Zhiqiang Liang[1], Xue Guo[2], Perianen Ramasawmy[2], Zhiqiang Liang[3], Andrea Antal[2], Yu Liu, FACSM[1]. [1]*Shanghai University of Sport, Shanghai, China.* [2]*University Medical Center Göttingen, Göttingen, Germany.* [3]*Zhejiang University, Hangzhou, China.*
(Sponsor: Yu Liu, FACSM)
Email: liang_sus@163.com
(No relevant relationships reported)

Based on recent research findings, endurance performance during incremental cycling depends on the level of cortical activation of the FC1-FC2-C1-C2 motor network. Indeed, a novel multifocal transcranial direct current stimulation (tDCS) protocol with different individual stimulation intensities and polarities to simultaneously target multi-different cortical areas has been used to modulate this specific area in order to enhance endurance capacity.
PURPOSE: This study was designed to examine how multifocal tDCS affects cortical excitability and blood flow of specific areas.
METHODS: Fifteen healthy participants (21.6±2.91yrs, 163.9±6.62cm, 53.5±8.49kg) received two types of 20minutes multifocal tDCS with a seven-electrode montage targeting the motor cortex (FC1, FC2, C1, C2) and associated areas (AF7, P9 and PO7) based on electric-field modelling. They received either anodal or cathodal currents over the motor cortex electrodes. Anodal motor stimulation was consisted of FC1(1.221mA), FC2(0.954 mA), C1(1.053 mA), C2(0.77mA), AF7(-1.016mA), P9(-1.430mA), and PO7(-1.552mA), and cathodal was consisted of FC1(-1.221mA), FC2(-0.954mA), C1(-1.053 mA), C2(-0.77mA), AF7(1.016mA), P9(1.430mA), and PO7(1.552mA). The functional near-infrared spectroscopy was used to assess the cortical excitability and blood flow during tDCS by measuring the concentrations of oxygenated (HbO) and total hemoglobin (THb) respectively.
RESULTS: Anodal motor cortex stimulation resulted in significantly higher HbO in FC1 (t=2.92, p=0.015), FC2 (t=3.37, p=0.007), and C2 (t=2.44, p=0.035), and significantly higher THb in C2 (t=2.24, p=0.049) than cathodal motor cortex stimulation, but no differences were observed in other areas.
CONCLUSIONS: Multifocal tDCS with anodal configuration induces cortical excitability increases in majority of specific cortical areas, while having less effect on blood flow. Therefore, using multifocal tDCS with anodal configuration might induce more promising modulation effects in enhancing endurance capacity.
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Per-session Improvement Of Biceps Brachii Power Among Males Performing Concentric Unilateral Curls

Marie R. Jensen[1], Jacob M. Cunha[2], Michael L. Bruneau, Jr, FACSM[3], Courtney D. Jensen[2]. [1]*Tufts University, Phoenix, AZ.* [2]*University of the Pacific, Stockton, CA.* [3]*Drexel University, Philadelphia, PA.* (Sponsor: Michael Bruneau, Jr., FACSM)
(No relevant relationships reported)

Muscular power is important in athletic settings and activities of daily living. Skeletal muscle is a highly adaptable tissue; however, the rate of power improvement upon novel unilateral training requires further investigation.
PURPOSE: To evaluate changes in power output of the biceps brachii during concentric unilateral exercise against a 3D isotonic load.
METHODS: We tracked 26 male subjects for a minimum of 5 consecutive workout sessions involving unilateral bicep curls (dominant and non-dominant) using a Proteus device. Owing to inconsistency of performance during the first session, we evaluated sessions 2 through 10. We retained 15 subjects through 8 sessions, and 8 subjects through 10 sessions. We performed paired-samples t-tests comparing power output of the dominant arm to the non-dominant arm at days 2, 5, 8, and 10. We also compared the rate of progress of each arm from day 2 to day 5 and from day 5 to day 8. Linear regression, holding age constant, evaluated power improvement from day 2 to day 5.
RESULTS: Subject age was 30.6 ± 15.5 yr, height was 71.0 ± 3.9 in, and weight was 179.3 ± 25.8 lb. On day 2, dominant arm power was 75.8 ± 37.9 w and non-dominant power was 74.9 ± 39.5 w. No difference was observed between arms at day 2 (p=0.817), day 5 (p=0.885), day 8 (p=0.108), or day 10 (p=0.396). From day 2 to day 5, subjects improved 25.2 ± 40.6 w (33.2%) in the dominant arm (p=0.004) and 26.1 ± 42.7 w (34.0%) in the non-dominant arm (p=0.005). From day 5 to day 8, power improvement was not significant for dominant (p=0.739) or non-dominant (p=0.629) arms. From day 5 to day 10, differences in power were not significant for dominant (p=0.376) or non-dominant (p=0.967) arms. In the dominant arm, between sessions 2 and 5, each additional exercise session predicted a power increase of 8.7 w (p=0.015; 95% CI: 1.8, 15.7) when holding age constant (p=0.026). In the non-dominant arm, each additional day predicted an increase of 8.4 w (p=0.030; 95% CI: 0.9, 16.0). Age was not significant (p=0.120); removing it from the model did not affect the relationship between exercise session and power (β=8.4; p=0.031).
CONCLUSION: Five consecutive sessions of a novel training stimulus were sufficient to elicit significant improvements in power of the biceps brachii. Improvement tapered after 5 exercise sessions, indicating a neurophysiological explanation.

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Effect Of Different Doses Of Cupping Therapy In Reducing Muscle Fatigue

Zhao Pengrui, Hou Xiao, Bai Zhenmin, Jia Yuanyuan, Liu Yangxiaoxue. *Beijing Sport University, Beijing, China.*
Email: zhaopr981027@163.com
(No relevant relationships reported)

Cupping therapy has been used to alleviate muscle fatigue. However, the lack of standardized guidelines on the dose-response relationship of cupping therapy limits the adoption of cupping therapy in clinical practice.
PURPOSE: The purpose of this study was to investigate the effect of various durations and pressures of cupping therapy in reducing muscle fatigue.
METHODS: Twenty-eight healthy participants were randomized into four groups. The 2×2 factorial design was used to test four cupping protocols, including two durations of 5 and 10 minutes and two negative pressures at -300 and -400mmHg. Different doses of cupping therapy were applied after muscle fatigue. Surface electromyography (EMG) with mean frequency (MF) and median frequency (MDF) were used to assess muscle fatigue before fatigue, immediately after fatigue, and 24 hours after fatigue. Two-way analysis of variance (ANOVA) was used to examine the main effects of the duration and pressure and the interaction effect between the duration and pressure factors.
RESULTS: The results showed that there were no significant differences in baseline levels and immediately after fatigue among the 4 groups. There were no interactions between the durations and pressure factors (MF p=0.830, MDF p=0.742). The main effects of the pressure of MF and MDF were both p<0.001. The main effects of the duration of MF and MDF were p=0.06 and p=0.189, respectively. The post hoc comparison showed that -400mmHg cupping is more effective in reducing muscle fatigue than -300mmHg cupping with the same duration (MF: -400mmHg 127.074±2.514 Hz vs. -300mmHg 111.320±2.514 Hz, P<0.001; MDF: -400mmHg 107.670±2.608 Hz vs. -300mmHg 124.320±2.608 HZ, P<0.001). However, there was no significant difference between the different cupping durations in reducing muscle fatigue with the same pressure (MF: -400mmHg 115.6993±2.514 Hz vs. -300mmHg 122.700±2.514 Hz, P=0.06; MDF: -400mmHg 113.734±2.608 Hz vs. -300mmHg 118.726±2.608 Hz, P=0.189).