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Presentation Abstract

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Presentation Title: Assessing brain-machine interface priorities from the perspective of spinal cord injury participants

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Abstract: Brain machine interface (BMI) technologies have the potential to restore function to people with spinal cord injury. Currently, multiple BMI design features are being investigated, such as interface modality, wireless potential, and multiple control outputs (e.g. natural arm, robotic arm, cursor control, typing). While these technologies may eventually provide some level of benefit, they also carry associated burdens. We conducted a technology survey to determine the level of benefit necessary for paralyzed individuals to consider using different technologies, given their associated burdens.
The survey queried user preferences for 8 BMI systems including EEG, ECoG, and intracortical microelectrode arrays, in different form factors. Illustrations of each technology and associate text described their usage, including information on donning and doffing the device, assistance needed, and associated burdens, including the potential for surgery. Thirteen questions were asked about different applications such as communication, hand or arm control, and different levels of performance. Participants rated their interest in each combination of technology and application on a 5-point scale ranging from “very unlikely” to “very likely”.
A total of 108 out of 137 participants who completed the survey had cervical spinal cord injuries. Here we summarize some of the results for this subset of

respondents.
84% of respondents were likely or very likely to consider using at least one technology for restoring "some ability to grasp with the hand", with 41% of these respondents interested in using a wireless intracortical array. Similarly, using a wireless array, 27% would be likely to use it if they could control a robotic arm, and 12% would be likely to use it if they could type accurately at 3 words per minute.
Assuming equivalent performance between a wireless EEG-based system and a wireless intracortical implant, 15% preferred the implanted device, whereas 56% preferred the EEG system, and 29% had no clear preference. There was little difference in preferences between the wireless intracortical array and wireless ECoG array, with 71% of the responses being the same for both.
There are an estimated 236,000-370,000 people living with traumatic spinal cord injury in the US alone, of which 56.6% are quadriplegic (NSCISC, 2012). The results of this survey provide a rational patient-centered basis for determining research priorities in the field of BMI.

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