SPINDLE: A New Hope for Tremor Patients

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Dear editor,

Tremors are involuntary, rhythmic movements of one limb or a part of the human body produced by irregularly synchronous contractions of reciprocally innervated muscles. The prevalence of essential tremors (ET) is 0.32% globally, affecting 24.9 million people[1]. Tremors affect significantly on an individual's capability to perform tasks of daily routine and reduce their independence and quality of life. It may also affect mood, sleep, ways of thinking, and fundamental motor functions.

Tremors could be treated pharmacologically or surgically depending on the severity of patients. The US Food and Drug Administration (FDA) has only granted approval for propranolol as a medication of limb tremors. Nevertheless, various patients showed poor response to propranolol and ended up with severe uncontrollable tremors enlightening the unfulfilled need for Electroconvulsive therapies. Based on scant data, treatments such as alprazolam, primidone, topiramate, and injections of type A botulinum toxin are being used. Although their durability is yet unknown.

FDA-approved treatments based on MRI-guided focused ultrasonography provide patients not responding to medicine with other options[2]. Besides pharmacological and surgical treatments, experts are introducing tremor control devices. A review published in 2019 highlighted efficacy of external tremor control devices including exoskeleton robots with tremor suppression control, magnetic particle brakes, pneumatic actuators and motors neuromodulation-based orthoses. However, there is little evidence for the effectiveness of these devices[3]. ADL-focused robotic training is quite important to enhance the individual's ability to perform Activities of Daily Living (ADLs), as tremor-related motor impairments make these tasks extremely difficult [4].

The research team of Gwangju Institute of Science and Technology (GIST), Korea took the responsibility and crowned themselves as the pioneer in the world of modern medical sciences by inventing the SPINDLE therapy technique. Their research was published in IEEE Transactions on Neural Systems and Rehabilitation in which the Spherical Parallel Instrument for Daily Living Emulation (SPINDLE) was introduced [5].

SPINDLE is a robotic rehabilitation device that provides resistive forces in 3-dimensional rotations. It is incorporated with a 6-axis force or torque sensor and a Virtual Reality (VR) System to enable an interactive ADL rehabilitation experience.

SPINDLE usage was proved to be effective and it had improved coordination, motor control, and neuroplasticity during rehabilitation. An amazing feature of the SPINDLE system is its game-based training paradigm, which facilitates different levels of resistance needed for therapy. People with tremors gets benefit greatly from SPINDLE therapy, which not only makes therapy sessions interesting and fun but also helps them become more agile and strong.

By concentrating on complex ADLs which seems challenging for other rehabilitation robots, SPINDLE has great potential to enhance the quality of life for patients with neurological disorders specifically the patients with tremors. Its small size makes it simple and easy to use with TV or VR systems, that creates stimulating atmosphere and promotes compliance with recovery plans. Its potential for home use represents a significant advancement in tremor rehabilitation, providing broader healthcare implications[5].

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However, the study had a limitation, it experimented with only one-dimensional tasks while SPINDLE can perform three-dimensional rotations. Therefore, emphasis needs to be put on investigating complex tasks with the vision of using SPINDLE as a potential tool to train individuals in performing daily life activities and improving their quality of life [4].

SPINDLE technology has broader implications that could be applied to fields such as sports training and injury prevention. SPINDLE sessions may also contribute valuable insights into neuroplasticity and motor learning, which could refine treatments for various neurological disorders. The promising outcomes endorse that SPINDLE can emerge as a preferred device in tremor rehabilitation programs. It is quite important to introduce new and interesting features in SPINDLE-based therapy that could be more effective and enjoyable for patients of tremors whose life is already frustrated by tremors.

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