

V. Monaco, A. Ghionzoli, P. Dario, S. Micera. Features of the EMG patterns during walking in young and elderly people: Preliminary study. *Gerontechnology* 2008; 7(2):165. Neuroscientists have been testing the hypothesis that muscle synergies are able to manage the many degrees of freedom of the musculoskeletal system, providing great flexibility and making easy its control<sup>1</sup>. Agreements with this hypothesis have been found in cyclic motor tasks, both in animal<sup>1</sup> and in young adult human<sup>2</sup>. Concerning elderly people, literature shows that they have more consistent motor patterns compared with young ones<sup>3</sup>, which have been related to a lack of brain plasticity. The presented work is aimed at evaluating the degree of lack of plasticity, regarding the muscle activation in the control of the locomotion. The hypothesis is that due to the lack of the plasticity, the features of elderly people's motor patterns should be fewer than in the young ones. **Methods** Five young (24.4±2.3 years old) and five elderly (70.4±5.3 years old) men walked on the floor of a 15 m long room, at six different cadences (40, 60, 80, 100, 120, 140 steps/min) scanned by a metronome. EMG data about six couples of muscles (Tibialis anterior, TA, Gastrocnemius lateralis, LG, Soleus, Sol, Rectus femoris, RF, Vastus Medial, VM, Biceps femoris, BF) were acquired from both legs, in order to take in account functional asymmetries. Data were pre-processed according to the literature<sup>4</sup> and post-processed by using the Factorial Analysis. The factors were considered significant in case their associated eigenvalue was greater than one. **Results and discussion** Figure 1 shows that, in both groups, four factors explained the greatest amount of variability of the data. Nevertheless senior's weighting coefficients were more symmetrically distributed compared with the young ones. The results argue for a more rigid motor control in seniors, who are less versatile than the young in managing the redundancy of the musculoskeletal system. Since the same number of factors were found, probably depending on the short number of muscles included in the study, results suggest to carry out an analysis involving more muscles on the same leg.

**References**

1. D'Avella A, Bizzi E. *PNAS* 2005;102: 3076-3081
2. Ivanenko YP, Poppele RE, Lacquaniti F. *Journal of Physiology* 2004;556:267-282.
3. Winter DA, Waterloo: Waterloo Biomechanics; 1990
4. Merkle LA, Layne CS, Bloomberg JJ, Zhang JJ. *Journal of Neuroscience Methods* 1998;82:207-214

**Keywords:** EMG, walking, older adults

**Address:** Scuola Superiore Sant'Anna, Italy; E: v.monaco@imtlucca.it

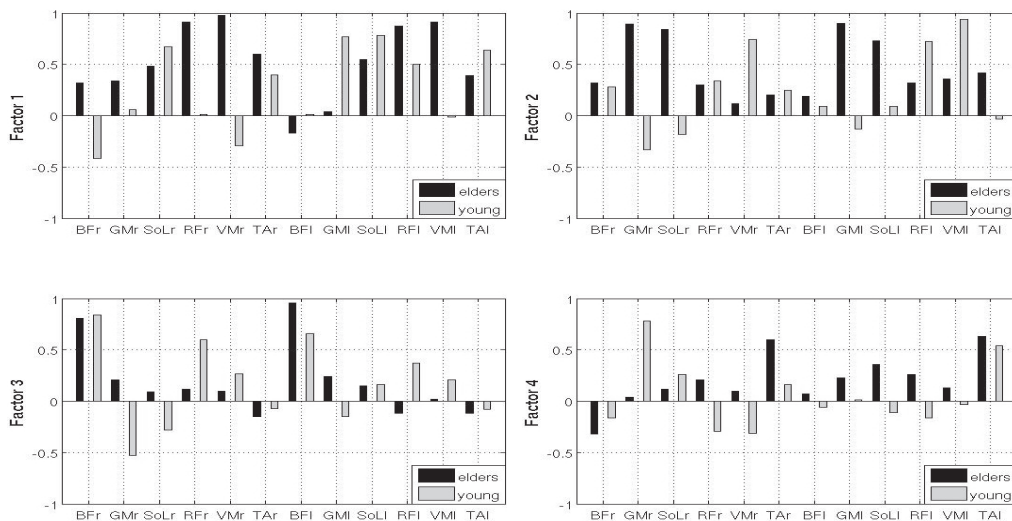


Figure 1 Weight distribution among factors