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“Dissociable Roles of Ventromedial Prefrontal Cortex and Anterior Cingulate in Subjective Valuation of Prospective Effort”

Abstract: How effortful an action feels critically shapes everyday decisions. Despite the importance of perceptions of effortfulness for making choices, the behavioral and neural representations of the subjective cost of physical effort are not well understood. We used functional prospective physical effort. Critically, our task was designed to experimentally isolate effort from both reward and choice difficulty – allowing us to examine the brain’s role in effort valuation, independent of these other factors. Behaviorally we found that participants exhibited subjectivity in their decision-making, displaying increased sensitivity to changes in subjective effort as objective effort levels increased. Analysis of blood-oxygenation level dependent (BOLD) activity revealed that the ventromedial prefrontal cortex (vmPFC), previously found to encode subjective value signals for numerous appetitive and aversive stimuli, encoded the subjective cost of prospective effort at the time of choice. Moreover, anterior cingulate cortex (ACC), a brain region previously implicated in effort cost valuation and effort-reward trade-offs, was found to encode choice difficulty for our task, rather than effort value. These results provide insight into the circuit responsible for human decision-making regarding effort, dissociating the roles these two brain regions have regarding feelings of effortfulness and how they engender choices about exertion. A fundamental understanding of effort valuation is crucial in studying how this neural process behaves in pathological cases (e.g., depression, schizophrenia, multiple sclerosis), potentially allowing for a better characterization of the roles that apathy, fatigue, or weakness have on the nervous system as a whole.

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“Applications of Nanopore Sequencing in Genomics and Epigenomics”

Abstract: Nanopore sequencing has enormous potential in genomic and epigenomic applications. I will demonstrate our application of nanopore sequencing in context of cancer. We successfully applied solution-phase hybridization to selectively sequence sites of interest in nanopore sequencing. We coupled this methodology with the long reads lengths (>10kb) generated by nanopore sequencing to study structural variations - large chunks of genomic anomalies - in cancer. Also, we exploited the ability of nanopore sequencing to distinguish covalently modified nucleotides to study the epigenome of cancer, such as DNA methylation.