ORIGINAL ARTICLE

Development of a Theory-Driven Rehabilitation Treatment Taxonomy: Conceptual Issues

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Abstract

Many rehabilitation treatment interventions, unlike pharmacologic treatments, are not operationally defined, and the labels given to such treatments do not specify the active ingredients that produce the intended treatment effects. This, in turn, limits the ability to study and disseminate treatments, to communicate about them clearly, or to train new clinicians to administer them appropriately. We sought to begin the development of a system of classification of rehabilitation treatments and services that is based on their active ingredients. To do this, we reviewed a range of published descriptions of rehabilitation treatments and treatments that were familiar to the authors from their clinical and research experience. These treatment examples were used to develop preliminary rules for defining discrete treatments, identifying the area of function they directly treat, and identifying their active ingredients. These preliminary rules were then tested against additional treatment examples, and problems in their application were used to revise the rules in an iterative fashion. The following concepts, which emerged from this process, are defined and discussed in relation with the development of a rehabilitation treatment taxonomy: *rehabilitation treatment taxonomy*; *treatment and enablement theory*; *recipient (of treatment)*; *essential, active, and inactive ingredients*; *mechanism of action*; *targets and aims of treatment*; *session*; *progression*; *dosing parameters*; and *social and physical environment*. It is hoped that articulation of the conceptual issues encountered during this project will be useful to others attempting to promote theory-based discussion of rehabilitation effects and that multidisciplinary discussion and research will further refine these rules and definitions to advance rehabilitation treatment classification.
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It has long been recognized that rehabilitation is in need of more precise and coherent means of defining, specifying, and measuring the contents of interventions for both clinical and research applications.[1-4] Attention to this need has lagged behind the development of measures of both the inputs to the process (eg, patient characteristics) and its outcomes.[5-9] As described elsewhere,[10] we believe that a *rehabilitation treatment taxonomy* (RTT) that is based on *treatment theory* will lead to a better understanding of rehabilitation interventions and their effects. (Words and phrases that are specifically defined in supplemental appendix S1 [available on page A9 of this supplement and online at http://www.archives-pmr.org/] are marked with an asterisk and italicized when initially used.)

An important first step in creating such an RTT is to develop a set of rules or principles about what the taxonomy should cover and how *treatments* are to be defined and grouped. As we grappled with these issues in the context of the wide variety of treatments relevant to rehabilitation, we recognized that they could not be entirely resolved with empirical data on the efficacy/effectiveness of existing treatments. Although empirical evidence will certainly affect its development, an RTT needs to be conceptually coherent, whether treatments are effective or ineffective; indeed, one of its main purposes is to guide systematic exploration of the efficacy of coherent classes or groups of treatments that share similar mechanisms of action. Thus, we assembled a range of treatments from published research articles, rehabilitation textbooks, and the clinical experiences of the authors. These sources were not reviewed as evidence along the lines of a systematic review (indeed, many of the treatments we reviewed were relatively poorly described and/or their hypothesized mechanisms

minimally discussed). Rather, we used them as examples of treatments to which our definitions and conceptual rules could be applied and tested. We used the empirical rehabilitation literature in an iterative process in resolving these conceptual issues, in which initial decisions were arrived at through discussion and documented in writing. Descriptions of treatments were then reviewed in light of those decisions. In this way we uncovered problematic implications of previous decisions and worked to refine or revise them until they appeared robust to the examples examined.

In this article, we delineate the conceptual issues encountered and their implications and discuss how we have resolved them in our work on the RTT to date. There is no doubt that new conceptual problems will be discovered in the additional steps of taxonomy development[11] and that new eyes will identify problems with the formulations developed to date. Although we are far from a practically useful RTT, we summarize the conceptual issues encountered to date in the belief that an understanding of these issues is critical for clinicians and researchers seeking to enhance theory-based treatment definition.

Treatment Theory as a Guide to Treatment Definition

We propose to define rehabilitation treatment in terms of treatment theory. (Here and throughout the article, we use the singular theory to refer to a class of theories that address a kind of question—in this case, how treatments exert their immediate effects. We use the plural theories to refer to multiple specific theories in that class.) A treatment theory defines and links (1) the *target of treatment*—the aspect of the treatment *recipient*'s functioning or personal factors that is directly altered by treatment; (2) the *ingredients* that produce change in the target; and (3) the hypothesized or known *mechanism of action* by which those ingredients cause change in the target of treatment. This tripartite structure of treatment theory is illustrated in figure 1.

Many rehabilitation treatments are undertaken in the hope of enhancing aspects of functioning that are distal to the target of treatment. We refer to these distal functional changes as *treatment aims*. For example, one might treat hypertonia (the target, an impairment of body function) with the goal of improving gait speed (an aim). This expectation, however, rests on a different theoretical foundation, *enablement/disablement theory*.[12]

Enablement/disablement theory concerns itself with the relations of abilities and limitations located at various levels of functioning, within individuals. It defines the interrelations among domains of functioning but does not identify the methods by which changes may be made in any one of these domains. In the previously mentioned example, it is quite possible that gait speed is primarily limited by muscle strength, with only a minor contribution of hypertonia. Enablement/disablement theories would address how muscle strength and hypertonia relate to gait speed, and in so doing might help one determine whether muscle strength or hypertonia should be the target of treatment. However, enablement/disablement theories do not identify the specific treatment ingredients or mechanisms of action that could be applied to effect change in muscle strength or hypertonia. These are addressed by treatment

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List of abbreviations:

ICF *International Classification of Functioning, Disability and Health*
RTT rehabilitation treatment taxonomy

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theory, which is why we believe that an RTT should be built around treatment rather than enablement/disablement theories.

Treatment targets in rehabilitation are varied, including aspects of body structure, body function, activity, and participation, to use *International Classification of Functioning, Disability and Health* (ICF) terminology.[13] Consequently, treatment theories relevant to rehabilitation come from many different scientific domains; the mechanisms by which muscle function might be changed are distinct from the mechanisms by which a new skill might be acquired. We also expect that specific rehabilitation disciplines or specific functional domains[14] will not be isolated from one another in the taxonomy. For example, both physical therapists and speech and language pathologists may recommend devices that compensate for body function impairments (eg, prosthetic limb, cochlear implant). Therapists in both disciplines provide education and skill training of various kinds, many of which involve similar principles of change.

Setting Treatment Goals and Selecting Treatments

It is generally agreed that rehabilitation goals should be selected, to the extent possible, through a collaborative process between patient and clinician. However, it is often the case that the patient will express goals in activity and participation domains, but they will not have the knowledge or expertise to assess body structure or functional limitations that contribute to the activity or participation restrictions, nor will they be able to identify the specific treatment ingredients that they should receive to achieve those goals. Thus, in this discussion we refer to the clinician's selection of treatments and treatment ingredients. This is not to deny the importance of maximizing patient autonomy, but to reflect the complex reasoning process that a clinician must undertake to organize specific therapeutic actions in line with those larger negotiated goals.

Target of Treatment

A treatment target, as previously defined, is not simply an area of functioning that needs to improve (eg, reaching, preparing a hot meal), but a measurable aspect of functioning in that area. For example, for reaching, one could measure progress on speed, distance, or precision; for meal preparation, one could measure time required, avoidance of hazards, or the success of the final product, as rated by others. This degree of specificity is critical because the mechanism of action of a treatment is described with reference to the change in a specific target. But then how do we distinguish among closely related treatment targets within the same organ, or person? For example, is the target of progressive resistance exercises improved muscle metabolism, increased central drive, muscle hypertrophy, or increased muscle strength, given that all of these may be occurring simultaneously? For practical reasons, we propose to define the target as the most directly affected functionally relevant aspect that is hypothesized to change. If we found a change in muscle metabolism without a change in strength, the treatment would be considered a failure; if we found an increase in muscle strength without an improvement in muscle metabolism, we would still consider the treatment a success (but would need to reconsider our assumptions about mechanisms). Therefore, the target should be expressed as increased muscle strength. In identifying the target of treatment in this way, we consider physiological steps that are precursors to this target to be part of the mechanism of action of treatment. In this example, we recognize that physiological contributions (ie, changes in central drive, or changes in muscle metabolism)