Supplementary Materials

Cognitive benefits of using non-invasive compared to implantable neural feedback

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Tables

	Sum of Squared Residuals	R-squared	Root Mean Square Error		
	(SSE)		(RMSE)		
NI1	0.139	0.9223	0.1243		
NI2	0.8546	0.8384	0.135		

Table S1. JNDs Goodness of Fit for NI subjects

	Stimulation Channel	Pulse-width (μs)					Amplitude (mA)
		L1	L2	L3	L4		
	Ch 1	136	198	278	391		7
NI 1	Ch 2	140	196	278	390		7
	Ch 3	134	190	267	374		11
	Ch 4	134	191	278	390		10

Table S2. Stimulation Pulse-Widths and Amplitudes for Subject NI1.

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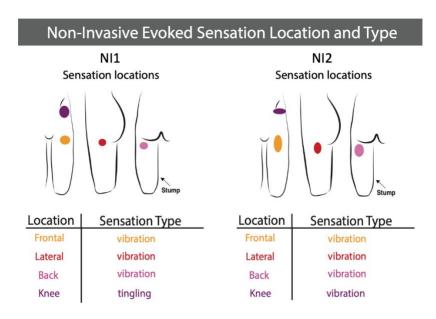


Figure S1 Non-Invasive Sensation Characterization. Perceived sensation locations and types in NI subjects.

Electrically-Evoked Sensation Characterization Extended Results A NI2 12 Perceived Magnitude Perceived Magnitude N=105 Normalized perceived intensity R= 0.99 Perceived Intensity p< 0.0001 3 int=10 mA f =50 Hz 260 300 320 240 140 220 Pulsewidth (µs) Stimulation Amplitude (µA) **Sensation Type Sensation Type** 6% 2% 20% Vibration 22% Pulsation Warm Tingling **Tingling** 21% Pressure Vibration 96% Electricity 29% Just Noticeable Difference - JND P judged stronger 7.0 9.0 8.0 JND = 232.3 nC int =10 mA f =50 Hz 0 216 227 238 302 313 324 248 259 270 281 292 Pulsewidth (µs) **Charge Density All NI Subjects** Charge Density All I Subjets (B) 1400 1200 8.0 Charge (µC/cm²) 000 008 009 (µC/cm²) 90 90 0.2 200 min max min max

Figure S2 Electrically-Evoked Sensation Characterization Extended results. (A) Electrical charge sensitivity, perceived intensity of charge, and sensation type for NI2 and I2. (B) Charge Density in all NI and I subjects.

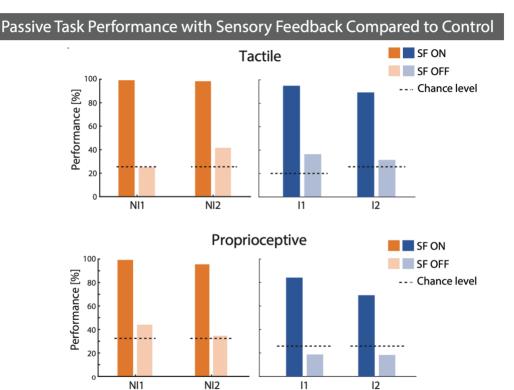


Figure S3. Passive Task Control Conditions. Correct passive identification of touched location or flexion level for Non-invasive subjects NI1, NI2 and invasive subjects I1, I2.

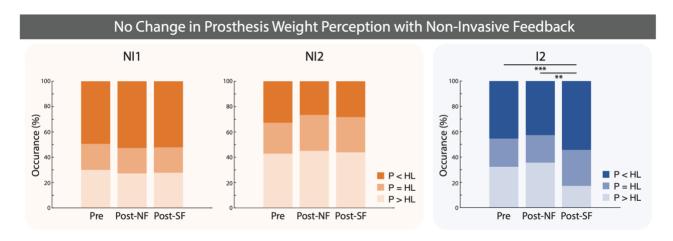


Figure S4. Prosthesis Weight Perception Relative to Healthy Leg. Occurrence of response to the question "Which leg is heavier". P = prosthetic, HL = healthy leg. Statistical significance is marked with p<0.05, p<0.01, p<0.001.

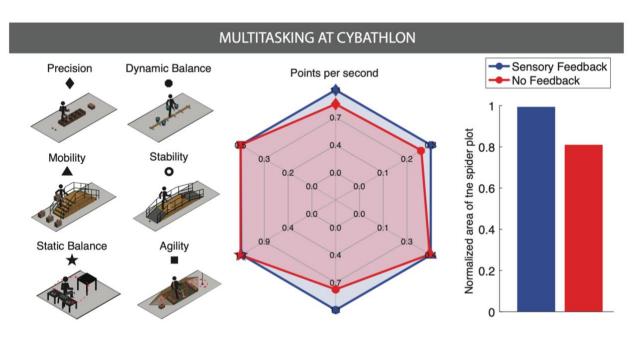


Figure S5. Daily Life Task Performance at Cybathlon. Points per second achieved in each of the daily life tasks at Cybathlon are plotted in a spider plot and compared with and without sensory feedback for NI1

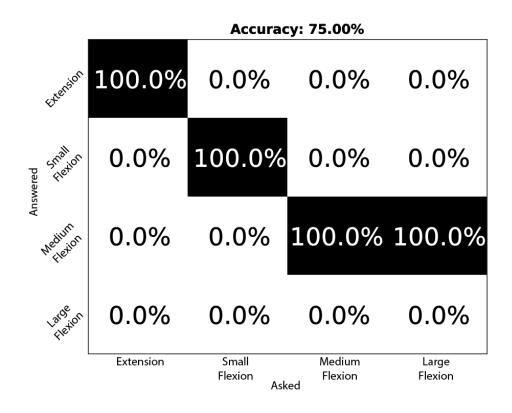


Figure S6. NI1 flexion level task performance with 4 levels. Corresponding levels of charge injected can be found in Table S2 in the CH 1 row.