FOREWORD

An estimated 30–60% of adult patients after stroke do not achieve satisfactory motor recovery of the upper limb despite intensive rehabilitation. Motor re-organization in adults also depends on substantial contributions from the undamaged motor cortex, with functional inhibition by the unaffected arm that has become dominant – a limitation that neuro-rehabilitation should counterbalance after stroke as well as in other pathological conditions (e.g. multiple sclerosis) and in children.

Innovative technologies, such as advanced robotics and virtual reality, have proven applicable in neuro-rehabilitation, and their use in the treatment of the paretic upper limb appears promising. The available evidence supports applicability. However, research on efficacy has thus far been unsystematic, and the advantages of robotic-supported rehabilitation compared with conventional treatments remain, to a relevant extent, undocumented. More importantly, a comprehensive scientific rationale and pathophysiological understanding of the mechanisms underlying recovery (with or without robot assistance) remain to be devised.

The applicability of novel technologies depends on efficacy and cost-benefit ratio as much as it requires scientific background, expertise and communication to be shared by professionals and scientists from different fields. In this respect, the knowledge of bio-engineers and rehabilitators need to be integrated for the robotic implements to be usable in neuro-rehabilitation. The patient's needs and the training goals are central to the development of machine-human interfaces. Design, research and programming for robotics application in neuro-rehabilitation can benefit from captology and develop interactive computing products purported to change people's attitude and/or behavior. The approach would also enhance the patients' commitment to training and expand rehabilitation beyond the mere, often partial and usually compensatory, recovery of motor function. The approach looks promising, and research in this field is due.

A workshop on "The application of robotics in the functional motor recovery of the paretic upper limb" was held in Crotone, Italy, on 5–6 September 2008, with contributions from the major neuro-rehabilitation centres in the country and participation of leading scientists in neuroscience. The objectives of the workshop were to characterize by technology and rationale of development the robots and virtual reality systems available today for neuro-rehabilitation, focus attention on the methodological and applicative problems, promote multidisciplinary interaction and collaboration. It is our hope that the workshop and its proceedings will help share the relevant information on the issue and promote further research. With such an achievement, the workshop would be successful beyond the duties and purposes of a scientific event. Thanks are due to Institute S. Anna – Research in Advanced Neuro-rehabilitation (RAN) for the successful organization, financial support, and publication of this special issue.

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