Induction of embodiment of a prosthesis into the body

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A phantom limb is the sensation where an amputated limb is still attached to the body and is moving together with other body parts. This phenomenon is reported by almost all amputees, and is usually accompanied by pain. While some amputees have a vivid kinesthesia for their phantom limb, previous studies have described others as having an awareness of the missing limb as clenched and paralyzed in a specific position. An evidence has been reported that effective use of a myoelectric prosthesis in upper extremity amputees result in the reduction of phantom limb pain and minimize an extent of cortical reorganization. This fact suggests that the long-term use of the artificial hand can be regarded as a process in which the prosthesis becomes part of the body.

In my talk, I demonstrate several cases of upper limb amputees who had extraordinary experience with their phantom limb, and will then introduce our attempts for better understanding of the phantom limb phenomenon and novel strategy for minimizing phantom limb pain through use of newly-developed prosthesis. Our developed prosthesis is based on the previous knowledge regarding the recognition of prostheses, those are, “prosthesis as a part of body” and “prosthesis as a tool”. We hypothesize that high function might enhance sense of agency (I am controlling the hand) with prosthesis while a realistic appearance might facilitate sense of ownership (the hand belongs to me), and long-term use of both two prosthesis will finally lead embodiment of the prosthesis into the body.

Biography:

Dr Noritaka Kawashima has received his PhD in 2005 from Shibaura institute of Technology. He worked at Toronto Rehabilitation Institute as a JSPS Postdoctoral Fellow for Research Abroad until 2006 and National Rehabilitation Center as a JSPS Superlative Postdoctoral Fellows (SPD) until 2008. Currently, he is a chief of Motor Control Section, Research Intsitute of National Rehabilitation Center for Persons with Disabilities (NRCD). Dr. Kawashima is a recipient of SICE Scientific Research Prize (2005), and Encouraging Prize by the Society of Life Support Engineering (LSE) (2011). His fields of expertise are neuromuscular control of human movement. His research interests are in the areas of behavioral/cognitive neuroscience and neuro-rehabilitation.