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Age-related decrease in the modulation of the soleus Hoffmann reflex during submaximal ankle dorsiflexion and plantarflexion

Daily activities involve complex and specific sensorimotor adjustments that can be impacted by adverse events, pathologies, or aging. The modulation of the Hoffmann (H) reflex amplitude during agonist and antagonist muscle contractions provides relevant information on the neural control of leg muscles but remains largely unknown in older adults. This study investigated the H-reflex gain in the soleus muscle at rest and during contractions performed with the plantar flexor and dorsiflexor muscles at 10%, 20% and 30% of the maximal electromyographic activity in 12 young (23-35yrs) and 12 older adults (61-76yrs). The reflex gain was measured as the slope of the relation between H-reflex amplitude and background electromyographic activity. The stimulation intensity was set to evoke at rest an H reflex in the ascending phase of its recruitment curve preceded by an M wave (5 and 10% of its maximal amplitude). During plantarflexion contractions, the H-reflex amplitude increased with contraction intensity in both groups with a greater reflex gain in young than older adults ($p=0.024$). During dorsiflexion contractions, the H-reflex amplitude decreased in both groups, more so in young than older adults ($p=0.009$). Furthermore, the decrease in H-reflex amplitude was linearly associated with the increase in tibialis anterior activity in both groups. The present study showed a smaller reflex gain in older adults in soleus during submaximal plantarflexion and dorsiflexion contractions. This findings suggest a decreased ability to adjust the excitatory afferent inputs during plantarflexion contractions, and to modulate reciprocal inhibition during dorsiflexion contractions.

Keywords: Aging, Hoffmann reflex, M wave, Electromyography, Antagonist coactivation

Biography

Dr. Mélanie Henry is a postdoctoral associate in the Department of Integrative Physiology at the University of Colorado Boulder. She earned her PhD in Human Movement Science from the Université Libre de Bruxelles (Belgium) in 2022, where she investigated age-related changes in proprioception and their impact on motor control. Her current research focuses on neurophysiology of aging and multiple sclerosis.