Impact of intensity of practice after stroke: Issues for consideration

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The lecture addresses four relevant issues related to the impact of intensity of practice after stroke. First, the lecture discusses from perspective of existing literature the evidence for a dose-response relationship in stroke rehabilitation. Despite the evidence that early started intensive practice may enhance the pattern of functional recovery after stroke, in most countries patients receive an insufficient dose of therapy at working days suggesting a discrepancy between existing evidence for intensive practice, on the one hand, and, the actual amount of therapy applied in the current healthcare system which appeared more related with management decisions rather than the number of staff available. With that the question raises how we can augment intensity of exercise training after stroke, without increasing resources. Fortunately, a number of studies have shown that augmentation of task-oriented practice is possible by increasing:

- the ability to practice in groups by using patient tailored workstations (i.e. circuit class training);
- using forced use paradigms such as constrained induced movement therapy for the upper limb;
- using (electronic) devices, including robotics that allow patients to practice on their own;
- preventing poor compliance in physical and occupational treatment sessions by identifying factors that predict poor adherence.

The reported effects of stroke rehabilitation seem to be largely dependent on adequate control for therapy time in the control group in order to augment treatment contrast, as well as on the appropriate selection of patients with some potential for functional change. For example, this latter precondition in particular is critical for upper limb training, in which the increased probability of return of dexterity seems to be largely defined in the first 4 weeks post stroke. In other words, understanding the effects of intensity of practice requires knowledge about functional prognosis as well as the mechanisms underlying the non-linear recovery pattern after stroke.

Introduction. During a rehabilitation session, the use of robot-assisted device allows high number of movements, enhancing motor command in hemiparesis [1]. The robot can also be used as a tool to quantify effects of upper limb robot-assisted training associated with standard therapy in subacute stroke.

Methods. Seventeen patients with subacute hemiparesis (52 ± 20 years; time since stroke 54 ± 27 days; upper limb Motricity Index, 31 ± 15/100; Functional Independence Measure, 74 ± 25/126) performed 16 sessions (4/week) of robot-assisted shoulder/elbow training (MIT-Manus, InMotion Inc., MA, USA) associated with standard therapy. Number of movements and assistance provided by the robot were collected at sessions S1, S8 and S16. Patients were also evaluated on the 4-target pointing task (14 cm apart) without robot-assistance, by measuring task success index (1 = target reached; 0 = not reached), hand trajectory length, velocity and smoothness index.

Results. Overall, the mean number of movements performed per session with the robot was 681 ± 214 [357–1000]. At S8, there was an increase by 46% of the number of movements (S1, 513 ± 262; S8, 750 ± 261; P = 0.002), by 8% of robot-assistance intensity (S1, 205 ± 7Nm; S8, 189 ± 23Nm, P = 0.009), and an improvement in task success index (+28%, P = 0.04), and in movement velocity (+61%, P = 0.007). Between S8 and S16, there was further increase in movement velocity (+50%, P = 0.0002) and a decrease in hand trajectory (~17%, P = 0.004). Smoothness remained unchanged.

Conclusion. Robot-assisted training may provide high intensity training in combination with standard rehabilitation in subacute hemiparesis. With an upper limb rehabilitation program including robot-assisted training, kinematic improvement occurred from the first sessions and trajectory accuracy increased during the last sessions (S8–S16).

Reference


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Robot-assisted training combined with standard therapy in subacute stroke – impact measured with the robot

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Effect of repeated sessions of combined anodal tDCS and peripheral nerve stimulation on motor performance in acute stroke: A behavioural and electrophysiological study

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Background and purpose. Non-invasive neuromodulation such as repetitive transcranial magnetic stimulation (rTMS) or transcranial direct current stimulation (tDCS) applied over the contralesional or ipsilesional motor cortices (M1), in association with neurorehabilitation, can improve motor recovery in patients after stroke [1–3]. Most studies have been performed in the chronic phase and very few in the acute one. The purpose of this study was to assess in the acute phase of post-stroke recovery the effect of anodal direct current stimulation (tDCS) applied over the ipsilesional primary motor cortex (M1) combined with repetitive peripheral nerve stimulation (rEPNS) on the motor performance of the paretic hand.

Methods. In this double-blind, sham-controlled study, 20 patients are enrolled within the first month after a cortical or subcortical stroke and are randomized in two parallel groups. The first group receives five consecutive daily sessions of anodal tDCS over the ipsilesional M1 in association with rEPNS of the radial