), they also store their mood and emotional states. An individual's present mood thus affects the memories that are most easily available to them, such that when they are in a good mood they recall good memories (and vice versa). The associative nature of memory also means that one tends to store happy memories in a linked set. Unlike mood-congruent memory, mood-dependent memory occurs when one's current mood resembles their mood at the time of memory storage, which helps to recall the memory.

Keywords: Humans; Wildlife; Vinaya; Music; Recitation of Suttas; Rituals

Understanding that animals are individuals that make context dependent decisions about how to respond to their environment results is an important insight with practical application to understanding how animals respond to anthropogenic stimuli. It is also crucial to differentiate between disturbance effect and disturbance impact. I have shown how this context dependent decision making means the use of simple behavioral indices as a direct measure of disturbance impact is unsound, and have pointed out areas where incorporating further information can make behavior measures potentially useful. I have shown how the decisions animals make about where to feed and breed can be influenced by human activities and the consequences or otherwise this might have for the population. I have shown that in birds at least, it is clear that disturbance from anthropogenic activity can reduce breeding success even in the absence of behavioral effects. I have also shown how even physiological responses to anthropogenic activity can be individualistic, indicating that a more profound understanding of these responses also required understanding decision making behavior. Throughout, I have attempted to stress the distinction between effects and impacts, a distinction that is crucially important when making management decisions. Research on the effects of human disturbance is slowly taking account of the need to understand behavior [6,9,16], though papers continue to be published that overlook context-dependant decision-making behavior [6-8]. Future work on disturbance impacts is likely to be valuable and the impact of recreation on biodiversity has been identified as one of the 100 ecological questions of high policy relevance in the UK [17]. Future efforts must distinguish between effect and impact and must adequately incorporate context-dependent decision making behavior. Although behavioral measures are inappropriate for assessing the comparative impact of disturbance on multiple species (even at the same location different species will experience the environment differently and will find themselves in different contexts), there is clearly a need to identify methods to protect multiple species [2]. It is likely that further advances may be made through the use of individual based models that allow individuals to make truly context-dependent decisions. Further studies that identify disturbance effects at multiple levels – behavioral, physiological and metabolic - 118 - – are likely to improve understanding of disturbance impacts. Finally, I believe that more study of the behavior of people in wildlife areas is likely to offer new insights into how to manage conflicts between humans and wildlife. This aspect of human disturbance research is currently largely neglected, but must be considered a crucial part of the equation.

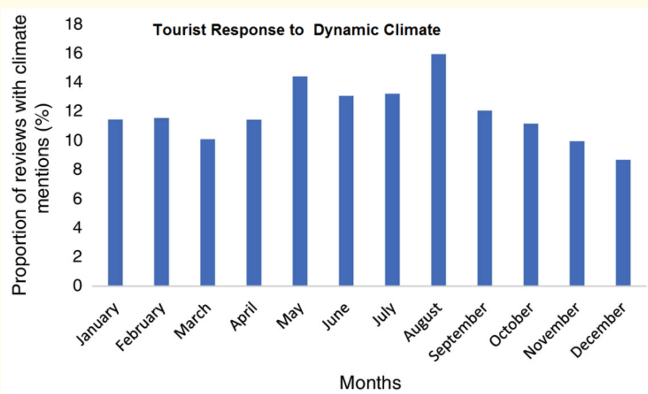

Figure 1

The most commonly researched area of environmental context-dependent memory is the phenomenon of the environmental reinstatement effect. This effect occurs when the reinstatement (i.e. revisiting) of an environmental context acts as a cue for past memories related to that particular environmental context [15]. Commonly, memories recalled in this situation are ones a subject believed they had forgotten, and it is only when an individual revisits this environmental context that they recall these memories. How much this effect occurs varies depending on a number of factors, and may be classified under two types of reinstatement effects: long-term and short-term.

Mood dependence

Mood dependence is the facilitation of memory when mood at retrieval is matched to mood at encoding [11]. Thus, the likelihood of recalling an event is higher when encoding and recall moods match than when they are mismatched [3]. However, it seems that only authentic moods have the power to produce these mood-dependent effects [5].

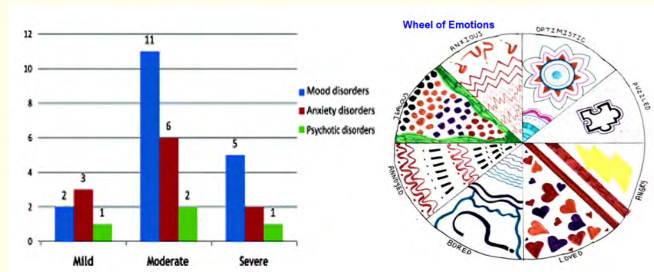

Figure 2

It has also been found that events that originate through internal mental operations—such as reasoning, imagination, and thought—are more connected to one's current mood than are those that emanate from external sources. This makes the former less likely than external events to be recalled after a shift in mood state [3]. Importantly, this role of emotional state in memory recall suggests a potential mechanism for enhancing retrieval of past memories. Mood dependence is the facilitation of memory when mood at retrieval is identical to the mood at encoding. When one encodes a memory, they not only record sensory data (such as visual or auditory data), they also store their mood and emotional states. An individual's present mood thus affects the memories that are most easily available to them, such that when they are in a good mood they recall good memories (and vice versa). The associative nature of memory also means that one tends to store happy memories in a linked set. Unlike mood-congruent memory, mood-dependent memory occurs when one's current mood resembles their mood at the time of memory storage, which helps to recall the memory. Thus, the likelihood of remembering an event is higher when encoding and recall moods match up. However, it seems that only authentic moods have the power to produce these mood-dependent effects. Based on discoveries made through neural mapping of the limbic system, the neurobiological explanation of human emotion is that emotion is a pleasant or unpleasant mental state organized in the limbic system of the mammalian brain. If distinguished from reactive responses of reptiles, emotions would then be mammalian elaborations of general vertebrate arousal patterns, in which neurochemicals (for example, dopamine, noradrenaline, and serotonin) step-up or step-down the brain's activity level, as visible in body movements, gestures, and postures. This hypothesis that synaptic plasticity is an important part of the neural mechanisms underlying learning and memory is now widely accepted [12].

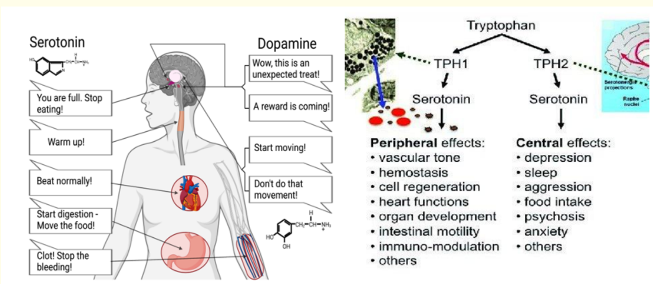

Figure 3

Biochemically, the indoleamine molecule derives from the amino acid tryptophan, via the (rate-limiting) hydroxylation of the 5 position on the ring (forming the intermediate 5-hydroxytryptophan), and then decarboxylation to produce serotonin [11]. Serotonin is primarily found in the enteric nervous system located in the gastrointestinal tract (GI tract). However, it is also produced in the central nervous system (CNS), specifically in the raphe nuclei located in the brainstem, Merkel cells located in the skin, pulmonary neuroendocrine cells and taste receptor cells in the tongue. Additionally, serotonin is stored in blood platelets and is released during agitation and vasoconstriction, where it then acts as an agonist to other platelets [13]. Approximately 90% of the human body's total serotonin is located in the enterochromaffin cells in the GI tract, where it regulates intestinal movements. Enterochromaffin (EC) cells (also known as Kulchitsky cells) are a type of enteroendocrine cell, and neuroendocrine cell. They reside alongside the epithelium lining the lumen of the digestive tract and play a crucial role in gastrointestinal regulation, particularly intestinal motility and secretion.

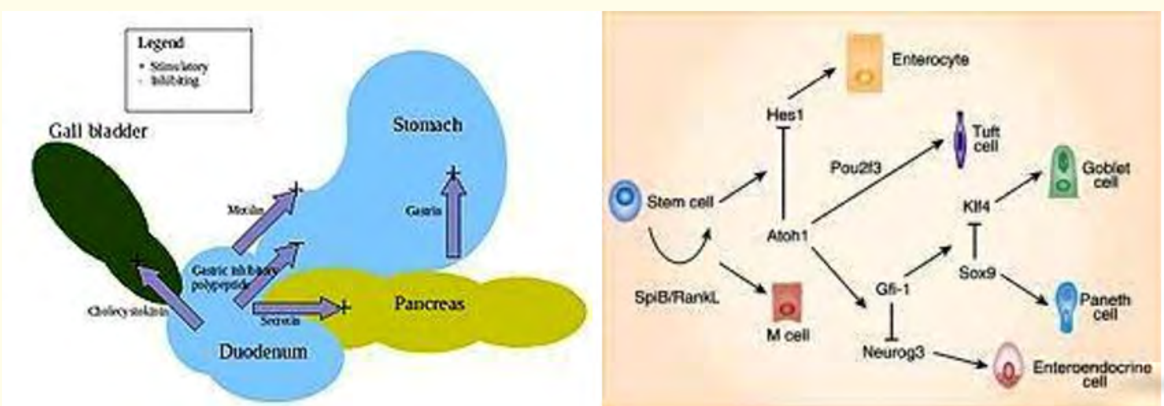

Figure 4

Music-dependent memory is an effect of mood-dependent memory. There have been many studies conducted that have suggested that the music one listens to may affect their mood. In Balch and Lewis' article, they studied how the participants' moods were affected by the change in tempo of a musical piece. The participants were each given a list of words to read while music played in the background, with varying tempos distributed randomly. The participants were then asked to recall all the words they had read previously. Balch and Lewis found that the participants were able to remember more words when the tempo did not change. This same experiment was composed in different ways: with a change in timbre, a different song playing, or silence with no music at all. However, none of these experiments returned results suggesting that changing the different aspects of music affected the memory of participants, indicating that change in tempo seemed to be the only thing that influenced the participants' memories. There is still much research being done concerning music-dependent memory [1].

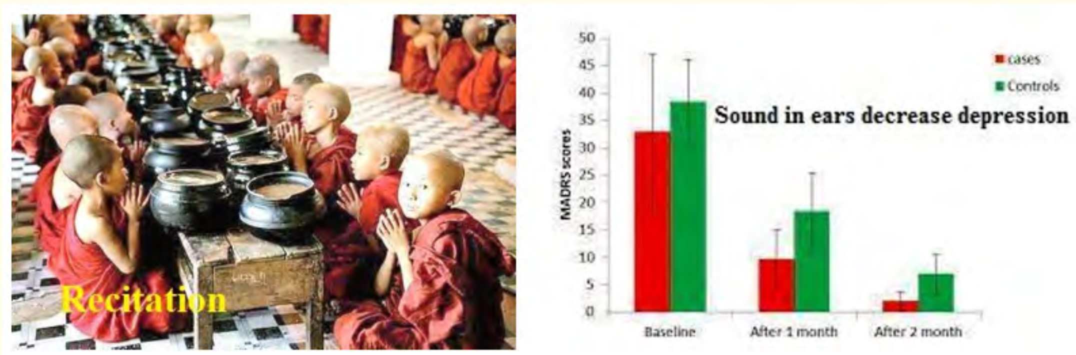

Figure 5

It provides a total brain workout. Research has shown that listening to music can reduce anxiety, blood pressure, and pain as well as improve sleep quality, mood, mental alertness, and memory. Music improves brain health and function in many ways. It makes you smarter, happier, and more productive at any age. Listening is good, playing is better. Music has played an important part in every human culture, both past and present. People around the world respond to music in a universal way. And now, advances in neuroscience enable researchers to measure just how music affects the brain. The interest in the effects of music on the brain has produced a new field of research called neuromusicology which explores how the nervous system reacts to music.

Practical uses

According to the literature cited above, information is better recalled when the context matches from encoding to retrieval. Therefore, when a person is studying, they should match the studying context as best as possible to the testing context to optimize the amount of material that will be recalled. This idea was made apparent in a study done by [10]. In this study, participants were asked to study meaningful information under either quiet or noisy conditions. Afterwards, they were asked short-answer and multiple choice questions on the previously learned material, which prompted both recognition and recall. Half of them were tested under silent conditions and the other half under noisy conditions. The participants whose noise-level matched during studying and testing conditions remembered significantly more information than those whose noise-level was mismatched. Grant et al. conclude that students should take into consideration the context of testing, such as the noise level, while studying, in order to maximize their performance on both recall and recognition tasks.

Further, in cases where it is not possible to have similar learning and testing contexts, individuals who pay conscious attention to cues in the learning environment may produce better results when recalling this information. By doing so, individuals are better able to create a mental image of the original context when trying to recall information in the new testing context—allowing for improved memory retrieval [14]. Further, several contextual cues should be attended to, using more than one sensory system to maximize the number of cues that can help remember information.

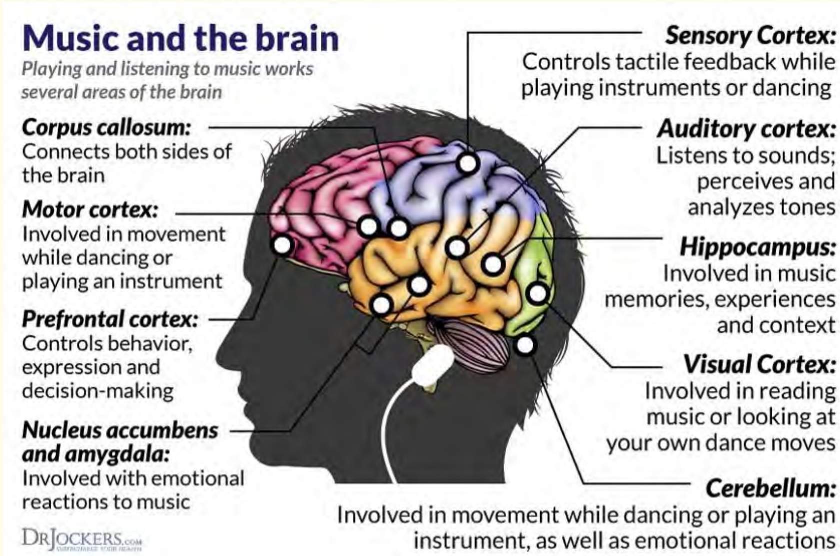

Figure 6

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