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TRENDS AND REFLECTIONS

Developing Human Functioning and Rehabilitation Research from a comprehensive perspective

O desenvolvimento da "Pesquisa em Funcionalidade Humana e Reabilitação" a partir de uma perspectiva abrangente

[1]Gerold Stucki, [2]Jan Dietrich Reinhardt, [3]Gunnar Grimby, [4]John Melvin

ABSTRACT

By creating the International Classification of Functioning, Disability and Health (ICF) the World Health Organization (WHO) prepared the ground for a comprehensive understanding of Human Functioning and Rehabilitation Research, integrating the biomedical perspective on impairment with the social model of disability. This new understanding poses a number of old and new challenges related to the enhancement of adequate research capacity. Here we will summarize approaches to address these challenges with respect to three areas: the organization of Human Functioning and Rehabilitation Research into distinct scientific fields, the development of suitable academic training programs and the building of university centers and collaboration networks.

KEYWORDS

International Classification of Functioning, Disability and Health, research, disabled persons, rehabilitation

RESUMO

Por meio da Classificação Internacional de Funcionalidade, Incapacidade e Saúde (CIF), a Organização Mundial de Saúde (OMS) preparou o terreno para uma compreensão abrangente da Pesquisa em Funcionalidade Humana e Reabilitação que integra a perspectiva biomédica da deficiência ao modelo social da incapacidade. Esta nova compreensão introduz uma série de desafios novos e antigos relacionados ao aprimoramento da capacidade de pesquisa adequada. Resumiremos aqui abordagens que procuraram dar conta destes desafios em relação a três áreas: a organização da Pesquisa em Reabilitação e Funcionalidade Humana em áreas científicas distintas, o desenvolvimento de programas acadêmicos de treinamento adequados e a estruturação de centros universitários e redes de cooperação.

PALAVRAS-CHAVE

Classificação Internacional de Funcionalidades, Incapacidades e Saúde, pesquisa, pessoas portadoras de deficiência, reabilitação

1 Department of Physical Medicine and Rehabilitation, Ludwig-Maximilian University Munich, Germany; ICF Research Branch of the WHO CC FIC (DIMDI), Institute for Health and Rehabilitation Sciences, Ludwig-Maximilian University Munich, Germany; Swiss Paraplegic Research, Nottwil, Switzerland
2 Swiss Paraplegic Research, Nottwil, Switzerland; Faculty of Humanities, University of Lucerne, Lucerne, Switzerland
3 Rehabilitation Medicine, Institute of Neuroscience and Physiology, Sahlgrenska; Academy, Göteborg University, Göteborg, Sweden
4 Department of Rehabilitation Medicine, Jefferson Medical College, Thomas Jefferson University, Philadelphia, United States of America

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INTRODUCTION

The integrative model of human functioning and disability provided by the World Health Organisation (WHO) with its International Classification of Functioning, Disability and Health (ICF)[1] has provided the scientific community with a paradigm change[2] in rehabilitation and related research. At least, a competitor for the long-time dominant biomedical paradigm has been introduced with regard to a wider understanding of human functioning. The term 'human functioning' points at the interrelatedness of body functions and structures, individual activity and societal participation within health-related human experience. Likewise, disability may no longer be seen as an attribute of the person but as an experience[3-6] that may comprise some or all of the following: impairment at the body level, limitation in activities, restriction to participation, some, or all of these.

The universal human experiences of functioning and disability are not only related to health conditions but occur in the context of facilitating or hindering environments and personal resources (figure 1 shows the integrative or comprehensive model of functioning in contrast to the traditional biomedical perspective). Against the background of the integrative model of functioning and disability, rehabilitation can be understood as one out of four health strategies also including prevention, cure and support. Rehabilitation can be briefly defined as the health strategy which aims to enable people with health conditions experiencing or likely to experience disability to achieve and maintain optimal functioning in interaction with the environment.[7] Accordingly, Physical and Rehabilitation Medicine (PRM) is the medical specialty applying rehabilitation as its main strategy.

Given that "about six hundred million people live with physical and mental disabilities of various types", that there is a "rapid increase in the number of persons with disabilities"[8] and that "today's investments in rehabilitation research are investments in improved rehabilitation care in the future"[9] there is an urgent need to increase rehabilitation research capacity.[10,11] Comprehensively understood rehabilitation builds on fundamental knowledge about the biological, psychological and social dimensions as well as determinants of human functioning and disability. We therefore suggest referring to this needed research as "Human Functioning and Rehabilitation Research".

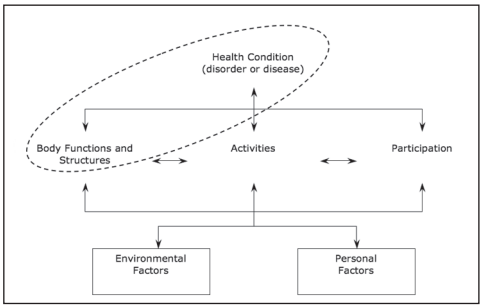

Figure 1
Illustration of the focused perspective based on the biomedical model (dotted circle) versus the comprehensive perspective based on the integrative model (whole figure).

Challenges in the building of research capacity in the area of Human Functioning and Rehabilitation include the lack of a globally agreed conceptualization and organization of Human Functioning and Rehabilitation Research,[9,10,12] the absence of appropriate funding channels,[9,11] the need for interdisciplinary research efforts as well as community-based collaboration networks,[11,13] and the lack of appropriate training and education programs as well as career opportunities for human functioning and rehabilitation researchers.[11,14,15] They have been outlined in detail elsewhere.[5,16]

Here we will summarize approaches to address these challenges with respect to three areas: the organization of Human Functioning and Rehabilitation Research into distinct scientific fields, the development of suitable academic training programs and the building of university centres and collaboration networks.

The aim is to stimulate the discussion initiated by a recent special issue of the Journal of Rehabilitation Medicine.[5]

DISTINCT SCIENTIFIC FIELDS OF HUMAN FUNCTIONING AND REHABILITATION RESEARCH

Currently, an organization of Human Functioning and Rehabilitation Research into distinct scientific fields is missing.[9,10,14] However, distinct scientific fields are pivotal for the meaningful structuring of any research area, the fruitful division of labor, the advancement of innovations, and the development of a common identity among researchers. We have therefore suggested five distinct scientific fields for human functioning and rehabilitation covering research from the cell to society.[17,18] The basis for the delineation of these distinct scientific fields is the general distinction in basic, applied and professional sciences applicable to research in general, and the rehabilitation relevant distinction between the comprehensive perspective based on the WHO's integrative model of human functioning and the more focused perspective of the biomedical aspects of functioning.

Figure 2 shows a graphical depiction of the organization of Human Functioning and Rehabilitation Research into five distinct scientific fields.[17] The figure also includes a short description of these fields. The Biosciences in relation to rehabilitation and the Biomedical Rehabilitation Sciences and Engineering are well established. Instead, there is the need to now systematically develop research from the comprehensive perspective in the emerging Human Functioning Sciences and Integrative Rehabilitation Sciences. It is also time to further develop the Professional Rehabilitation Sciences that are situated at the interface of research and practice as well as the focused and comprehensive perspectives of functioning. Particularly, "scientific discovery" needs to be established "as an institutional core set of values within professional organizations".[11]

A better understanding of the distinct scientific fields can be gained by describing their particular research domains.[18] Accordingly, table 1 shows the domains of research. While the research domains of the Human Functioning Sciences can be identified and described with regard to the generic research process which involves theory building and observation, the research domains of the

Integrative Rehabilitation Sciences can be identified and described by drawing on the public health approach. The research domains of the Professional Rehabilitation Sciences are geared to domains established in the clinical sciences.

Research relevant to the five distinct scientific fields in the area of Human Functioning and Rehabilitation is presented at a wide range of conferences and is published in a wide range of journals. A list of scientific journals assigned to the five distinct scientific fields has been provided elsewhere.[19] This lists may serve scientists interested in human functioning and rehabilitation research as an initial guideline while identifying possibilities for the submission of papers as well as sources of scientific information and platforms for the scientific exchange and discourse.

The organization of Human Functioning and Rehabilitation Research into the five distinct scientific fields facilitates the development of academic training programs and career building as well as the development of research structures dedicated to Human Functioning and Rehabilitation Research as described in the following sections. Before we do so, we would like to sketch the potential of the emerging distinct scientific field of Human Functioning Sciences.

HUMAN FUNCTIONING SCIENCES, AN EMERGING BASIC SCIENCE FOR REHABILITATION FROM THE COMPREHENSIVE PERSPECTIVE

While the established Biosciences in Rehabilitation represent basic sciences interested in the fundamental understanding of the biomedical aspects of functioning, the Human Functioning Sciences have the potential to become basic sciences from the comprehensive perspective.[17,18] Basic research from the comprehensive perspective should take into account all components and determinants of functioning and particularly their interdependency and interactions.[20,21] Firstly, the Human Functioning Sciences thus should comprise the development of theory and models addressing the complex interplay of various factors from the physiological to the societal level. Secondly, it is also indispensable that they encompass systematic efforts to classify and measure all involved variables.

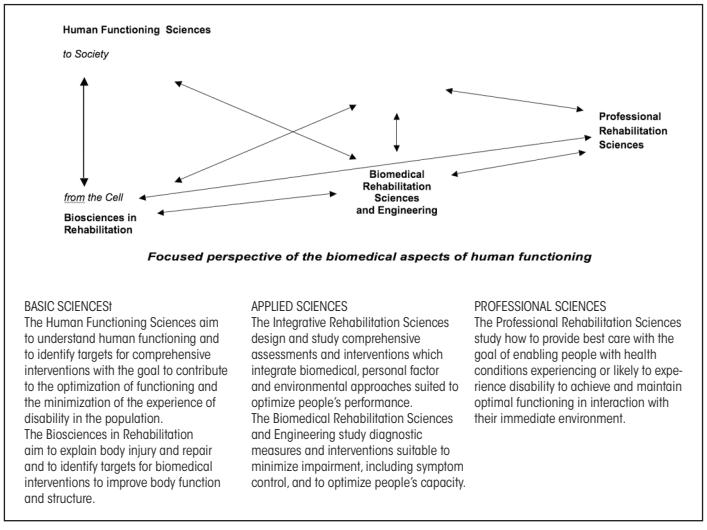

Figure 2
Distinct scientific fields in Human Functioning and Rehabilitation Research: The figure illustrates relations for the communication of scientific knowledge between the distinct scientific fields. The double arrows indicate that knowledge may be communicated in both directions. The horizontal dimension symbolizes the confluence of knowledge generated by the basic and applied sciences to serve the professional sciences and vice versa. The vertical dimension distinguishes the comprehensive perspective based on the integrative model of functioning from the focused perspective of the biomedical aspects of functioning. Diagonal arrows thus display flows of knowledge with respect to both dimensions. Adopted from.[5]

Table 1
Domains of research in the five distinct scientific fields of Human Functioning and Rehabilitation Research. Adopted from.[17]

Human Functioning Sciences
- Theory and models of functioning
- Classification and measurement of functioning
- Functioning epidemiology
- Functioning impact assessment
Integrative Rehabilitation Sciences
- Rehabilitation services research
including health policy and law, rehabilitation economics and community-based participatory research
- Rehabilitation intervention research including rehabilitation intervention program research; rehabilitation technology assessment in clinical and community settings, technology transfer; and applying research designs ranging from randomized controlled trials to observational studies
- Rehabilitation administration and management including the development of integrated care and service concepts and ICF-based case management programs as well as the design of other structures and processes in rehabilitation institutions
Biosciences in Rehabilitation (examples)
- Tissue injury and repair
- Plasticity
- Homeostatic mechanisms of muscle contraction
Biomedical Rehabilitation Sciences and Engineering
- Research in relation to organ systems, e.g. cardiopulmonary, musculoskeletal or neurological rehabilitation research
- Research in relation to intervention principles, e.g. rehabilitation engineering, occupational therapy and physiotherapy research, drug trials
Professional Rehabilitation Sciences
- Standards and guidelines for the provision of best care
- Rehabilitation quality management
- Scientific education and training of professionals in rehabilitation
- Development and evaluation of the rehabilitation team

On the basis of theory and classification the Human Functioning Sciences should then guide respective scientific observation. This includes, thirdly, the accomplishment of epidemiological studies suited to comprehensively describe functioning at the population level as well as to test respective theories. Fourthly, it should entail the modeling of the impact of intended and non-intended changes in the physical and social environment on future functioning.18 Table 2 shows an ICF-based conceptual description of the Human Functioning Sciences.

ACADEMIC TRAINING PROGRAMS IN HUMAN FUNCTIONING AND REHABILITATION RESEARCHT

Research without people is impossible. A key to building research capacity in Human Functioning and Rehabilitation Research is thus the development of a qualified workforce. We currently face a double challenge regarding firstly the establishment of academic training programs, and secondly the creation of attractive career opportunities for Human Functioning and Rehabilitation researchers.[11,14,15] The adoption of the ICF as unifying conceptual model for rehabilitation, the emergence of distinct scientific fields in the area and the change to Bachelor and Masters in Europe provide unique opportunities to now initiate innovative academic training programs in Human Functioning and Rehabilitation Research.

Applied training may include certificate programs in rehabilitation effectiveness and Master and Doctoral programs in rehabilitation with concentration e.g. in rehabilitation studies, management, education and rehabilitation counseling. Scientifically oriented training may include certificate, Master of Science and PhD programs in the Human Functioning Sciences and Integrative Rehabilitation Sciences. Collaborative Master and Doctoral programs with the rehabilitation professions, the movement sciences, psychology, the behavioral sciences, and the social sciences are also a promising approach. When initiating the process to develop these programs one may learn from and cooperate with programs established in public health.

Table 3 shows envisioned academic training programs in Human Functioning and Rehabilitation Research. A detailed description of the careers and training programs can be found elsewhere.[15]

INTERDISCIPLINARY UNIVERSITY CENTRES AND COLLABORATION NETWORKS

There is hardly an academic discipline that is not at least partially relevant to Human Functioning and Rehabilitation Research from the comprehensive perspective. Conversely, Human Functioning and Rehabilitation Research offers practice driven research questions to scholars of the most diverse disciplines. It bears thus an enormous potential for the establishment of interdisciplinary research centers across university faculties and research institutes. It also fits well into an academic landscape in which interdisciplinarity is more and more valued, e.g. in international calls.[13]

Table 2
ICF-based conceptual description of the Human Functioning Sciences. Terms referring to components of the ICF model are written in bold. Adopted from.[17]

Human Functioning Sciences
are basic sciences whichbased on WHO's integrative model of human functioning and disabilityand focusing on populations
1) develop and test theories and models of functioning
2) develop classifications and measurements of functioning
3) study the incidence, prevalence, distribution of factors associated with functioning and disability across health conditions, populations and environments, and over time
4) predict the impact of intended and non-intended changes in the physical and social environment on functioning including the impact of proposals (policies, programs and projects) in the health sector and across sectors; changes in the provision and the payment for services; the costs and benefits of implementing new products and procedures
5) inform and advise the public, policy and decision makers about the burden associated with health conditions and the consequences of intended and non-intended changes in the hysical and social environment on functioning with the goal to contribute to the understanding of functioning of people with health conditions as well as to the optimization of functioning and the minimization of the experience of disability in the population and of specific groups.

Moreover, a better understanding of human functioning and disability will uncover unexplored possibilities to optimize populations' functioning and minimize individuals' experience of disability in the presence of a health condition. The ultimate goal of all Human Functioning and Rehabilitation Research is to integrate and translate scientific advances into benefits for people and the society. It is thus highly interesting for and relevant to a wide range of different social groups and professions such as people with disabilities and advocacy organizations, families and friends of people experiencing disability, doctors and other health professionals, social workers, politicians, architects etc. Human Functioning and Rehabilitation Research therefore offers manifold possibilities for the creation of national, regional or international collaboration networks[13] comprising all groups of people that are affected by the research results. Although it has not been largely explored so far, community-based participatory research[22] will probably be an important means to increase the potential of Human Functioning and Rehabilitation Research to learn from people's life worlds for people's quality of life.

Tables 4 and 5 show selected scientific and professional disciplines that are related to Human Functioning and Rehabilitation Research while figure 3 shows groups of stakeholders in human functioning and rehabilitation research.

CONCLUDING REMARKS

Comprehensively understood Human Functioning and Rehabi-

Table 3
Academic training programs in Human Functioning and Rehabilitation Research. Adopted from.[15]

Programs from the comprehensive perspective based on the integrative model of human functioning		
Program	Human Functioning and Rehabilitation	Target Group
Certificate Program	Rehabilitation Management	Related professional disciplines*
Applied Master / Doctorate	Rehabilitation Counselling Rehabilitation Education	Related professional disciplines*
Collaborative Applied Master / Doctorate	Rehabilitation Studies Physiotherapy and Occupational Therapy (or another related professional discipline)	Related professional disciplines*
Master of Science / PhD	Professional Rehabilitation Sciences Human Functioning Sciences Integrative Rehabilitation Sciences	Related professional disciplines* Related scientific disciplines and fields**
Collaborative Master of Science / PhD	Human Functioning and Rehabilitation Sciences Sociology (or another related scientific discipline) and Human Functioning Sciences Integrative Rehabilitation Sciences Human Functioning and Rehabilitation Sciences	Related scientific disciplines and fields**
Programs from the focused perspective of the biomedical aspects of human functioning		
Master of Science / PhD	Biomedical Rehabilitation Sciences	Related scientific disciplines and fields***
Collaborative Master of Science / PhD	Movement Sciences (or another related scientific discipline) and Biomedical Rehabilitation Sciences	Related scientific disciplines and fields***

*Related professional disciplines: Clinical psychology, Physical and Rehabilitation Medicine and other medical specialties applying the rehabilitation strategy as a major strategy,6 Neuro-Psychology, Nursing, Occupational Therapy, Physiotherapy, Rehabilitation Counselling, Social Work, Speech Therapy
**Related scientific disciplines and fields:
Integrative Rehabilitation Sciences: Economics, Education, Environmental Engineering, Health Services Research, Health Management, Psychology; Human Functioning Sciences: Anthropology and Cultural Geography, Architecture and Design, Behavioural Sciences, Biostatistics, Decision Science and Epidemiology, Health Policy, History, Political Sciences and Economics, Public Health, Sociology and Social Psychology
***Related scientific disciplines and fields: Applied and Exercise Physiology, Movement and Sports Sciences, Nutrition Science and Pharmacology, Rehabilitation Engineering, Molecular and Genetic Biology, Neurobiology, Sensory Physiology

litation Research holds an enormous potential to become a multisided but coherent research area in which researchers from various disciplines and stakeholders from various backgrounds connect knowledge and efforts to improve functioning and quality of life of people experiencing disability. The integrative perspective of Human Functioning and Rehabilitation provides a new option for biomedical researchers and health professionals to look beyond their immediate fields of expertise. It also constitutes a particular opportunity for researchers from related disciplines like Psychology or Sociology to embark into a research area which is highly relevant to both individual lives and societal practice.

However, standardized funding channels of Human Functioning and Rehabilitation Research are hardly available at the moment. Most funding programs clearly refer to a focused perspective, most commonly the biomedical perspective, or on the perspective of a specific discipline.[10] Also, programs which foster interdisciplinary research often have specific aims which may not reflect the research agenda of integrative researchers.[10] Interdisciplinary grants as well as the parallel establishment of national, regional, and international collaboration networks and interdisciplinary university centers[13] are in important step towards "normal science".[2] Equally important is the building of research institutions from the comprehensive perspective on Human Functioning and Rehabilitation and the provision of appropriate infrastructure. The development of Swiss Paraplegic Research which has been presented elsewhere may serve as an example.[23] Integrative research institutions can serve as centers of excellence and nodes for research and stakeholder collaboration as well as catalysts for research which crosses the boundaries of the Natural Sciences and Engineering Research, the Human and Behavioral Sciences and the Social Sciences.[23]

Human Functioning and Rehabilitation Research which incorporates the comprehensive perspective may start from an interdisciplinary perspective. The ultimate goal, however, is to become transdisciplinary[24,25] which "would not only cover interactions or reciprocity between specialized research projects, but would place these relationships within a total system without any firm boundaries between disciplines".[25]

The goal is to combine knowledge and models of differential disciplines in order to comprehensively understand human func-

Figure 3
Stakeholders in Human Functioning and Rehabilitation Research.

Table 4
Selected scientific disciplines related to Human Functioning and Rehabilitation Research. A discipline may be relevant to, focus on or integrate more than one ICF component. For practical reasons it is only listed under one component in most of the cases. Adopted from. [13]

	Health conditiont	
	Biology	
	Molecular Medicine	
Body Functions and Structures	Activities	Participation
Anatomy and Physiology	Biomedical Rehabilitation Sciences and Engineering	Integrative Rehabilitation Sciences
Exercise, Applied and Transitional Physiology	Integrative Rehabilitation Sciences	
Movement and Sports Sciences		
Neurobiology		
Molecular & Genetic Biology		
Personal Factors		Environmental Factors
Anthropology		Economics
Behavioral Sciences	Overarching perspective	Sociology
Neurobiology	Epidemiology	Cultural and Social Anthropology
Psychology	Health Sciences	Political Science
	Human Development	Health and Social Law
	Human Functioning Science	Environmental Rehabilitation Engineering
	Philosophy, History and Ethics	Ergonomics
	Public Health	

Table 5
Selected professional disciplines related to Human Functioning and Rehabilitation Sciences according to the unifying conceptual model of the ICF. A professional discipline may be relevant, focus or integrate more than one ICF component. For practical reasons it is only listed under one component. Adopted from. [13]

	Health condition	
	Pathology	
	Pathophysiology	
	Clinical Medicine	
Body Functions and Structures	Activities	Participation
Pharmacology	Rehabilitation Medicine	Rehabilitation Counseling
Physical Medicine	Occupational Therapy	Vocational Rehabilitation
Physiotherapy		Social Work
Orthotechnology		
Neuro-Psychology		
Speech Language Pathology		
Sports Medicine		
Personal Factors		Environmental Factors
Clinical Psychology		Construction and architecture
Education	Overarching perspective	Design
	Family and Community Medicine	Law
	Geriatric Medicine	Politics
	Nursing	
	Rehabilitation Medicine	

tioning across health conditions, individuals, and environments.

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