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Toward a Neurobiology of Transference

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Introduction

The concept of transference has undergone changes and developments, relevant for clinical practice and research. From Freud's neurological perspective of the term, to the perception of being an obstacle and then being placed at the center of the therapeutic work (Makari, 1994).

In recent years, authors have explored possible ways of integrating neuroscience with object relations with the goal to further develop our understanding of human development and psychopathology (Kernberg, 2015 & 2022; Svrakic & Zorumski, 2021). However, the potential neurophysiological basis of transference have not yet been explored in depth.

Possible Neurobiological Underpinnings

Neurobiology of object relations:

- According to affective neuroscience and neuropsychoanalysis, all mammals, including humans, are born with innate affective needs (primary process) for survival (Solms, 2018; Panksepp, 2011).
- Through secondary processes, each human being develops new predictions and patterns, many of which will eventually become automatized.
- The development of tertiary-level cognitions, is influenced by primary and secondary processes, until they form their own nested hierarchy of basic emotions.
- In the pursuit of the satisfaction of primary needs in the environment, secondary processes predictive patterns are developed.
- These affectively charged object relations begin to lay the initial foundations for what will later emerge repeatedly through transference.

Most of the processes described above occur in the non-declarative systems of the long-term memory taxonomy. Many of the areas involved in the activation of these emotional processes, and their subsequent automatizations, are located in subcortical regions ranging from the brainstem to the basal ganglia and upper limbic structures.

Conscious and Unconscious Memory Systems

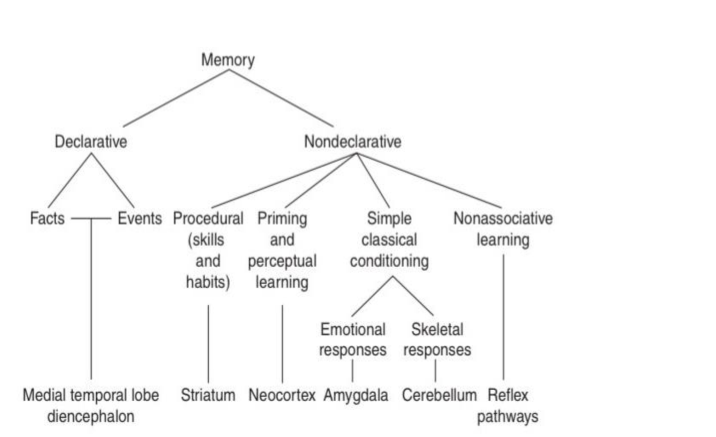
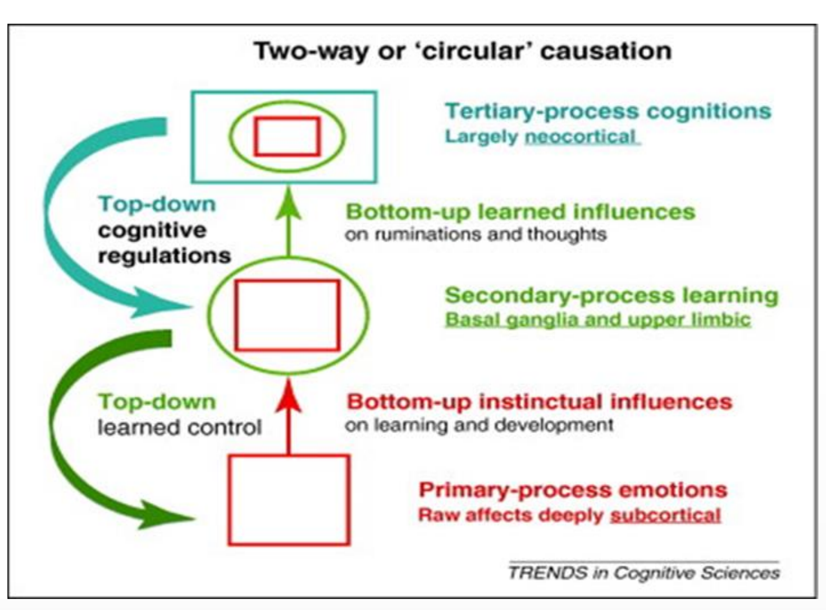
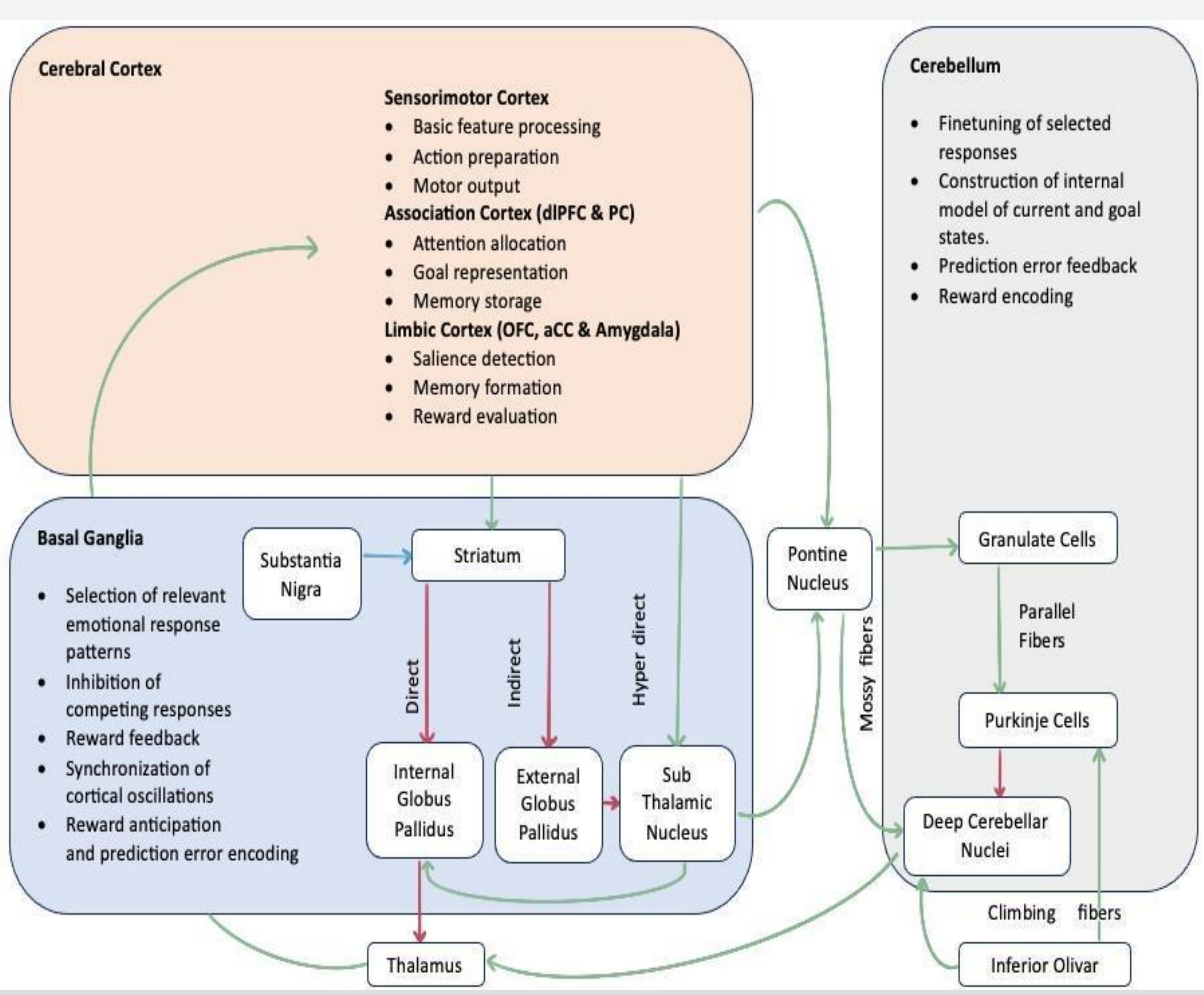


Figure 1. Organization of mammalian long-term memory systems. The figure lists the brain structures thought to be especially important for each form of memory. In addition to its central role in emotional learning, the amygdala is able to modulate the strength of both declarative and nondeclarative memory.



Possible Neurobiological underpinnings of Transference:

- Repressed predictions are stored in non-declarative memory and cannot be retrieved as conscious thoughts (Solms, 2018).
- While patients cannot remember cognitively repressed memories, they repeat them through mindless, subcortical patterns of behavior. These behaviors are known as derivatives of the repressed predictions.



__ Excitatory pathways/ __ Inhibitory pathways / __ Dopaminergic pathway

Image adapted from; Pierce & Peron, 2022.

Hypothesis from the Free Energy Principle

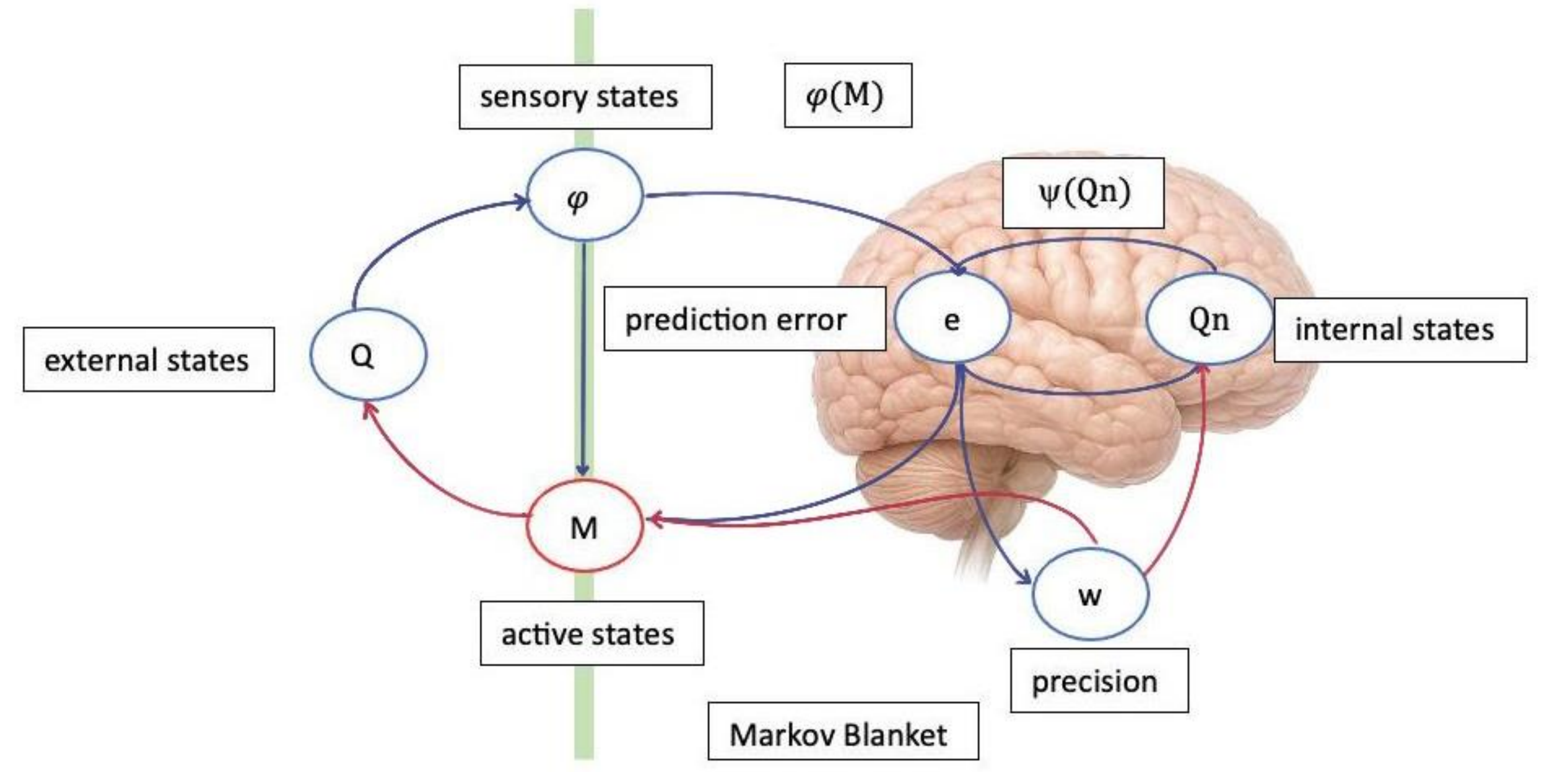


Image adapted from; Solms, 2022.

- Affective needs are felt as error signals (**e**), which guide the organism to "feel its way through its problems" in order to survive.
- Affects are homeostatic indicators of free energy levels (**F**) which help the system manage prediction error (**e**). High levels of free energy leads to unpleasant feelings.
- F decreases when:
  - The subject acts (**M**) to alter sensations (**φ**) so that they match its predictions (**ψ(Qn)**).
  - The subject changes its internal model (**Qn**) to produce a better prediction (**ψ(Qn)**)
  - The subject adjust confidence/precision (**w**) to match the amplitude of an incoming prediction error (**e**).
- The generative model/internal states (**Qn**) of the system is fundamentally object related.
- In this view, transference arises when deeply encoded and hierarchically nested object relations (**Qn**), are activated as high confidence/precision (w) interpersonal predictors (**ψ(Qn)**) to manage **e** about how the therapist (Q) will feel/think/act.
- Transference is in itself an attempt to manage **e**, by **M** to alter **φ** to match existing high **w** interpersonal **ψ(Qn)** and minimize **F**.

(Solms, 2022, Solms & Friston, 2018; Friston, 2010; Kuglaski, Jasko & Friston, 2020)

Implications

Research Implications:

- Transference cannot be studied in isolation as well as transference work.
- Localizationist approaches alone are not sufficient. It is important to have an integrative view of neural circuits within its context.
- Predictive processes favor efficiency over accuracy. Greater complexity leads to lower efficiency. Diverse levels of psychopathology could have diverse levels of accuracy and efficiency which could be measured.
- Diverse levels of pathology could have particular set points as regards to predictions of incoming error signals and capabilities for posterior updating.
- Physics and mathematics could aid our understanding of transference and its role in free energy management.

Clinical Implications:

- It is necessary to prevent intellectualization in transference work. Re-consolidation windows are activated by affective arousal and this is essential for the formation of new learning.
- Transference work introduces prediction error.
- Mismatch on the patients predictive process and what the therapist does starts prior to words.

Conclusion

Understanding the neurobiology of predictions and automatizations can help us understand the compulsion to repeat that manifests through transference. Examining transference through the bottom-up process can help us understand how affects are deeply embedded in the development of predictions and how transference work could impact neurobiological processes.

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