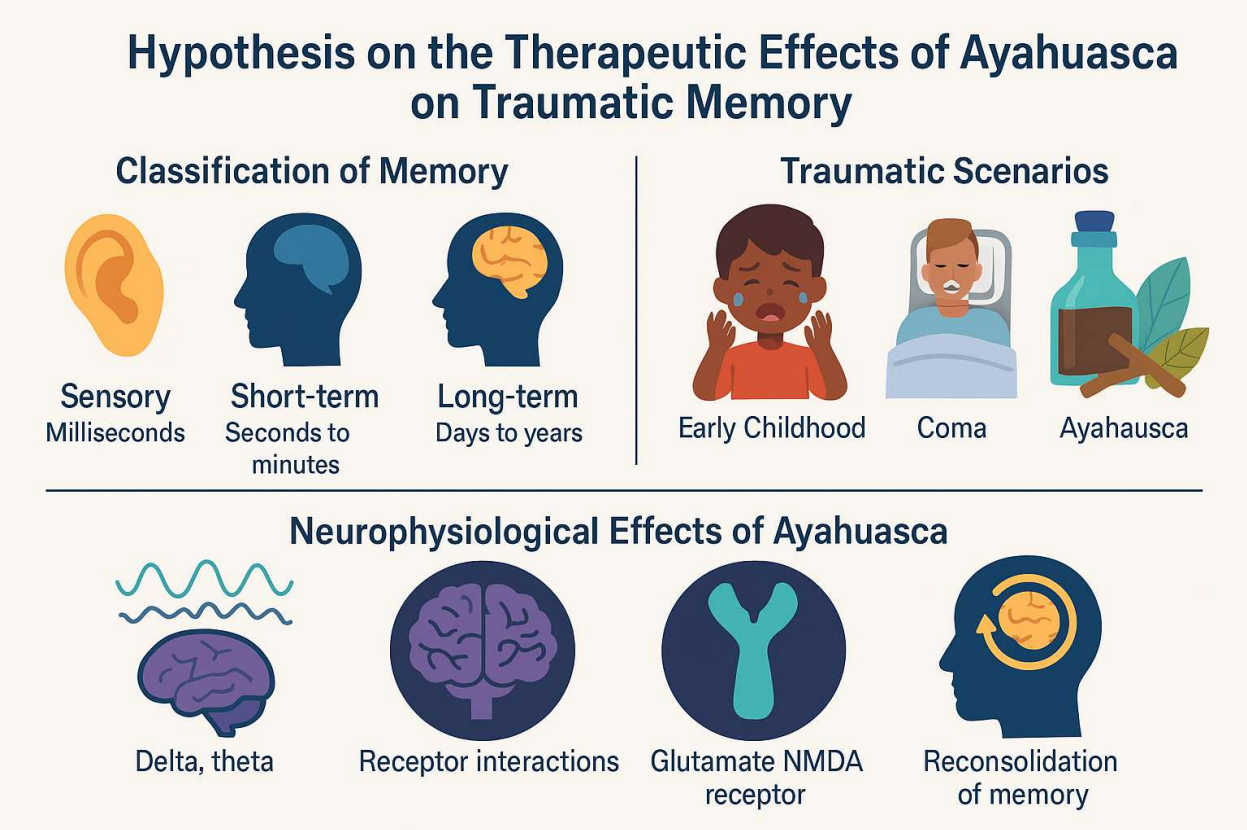
Hypothesis: Ayahuasca as a tool for reconsolidation and counterconditioning



The combined action of MAO inhibitors and DMT in ayahuasca allows serotonin to persist longer in the brain, promoting synaptic plasticity in limbic networks. DMT activates 5-HT2A receptors in the **prefrontal cortex**, **amygdala**, and **hippocampus**, creating a neurochemical state that facilitates what is known in psychotherapy as **"memory reconsolidation"**—where old memories can be recalled, modified, and re-sealed with new meanings.

From a behavioral perspective, this allows a process of **emotional counterconditioning**: the individual re-experiences traumatic emotion in a safe, ritualized context (guided by music, chants, symbolic figures), reducing fear and hypervigilance.

I. Introduction

Memory is not a unitary phenomenon but a set of processes distributed across different brain systems, ranging from the immediate registration of sensory stimuli to the long-term encoding of knowledge, emotions, and learned behaviors. In this essay, we will examine the neuroanatomical and physiological foundations of memory, classify its main types, and use this framework to analyze three clinical scenarios involving traumatic memory: 1) early childhood trauma (under 4 years), 2) trauma during unconscious states (such as coma), and 3) the therapeutic use of altered states of consciousness, such as those induced by ayahuasca.

II. Neuroanatomical and physiological foundations of memory

Memory can be broadly classified into three main types:

1. **Sensory and immediate memory**
2. **Short-term memory (working memory)**
3. **Long-term memory (explicit and implicit)**

2.1. Sensory and immediate memory

This refers to the nervous system's ability to briefly register environmental stimuli. It lasts from milliseconds to a few seconds. Olfactory, visual, and tactile memories perceived at early ages (e.g., before 3–4 years) are often stored in subcortical structures such as the **thalamus**, **hypothalamus**, and **amygdala**, without semantic or narrative integration due to the immaturity of the **hippocampus** and **prefrontal cortex**.

2.2. Short-term memory or working memory

This is the ability to maintain and manipulate information for a short period (seconds to minutes). It relies heavily on **dorsolateral prefrontal cortex** circuits and is often impaired in acute trauma situations, where the **hypothalamic-pituitary-adrenal (HPA)** axis activates and releases cortisol, interfering with rational processing.

2.3. Long-term memory

- **Explicit (declarative)**: Depends on the hippocampus and includes episodic (personal events) and semantic (facts, knowledge) memory. This is the type affected in **retrograde or anterograde amnesia**.
- **Implicit (non-declarative)**: Refers to automatic, emotional, or motor learning. Its storage involves the **cerebellum**, **basal ganglia**, **amygdala**, and other limbic structures. This type of memory is most persistent in childhood trauma and in situations where consciousness is altered (e.g., coma or dissociation).

III. Clinical scenarios and traumatic memory

3.1. Early childhood trauma

In children under 3–4 years, traumatic memories are not integrated verbally or consciously but may leave persistent somatosensory traces (smells, images, muscular tensions). These memories are coded implicitly, with significant participation of the amygdala and striatal systems.

3.2. Trauma during unconscious states

In cases of accidents with traumatic brain injury (TBI) and coma, as in the car accident example, the explicit memory of the event may be absent. However, upon recovery, post-traumatic stress disorder (PTSD) symptoms can appear: nightmares, hypervigilance, panic attacks. This supports

the idea that the body, via the **autonomic nervous system**, retains memory of the trauma—what is referred to as "somatic memory."

3.3. Altered states of consciousness and memory retrieval

The use of psychoactive substances such as **ayahuasca**, a traditional Amazonian decoction composed of **DMT** and **harmine/harmaline** (MAO inhibitors), induces visionary states allowing individuals to access mental contents not available in ordinary consciousness. Neuro physiologically, this implies a transition from **beta/alpha** brainwave patterns to **theta/delta**, associated with REM sleep and deep dreaming, favoring **emotional reactivation and recontextualization of implicit memories**.

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V. Conclusion

Traumatic memories are not always stored as explicit or narrative content. They may reside in emotional and somatic circuits of the nervous system, especially when the trauma occurs in early childhood or unconscious states. Conventional psychotherapeutic tools may be insufficient to access such content.

The therapeutic use of entheogenic substances such as ayahuasca, under controlled conditions, offers a promising avenue to access and resignifying these memories through mechanisms of brain plasticity, reconsolidation, and emotional counterconditioning.