Training Induced adaptations in Characteristics of Postural Reflexes in Elderly Men

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BACKGROUND

The aging neuromuscular system is affected by structural and functional changes which lead to a general slowing down of neuromuscular performance and an increased risk of falling.[1] The impact of heavy resistance training in the elderly on maximum voluntary contraction and rate of force development has been investigated in the past.[2] However, the influence of sensorimotor training (SMT) and heavy resistance training (HRT) on the ability to compensate for gait perturbations has not yet been investigated in the elderly. Therefore, the purpose of this study was to examine the impact of SMT and HRT in elderly men on unexpected treadmill perturbations.

• METHODS

• Recruitment

- Sixty healthy males (age 66±5 yrs) were randomly assigned to a HRT (*n* = 20) or a SMT (*n* = 20) or a control group (*n* = 20).

• Thirteen Week Training Program

- HRT consisted of lower limb exercises on weight machines at 80% of the one repetition maximum (Fig. 1).
- SMT was carried out in bipedal and monopedal stance on wobble boards, sissles, and uneven surfaces (Fig. 2).

Figure 1:
HRT on a leg press

Figure 2:
SMT on unstable devices

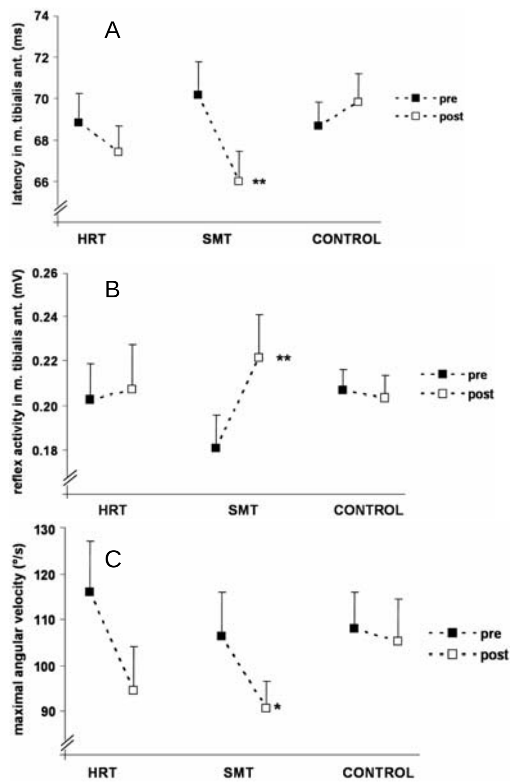
• Assessment of Postural Reflex Variables

- **Gait Perturbations**

  Pre and post training, latency and functional reflex activity during the compensation of decelerating perturbation impulses were recorded by means of surface electromyography (m. tibialis anterior, m. soleus, m. vastus medialis). Maximal angular velocity of the ankle joint was assessed by an electronic goniometer.

RESULTS

In contrast to HRT, SMT resulted in statistically significant improvements in latency of the m. tibialis anterior (**p<.01, Fig. 3A), reflex activity of the m. tibialis anterior (**p<.01, Fig. 3B) , and maximal angular velocity of the ankle joint (*p<.05, Fig. 3C).



Figures 3 A to C:
Effects of HRT or SMT on variables of postural control

CONCLUSIONS

The results indicate that SMT has an impact on spinal motor control mechanisms in the elderly, in contrast to HRT. This can be seen in a facilitated neural drive in the m. tibialis anterior during the perturbation impulses accompanied by a decrease in latency of m. tibialis anterior and a decline in maximal angular velocity of the ankle joint complex. Training induced improvements in perception and procession of afferent information could be a possible reason for the increase in reflex contraction. Due to these adaptive processes, SMT and not HRT could be a well-suited method for fall preventive programs in elderly people.

REFERENCES

1. Granacher et al. Eur J Sport Sci 2008; 8: 325-40.
2. Macaluso et al. Eur J Appl Physiol 2004; 91: 450-72.