

# “Typing-Blind” to Assess Distributed Sensorimotor Dynamics in Patients with Intact Hand Function

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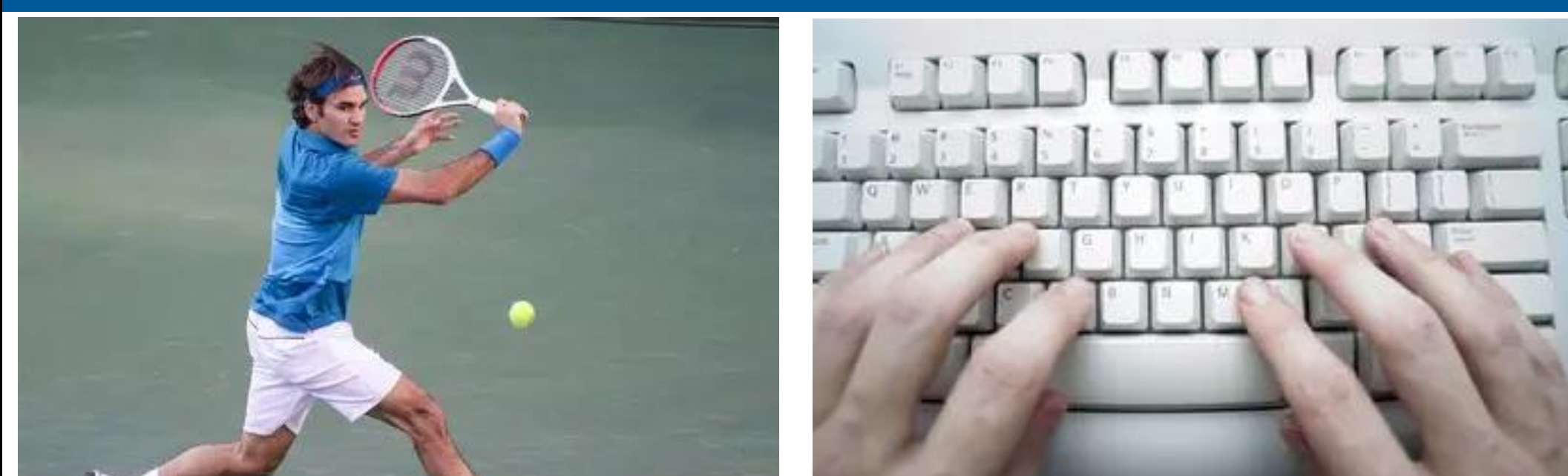
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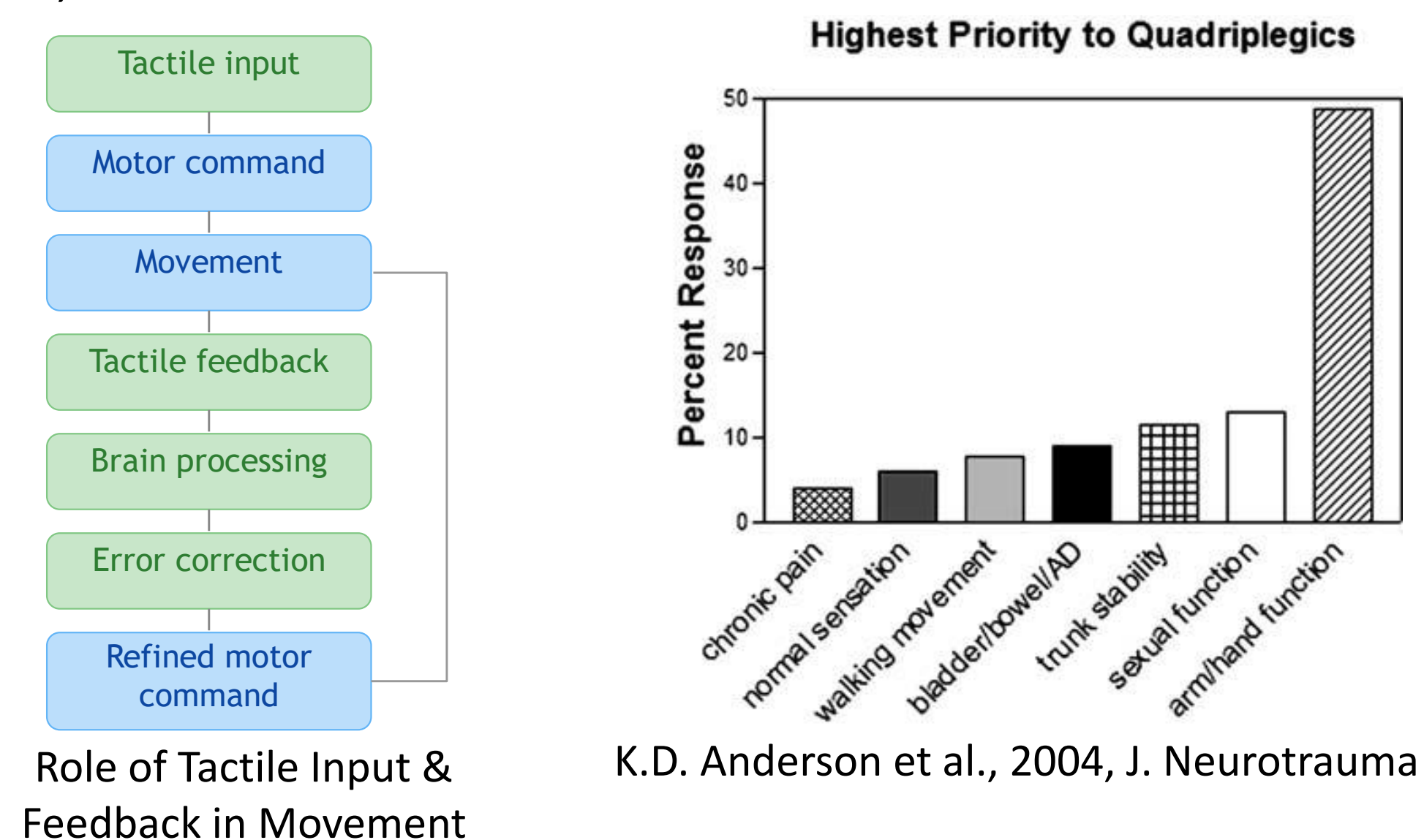
## INTRODUCTION



Sensory feedback guides skilled movement.

Dexterous Motor Control in Daily Tasks.

Touch is crucial for dexterous hand movement and our ability to learn new motor skills. Yet despite its clinical relevance, the neural dynamics underlying the interplay between touch and movement remains poorly understood. Most existing work relies on non-invasive methods that lack the resolution to capture how tactile feedback is integrated across distributed brain circuits in real-time. Filling this gap is critical for developing assistive technologies that can restore hand function in people with paralysis due to spinal cord injury, stroke, or ALS.

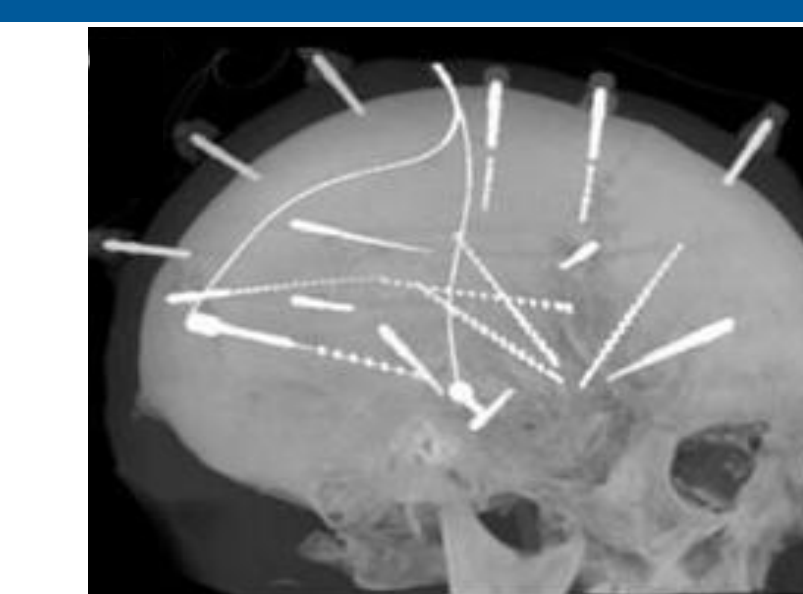


## HYPOTHESIS

- Sensorimotor dynamics underlying finger movement onset, offset, and identity will be decodable from sulcal, white matter, and subcortical sEEG sites: Pre-motor cortex, Supplementary Motor Area, and the Thalamus.
- Error-related neural responses will be detectable in Precentral, Frontal, and Medial Frontal sEEG sites (Anterior Cingulate Cortex and Hippocampus), with real-time decoding possible predicting erroneous responses.
- Modulating visual and tactile cues through feedback mode, zone outline visibility, and task cues will produce measurable changes in learning dynamics such as reaction time and accuracy.

## METHODS

sEEG is used in drug-resistant epilepsy to localize seizure onset zones via implanted depth electrodes across cortical and subcortical regions. Unlike other implant populations — where patients typically have paralysis and absent hand function — sEEG patients retain fully intact motor abilities. This creates a rare opportunity to record high-resolution neural activity during dexterous movement and tactile processing, capturing distributed sensorimotor dynamics inaccessible noninvasively.



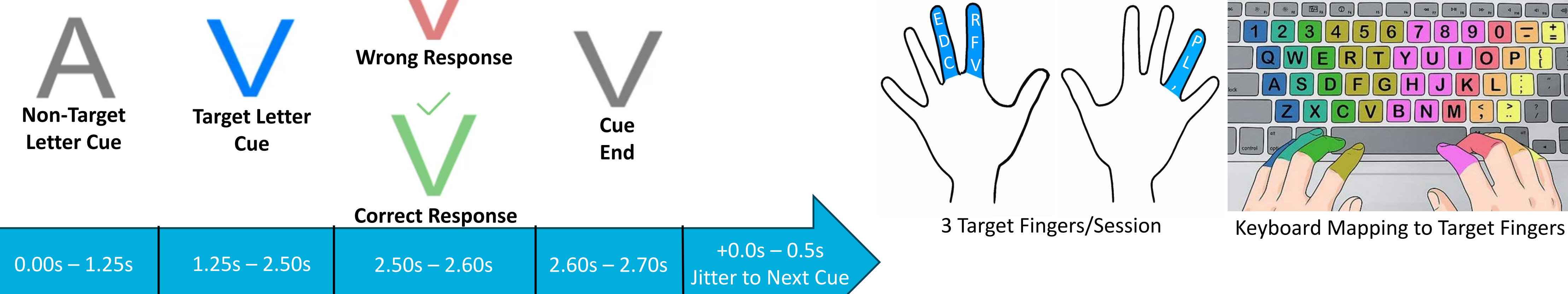
A. Campbell & C. Wu, 2019, Epilepsia

### Experimental Conditions

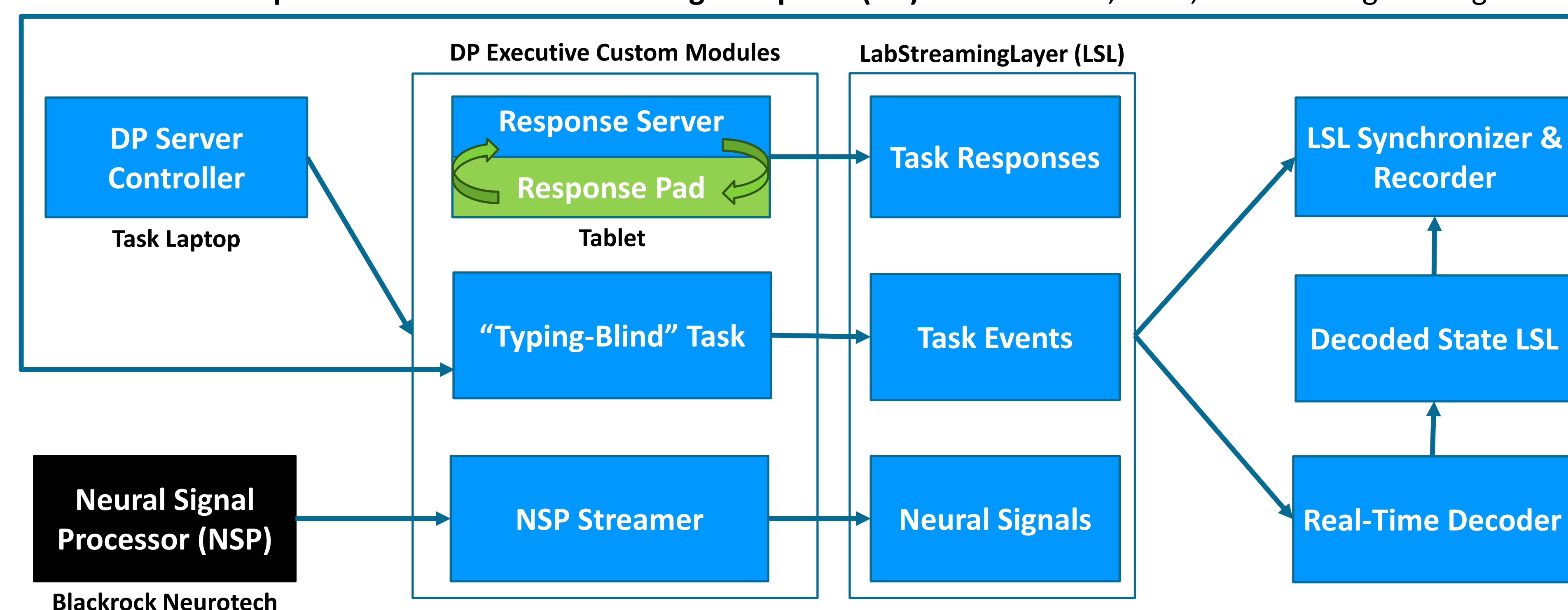
	Tactile Feedback	Visual Feedback	Response Pad
Yes	Yes	Yes	
No	No	Yes	
Yes	Yes	No	
No	No	No	



Tactile Feedback Aids

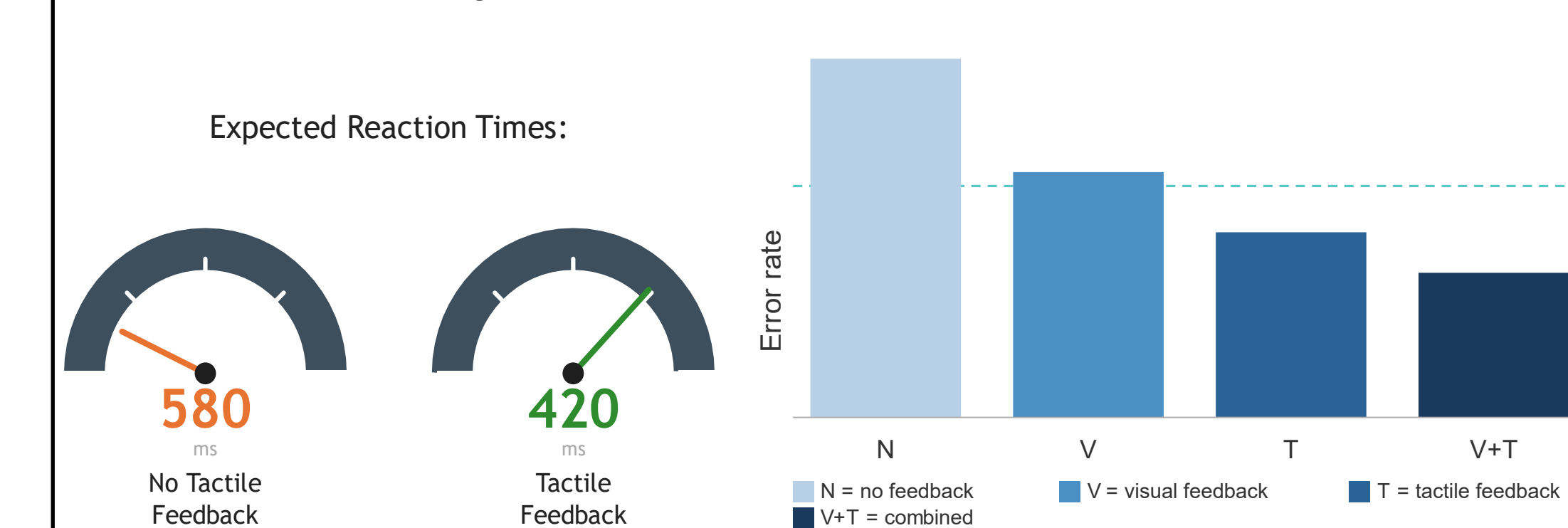


### Modular Experimental Framework Utilizing Dareplane (DP): M. Dold et al, 2025, J. Neural Engineering



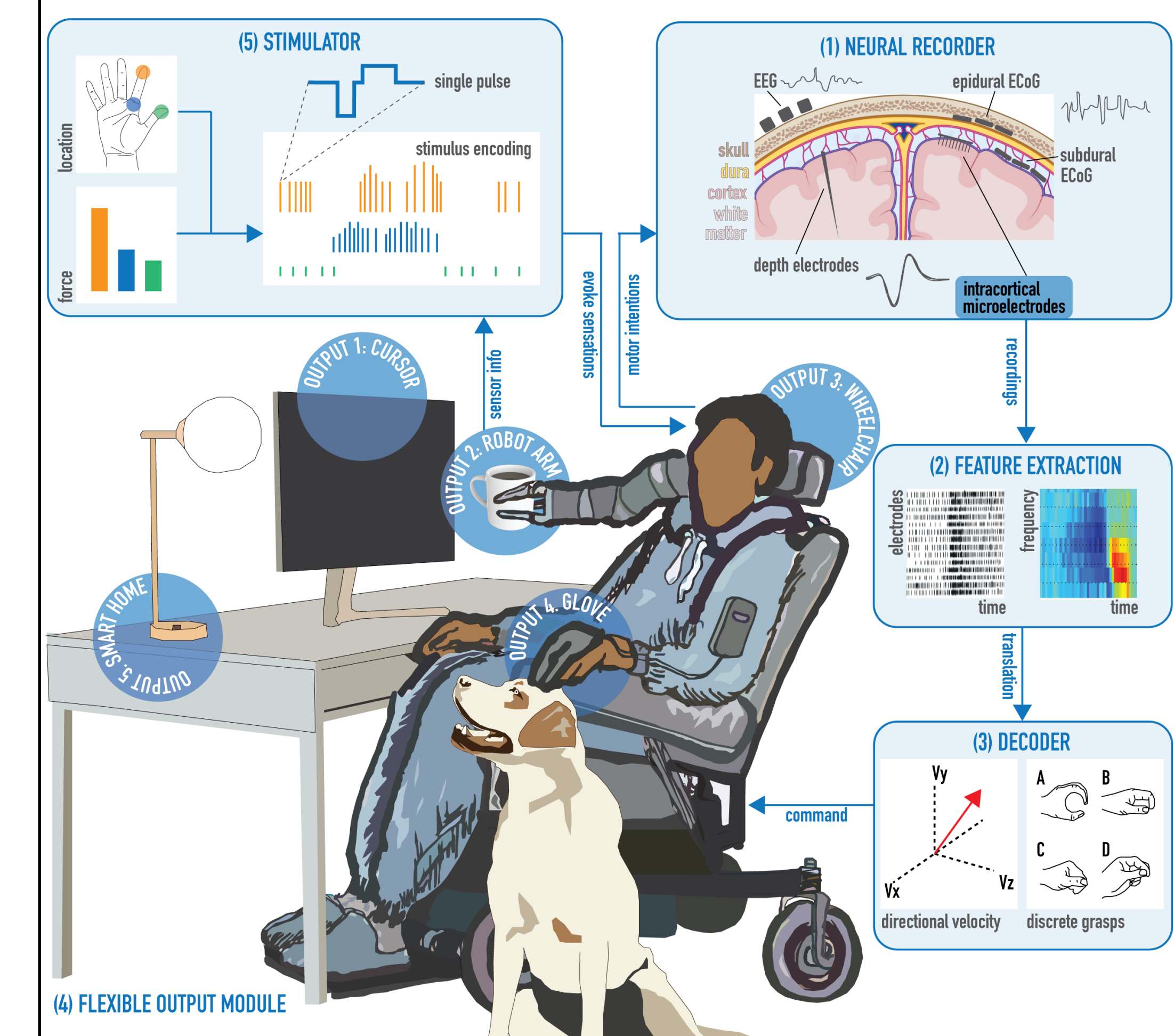
## EXPECTED RESULTS

### Benefit of Sensory Feedback in Motor Performance:



## FUTURE DIRECTIONS

Recruit sEEG patients to build a comprehensive dataset of finger movement and tactile processing recordings across all task conditions. Using the Dareplane pipeline, the team will implement closed-loop, real-time decoding of finger identity, movement onset/offset, and error-related responses during the Typing-Blind task, while systematically varying tactile and visual feedback to characterize their contributions to motor learning, reaction time, and error correction.



These findings will inform the design of next-generation machine interfaces that leverage both tactile and motor signals to restore dexterous hand function.

## ACKNOWLEDGMENTS & CONTACT

This research was funded by the Peter J. O’Donnell Jr. Brain Institute, Department of Neurological Surgery, and the Cain Scholarship in Mobility Disorders at UT Southwestern Medical Center.

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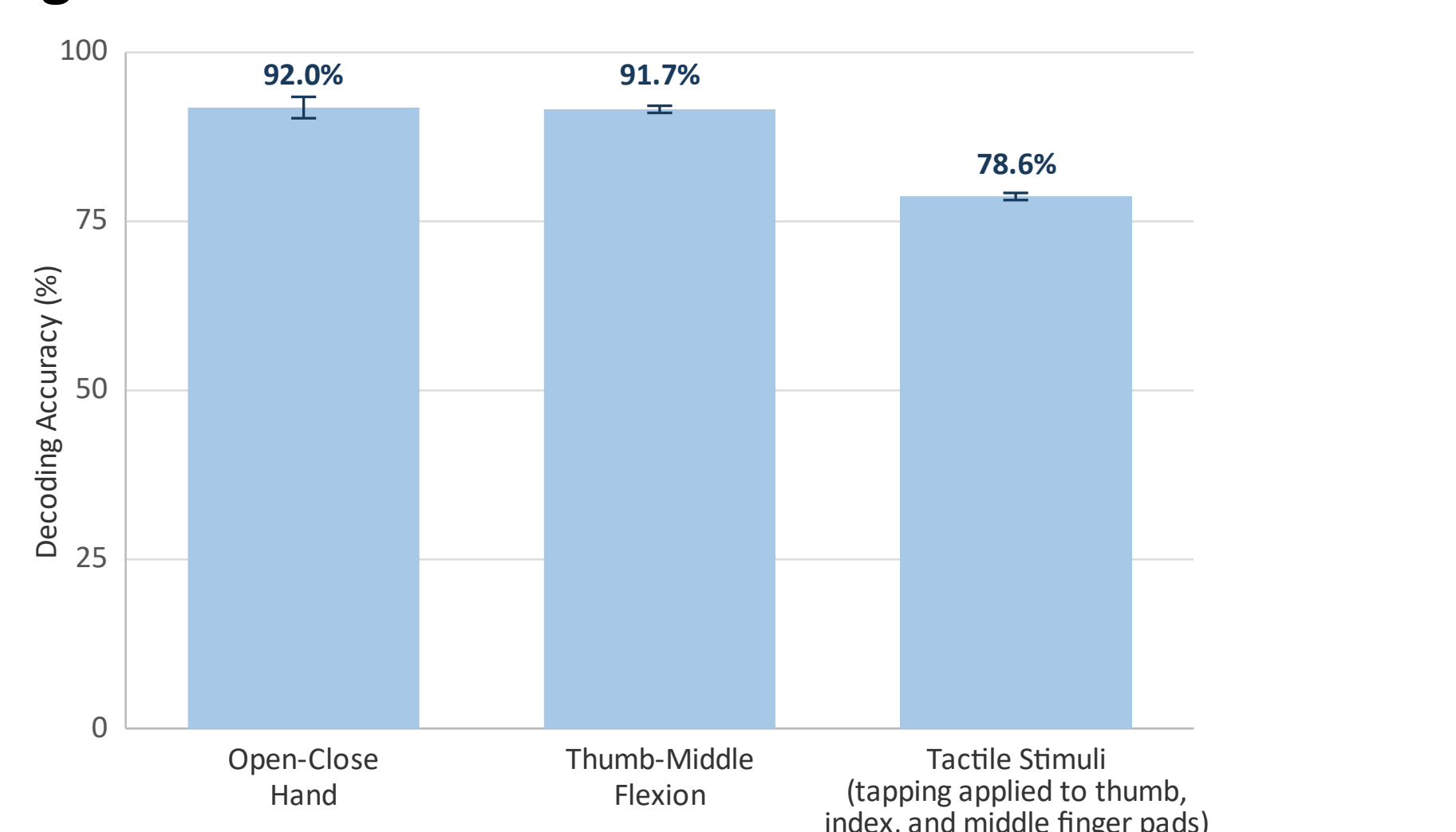
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Mind to Motion  
Lab Website

## PREVIOUS WORKS

**Stereo-electroencephalography (sEEG) can decode the type and timing of hand movements:** C. Bouton et al., 2021, Front. Neurosci.



**Error-Related Signals are Detectable in the Hippocampus up to ~1 second before Error Response:** M. Völker et al., (2018), IEEE SMC

