Journal of

Rehabilitation Research and Development

VOL. 37, NO. 2, 2000

A Peer-Reviewed Journal

Available in Superintendent of Documents Depositories,
U.S. Government Printing Office (GPO), Washington, DC 20402
Available in microfilm from University Microfilms International, Inc.
Single articles available on request from Congressional Information Services, Bethesda, MD 20814.

Indexed by:

- Cumulative Index to Nursing & Allied Health Literature® (print index)
- CINAHL® (database)
- Engineering Index (Bioengineering Abstracts)
- EMBASE/Excerpta Medica
- Index Medicus®
- The BDLOC System (French)
- U.S. Government Periodicals Index(Congressional Information Services)
- PubMed8
- RECAL Information Services (University of Strathclyde)
- Social Science Index, WILSONDISC Databases (H.W. Wilson Co.)
- SPORT Database/SPORT Discus (Canadian)

Library of Congress Catalog Card No. 6.60273
ISSN 0007–506X

The *Journal of Rehabilitation Research and Development* is a quarterly publication of the Rehabilitation Research and Development Service, Department of Veterans Affairs.

The opinions of contributors are their own and are not necessarily those of the Department of Veterans Affairs.

Address correspondence to: Editor, *Journal of Rehabilitation Research and Development,* Scientific and Technical Publications Section, VA Rehabilitation Research and Development Service, 103 South Gay Street, Baltimore, MD 21202-4051.

Contents of the *Journal of Rehabilitation Research and Development* are within the public domain with the exception of material specifically noted.

The *Journal of Rehabilitation Research and Development* and its supplements are printed on acid-free paper, as of Vol. 25 No. 2 (Spring 1988).

Department of Veterans Affairs

Journal of Rehabilitation Research and Development

Volume 37, Number 2, 2000

The *Journal of Rehabilitation Research and Development* is a publication of the Rehabilitation Research and Development Service, Veterans Health Administration, Department of Veterans Affairs, Baltimore, MD

EDITORIAL BOARD

Mindy L. Aisen, M.D., *Chairperson*

Kai-Nan An, Ph.D.
Gunnar B.J. Andersson, M.D., Ph.D.
Daine J. Atkins, O.T.R.
Peter Axelson, M.S.M.E.
Michael P. Barnes, M.D., F.R.C.P.
Craig Bash, M.D.
Bruce B. Blasch, Ph.D.
Michael L. Boninger, M.D.
John Brabyn, Ph.D.
Ernest M. Burgess, M.D.
Dudley S. Childress, Ph.D.
Rory A. Cooper, Ph.D.
Charles H. Dankmeyer, Jr., C.P.O.
William R. De l'Aune, Ph.D.
Carlo J. De Luca, Ph.D.
Pamela W. Duncan, Ph.D., P.T.
Joan Edelstein, M.A., P.T.
Stephen Fausti, Ph.D.
Jodie K. Haselkorn, M.D.
Douglas A. Hobson, Ph.D.
Helen M. Hoenig, M.D.
Vern Houston, Ph.D.
J. Lawrence Katz, Ph.D.
D. Casey Kerrigan, M.D.
Nicholas LaRocca, Ph.D.
Harry Levitt, Ph.D.
Joseph Maino, O.D.
Arthur F.T. Mak, Ph.D.
Robert W. Mann, Sc.D., *emeritus*
Paul R. Meyer, Jr., M.D.
Deborah Miller, Ph.D.
Janet Mulcare, Ph.D.
Tommy Öberg, Ph.D.
Joseph G. Ouslander, M.D.
P. Hunter Peckham, Ph.D.
Jacquelin Perry, M.D.
Michael Pinzur, M.D.
Charles H. Pritham, C.P.O.
Kristjan T. Ragnarsson, M.D.
James B. Reswick, Sc.D, *emeritus*
Michael J. Rosen, Ph.D.
Elliot J. Roth, M.D.
Leslie Gonzalez Rothi, Ph.D.
Robert L. Ruff, M.D., Ph.D.
Bruce Sangeorzan, M.D.
Jerome D. Schein, Ph.D.
Ronald A. Schuchard, Ph.D.
Arthur M. Sherwood, Ph.D.
Harry B. Skinner, M.D., Ph.D.
Douglas G. Smith, M.D.
Moshe Solomonow, Ph.D., M.D. (Hon)
Thomas E. Stripling
Ronald J. Triolo, Ph.D.
Luc H. V. van der Woude, Ph.D.
William M. Vannah, Ph.D.
Jacqueline J. Wertsch, M.D.
Felix E. Zajac, Ph.D.

Mindy L. Aisen, M.D., *Director*
Veterans Health Adminsitration
Rehabilitation Research & Development Service
Washington, DC
Editor-in-Chief,
Journal of Rehabilitation Research and Development
Laura Bowman, *Assistant Director*
Rehabilitation Research & Development Service

Tamara Sowell, *Editor*

ASSOCIATE EDITORS

Dudley S. Childress, Ph.D.
Prosthetics/Amputation
Peter Axelson, M.S.M.E.
Spinal Cord Injury
Jerome D. Schein, Ph.D.
Sensory Aids
Joan E. Edelstein, M.A., P. T.
Geriatrics

FOREIGN EDITORS

Satoshi Ueda, M.D.
Professor Director
Central Rehabilitation Service
University of Tokyo Hospital
731 Hongo, Bunkyo
Tokyo, Japan
Seishi Sawamura, M.D.
Director
Hyogo Rehabilitation Center
1070 Akebono-Cho (Tarumi-Ki)
Kobe, 673 Japan

CONSULTANTS

Jacquelin Perry, M.D.,
Medical Consultant
Leon Bennett,
Technical Consultant

SCIENTIFIC AND TECHNICAL PUBLICATIONS SECTION
Neil McAleer, Managing Editor
Don Martin, Technical Publications Editor
Nick Lancaster, Multimedia Production
June R. Terry, Program Assistant
Celeste Anderson, Program Assistant
Marcia Nealey, Program Clerk