SPECIAL COMMUNICATION

Treatment Taxonomy for Rehabilitation: Past, Present, and Prospects

Marcel P. Dijkers, PhD, FACRM,[a] Tessa Hart, PhD,[b] Theodore Tsaousides, PhD,[a] John Whyte, MD, PhD,[b] Jeanne M. Zanca, PhD, MPT[a]

From the [a]Department of Rehabilitation Medicine, Icahn School of Medicine at Mount Sinai, New York, NY; and [b]Moss Rehabilitation Research Institute, Elkins Park, PA.
Current affiliation for Zanca, Kessler Foundation, West Orange, NJ.

Abstract

The idea of constructing a taxonomy of rehabilitation interventions has been around for quite some time, but other than small and mostly ad hoc efforts, not much progress has been made, in spite of articulate pleas by some well-respected clinician scholars. In this article, treatment taxonomies used in health care, and in rehabilitation specifically, are selectively reviewed, with a focus on the need to base a rehabilitation treatment taxonomy (RTT) on the "active ingredients" of treatments and their link to patient/client deficits/problems that are targeted in therapy. This is followed by a description of what we see as a fruitful approach to the development of an RTT that crosses disciplines, settings, and patient diagnoses, and a discussion of the potential uses in and benefits of a well-developed RTT for clinical service, research, education, and service administration.
Archives of Physical Medicine and Rehabilitation 2014;95(1 Suppl 1):S6-16

© 2014 by the American Congress of Rehabilitation Medicine

Medical rehabilitation has frequently been compared with a black box because the processes by which clinic treatments, education, medications, aids and devices, environmental modifications, and other interventions turn inputs (impairments and activity limitations) into outcomes (improved functioning, independence, and quality of life) remain largely unknown.[1-5] To date, rehabilitation research has focused nearly all of its efforts on the delineation, specification, and valid and reliable measurement of inputs (patient deficits at admission) and outcomes (their status at and after discharge),[6] almost completely disregarding parallel issues relevant to interventions. Thus, interventions and their putative "active ingredients" tend to be inadequately described and characterized, even in the relatively few treatment studies that can be found in rehabilitation research literature.[7-9] As practitioners in a professional, treatment-focused field, we have failed to "disaggregate" the interventions that are part of the package provided to inpatients or outpatients; as a consequence, we do not know the individual and joint effects of our treatments.[10] Keith stated a point over 15 years ago that still rings true:

> Lack of treatment specification is the most glaring omission in research on rehabilitation outcomes. The unspoken assumption has been that treatment programs for the same condition are fairly standard, but research on practice patterns has shown that such assumptions are unwarranted...lack of identification of the components of treatment has meant we do not know which procedures in rehabilitation are essential to produce improvement, a necessary ingredient in efficiently instituting alternative treatment methods.[11(p1202)]

Given the current state of the science, we cannot explain well, if at all, why patients in rehabilitation improve and which of the various treatments, in what strength or dosage, for what patient groups, or in what time frame, are effective (cf, Bode et al[12]). There are at least 2 major reasons for the lack of progress in this area. One reason is that rehabilitation research is frequently not theory driven. The continuously increasing torrent of research on rehabilitation patients and their outcomes, including sophisticated randomized controlled trials demonstrating the effectiveness of certain treatments, is not likely to significantly advance our knowledge of the mechanisms leading to improvements unless treatments become described by their

(hypothesized) active ingredients, and the investigators offer a theory as to how those ingredients, through a mechanism of action, lead to improvements in those aspects of functioning they aim to improve.[13] The other reason, interrelated with the first, is that we lack a standard way of describing rehabilitation interventions across the diverse settings, disciplines, and treatments used in rehabilitation, although proposals for nomenclature standards in more limited areas have been made,[14,15] or at least asked for.[16,17] Almost all rehabilitation research is underdeveloped, not only in its theory underpinnings, but also in specifying the information that might be used by others in replicating the investigation, or in testing theory-derived hypotheses.[7,9]

Development of a broad-based taxonomy of rehabilitation interventions based on a solid theoretical footing and developed following modern taxonomic principles might go far to resolve the dual problem. A taxonomy "group[s] phenomena or observations into categories that are objective, mutually exclusive, and useful in scientific inquiry."[18(p204)] A typology (or classification) is the systematic distinguishing, ordering, and naming of type groups within a particular area. Bailey[19] notes that a typology is conceptual, an ordering of concepts that differ from one another along one or multiple axes or dimensions, whereas a taxonomy is an ordering of concrete cases or empirical entities. The terms typology, classification, and taxonomy are often used interchangeably. The term taxonomy easily reminds one of the ranked classifications Linnaeus created for the animal, vegetable, and mineral kingdoms, but it should be mentioned that other ways of systematically grouping entities (including abstract entities) are feasible and may be more appropriate and flexible.[20]

A well-developed and validated taxonomy or typology of medical rehabilitation interventions (a rehabilitation treatment taxonomy [RTT]), focused on the "active ingredients" hypothesized to carry treatment effects, would go far to advance the field.[21] It would offer a basis for identifying each of the various treatments, procedures, practices, services, and approaches used by rehabilitation professionals. Identification of treatments ideally would be based on those characteristics of interventions that are relevant both theoretically and practically. That is to say, theories would specify the client/patient problems or deficits that could be addressed by identified treatments (with the "how" addressed by a known or hypothesized mechanism of action), and research or systematic practice would show that clinically significant changes can be achieved without extraordinary resource expenditure. Characterization of treatments should be followed by quantification, which is a necessary step toward linking interventions to patient inputs and especially to outcomes.[10] However, an RTT will have benefits beyond describing interventions and evaluating their impacts. It can be used for selecting treatments most likely to be successful for a particular patient, and for designing, implementing, and evaluating

treatment programs. An RTT could have great utility for organizing existing knowledge for the benefit of students in preservice training programs, in designing systematic reviews of rehabilitation interventions research, and for otherwise organizing the knowledge base of the disciplines that constitute the rehabilitation team.[10]

Over 10 years ago, several members of the American Congress of Rehabilitation Medicine agreed on a need for a rehabilitation taxonomy; a task force was constituted, which held various meetings to attract interested scholars, collect and distribute ideas, and so forth. When the National Institute on Disability and Rehabilitation Research in 2007 announced the availability of a grant for a Disability Rehabilitation Research Project on the classification and measurement of medical rehabilitation interventions, key people in the task force saw this as an opportunity to bring forward the work they had been discussing. The group, consisting of the current authors, located at Icahn School of Medicine at Mount Sinai in New York and Moss Rehabilitation Research Institute in Elkins Park, received the grant; the current article and several other articles in this supplement are part of the outcomes of the work performed to date. In this project, we worked toward the goal of an RTT by developing and testing a standard method for characterizing the important components (essential and other active ingredients) of rehabilitation treatments.

State of the Art

It is true that after more than 50 years of rehabilitation research we lack a "grand unified theory of rehabilitation."[18(p203)] However, there is groundwork to inform the development of a theory-driven classification system for rehabilitation treatments. More than 20 years ago, Bickman described a "program theory" as "the construction of a plausible and sensible model of how a program is supposed to work."[22(p5)] Theorists and methodologists in the program evaluation field have argued for many years that program evaluation should be "theory driven," that is, evaluation questions, measurement and design, analysis, and interpretation should be guided by some explicit conceptualization of the causal process through which the intervention(s) offered is expected to have effects on client/patient attributes.[23] A similar emphasis on the importance of theory in research on interventions has also emerged in the medical rehabilitation literature.[3,18,24-26] For instance, Keith and Lipsey stated that the core of a treatment theory consists of "…some set of propositions that describe what goes on during the transformation of input into output, that is, the actual nature of the process that transforms received therapy into improved health."[27(p51)]

Rehabilitation specialists have begun to offer elements for a theory of rehabilitation, differentiating aspects of intervention structure and process that may be used to characterize treatments.[27-30] In an influential discussion of "treatment strength in rehabilitation," Keith[11] distinguished several important dimensions by which treatment strength must be measured (also see Cordray,[31] Warren,[32] and colleagues). These include, among others, purity (fidelity to an intended protocol), specificity (degree of tailoring to patient characteristics), and intensity variables, such as dose, timing, and sequencing; all of these are important characteristics to be considered in the creation of a theory-driven treatment taxonomy.

Quantification of the "dose" of treatment that patients and clients receive is being discussed[14,33,34]; however, most empirical work still uses a simple count of hours of "treatment."

List of abbreviations:

ADL	activities of daily living
CPT	Current Procedural Terminology
ICF	*International Classification of Functioning, Disability and Health*
NIC	Nursing Interventions Classification
OT	occupational therapy
PBE	practice-based evidence
PT	physical therapy
RTT	rehabilitation treatment taxonomy
SCI	spinal cord injury
TBI	traumatic brain injury