Functional Neuroanatomical Perspective of Emotional Avoidance

Abby Hurley [1,3], Psy.D., Natalie Colombana-Walsh[2,3], M.A., Andria Davis[1,3], M.A.

[1]Midwestern University Clinical Psychology [2]Wheaton College Clinical Psychology Program. [3] Heritage Professional Associates.

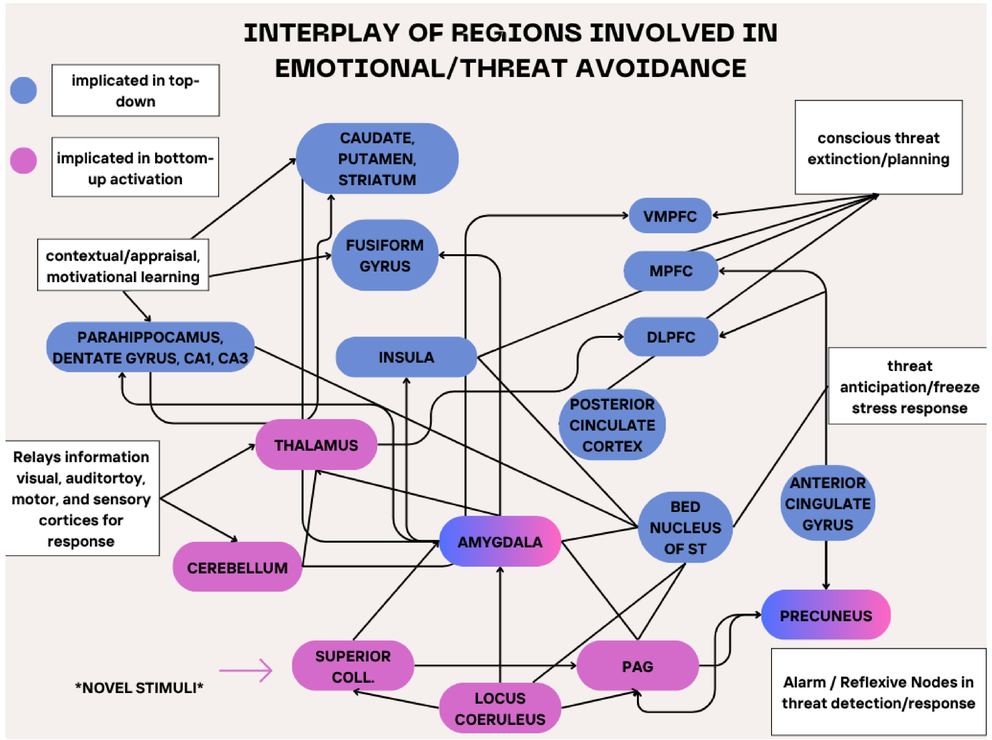
Background

Emotional avoidance, involved in maladaptive coping, is a target for behavioral interventions, yet its underlying neurocircuitry is not entirely understood. While cortical structures play a large role in emotion, the ascending sensory network and descending motor network implicate the amygdala's interaction with subcortical structures such as the periaqueductal gray (PAG), reticular, formation, thalamus, and hypothalamus which may play a role in reinforcing avoidant behaviors through involvement of emotional salience, by moving vigilance, arousal, and motor preparedness (Venkatraman et al., 2017; Panksepp et al., 2019). Meta-analyses implicated the auditory perception, attention, appraisal and prediction, and emotional response structural networks, which may also contribute to avoidance through sensory filtering, attention modulation, and anticipatory cognition (Riedel et al., 2017).

- While it is understood that the autonomic nervous system and amygdala are aroused during threat detection and response, little data has been illuminated on theoretical models of how top-down and bottom-up circuits may work in tandem during detection, response, and emotional avoidance.

Methods

Using PRISMA guidelines, a PubMed search used the query "affective cognition AND (emotion avoidance OR threat response) AND (anatomy OR physiology)" for studies published between 1995 and 2025, yielding 554 results to narrow study review to meet criteria. Inclusion criteria focused on studies examining the functional neuroanatomy of emotional avoidance (n = 87 studies). Findings from lesion studies and neuroimaging studies were synthesized to construct a theoretical framework of emotionally avoidant mechanisms.



Discussion

1. Bottom-Up Threat Detection

Novel or salient stimuli activate the superior colliculus, which rapidly signals the locus coeruleus (noradrenergic arousal) and periaqueductal gray (defensive reflexes), initiating alertness. The amygdala engages for threat evaluation, while the cerebellum and thalamus prepare motor and sensory systems.

2. Contextual Appraisal & Memory Integration

The amygdala interacts with the hippocampus, dentate gyrus, and parahippocampal gyrus to assess threat familiarity and context. These systems modulate safety appraisal and bodily readiness, while the striatum updates threat schemas. Schemas that become maladaptive may be due to higher-order regions assessing that an adaptive response is not possible (see 3 for greater details). The belief that an adaptive response is not possible may also be reinforced by DMN activation, which can result in dissociation (see 5 for greater details)

3. Higher-Order Regulation

The PFC (dlPFC, mPFC, vmPFC), insula, and posterior cingulate dynamically integrate self-regulation capacity, prior experience, and available external support to determine adaptive response potential; when these networks judge an adaptive response is not possible, control shifts to default mode and brainstem circuits, resulting in passive defenses such as freezing, dissociation, or shutdown (see 5 for greater details).

4. Sustained Threat & BNST

When threats are uncertain, the BNST sustains anxiety, driving freeze-like states (vigilance, motor inhibition, bradycardia) through limbic and cortical interactions, subsequently suspending an individual in time monitoring.

5. Defensive Withdrawal & DMN

Under overwhelming threat, the default mode network (mPFC, PCC, precuneus) evaluates coping resources. If insufficient, it coordinates with the PAG and LC to trigger dissociation: derealization, depersonalization, and, ultimately, shutdown).

6. Clinical Relevance

The brain constantly filters incoming data, and when a threat is perceived, it activates several strategies to manage it. One is top-down avoidance, such as changing the topic, shifting social stance, or leaving, which is guided by past experience, current capacity, and ongoing threat appraisal. Another is suspension of decision-making, leading to a freeze state. A third is bottom-up dissociation. Throughout, the self-referential network (especially the precuneus) monitors how the threat relates to the self, shaping whether a person stays engaged, detaches, or dissociates.

7. Intervention Implications

When avoidance is observed, it is important to recognize that this behavior reflects the brain's use of available resources in response to perceived threat and past learning. Removing avoidance without first strengthening alternative resources, such as increasing flexible responding, can overwhelm the individual and may trigger bottom-up survival responses.

Top Down Resources: Interventions that prioritize mindful awareness of thoughts, compassionate presence, and exposure strategies employed with agency, such as DBT's Check The Facts and distress tolerance, ACT's cognitive Defusion and Acceptance, or Emotional Efficacy Therapy's Labeling (Linehan, 2014; Hayes et al.,1999; Silberstein-Tirch et al., 2017)

Bottom-Up Resources: Interventions prioritizing direct engagement of subcortical structures, such as the Amygdala, DMN, and midbrain to foster physiological regulation and orientation in the present moment, such as "Where Self" practices for embodied awareness (Corrigan et al., 2024), DBT's TIP skills (Linehan, 2014), tactile grounding (Porges, 2011), movement-based approaches (Ogden et al., 2006), vagal maneuvers (Dana, 2018), and breathwork focusing (Porges, 2011).

References: