

S. Mazzoleni, S. Aliboni, G. Pierini, G. Rossi, B. Cesqui, F. Posteraro, M.C. Carrozza, S. Micera, P. Dario. An innovative robot-mediated therapy for the upper limb of elderly chronic hemiparetic subjects. *Gerontechnology* 2008; 7(2):162. Epidemiological studies have shown that the average age of patients affected by stroke is 70 years in men and 75 years in women¹. Recent studies have demonstrated that improvements in motor abilities induced by the therapy may even occur in chronically impaired paretic upper limbs more than 6 to 12 months post-stroke². Recently developed robotic devices for rehabilitation are able to provide a safe, highly accurate, intensive and prolonged motor therapy to patients with upper limb motor impairment^{3,4}. The paper presents an innovative scenario for an upper limb robotic therapy, primarily aimed at avoiding movements involving flexor muscles, and at the same time at maintaining and increasing the movements involving the extension of the arm, particularly at the elbow level. **Methods** Eighteen hemiparetic subjects, aged 61-77 (mean age 66.17 ± 4.82), ten men and eight women, were recruited for the robotic therapy. The Chedoke-McMaster Stroke Assessment Scale, the Motor Status Score for shoulder and elbow, the Modified Ashworth Scale and the Range of Motion were used as outcome measures. An innovative robot-mediated therapy, consisting of goal-directed, planar reaching tasks, was provided 3 times a week, for 6 weeks. For this purpose an innovative pattern of reaching exercises, named 'fan-like' scenario, consisting of seven peripherals and a center target was implemented (*Figure 1*). It was implemented in order to reduce the stimulation of the flexor synergy, avoiding a reinforcement of pectoralis and biceps muscles. The robotic therapy was composed of two different kinds of exercises, unassisted (Record) and assisted movements (Adaptive). In each Adaptive series, following five series of repetitions, a visual display in front of the subject provides five quantitative scores based on her/his performance. **Results and discussion** A statistically significant decrease of motor impairment in paretic upper limb before and after treatment was found. The results confirm that the proposed innovative robot-mediated therapy contributes to decrease the upper limb's motor impairment in elderly chronic neurologically impaired subjects. A reduction of the shoulder pain was observed too. The possibility of implementing different scenarios can contribute to optimize and personalize rehabilitative treatment according to the specific motor impairment and the expected results.

References

1. Feigin VL, Lawes CM, Bennett DA, Anderson CS. *Lancet Neurology* 2003;2:43-53
2. Hendricks HT, van Limbeek J, Geurts AC, Zwarts MJ. *Archives of Physical Medical Rehabilitation* 2002;83:1629-1637
3. Fasoli SE, Krebs, HI, Stein J, Frontera, WR, Hogan N. *Archives of Physical Medical Rehabilitation* 2003;84:477-482
4. Barreca S, Wolf SL, Fasoli S, Bohannon R. *Neurorehabilitation and Neural Repair* 2003;17:220-226

Keywords: robot-mediated therapy, neuro-rehabilitation, chronic hemiparesis

Address: Scuola Superiore Sant'Anna, Italy; E: stefano.mazzoleni@arts.sssup.it

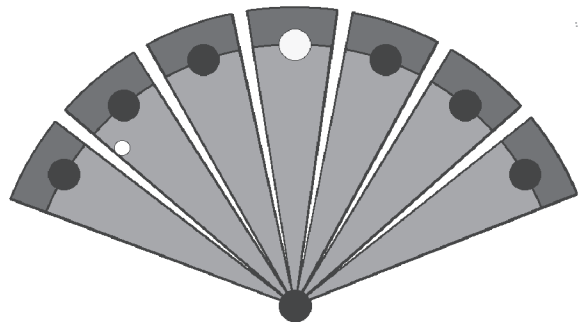


Figure 1 The innovative robot-mediated therapy scenario