Cannabinoid CB1 receptors improve anxiety and affective component of neuropathic pain by tDCS in MS

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Introduction

Neuropathic pain is a common symptom in patients affected by Multiple Sclerosis (MS), interfering with quality of life and physical and emotional functions.

Non-invasive brain stimulation techniques such as transcranial direct current stimulation (tDCS) can produce analgesic effects on several painful conditions by modulating neuronal plasticity.

Recent studies provided evidence that a polymorphism within the CB1R-encoding gene (CNR1), an AAT trinucleotide short tandem repeat (AATn) downstream of the translation site, is involved in the regulation of brain plasticity in MS patients and modulates affective states as well as chronic pain.

Aim of the study

The aim of this study was to explore whether CNR1(AATn) variants could influence anodal tDCS (atDCS) analgesic effect on neuropathic pain in patients with relapsing remitting MS (RRMS).

Methods

15 RRMS patients in remitting phase, affected by chronic, central, were included in the study. Patients received a constant current of 2mA intensity applied for 20 minutes daily for a 5-day period of treatment. We measured pain by using visual analogue scale (VAS) and the short-form McGill Pain Questionnaire (SF-MPQ) at baseline, at the end of the treatment and once a week during a 3-week follow-up period. Multiple Sclerosis Quality of Life-54 (MSQoL-54), Beck Depression Inventory (BDI) and State-Trait Anxiety Inventory (STAI) were also perfomed. AAT repeats in the CNR1 gene were investigated.

Results

9 patients were CNR1(AATn)-long and 6 patients were CNR1(AATn)-short. tDCS was well tolerated by all patients, no adverse reactions were reported. Our results revealed a significant effect of TIME main factor in VAS ($p<0.05$) [*figure 1*], SFMPQ-global ($p<0.01$) [*figure 2*], SFMPQ-sensory ($p<0.01$) [*figure 3*], SFMPQ-affective ($p<0.05$) [*figure 4*], showing that atDCS ameliorated pain sensation in both AAT-long and AAT-short groups. Moreover, a significant time*group interaction for SFMPQ-a ($p<0.05$) and STAI ($p<0.05$) emerged revealing that after atDCS the affective dimension of pain and state and trait anxiety significantly improved in the AAT-short compared to the AAT-long group [*figure 4*].

No effect emerged for BDI and MSQoL-54 [*figure 5*].

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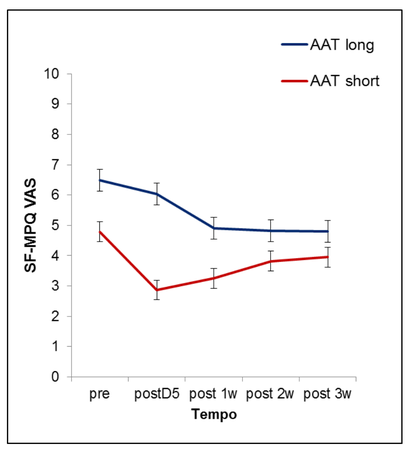

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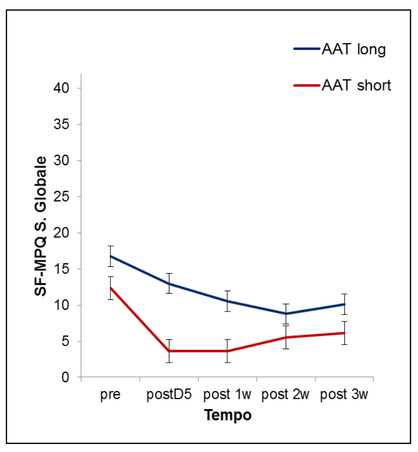

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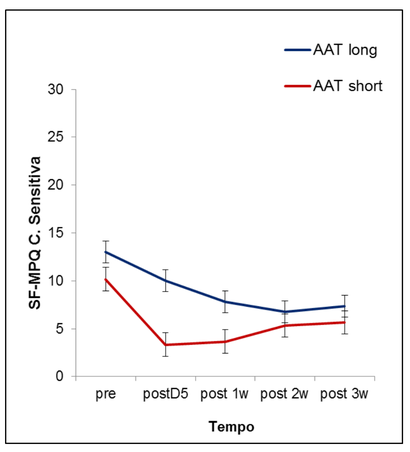

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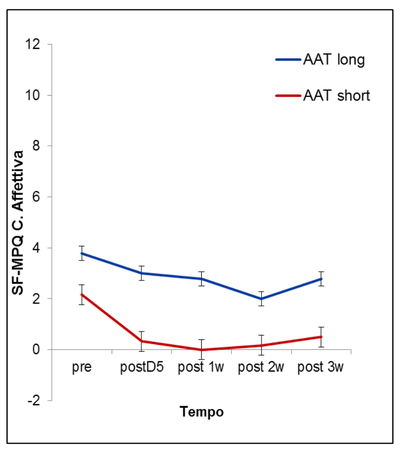

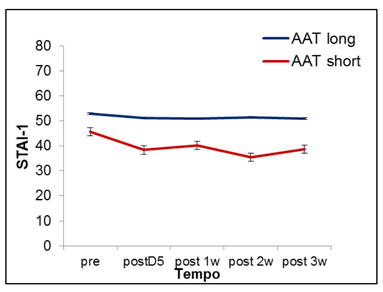

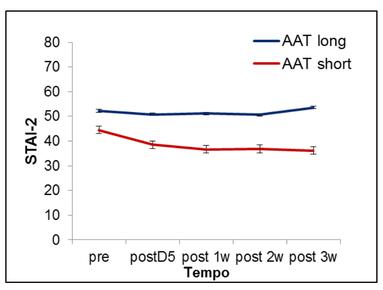

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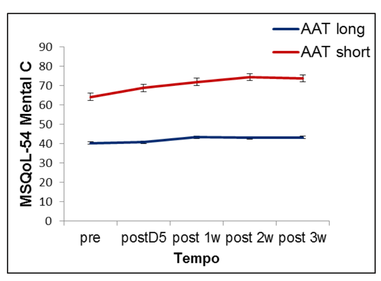

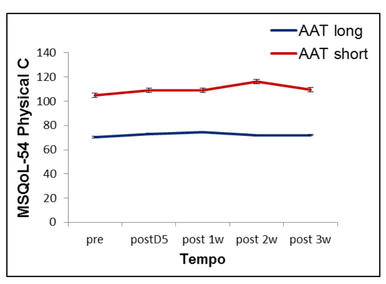

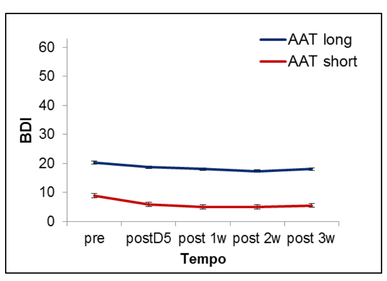

Conclusion

Our results provide the first evidence that genetic differences within the CB1R may influence analgesic responses to atDCS, mainly acting on the affective dimension of pain and on anxiety in MS patients. These results might be of great relevance for MS patient stratification and tailored treatment programs for chronic neuropathic pain.

References

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