Title: **Implications of movement coordination for developing myocontrolled prostheses**

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Abstract

The current presentation critically discusses the viability of myocontrolled upper extremity prostheses using insights from the coordination of movements. This is inspired from the finding that despite decades of research, users often report the control to be not straightforward and often reject the prosthesis. Part might be due to limitations using surface EMG. Here, novel issues related to myocontrol will be discussed. Independent of whether conventional, direct control or pattern recognition methods are used, for proper control of the prosthesis the myosignals need to be accurate, related to movement intent, and consistent over repetitions of the same intent. We will discuss whether these requirements are viable considering the properties of myosignals in goal-directed movements in an unaffected arm. First, myosignals do not accurately represent movement intent because muscle activations compensate for external force. Therefore, while myocontrol assumes myosignals to be the drivers of movement, myosignals may have a different role. Second, with respect to consistency over repetitions, in the natural situation muscle activation patterns are variable over repetitions of performing the same task, because an abundance of muscles is exploited. Thus, myosignals might have properties that differ from what is required for good myocontrol. The implications of these properties of myosignals will be translated into recommendations for future directions to develop

myocontrolled prostheses. Moreover, it will be discussed how these recommendations relate to what these properties of myosignals mean for alternative ways to detect movement intent, such as measuring force in the socket or directly measuring the neural signals.

Acknowledgement

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References

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