UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE
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DEPARTAMENTO DE EDUCAÇÃO FÍSICA

Transcranial cerebellar direct current stimulation in Paralympic powerlifters

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Paralympic sport

Mello; Winckler (2012)

Paralympic sport

Mello; Winckler (2012)


5 a side football
7 a side football
archery
athletics
boccia
equestrian
goalball
judo
powerlifting
road cycling
rowing
sailing
shooting
sitting volleyball
swimming
table tennis
track cycling
wheelchair basketball
wheelchair fencing
wheelchair rugby
wheelchair tennis

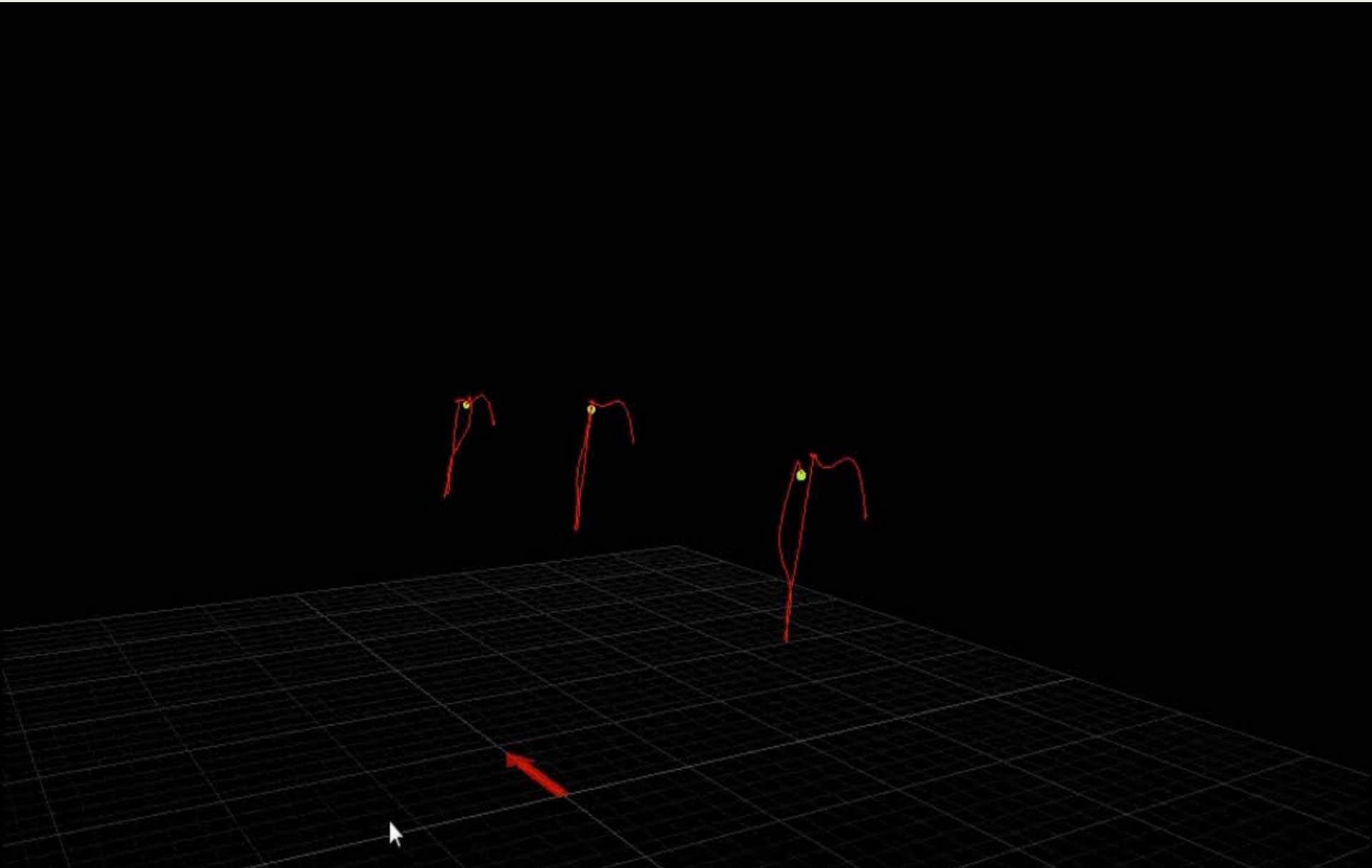
Powerlifting

Eight eligible physical impairments

(impaired muscle power, impaired passive range of movement, limb deficiency, leg length difference, short stature, hypertonia, ataxia, and athetosis)

All eligible athletes compete in one sport class

Training



Transcranial Direct Current Stimulation (tDCS)

Non-invasive tool that can modulate the excitability of specific regions of the cerebral cortex.

Cerebellum

Ergogenic resource

Nitsche et al., 2008; Boggio et al., 2006; Hummel et al., 2006; Cogiamanian et al., 2007; Tanaka et al., 2011; Okano et al., 2013

Objective

The purpose of this study was to evaluate the effect of tDCS applied to the cerebellum on movement control in Paralympic powerlifters.

Also, taking in consideration the disabilities.

Methods

8 elite powerlifters

(3 amputees, 5 *les autres*)

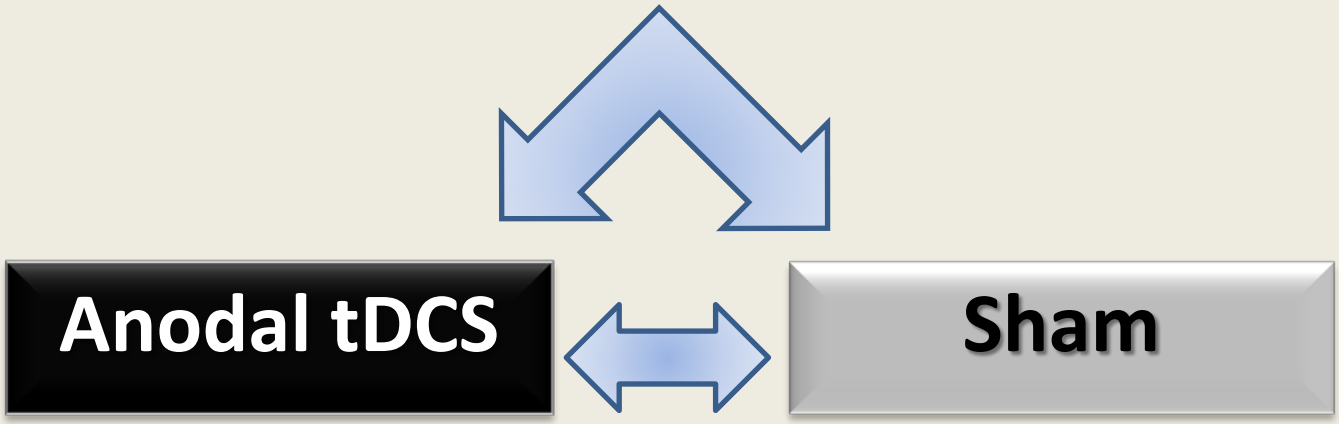
Table 1. Characteristics of participants (n = 8).

	Mean ± Standard Dev.
Age	28,5 ± 9,38
Body Weight (kg)	79,78 ± 24,37
Arm span (cm)	159,57 ± 28,11
Practice time (years)	4,44 ± 3,61

Study approved by local ethics committee

Methods

Randomization

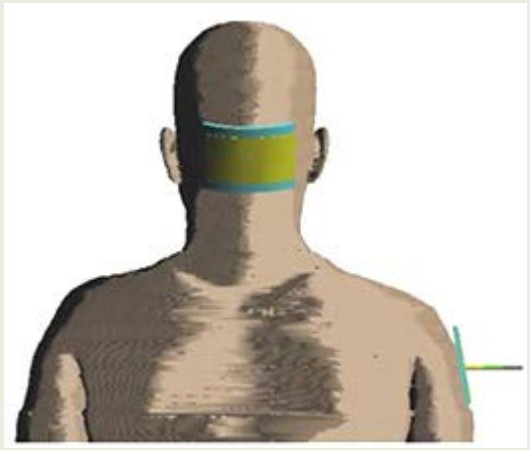


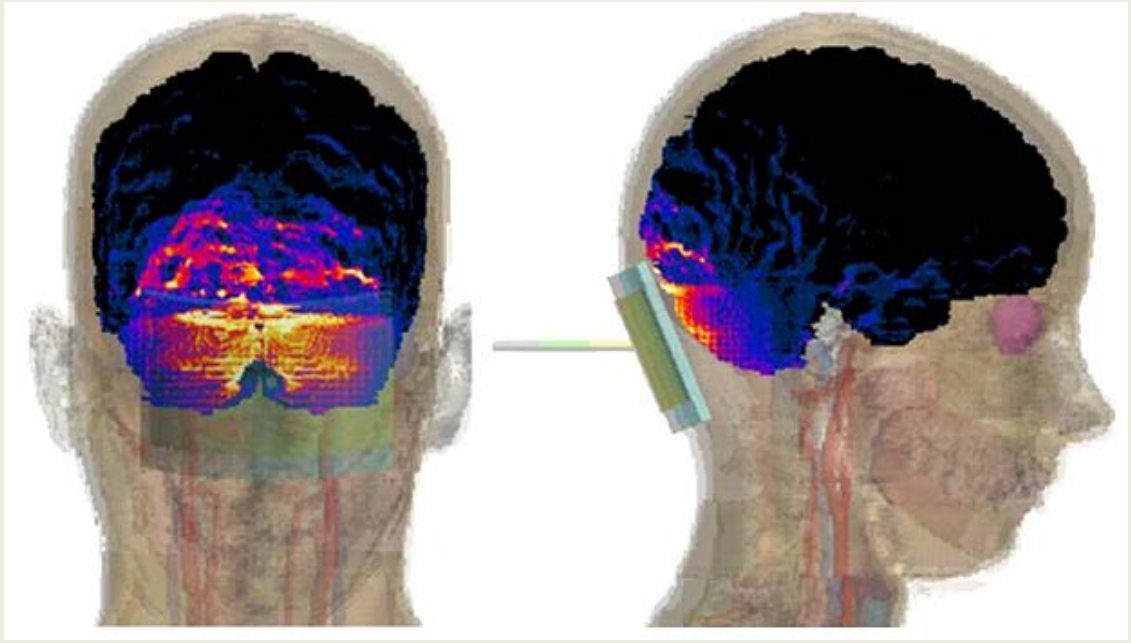
Methods

Cerebellar tDCS

2 mA

20 min



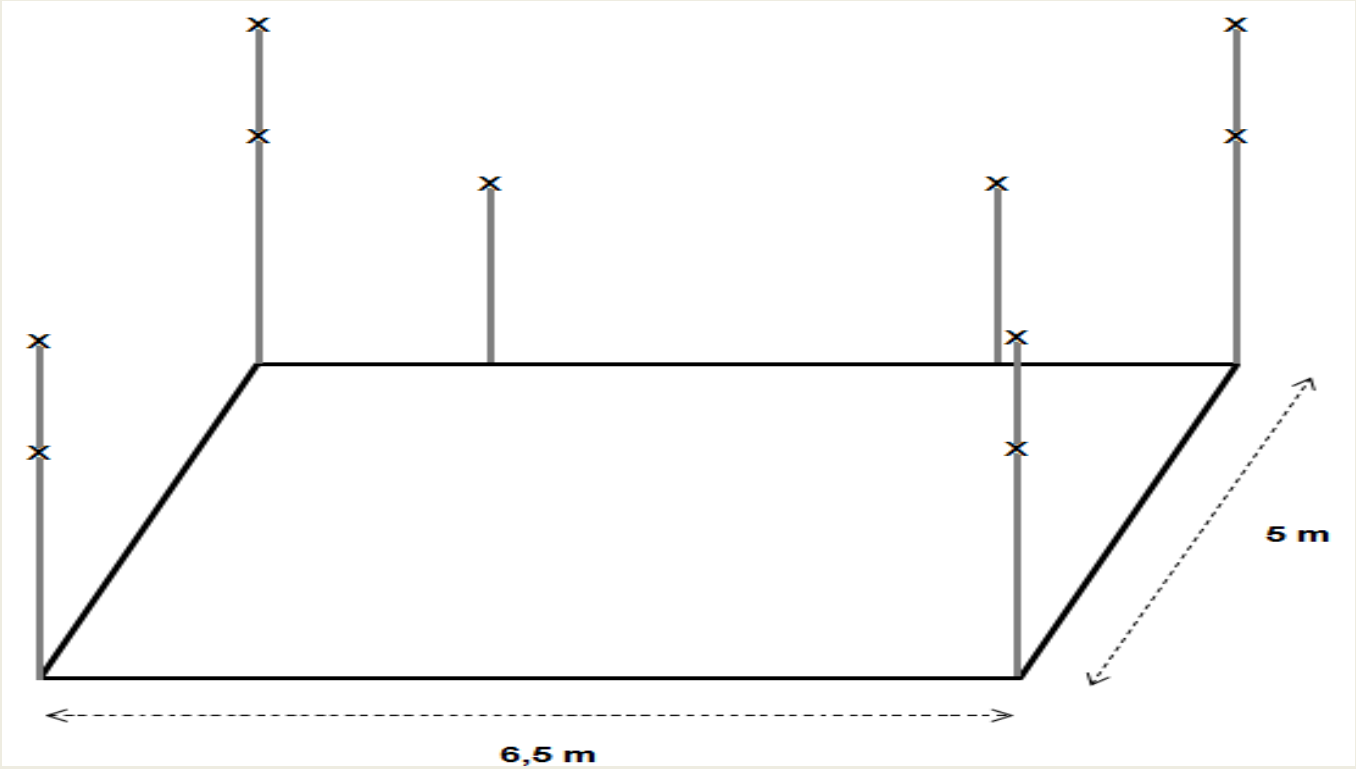


Ferrucci *et al*. (2013)

Methods

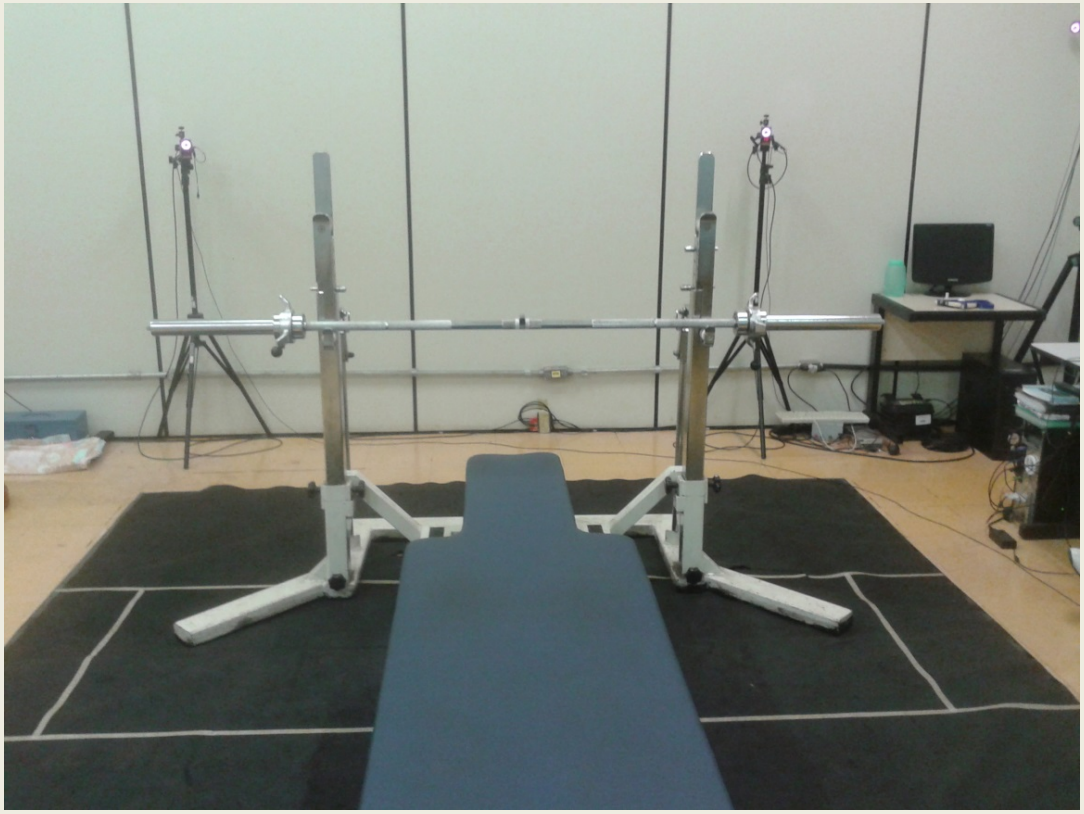
Motion capture

OptiTrack V100:R2
NaturalPoint®



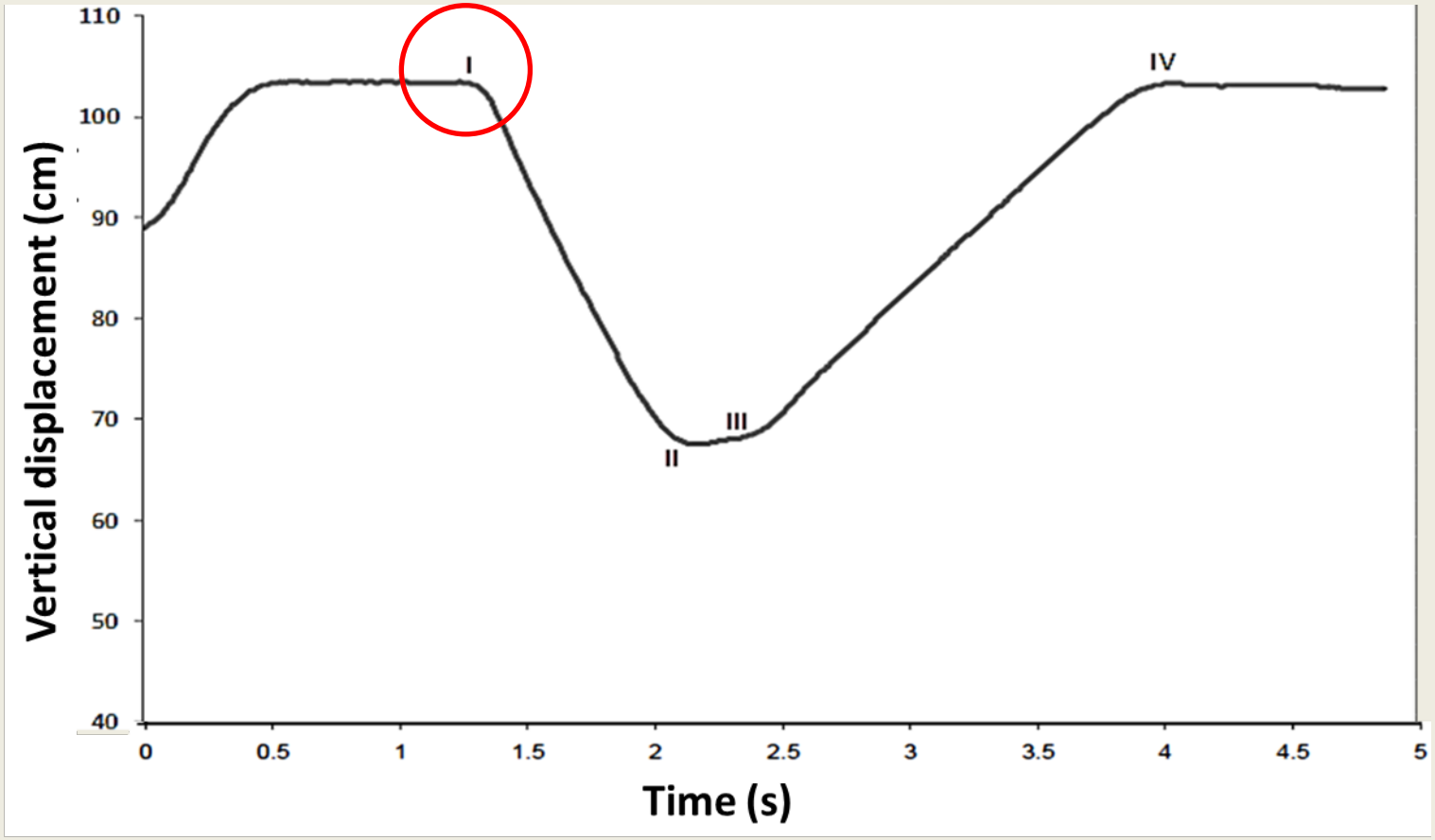
Methods

Motion capture



Methods

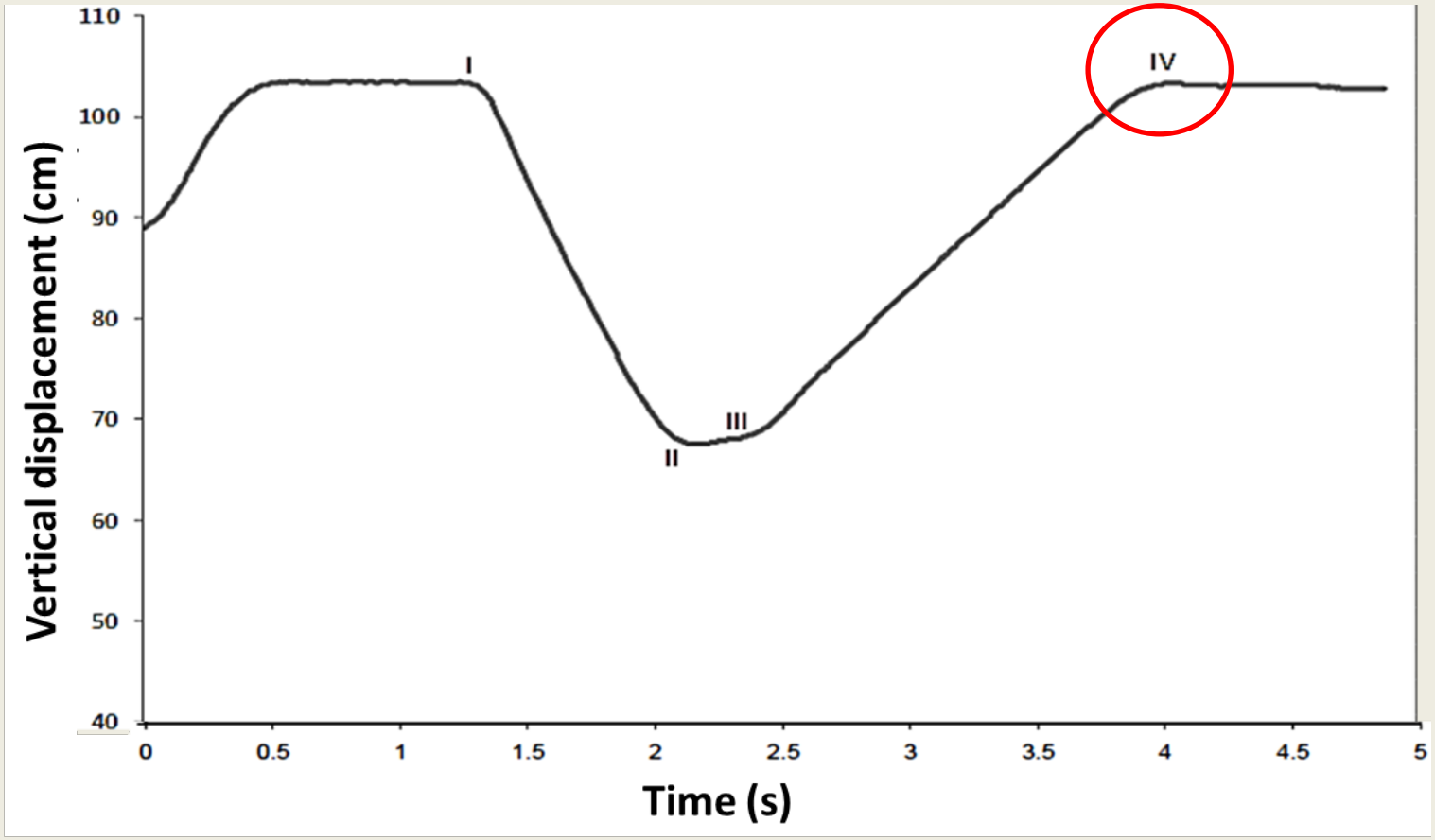
Data analysis



Initial unevenness

Methods

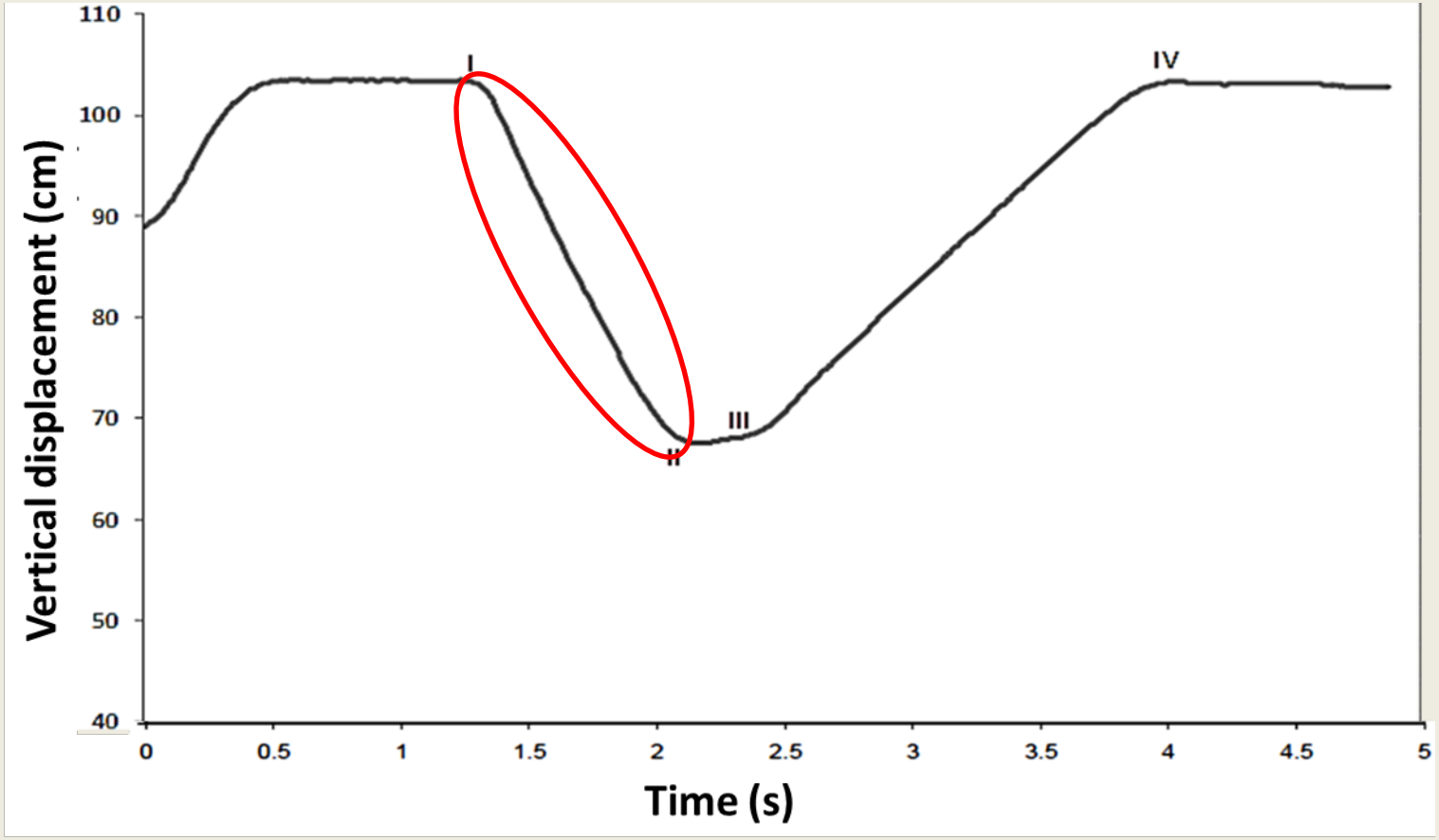
Data analysis



Final unevenness

Methods

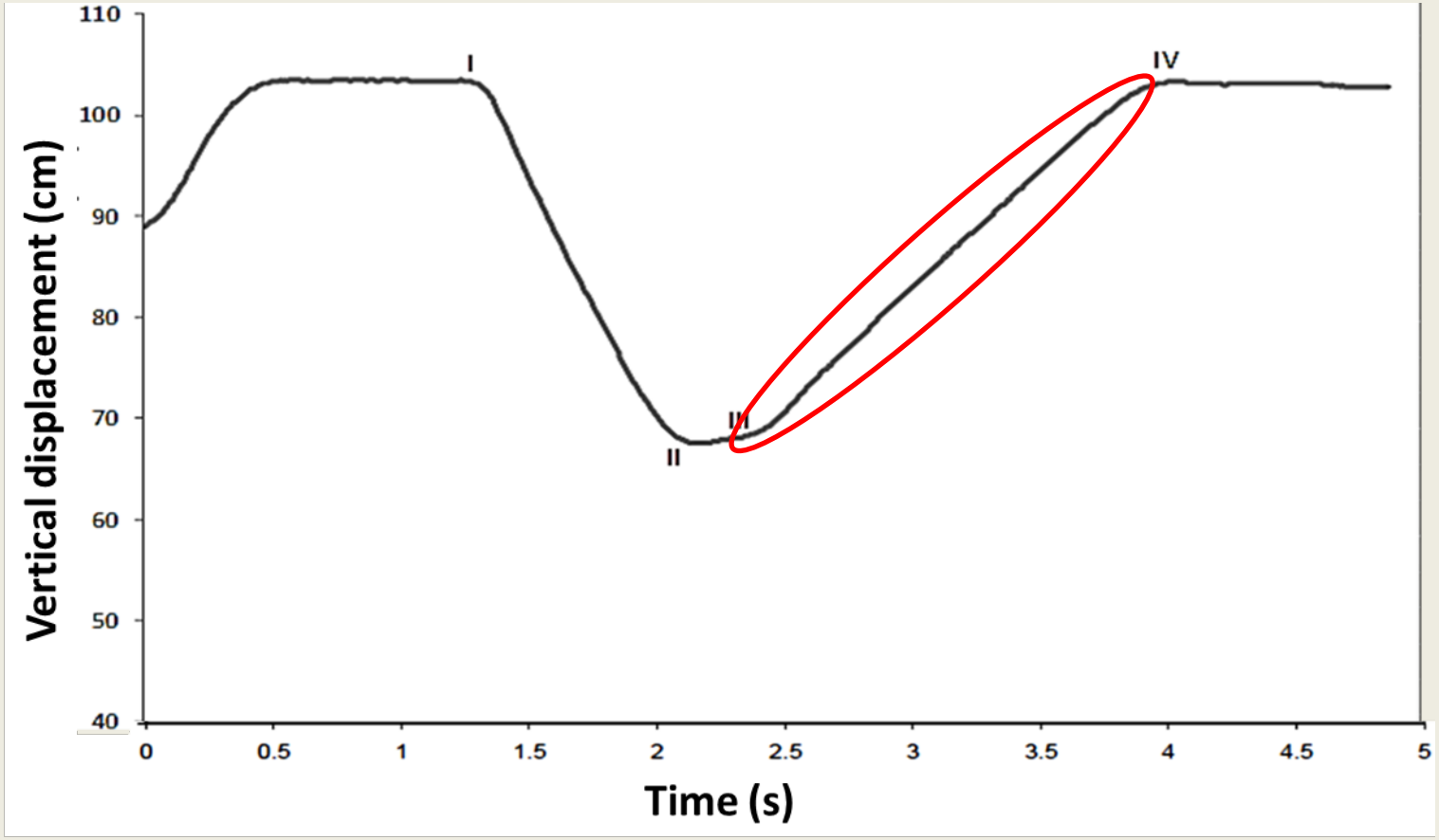
Data analysis



Maximum unevenness in the eccentric phase

Methods

Data analysis



Maximum unevenness in the concentric phase

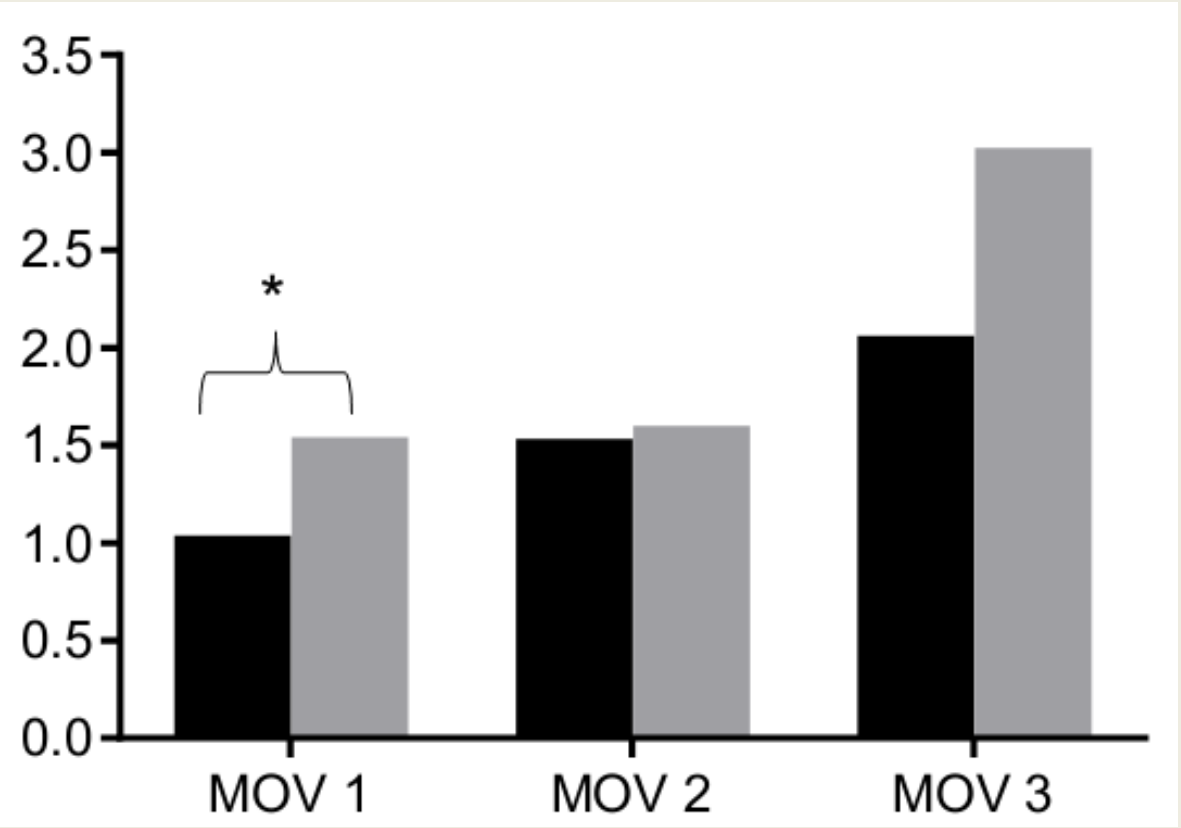
Methods

Statistical analysis

- Wilcoxon
- Mann-Whitney
- $P < 0,05$
- SPSS 20.0

Results

Initial unevenness



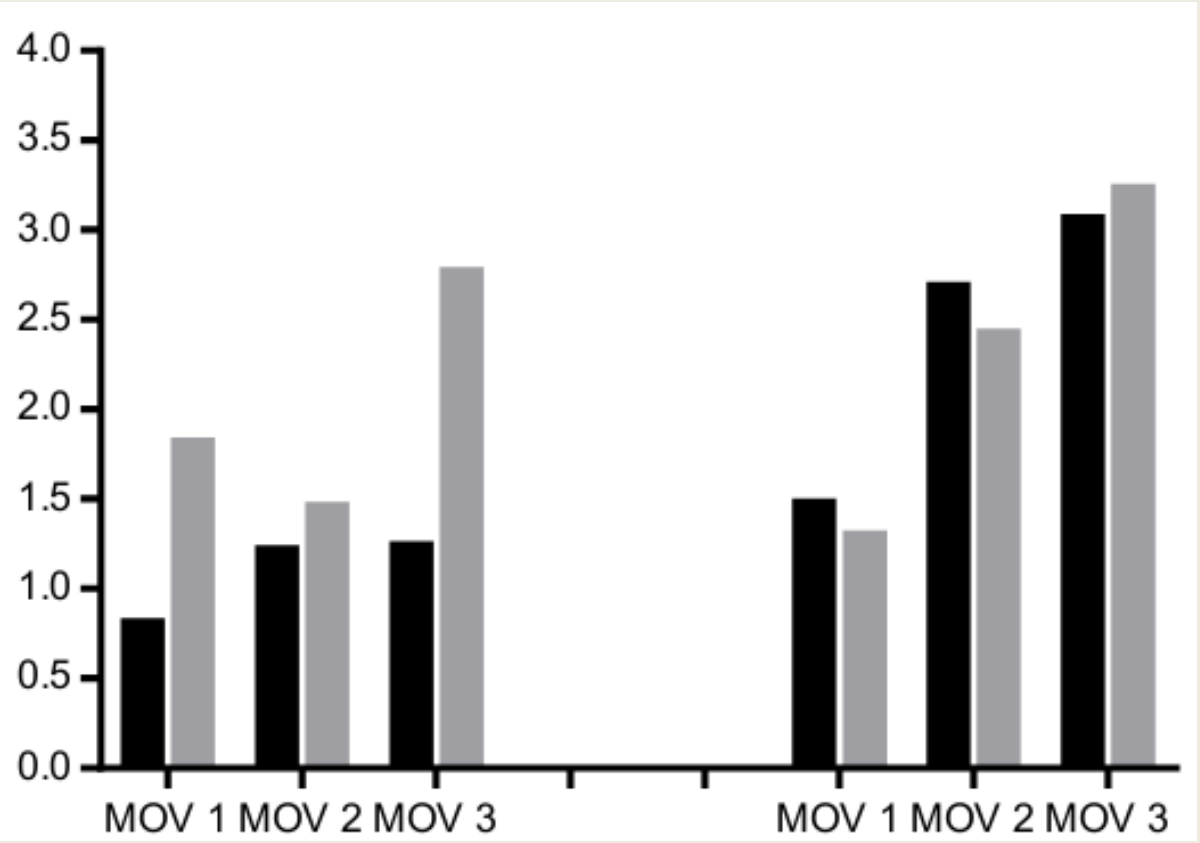
Positive effect of tDCS in reducing the initial unevenness of the first movement.

1,01 x 1,51cm
P=0,049

Results

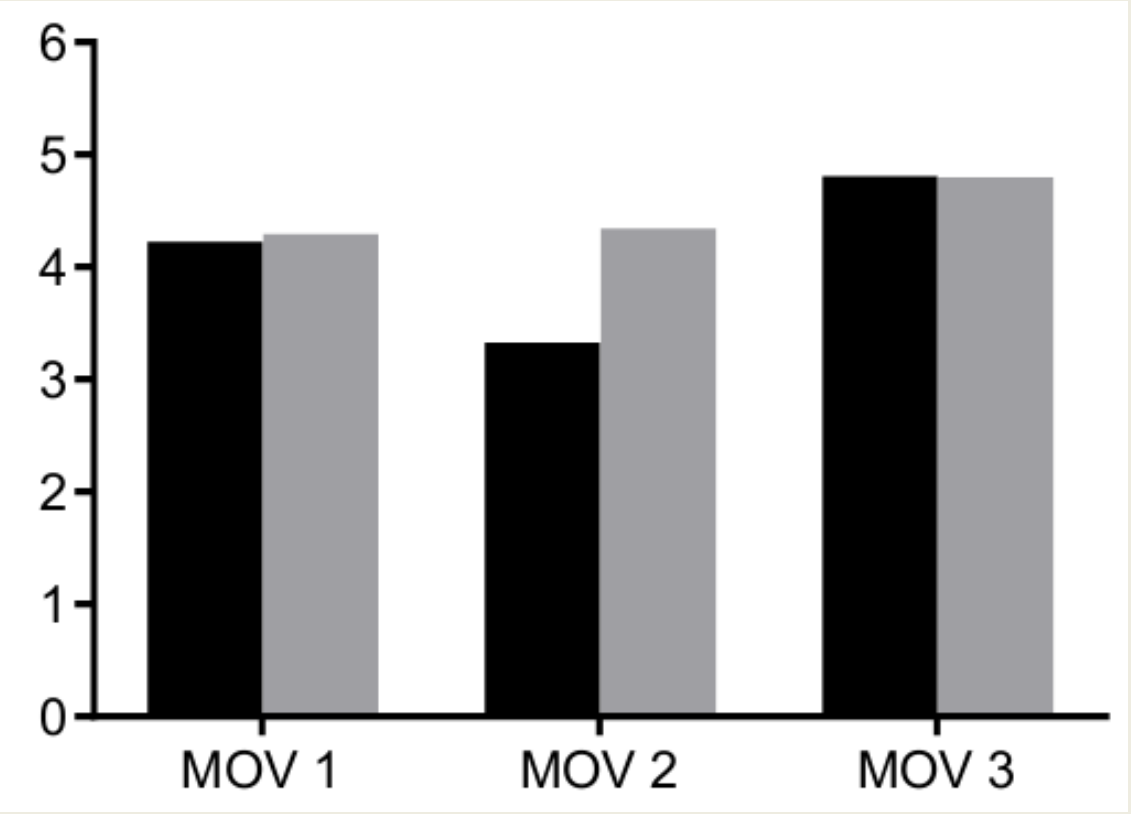
Initial unevenness

Les autres and Amputees



Results

Unevenness in eccentric phase



Strength

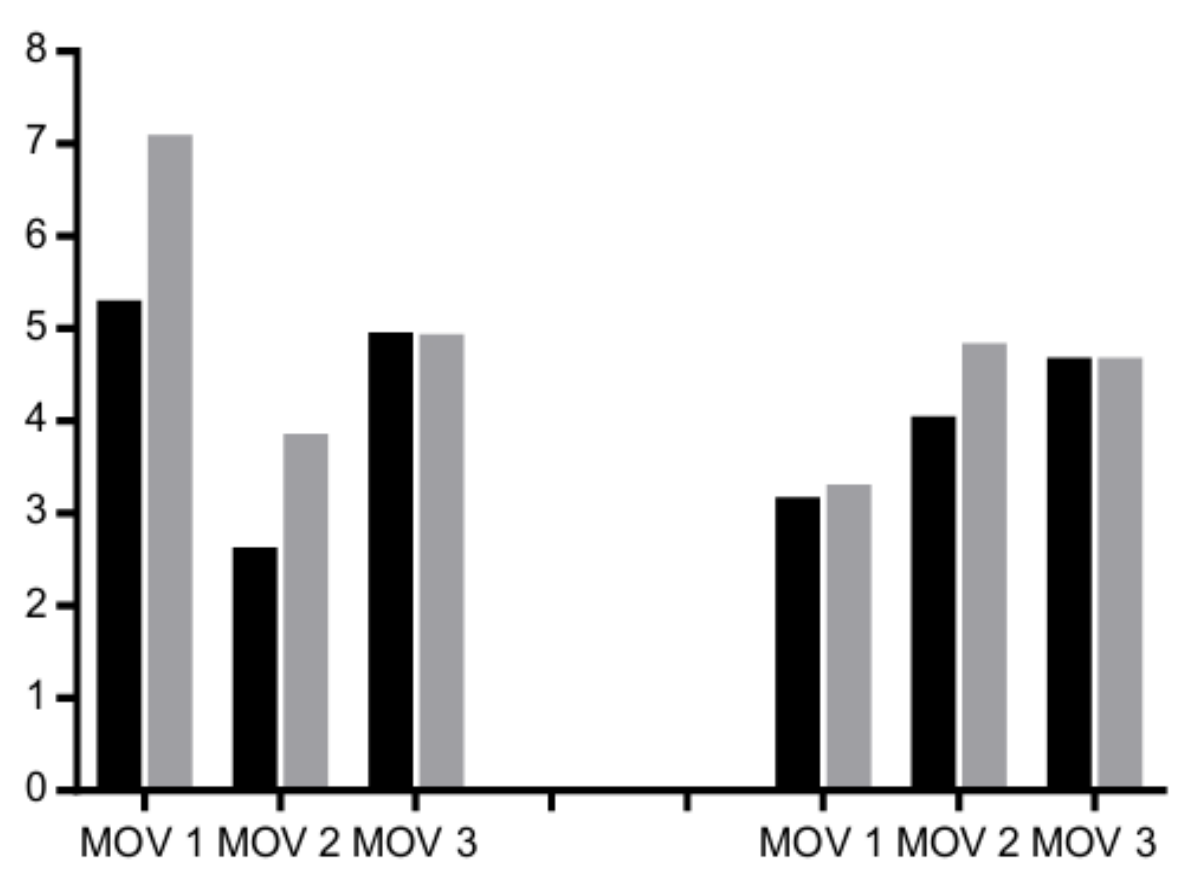
Eccentric > Concentric

Fleck; Kraemer (2006)

Results

Unevenness in eccentric phase

Les autres and Amputees



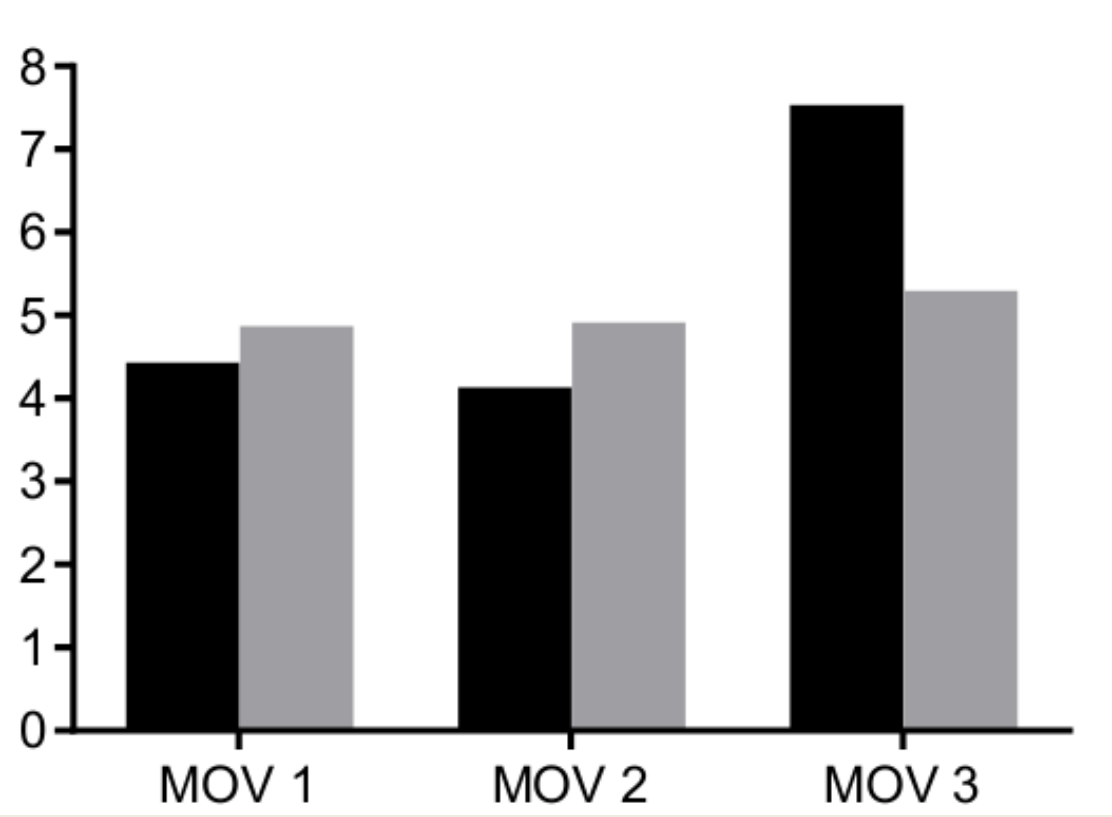
Strength

Eccentric > Concentric

Fleck; Kraemer (2006)

Results

Unevenness in concentric phase



Sticking point

(Madsen; McLaughlin, 1984; Newton et al., 1997)

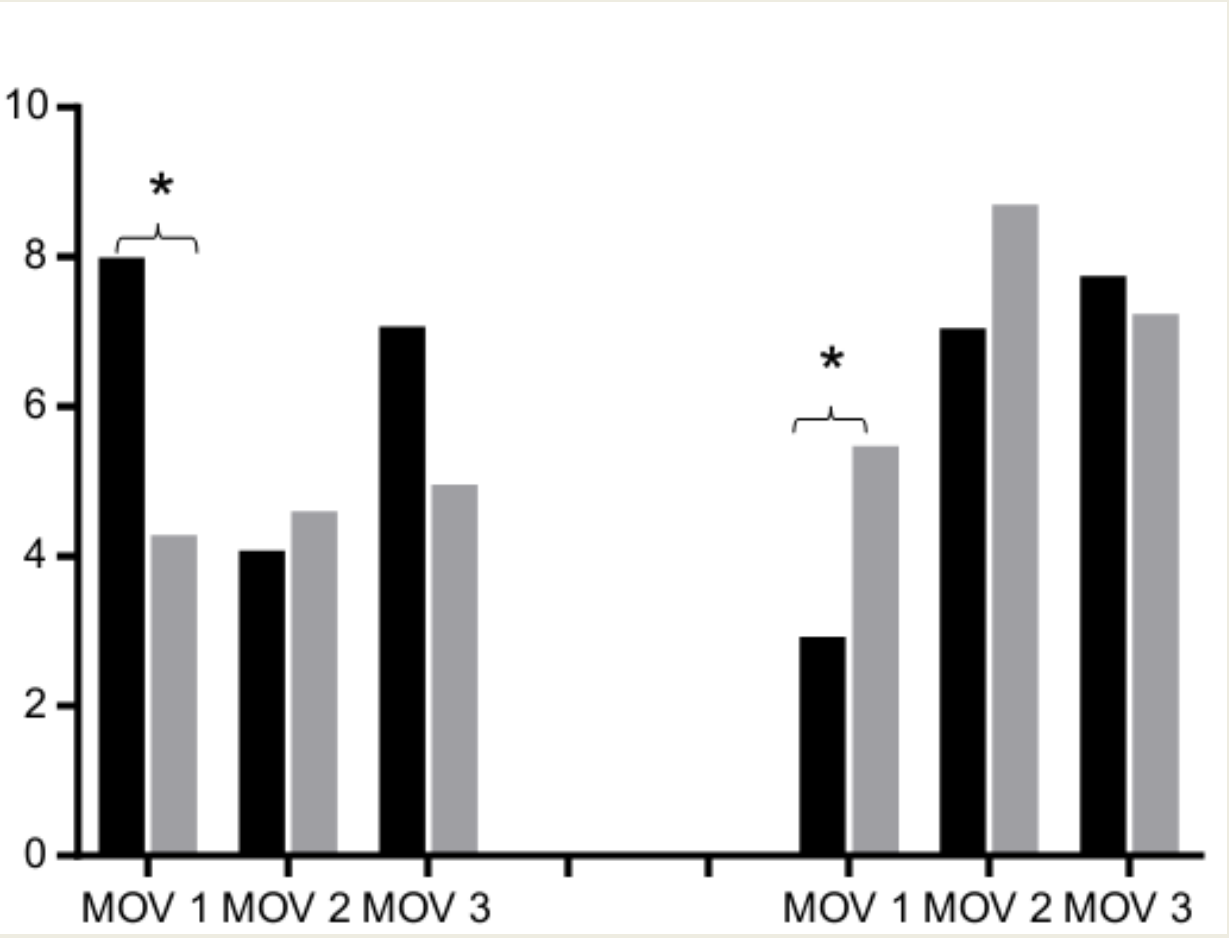
Sticking period

(Van Den Tillaar; Ettema, 2010)

Results

Unevenness in concentric phase

Les autres and Amputees

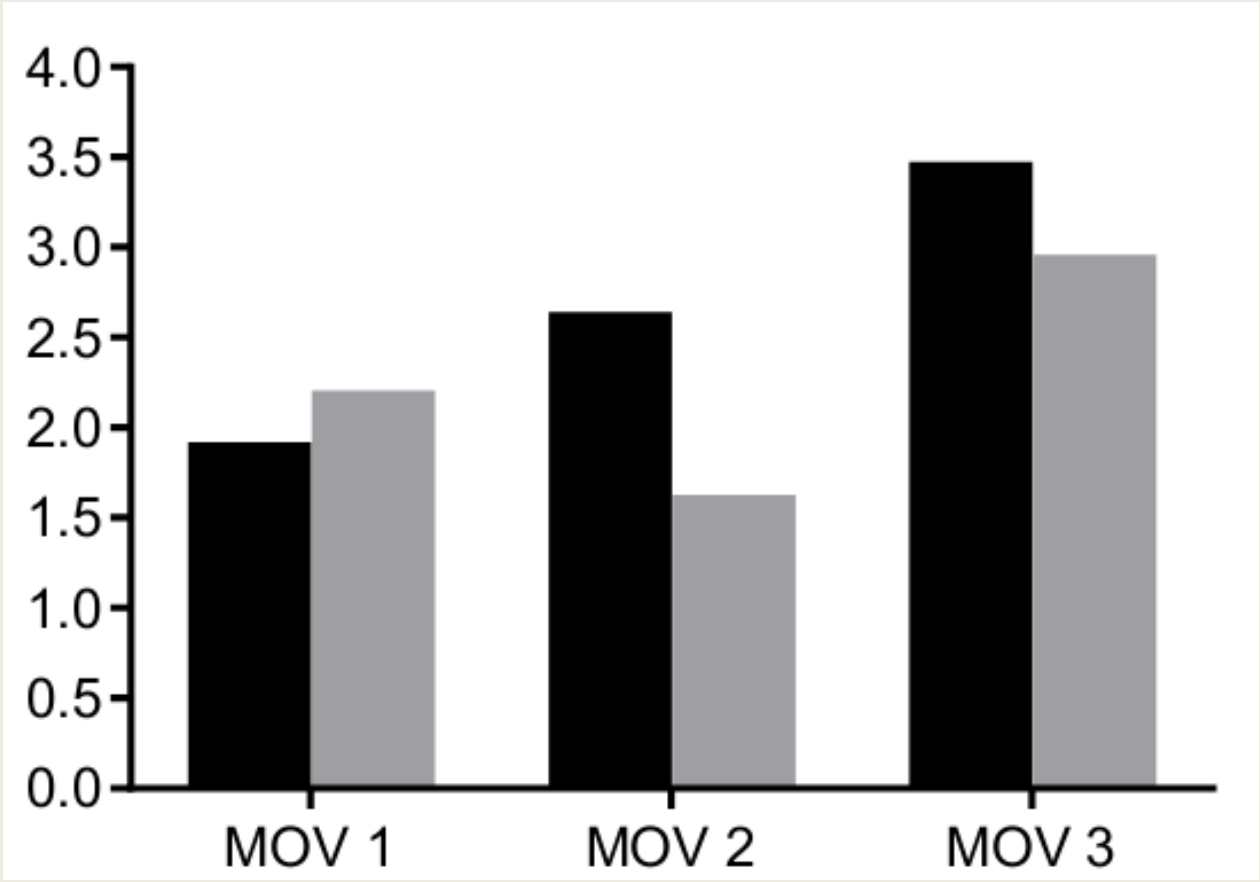


Beneficial result for amputees

-2,55cm
P=0,036

Results

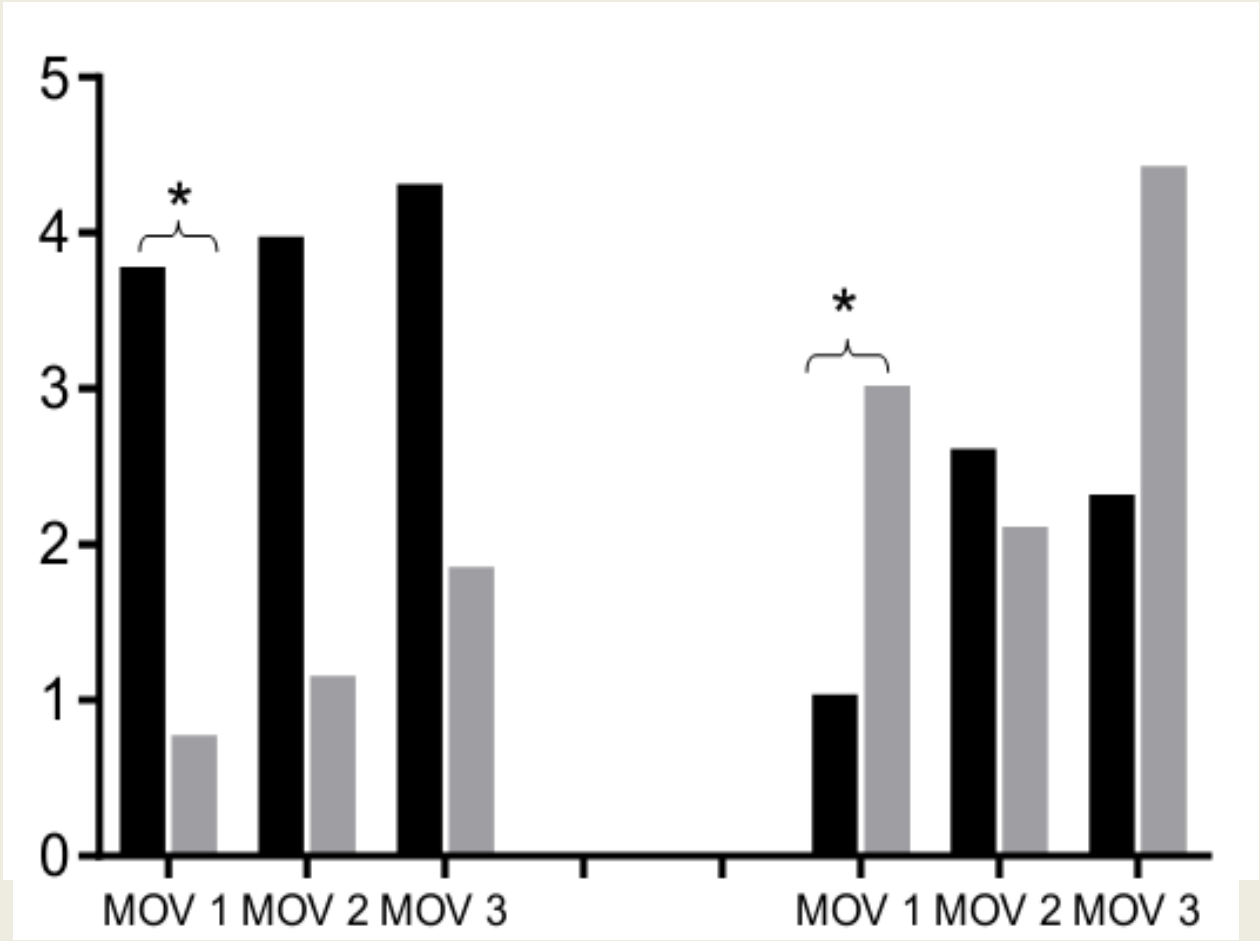
Final unevenness



Results

Final unevenness

Les autres and Amputees



Beneficial result for amputees

-2,82cm
P=0,036

Results

Greater modification in Mov 01

tDCS effects duration

Pronounced effect in amputees

(Galea et al., 2009; Liebetanz et al., 2002; Nietsche; Paulus, 2000)

Conclusion

- Anodal cerebellar tDCS acts selectively
- Effect on movement control is more pronounced in amputees
- Individual characteristics
- Potential ergogenic resource

Future directions

- Duration of the effects of tDCS applied over the cerebellum
- Electrodes placement
- Cortical reorganization after amputation

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Thanks!

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