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BOOK OF ABSTRACTS
Edited by:
Guilhem, G., Rabita, G., Brocherie, F., Tsolakidis, E.,
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RESULTS: Thirty-eight older adults were analyzed based on the criteria. The participants were divided into two groups, 15 older adults with normal motor unit firing patterns (N group) with $p < 0.05$ calculated by regression analysis between recruitment threshold and firing rate of individual motor units, and 23 older adults with abnormal motor unit firing patterns (AN group). Mean time and CV of stepping time during the whole duration were not different between two groups ($p = 0.687$, $p = 0.066$, respectively), but the peak CV among every 5-s interval was significantly higher in AN group than N group ($p = 0.044$).

CONCLUSION: Older adults with abnormal motor unit firing patterns would have the impaired ability to perform rapid and regular stepping, which would rely on neural control. The findings suggest the importance of normal motor unit firing patterns for maintaining motor functions in older adults.

REFERENCES:

[1] Watanabe K et al. Age (Dordr) 38(3): 48, 2016.

IN HEALTHY YOUNG ADULTS, MAT PILATES INDUCES NEUROMUSCULAR FACILITATION OF MAXIMAL ISOMETRIC FORCES DURING KNEE FLEXION AND EXTENSION MOVEMENT

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INTRODUCTION: Pilates exercise has become popular for strengthening trunk muscle and increasing flexibility. Recent research found that mat Pilates induced improved multiple isokinetic torque parameters (1) (2) and maximal isometric forces from knee extension and flexion (3) in elderly women. However, limited studies have been conducted to validate the effects of Pilates on isometric muscular strength in young adults. This study aimed to investigate whether mat Pilates training improved maximal isometric forces during knee extension and flexion movements in healthy young adults.

METHODS: The study included 23 college students (aged 21.0 ± 1.0 years) divided into two groups: Pilates group (PG; n = 11) and control group (CG; n = 12). Participants in PG performed a 60-minute mat Pilates exercise once a week for 12 weeks under the supervision of a licensed instructor. CG received no Pilates intervention and was instructed to spend as much of their daily life as possible without physical activity. The maximal isometric forces during knee extension and flexion movements were measured in both PG and CG before and after the intervention.

RESULTS: Height and bodyweight did not differ significantly different between groups. When comparing the pre- (203.96 ± 6.5 Nm) and post 12-week intervention (224.77 ± 14.2 Nm), the PG demonstrated a significant improvement in peak torque of knee extensor muscles during maximal isometric knee extension movement ($p < 0.01$). Furthermore, there was a significant improvement in peak torque of knee flexor muscles during maximal isometric knee flexion movement ($p < 0.05$), when comparing pre- (88.18 ± 7.2 Nm) and post-intervention (96.46 ± 7.7 Nm). Conversely, there were no significant differences for the CG in any of the analyzed variables in the intra-group comparison, pre- and post-intervention.

CONCLUSION: Mat Pilates improves maximal isometric forces during knee flexion and extension movements. These findings imply that Pilates exercise aids in the neuromuscular facilitation of the lower limbs as well as improvement of knee flexor and extensor muscular function in young adults.

1. Bertoli et al., J Bodyw Mov Ther, 2018

2. Oliveira et al., J Bodyw Mov Ther, 2017

3. Teixeira de Carvalho et al., Exp Aging Res, 2017

THE EFFECTS OF TACTILE STIMULUS ON BIPEDAL POSTURAL SWAY IN EARLY ADOLESCENTS

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INTRODUCTION: The purpose of this study was to investigate the effects of painful and indolent tactile stimulus which was applied through the skin of calf area over bipedal postural sway in early adolescents.

METHODS: 156 adolescents volunteered in the study (n girls=82, n boys=74). They were divided randomly into 3 groups as Painful Stimulus Group (PS) (n=47), Indolent Stimulus Group (IS) (n=55) and the Control Group (C) (n=54). GYKO inertial sensor was used for bipedal postural sway measurements. The data considered from sway measurements were Elliptical Area (EA), Length (L), Mean Distance (MD), Velocity (V) on Medio-Lateral (ML) and Antero-Posterior (AP) directions. PS and IS groups were respectively asked for bipedal postural sway measurement, prone position for 1-minute bilateral calf stimulus and bipedal postural sway measurement again. C group distinctly just lied down for 1-minute without stimulation between the tests. One way ANOVA was used for intergroup comparison and paired sample t-test was used for intragroup comparison.

RESULTS: There was no significant difference between the groups in pre and post-tests. All three groups showed significant increases between the tests in V, AP-L, AP-V. In addition, the PS group showed statistically significant difference in L, ML-L and ML-V. Although there were significant differences, the effect sizes were determined as trivial or small, and the bipedal postural sway responses of girls and boys to tactile stimuli differs.

CONCLUSION: In conclusion investigating the effects of sensory manipulations on bipedal postural sway, we should notice the quality of the stimulus matters. The application area and the quality of the tactile stimuli can affect the bipedal

postural sway parameters differently. This study should be applied for investigating the age and gender effects in different age and gender groups and for customizing the effects of the stimuli characteristics the stimuli should be applied on different body parts.

EFFECTS OF PULSE DURATION AND FREQUENCY ON ELECTROSTIMULATION-EVOKED FORCE: COMPARISON BETWEEN THREE MUSCLE GROUPS

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INTRODUCTION: Neuromuscular electrical stimulation (NMES) consists in the application of transcutaneous stimuli to superficial muscles with the goal to evoke visible contractions. The technique is commonly used to improve muscle function but has inherent limitations such incomplete motor unit recruitment and discomfort. Over the recent years, the so-called wide-pulse high-frequency (WPHF) NMES has been introduced to partially overcome these limitations. It has indeed been shown that low-intensity NMES delivered with a pulse duration of 1 ms and a frequency of 100 Hz can generate a progressive increase in plantar flexor tetanic force through central recruitment of motor units called extra force (EF) (Collins, 2007; Wegrzyk, 2015). However, the combination of stimulation parameters other than 1 ms-100 Hz to maximize EF has not been investigated and it is currently unknown if the EF response differs between muscle groups with different composition, architecture or function. The aim of the present study was to assess the impact of the stimulation parameters on the NMES evoked force profile in plantar flexors, knee extensors and elbow flexors of the same participants.

METHODS: Sixteen volunteers, 14 men and 2 women (29±6 yrs, 177±6 cm, 74±11 kg) participated in a familiarization session followed by 3 experimental sessions (one per muscle group), which included twelve 10-s NMES trains separated by at least 2 min of rest and delivered at an intensity set initially to evoke 10% of the maximal voluntary contraction force. Stimulation trains were randomly delivered with a combination of frequencies (20, 50, 100 and 147 Hz) and pulse durations (0.2, 1 and 2 ms). The development of EF was calculated as the relative percent increase in force between the last and the 2nd second of the stimulation.

RESULTS: For the plantar flexors, greater EFs were generated with frequencies of 100 and 147 Hz (80±77%) compared to 20 and 50 Hz (51±57%, $p<0.001$) and with durations of 1 and 2 ms (74±71%) compared to 0.2 ms (48±51%, $p<0.001$). For the knee extensors and the elbow flexors, no difference in EF was observed between any parameter (respectively 51±109% and 26±74%). Higher EFs were generated for plantar flexors (92±76%) compared to elbow flexors (14±39%, $p=0.005$) using the standard WPHF stimulation parameters (100 Hz, 1 ms) but EFs were not significantly different between knee extensors and the two other muscle groups with this frequency and pulse duration.

CONCLUSION: Despite individual variability in the generation of EF depending on the parameters, the wider pulses (1 and 2 ms) and higher frequencies (100 and 147 Hz) induced greater EFs than the other tested parameters for the plantar flexors. The composition, architecture and function of the stimulated muscle seem to influence the generation of EF, which was the highest for the plantar flexors and the lowest for the elbow flexors.

Collins, D. F. Exerc. Sport Sci. Rev., 35(3), 2007

Wegrzyk, J. et al. Clin Neurophysiol, 126(7), 2015

EFFECT OF LEGS STARTING BLOCK POSITION ON KINETICS AND KINEMATICS OF AN HEMIPLEGIC/BRAIN IMPAIREMENT T37 ELITE SPRINTER

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INTRODUCTION: Brain impairment (BI) significantly slows down the movement and leads to a reduction of the range of motion of the movement (ROM) and forces (Bezodis et al., 2020; Connick et al., 2015). Specifically, for hemiplegic, this loss of force is not the same in the right or the left side (Beckman et al., 2016). Thus, in starting block sprint phase, the force developed by the right and left leg should be different and the ability of the sprinter to have a balance of force between the right and left could be a strategy to improve sprint performance. The purpose of this study was to compare legs starting block position on kinetics and kinematics of a hemiplegic elite sprinter

METHODS: An elite sprinter (T37) performed 6 maximal 40-m sprints from starting blocks. The athlete realised three sprints with the paretic side in the front position (PSF) in the starting block and three sprints with the paretic side in the rear position (PSR). Average forces, impulses, were measured from the start to the 4th step using force plate (Kisler ; 1000 Hz). During the entire race, instantaneous velocity, maximal velocity, time contact, time flight, steps rate and lenght (V, Vmax,Tc, Tv, SR and SL) were measured using radar (Stalker Pro II; 48 Hz) and an optojump (Microgate, Bolzano). Using the velocity time curve and the model proposed by Samozino et al. (2016), the theoretical force (F0), velocity (V0) and maximal power (Pmax) were calculated.

RESULTS: The results demonstrated that lateral force and impulse were lower in the PSF condition (84 ± 75 vs 70 ± 46 N and 29 ± 41 vs 20 ± 23 N.s-1). Tc, Tv, SR and SL, averaged on the entire sprint, were not different between PSF and PSR, respectively for Tc, 0.142 ± 0.018 vs 0.145 ± 0.022 s for Tv, 0.103 ± 0.021 vs 0.102 ± 0.02 s, for SR 4.1 ± 0.1 vs 4.1 ± 0.4 Hz and for SL 168.5 ± 36.7 vs 168.4 ± 37.1 cm. Concerning the force velocity profile, F0 and Pmax

were greater for PSF condition (respectively for F0 373 ± 25 vs 358 ± 1 N and for Pmax 795 ± 49 vs 766 ± 8 W).