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“Dissecting Changes in Movement Perception Following Locomotor Adaptation”

Abstract: The ability to flexibly modify our movements is essential to navigate the constantly changing environment we live in. A lot is still unknown about the different neural mechanisms that allow us to adapt our walking pattern to account for these changes. Interestingly, as we learn to recalibrate our movements and produce a desired walking pattern, we also recalibrate our perception of movement and begin to feel the changed environment as more normal. Here, we study motor and perceptual recalibration following locomotor adaptation in response to a split-belt perturbation, where legs are made to walk at different speeds. We find that leg speed perception recalibrates with adaptation, as participants begin to perceive their legs to be moving at more similar speeds than they really are. Perception does not though recalibrate fully, as participants do not feel the perturbed environment as normal. Instead, they feel unperturbed when walking in an environment that is less perturbed than what they have trained on. Despite incomplete perceptual recalibration, participants are able to achieve nearly optimal movement pattern in the fully perturbed environment. In particular, movement pattern is nearly optimal when walking in the environment that feels normal, i.e. with leg speeds that feel equal, and also when walking with leg speeds that are more different, despite participants being aware the speeds are different. Perceptual recalibration may therefore be a marker of one the mechanisms of motor adaptation, and a different mechanism may allow to maintain a desired gait pattern when walking in an environment that still feels perturbed. Ultimately, understanding how different mechanisms and brain regions contribute to motor flexibility may provide insights into rehabilitation strategies for movement impairments.

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“Nanopore Sequencing to Detect Structural Variations, DNA Methylation, and Chromatin states”

Abstract: Nanopore sequencing is a disruptive DNA sequencing technology that has enormous potential in genomic and epigenomic applications. 1) We can use the long read lengths (>10kb) generated by nanopore sequencing to distinguish haplotypes and detect large structural changes in the genome. Also, 2) nanopore sequencing can distinguish covalently modified nucleotides directly through their modulation of the electrolytic current, enabling detection of epigenetic signatures such as 5-cytosine methylation. I will demonstrate how we leveraged these features of nanopore sequencing to detect structural variations, methylation, and chromatin states.