

The influence of neuromodulation effects on the functional state of the neuromotor apparatus of the soleus muscle in middle-aged male rats under conditions of long-term hindlimb unloading

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INTRODUCTION & AIM

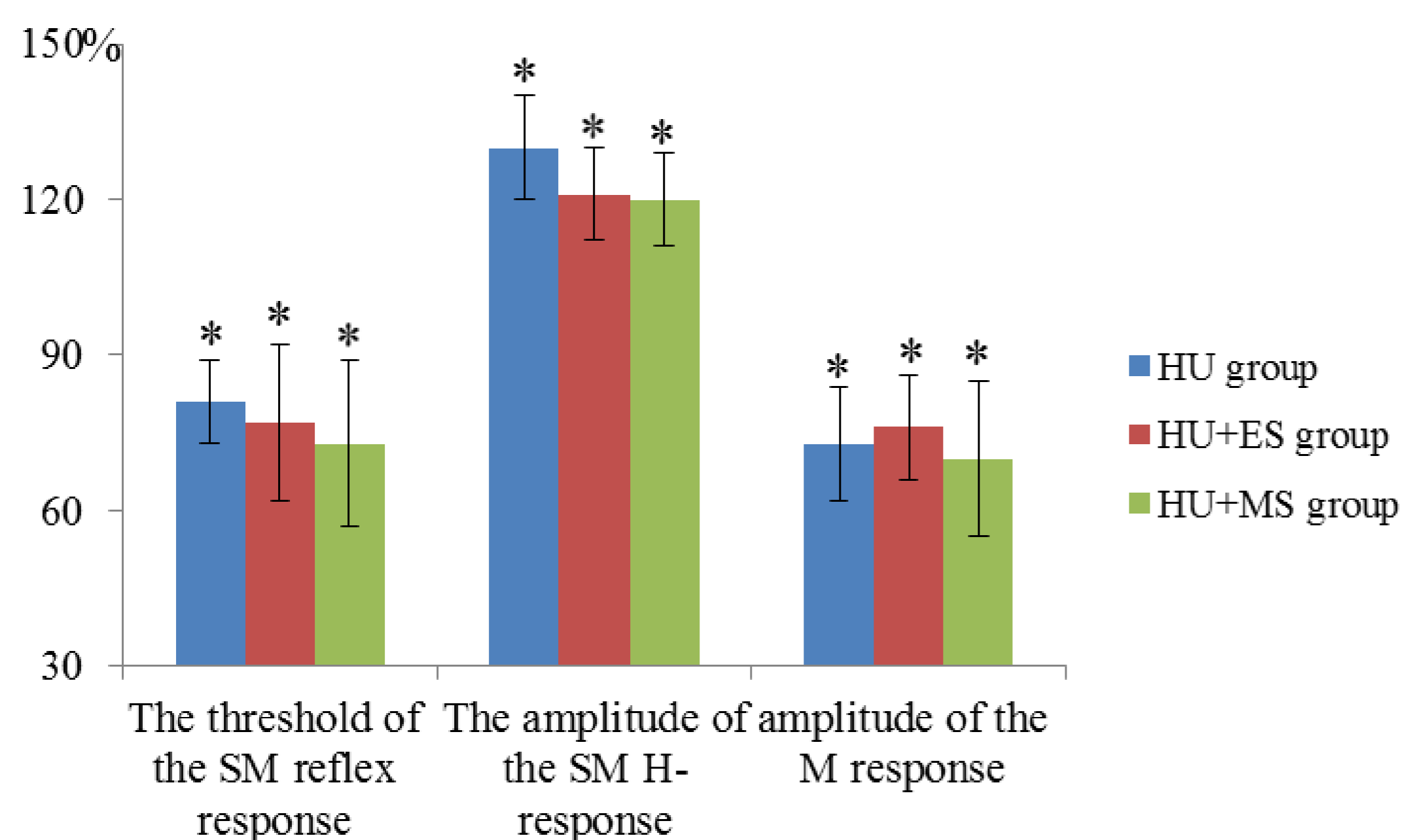
The study of the nature of motor pathologies is one of the important area in physiology and medicine. The aim of this work was to assess the functional state of the neuromotor apparatus of the soleus muscle (SM) in middle-aged male rats under conditions of long-term hindlimb unloading (HU).

METHOD

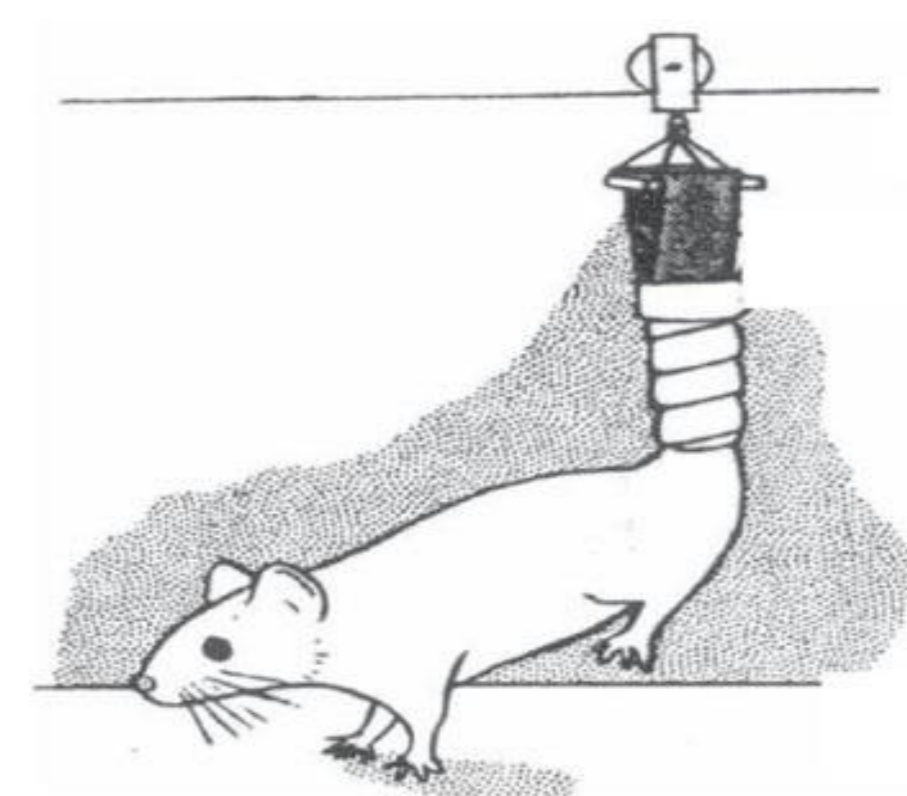
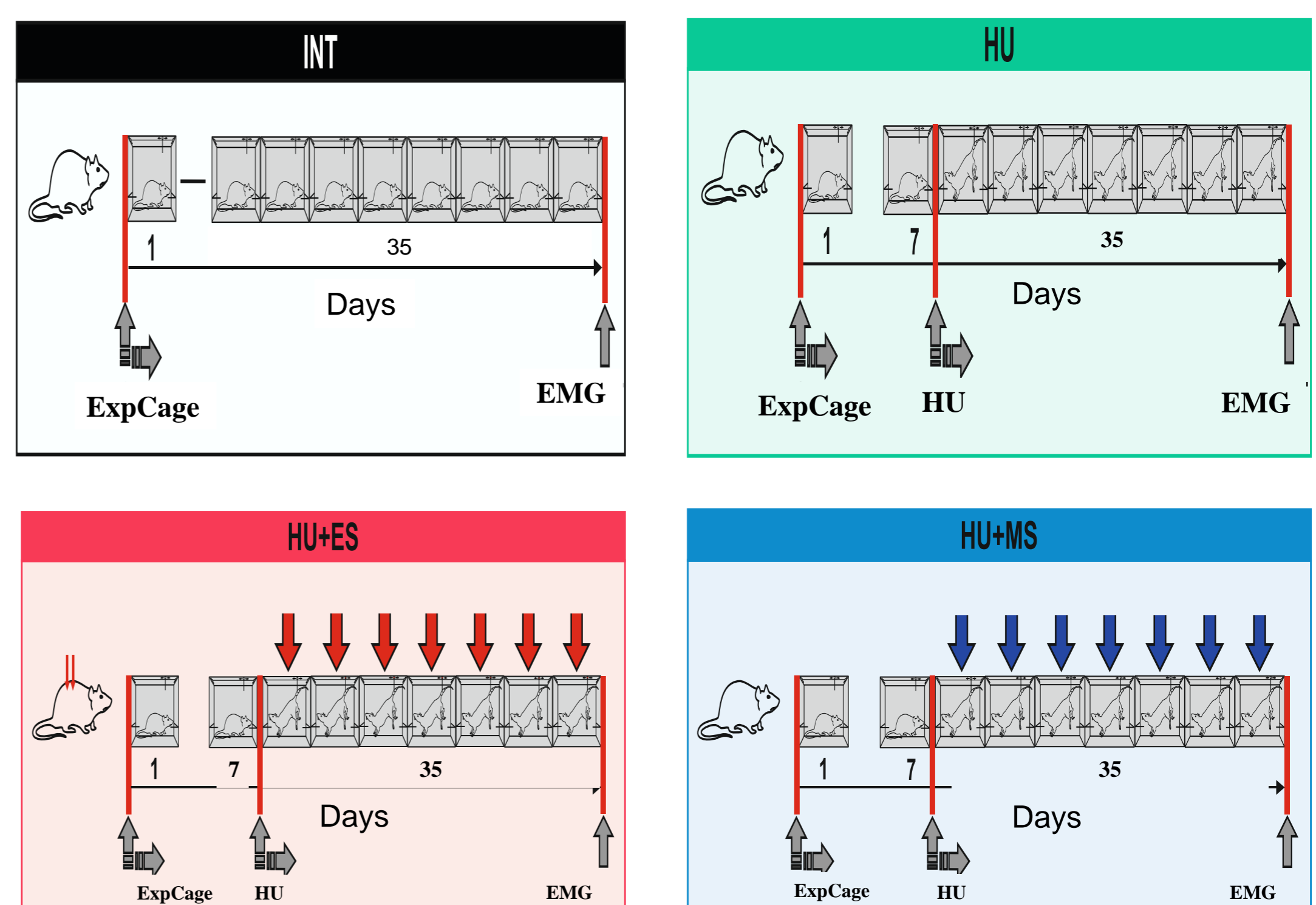
Experiments were carried out in strict accordance with accepted bioethical standards. The animals were divided into 3 groups: hindlimb unloading (HU), HU with electromagnetic stimulation (HU+MS) and with electrical stimulation of the spinal cord (HU+ES). Parameters of motor and reflex responses were recorded.

RESULTS

The threshold of the SM reflex response in the HU group was reduced to $81 \pm 8\%$ ($p < 0.05$), in the HU+ES group - $77 \pm 10\%$ ($p < 0.05$), in the HU+MS - $73 \pm 16\%$ ($p < 0.05$). The amplitude of the SM H-response in the HU group increased to $130 \pm 15\%$ ($p < 0.05$), in the HU+ES group - $121 \pm 9\%$ ($p < 0.05$), in the HU+MS group - $120 \pm 10\%$ ($p < 0.05$). In the HU group, the amplitude of the M response was $73 \pm 11\%$ ($p < 0.05$), in the HU+ES group - $76 \pm 9\%$ ($p < 0.05$), in the HU+MS group - $70 \pm 15\%$ ($p < 0.05$).



Picture 3 - The diagrams show the average values of electromyographic parameters obtained when testing the soleus muscle in the studied groups



Picture 1 – Model of hindlimb unloading of rat

CONCLUSION

Thus, during long-term hindlimb unloading, we recorded an increase in the reflex excitability of the spinal motor center of the SM. And also we found that spinal cord stimulation prevented changes in the threshold of the M-response of the SM, but did not exclude a decrease in amplitude.



Picture 2 – ElectroMagnetic stimulator (Neurosoft, Russia) and Electrostimulator (DataWave technologies, «A-M Systems», USA).