

An fMRI system integrated with virtual reality based neuro-rehabilitation gaming system: bimanual versus unimanual motor control study

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Utilizing recent advanced technology based neurorehabilitation approach has increased to face the high demands due to the increasing numbers of functional motor deficit after stroke. Virtual reality based neurorehabilitation gaming system (VR-RGS) is one of these technology that is targeted for the induction and enhancement of functional recovery after lesions to the nervous system using non-invasive multi-modal stimulation. Patient engaged in VR-RGS observe colored balls in an outdoor virtual environment that is flying from far distance towards them. The patients' task is grasping the balls using virtual hands that is rendering in the VR world. The speed of the balls, the time interval between consecutive balls and the range of dispersion of the balls from the center line of the virtual environment can be adjusted to match the individual capacity of the subject in a flexible performance-adjusted manner, providing for individualized training. Thus, the core assumption behind the RGS rely on stimulating the human mirror neuron system, a special neurons that is being active both goal-oriented action execution and action observation performed with a biological effectors. This special neuron system facilitate the human brain plasticity that able to re-map lost adult brain functions by shifting regions of motor control to adjacent tissue to takeover damaged cortical area. Patients who have treated with VR-RGS obtained significance improvement on functional capabilities of the paretic arm assed by standard clinical scales.

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