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ORIGINAL PAPERS

EXPLORING CONCUSSION RECOVERY THROUGH THE LENS OF THE FREE ENERGY PRINCIPLE AND MARKOV BLANKET THEORY

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Abstract. This paper delves into the application of the Free Energy Principle (FEP) and the concept of the Markov blanket in understanding the neurocognitive implications of concussion. The FEP, a unifying theory in neuroscience, posits that the brain functions to minimize free energy, equating to a reduction in surprise or uncertainty regarding sensory inputs. The Markov blanket, defining the boundary between a system and its environment, is integral to this framework, particularly in understanding how the brain processes and responds to sensory information. We explore how a concussion might disrupt the brain's predictive processing and its ability to minimize free energy, leading to increased prediction errors and cognitive deficits. This disruption is hypothesized to manifest as an inability to accurately predict sensory inputs, resulting in impaired cognitive functions post-concussion. The paper also discusses the potential of neuroplasticity in concussion recovery, framed within the FEP as the brain's effort to re-establish minimized free energy under new constraints. We propose a methodological approach combining neuroimaging and computational modeling to empirically test these hypotheses. This theoretical exploration offers novel insights into the mechanisms underlying concussion-induced cognitive impairments and suggests new avenues for therapeutic intervention and rehabilitation strategies.

Keywords: Galectin, Cardiovascular Diseases, Heart Failure.

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INTRODUCTION

The Free Energy Principle (FEP), a concept introduced and extensively developed by Karl Friston and colleagues, has emerged as a pivotal theoretical framework in neuroscience, offering profound insights into the functioning of the