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Neurorehabilitation 2
Delayed and abbreviated environmental enrichment, a model of preclinical neurorehabilitation, enhances functional outcome after experimental brain trauma

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Background: Environmental enrichment (EE) confers improvements in behavioral outcome and histopathology after experimental traumatic brain injury (TBI) vs. standard (STD) housing. However, as a model of rehabilitation, continuous EE is not clinically relevant due to the timing parameters of the typical EE and thus translatability could be limited. Specifically, TBI patients typically receive rehabilitation only after critical care has been provided and then only for 3-6 hours per day.
Objective: To mimic the clinic, the goal of this study was to determine whether delaying EE by three days and providing only six hours per day would provide benefits similar to continuous EE.
Methods: To address this rehabilitation relevant issue, isoflurane-anesthetized male rats were subjected to a controlled cortical impact (2.8 mm depth at 4 m/s) or sham injury and randomly assigned to TBI+EE (continuous), TBI+EE (3 day delayed, 6 hr day), and respective sham controls. Motor function (beam-balance/beam-walk) was assessed on post-operative days 1-5. Spatial learning/memory (Morris water maze) was evaluated on days 14-19.
Results: The data showed that EE, regardless of timing, improved motor and cognitive function compared to STD housing ($p < 0.0001$). Moreover, there were no differences between the TBI+EE (continuous) and TBI+EE (3 day delayed, 6 hr day), $p > 0.05$.
Conclusions: These data demonstrate that delayed and abbreviated EE produces motor and cognitive benefits similar to continuous EE after TBI and thus further supports EE as a preclinical model of neurorehabilitation. Ongoing studies are evaluating the effects of longer delays in implementing EE after TBI.

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How do the Task Constraints affect the Performance of Aiming Movements after Stroke?

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Background: Discrete and cyclic movements are differentially controlled by the central nervous system, which influences the performance of aiming movements. Direction of movement also influences performance. Cyclic and ipsilateral movements are faster and smoother than discrete and contralateral movements. The effects of task constraints over paretic arm performance were less explored.
Objective: This study analyzed the influence of the task constraints in paretic arm performance after stroke.
Method: A cross-sectional study was conducted with 10 post-stroke and 10 healthy individuals. Participants performed aiming movements over a digitizing tablet in different ways: discrete and cyclic movements and for ipsilateral and contralateral direction of the moving limb. The paretic arm was used by all patients. Temporal (reaction time, movement time and peak velocity) and spatial (smoothness, trajectory length and resultant constant error) variables were analyzed. Analysis of variance was used considering a significance level of 5%.
Results: Patients were slower to react and less smooth and accurate than the healthy group. Cyclic and ipsilateral movements were faster and less accurate than the discrete and contralateral movements for both groups. Additionally, patients could not reach the same trajectory length of the healthy group in cyclic movements.
Conclusion: Individuals after stroke modulate the paretic arm performance according to the task constraints similarly to that of healthy individuals. Both groups prioritized accuracy in discrete movements and speed in cyclical movements and were faster and smoother in the ipsilateral direction. Cyclic movements were, however, more difficult to be completed by the paretic arm.

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Neurorehabilitation 2
The activation of lower-extremity muscles during walking in different stage of Parkinson's disease

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Background: In the progression of Parkinson disease (PD), gradual derangement of the usage of lower extremity muscles are disabling. Therapeutic exercises has been effective on the mobility and balance. But the change of muscle activation pattern with progression of PD might give important information for therapeutic exercise implementation.
Objective: The purpose of this study was to investigate the activation of lower-extremity muscles according to Hoehn-Yahr scale during gait.
Patients and methods / material and methods: Thirty six Parkinson's patients (Hoehn and Yahr stage 1; 13, 63.1±7.8, stage 2; 15, 67.1±6.4, stage 3; 8, 63.7±8.7) participated in this study. Gait analyis was done with GAITRite system. We recorded EMG signals of the tibialis anterior (TA), medial gastrocnemius (MG), lateral gastrocnemius (LG), soleus (SOL), rectus femoris (RF), vastus lateralis (VL), semitendinosus (ST) and biceps femoris (BF) using Noraxon 16 channels EMG system during walking at preferred speed. Rectified EMG signals were normalized to reference voluntary contractions (RVC) over a gait cycle at the preferred speed.
Results: In loading response, TA showed gradual attenuation throughout H&Y stages, but MG, LG showed gradual increment ($p<0.05$).

In mid-stance and terminal stance, there was no significant changes except VL between H&Y stage 1 vs 3 in mid stance ($p<0.05$).

In initial swing phase, TA and in terminal swing phase MG showed gradual attenuation throughout H&Y stages ($p<0.05$).
Conclusion: In progression of PD, muscular exercise programs needs to focus on pretibial and calf muscles for good control over gait cycle.

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