

Safety and efficacy of high frequency repetitive transcranial magnetic stimulation over the motor areas bilaterally for improving upper limb motor function in chronic stroke

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Introduzione: Repetitive transcranial magnetic stimulation (rTMS) is a promising intervention for the treatment of post-stroke motor deficits by enhancing brain plasticity. Since the crucial role of non-primary motor cortices and contralesional brain areas is emerging for motor recovery in chronic stroke; we assessed safety and efficacy of bilateral rTMS over the motor areas associated to motor training (MT) on upper limb (UL) motor function.

Metodi: 16 chronic stroke patients (> 6 months) were included in this study double-blind, sham-controlled prospective trial. Eleven sessions of rTMS (20 Hz at 90% of resting motor threshold-RMT) were delivered with the H-coil over the motor areas bilaterally. Subjects were randomly allocated to the real rTMS+MT (8 pz) or the sham rTMS+MT (8 pz). UL function was evaluated by the Fugl-Meyer assessment (FMA), hand grip and pinch strength at baseline (T0), one day after treatment (T1) and at one-month follow-up (T2). Motor evoked potential (MEPs) at 120% of RMT on the first dorsal interosseum were also measured.

Risultati: no participant reported adverse effects. no significant differences in demographic characteristics and clinical scores at baseline between the two groups were observed ($p < 0.05$) (Table 1). At T1 both groups showed a significant improvement in FMA (sham+MT $p = 0,015$; real+MT $p = 0,002$) while at T2 the difference with baseline persisted only for the real+MT group ($p = 0,001$). Furthermore, the improvement obtained for the real+MT was significantly higher than that observed for the sham+MT group (ANOVA- $p = 0.03$) (Figure 1). Patients more impaired at T0 who underwent real stimulation showed better recovery at T2 ($r = -0,69$ $p = 0,003$), an opposite trend was observed for the sham group (Figure 2). Grip and pinch straight improved after treatment without significant differences between groups. MEPs amplitude over the affected side significantly increased in the real+MT than the sham+MT group at T2 ($p = 0.01$) (Figure 3).

Conclusioni: we demonstrated that bilateral high-frequency rTMS with H-coil associated with MT is safe and enhances and prolong the effect of MT alone. Our data suggest that subject with a more severe motor impairment may mainly benefit from this stimulation protocol.

	REAL	SHAM
sex (males/females)	(7/1)	(7/1)
age (mean)	52,6 (+/-13,7)	66 (+/- 10,5)
affected hem. (left/right)	(3/5)	(5/3)
stroke type (cortical/subcortical)	(3/5)	(5/3)
NIHSS T0 (mean)	4 (+/-2,2)	3,1 (+/-2,2)
Barthel T0 (mean)	90 (+/-16,5)	95,6 (+/-5,7)
Rankin T0 (mean)	2,4 (+/-0,7)	1,9 (+/-0,6)
FM T0 (mean)	38,4 (+/-13,4)	45,1 (+/-16,1)

Table 1: demographic characteristics and clinical scores

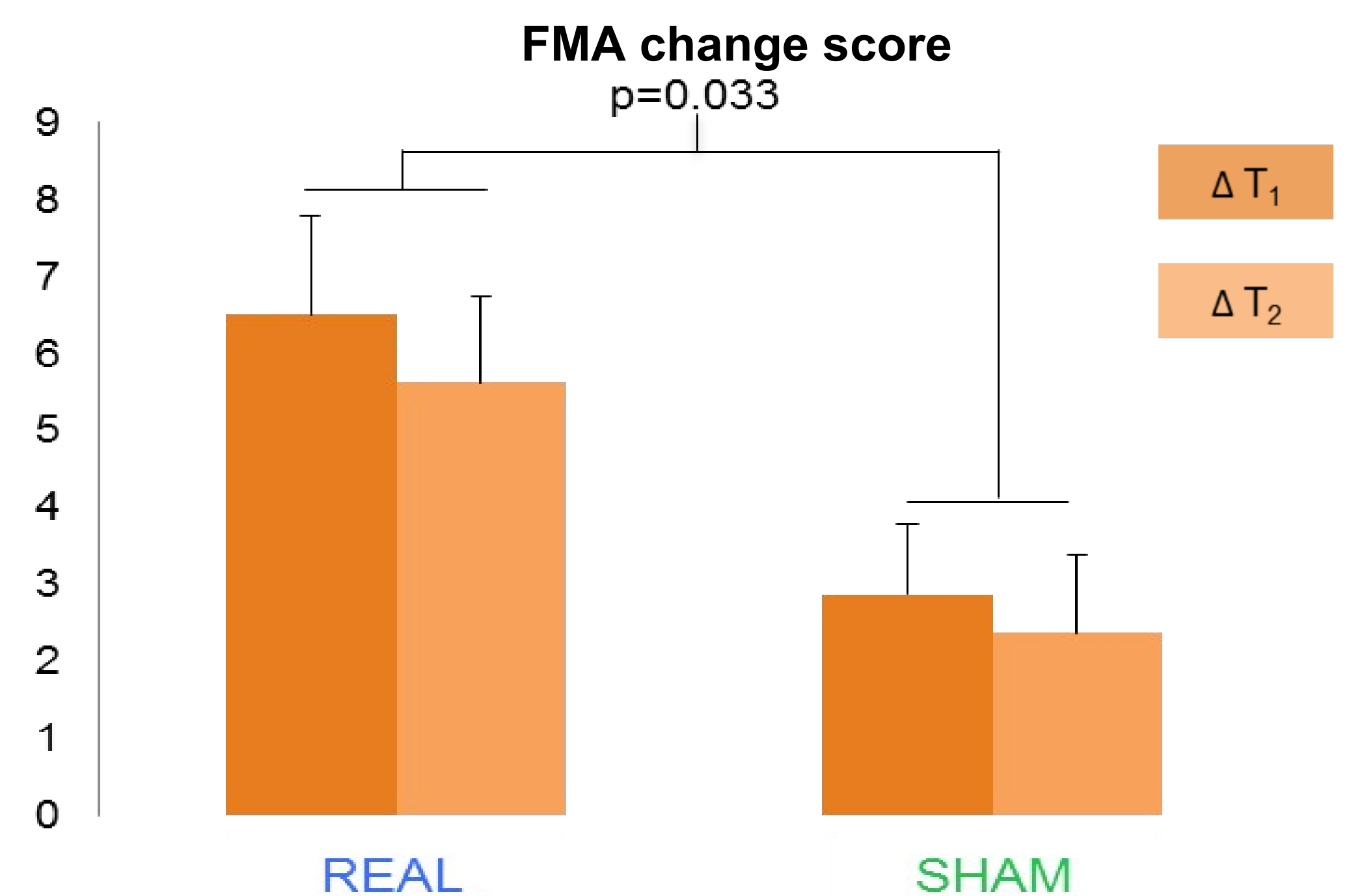


Figure 1: the improvement in FMA obtained after real rTMS was significantly greater than that obtained after sham rTMS (ANOVA-significant group effect)

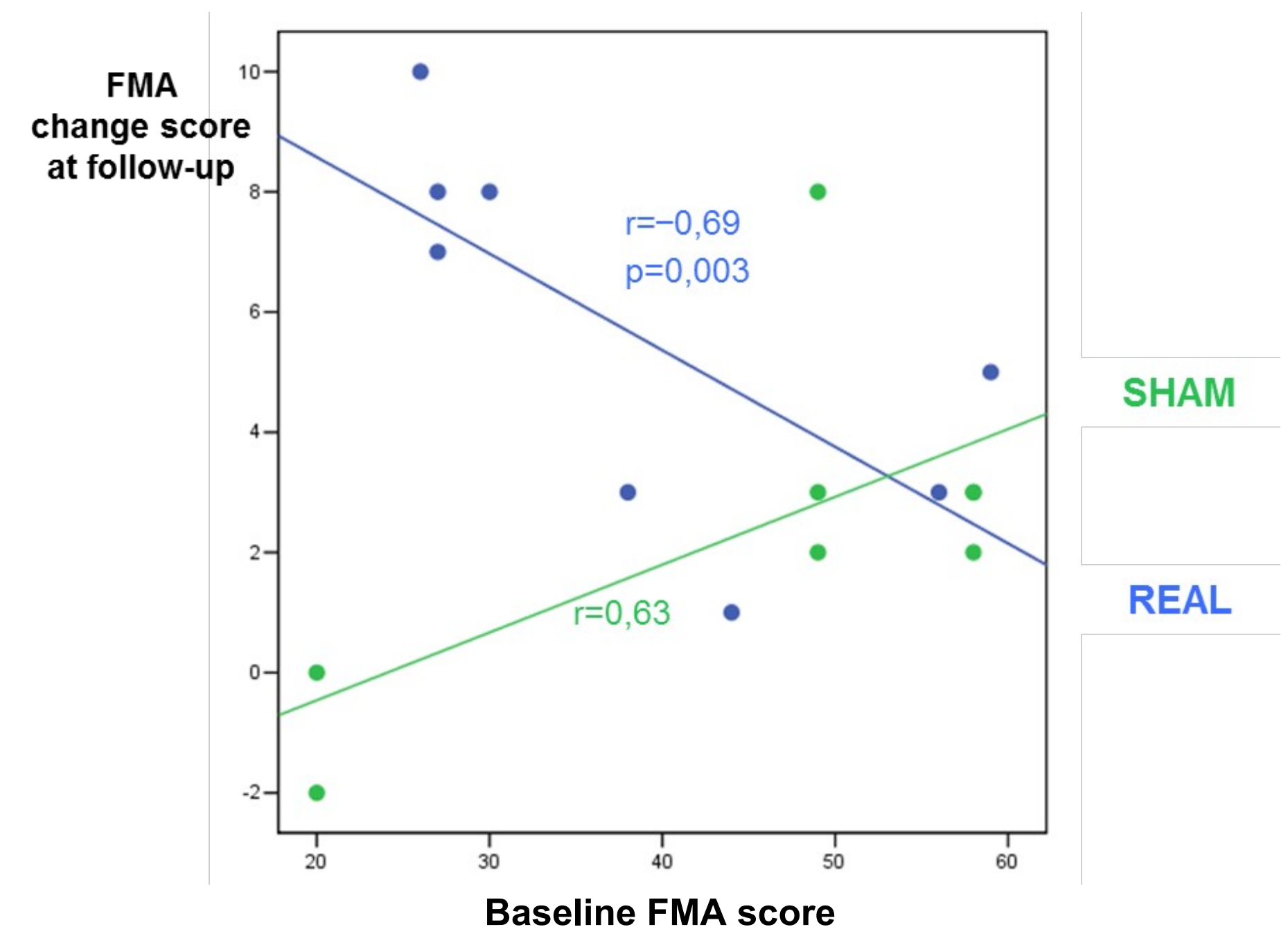


Figure 4: Patients more impaired at baseline who underwent real stimulation showed better recovery at 1-month follow-up.

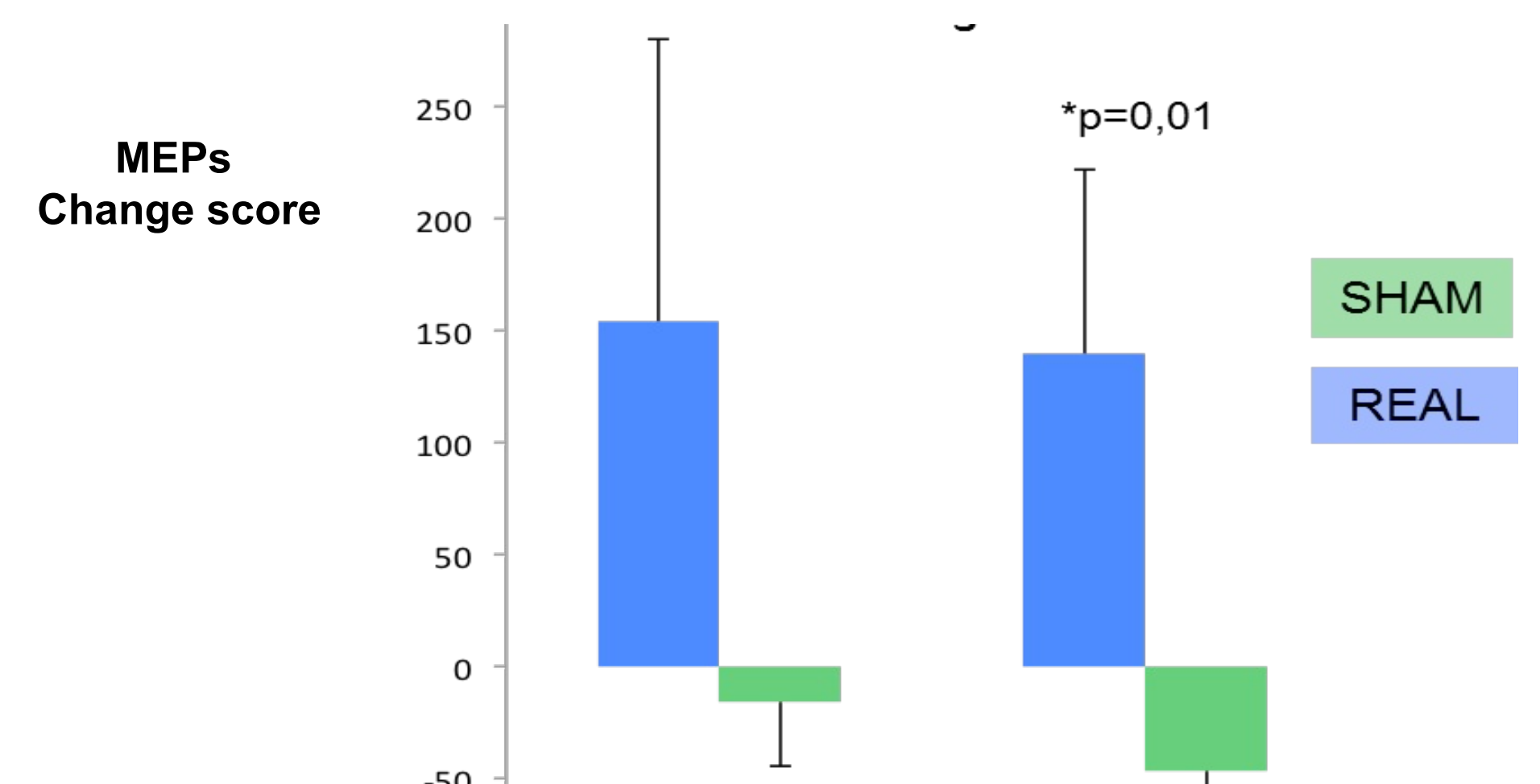


Figure 5: the increase in MEPs amplitude was significantly greater in the real than the sham group at T2.

Bibliografia

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