# **Contents**

Abbreviations ix Contributors xiii Digital media accompanying the book xv

#### SECTION I

## General aspects of neurorehabilitation

 The International Classification of Functioning, Disability, and Health

E. Diane Playford

2. A teamwork approach to neurological rehabilitation 9

Derick Wade

- The economic benefits of rehabilitation for neurological conditions 23
   Rory J. O'Connor
- **4. Predicting activities after stroke** 31 Gert Kwakkel and Boudewijn Kollen
- Designing a clinical trial for neurorehabilitation 47
   Bruce Dobkin and Clarisa Martinez
- **6. The influence of age on neurorehabilitation** 61 Markus Wirz and Louise Rutz-LaPitz
- 7. The applicability of motor learning to neurorehabilitation 71

## SECTION II

# Physiological consequences of CNS damage

 Spinal neuronal dysfunction after deprivation of supraspinal input 83
 Michèle Hubli and Volker Dietz 9. Secondary changes after damage of the central nervous system: Significance of spastic muscle tone in rehabilitation 95

Volker Dietz and Thomas Sinkjær

- 10. Autonomous nervous system dysfunction 111

  Tom E. Nightingale, Ulrich Mehnert, Thomas M. Kessler, and Andrei V. Krassioukov
- Functional recovery in CNS disease: Impact of animal models 131
   Steffen Franz, Andreas Hug, and Norbert Weidner

#### SECTION III

## Neuroplasticity and repair

- 12. Animal models of damage, repair, and plasticity in the brain 147

  Andreas R. Luft
- 13. Animal models of damage, repair, and plasticity in the spinal cord 155
  Patrick Freund, V. Reggie Edgerton, Roland R. Roy, Daniel C. Lu, and Yury Gerasimenko
- 14. **Stem cell application in neurorehabilitation** 169
  Sebastian Jessberger, Armin Curt, and Roger A. Barker
- The role of neuroimaging in understanding the impact of neuroplasticity after CNS damage 185 Nick S. Ward
- 16. Enhancement of neuroplasticity by cortical stimulation 199
  Orlando B.C. Swayne and John C. Rothwell
- 17. Enhancement of neuroplasticity by drug therapy 221
  Ulf Ziemann

### **SECTION IV**

## Clinical concepts

18. Rehabilitation of gait and balance after CNS damage 239

Jacques Duysens, Geert Verheyden, Firas Massaad, Pieter Meyns, Bouwien Smits-Engelsman, and Ilse Jonkers

 Neurorehabilitation approaches for disorders of the peripheral nervous system 253

William Huynh, Michael Lee, and Matthew C. Kiernan

20. Treatment of arm and hand dysfunction after CNS damage 269

Nick S. Ward

21. Acquired disorders of language and their treatment 279

Alex Leff and Jenny Crinion

- Neuropsychological rehabilitation of higher cortical functions after brain damage 291
   Radek Ptak and Armin Schnider
- 23. The clinical neurology of problems with oral feeding 305
  Tom Richards and Tom Hughes
- 24. Management of lower urinary tract, bowel, and sexual dysfunction 315

  Ulrich Mehnert and Thomas M. Kessler
- 25. The assessment and treatment of pain syndromes in neurorehabilitation 339

  Eva Widerström-Noga
- 26. The impact of fatigue on neurorehabilitation 359
  Killian A. Welch and Mansur A. Kutlubaev
- **27. Vocational rehabilitation** 377 Andy Tyerman
- 28. Self-management strategies in neurorehabilitation 387
  Fiona Jones and Sara Demain

29. Neuropalliative rehabilitation: Managing neurological disability in the context of deteriorating illness 401

Gail Eva, Jo Bayly, and E. Diane Playford

30. Recognition and management of functional symptoms after traumatic brain injury 413
Lucia Ricciardi, Alan J. Carson, and Mark J. Edwards

#### **SECTION V**

## **Technical concepts**

31. Music supported therapy in neurorehabilitation 421

Eckart Altenmüller and Lauren Stewart

32. Application of orthoses and neurostimulation in neurorehabilitation 433

Jacopo Carpaneto and Silvestro Micera

33. Technology to enhance arm and hand function 445

Arthur Prochazka

- 34. Technology to enhance locomotor function
  Rüdiger Rupp, Daniel Schließmann, Christian Schuld, and
  Norbert Weidner
- 35. Enhancing independent community access and participation: Services, technologies, and policies 477

  Luc Noreau, Normand Boucher, Geoffrey Edwards, Patrick Fougeyrollas, Ernesto Morales, François Routhier,

36. **Virtual reality for neurorehabilitation** 497 Mathias Bannwart and Robert Riener

Claude Vincent, and Hubert Gascon

37. Promises and challenges of neurorehabilitation technology 523

Arun Jayaraman, Sheila Burt, and William Z. Rymer

Index 529