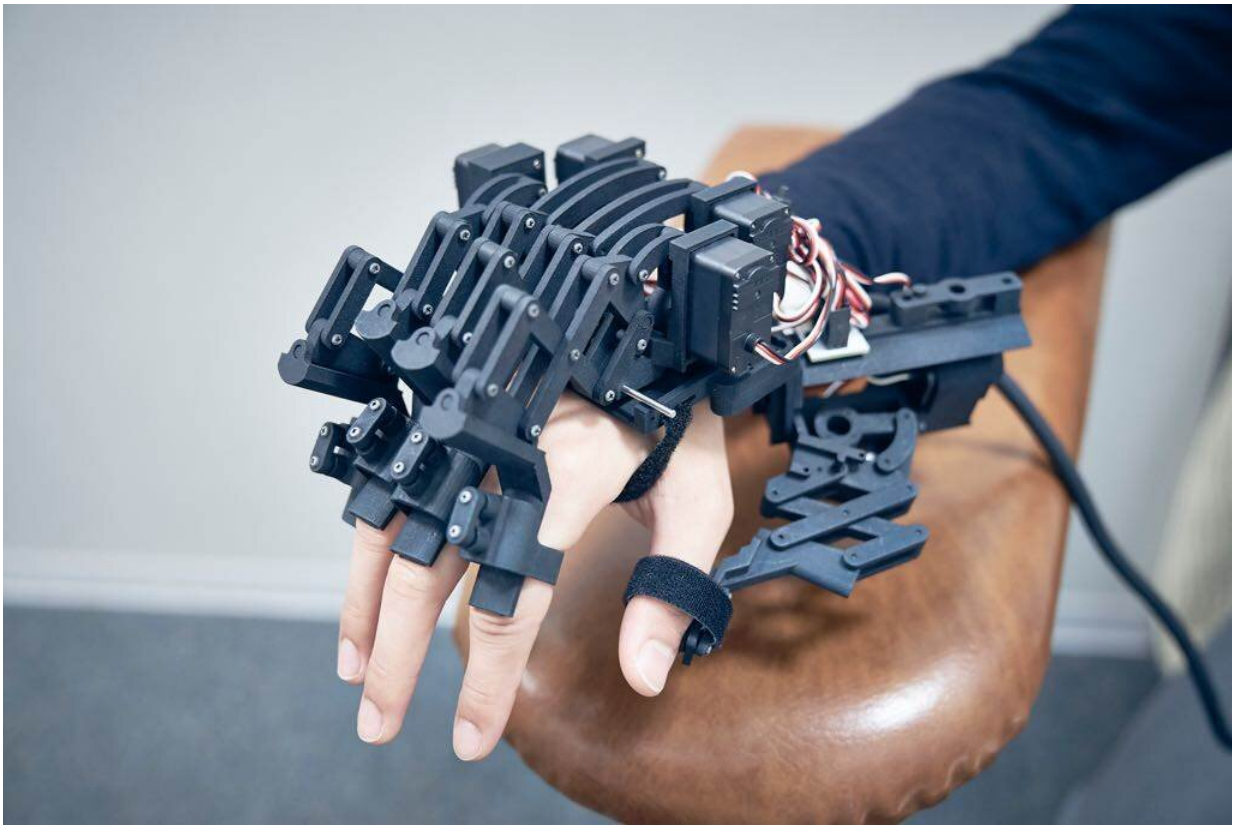


# Biological mechanisms behind skillful piano fingering

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Exoskeletal robot hand. Credit: JST  Sony CSL

Dr. Masato Hirano of Sony Computer Science Laboratories and his colleagues have discovered a sensorimotor function integration mechanism that enables skillful fingering by pianists.

The [tactile sensation](#) signaled by the skin and the proprioceptive sensation (deep sensation) signaled by muscles and joints are collectively called the [somatosensory system](#). It has long been understood that somatosensory information plays an important role in movement control. However, how somatic sensation contributes to production of the skillful movements of pianists has not been elucidated.

The research group developed a system to produce tactile and proprioceptive sensation in the fingers with an electric current stimulator and an exoskeletal robot hand, and developed an assessment system that evaluated the processing of neural information in the [cerebral cortex](#) using electroencephalogram measurements and transcranial magnetic stimulation. Using this system, expert pianists were found to have altered mechanisms by which tactile and proprioceptive sensation suppress the activity of the primary motor cortex in a specialized manner (somatosensory-motor integration). This neuroplastic adaptation was associated with enhancement of speed and precision of finger movements in pianists.

This finding is expected to be useful in the development of techniques to identify factors necessary for acquiring proficiency in skills such as [piano playing](#), tailor-made training methods that take [individual differences](#) into account, diagnostic methods for the early detection of neurological disorders where the function of fingers deteriorates due to excessive training, and in the development of rehabilitation methods.

**More information:** Masato Hirano et al. Specialized Somatosensory–Motor Integration Functions in Musicians, *Cerebral Cortex* (2019). [DOI: 10.1093/cercor/bhz154](https://doi.org/10.1093/cercor/bhz154)

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