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# Combination of anodal transcranial direct current stimulation and robot-assisted arm training for the rehabilitation of upper extremity in chronic stroke patients: a pilot investigation

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## Introduction

Stroke is one of the leading causes of long term disability in adults. Evidences suggest that less than 20% of stroke survivors regain normal motor function over their hemiplegic upper extremity after rehabilitation. Transcranial direct current stimulation (tDCS) is a form of non-invasive brain neurostimulation technique that use constant, low electrical current delivered directly through the scalp via electrodes, aiming to change the cortical excitability, and hence promote recovery in the area of interest being stimulated. This novel technique is believed to have promising effects in promoting recovery in stroke patients. Combination of upper extremity exercise with tDCS might further enhance the therapeutic effects.

## Objectives

To evaluate the effects of anodal tDCS followed immediately by robot-assisted arm training for promoting the motor and functional recovery of the hemiparetic upper limb in patients with chronic stroke.

## Methodology

A pre-test and post-test study design was adopted. Seventeen chronic stroke patients (11 males, 6 females), aged 63.4±10.6 years old participated in this investigation. Averaged time post-stroke was 16.9±4.5 months. All of them presented with mild to moderate motor impairment in the affected upper extremity. Twenty minutes of anodal tDCS (1mA) was applied over the ipsilesional primary motor cortex followed immediately by 30 minutes of robot-assisted arm training. The interventions were delivered twice per week for 5 weeks. Outcome measures included Fugl-Meyer Motor Assessment of Upper Extremity, Action Research Arm Test, and Box & Block Test. Evaluations were done at baseline and after interventions. Paired sample t-test was used for statistical analysis.

**Result**

On completion of 10 sessions of interventions, the mean Fugl-Meyer Motor Assessment of Upper Extremity score improved significantly from 36.7±18.4 to 41.7±19.0 (13.6%, p=0.028). Moreover, the Action Research Arm Test score increased significantly from 29.3±21.9 to 32.3±21.8 (7.9%, p=0.043). A non-significant improvement in the Box & Block Test, from 15.1±16.6 to 17.7±17.5 (17.0%, p=0.104) was observed post-interventions. The administration of anodal tDCS in combination with robot-assisted arm training appears to be beneficial for promoting the motor and functional recovery of hemiparetic upper extremity in chronic stroke survivors.