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SPECIAL COMMUNICATION

The Importance of Voluntary Behavior in Rehabilitation Treatment and Outcomes

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Abstract

Most rehabilitation treatments are volitional in nature, meaning that they require the patient's active engagement and effort. Volitional treatments are particularly challenging to define in a standardized fashion, because the clinician is not in complete control of the patient's role in enacting these treatments. Current recommendations for describing treatments in research reports fail to distinguish between 2 fundamentally different aspects of treatment design: the selection of treatment ingredients to produce the desired functional change and the selection of ingredients that will ensure the patient's volitional performance. The Rehabilitation Treatment Specification System (RTSS) is a conceptual scheme for standardizing the way that rehabilitation treatments are defined by all disciplines across all areas of rehabilitation. The RTSS highlights the importance of volitional behavior in many treatment areas and provides specific guidance for how volitional treatments should be specified. In doing so, it suggests important crosscutting research questions about the nature of volitional behavior, factors that make it more or less likely to occur, and ingredients that are most effective in ensuring that patients perform desired treatment activities.

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Much of rehabilitation treatment consists of exercises performed by patients, practice to develop new or improved skills, and education and counseling to impart new information or alter perceptions, attitudes, or motivation. Whereas some rehabilitation treatments can be administered to patients without the need for their active participation (eg, passive range of motion exercises, massage, electrical stimulation), the vast majority are volitional* in nature, meaning that they require some degree of patient or client effort to launch the treatment's mechanism of action.* (Terms that are asterisked when first used have RTSS-specific definitions that are provided in the glossary included as supplemental appendix S1, available online only at http://www.archives-pmr.org/.) In addition, many treatments in which a patient has a passive role, such as range of motion exercises, wound management, or wrapping of a residual limb, are taught to patients for self-administration outside of the therapy setting, so they ultimately require volition on the part of the patient as well. A critical feature of all volitional treatments* is that there are 2 contributors to treatment effectiveness: (1) whether the exercises, skill training approaches, or educational content selected by the clinician are effective in changing the target* of treatment; and (2) whether the clinician's actions or words to instruct and motivate result in the patient engaging in the treatment activity as intended.

The importance of volition is not unique to rehabilitation treatments, but ubiquitous in health care. The issue of medication adherence, and lack thereof, is one example that has received considerable attention.[1-5] Self-administered medications exert

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their chemical effects passively, but their effectiveness depends on the patient reliably taking them. Prescribers of the same medication may achieve different treatment outcomes depending on how they convey the importance of the medication, whether they explore convenient dosing schedules and reminder strategies, and a variety of other factors. Patient education, too, depends on the patient's attention to information presented by the clinician, making efforts to remember it, and then acting on it. On an even more complex scale, many diseases and chronic conditions are related to habitual patterns of physical activity, diet, and other behaviors. Clinicians cannot directly control these patient behavior patterns, and so must find ways to elicit the patient's volitional behavior change toward healthier habits.*

Volitional behavior in the rehabilitation treatment specification system

The Rehabilitation Treatment Specification System* (RTSS), a framework developed over the past decade by a multidisciplinary group of rehabilitation scientists and practitioners, seeks to define rehabilitation treatments with respect to the known or hypothesized active ingredients* administered by clinicians. This framework, as detailed elsewhere in this issue,[6] is based on 3 core concepts within what is called a treatment theory*: the target, or specific, proximal intended effect of an intervention by a clinician; the ingredients that this clinician knows or hypothesizes will affect the targets, and the mechanisms of action that are the (often hypothesized) causal link between ingredients and targets. These 3 core concepts make up the tripartite structure* of a treatment component,* which is the smallest functional unit of a treatment and consists of a single target and 1 or more associated ingredients. Treatment specification* refers to the process of articulating the active ingredients and target for each treatment component of a clinical treatment, as specified by the relevant treatment theory. The RTSS process for specifying rehabilitation treatments is outlined in the *Manual for Rehabilitation Treatment* Specification, which is available for use by rehabilitation educators, researchers, and clinicians at http://mrri.org/innovations/manual-for-rehabilitation-treatment-specification. The RTSS, once implemented, has the potential to allow more incisive and coherent study of the effectiveness of rehabilitation treatments[7] and more reliable administration of ingredients that have a therapeutic effect.[8]

The RTSS focuses on the treatment ingredients delivered by individual clinicians and does not address structure or process aspects of rehabilitation treatment delivery—issues such as training level or discipline of staff, nature of treatment planning processes, team structure and communication, or case management. These factors may have important effects on rehabilitation outcomes,[9,10] but we hold that these exert their effects indirectly—for example, by increasing the likelihood that an optimal treatment will be selected, or the consistency with which the treatment ingredients (including educational and motivational messages) are delivered across team members.

List of abbreviations:

COM-B	**Capability, Opportunity, Motivation and Behavior**
RTSS	**Rehabilitation Treatment Specification System**
VR	**virtual reality**

The RTSS organizes treatments into 3 groups of treatment components (treatment groups*) with mutually exclusive targets and key ingredients. The Organ Functions* group consists of treatments intended to alter the functioning of organs or organ systems. This is the only treatment group that contains passively administered treatments, such as prolonged stretch to alter tissue length, compression to alter tissue pressure, and transcranial magnetic stimulation to alter brain activation. This group also includes volitional treatments such as exercises used to enhance muscle strength or endurance. The other 2 treatment groups—Skills and Habits*, and Representations*—contain only volitional treatments. Because the basic mechanism of action for Skills and Habits is *learning by doing*, the key ingredient in this group is providing opportunities to perform behaviors, often repeatedly and with feedback and other elements of *coaching*. These behaviors are intended to improve with practice (skills) and/or become routinely performed in the presence of specific triggers (habits). The term *Representations* is borrowed from cognitive psychology, where mental representations refer to the contents of mental life, both cognitive and emotional. The basic mechanism underlying changes in representations, is, broadly, *information processing*, so the key ingredients in the Representations group are related to facilitation of such processing to change what or how the patient thinks or feels, including how he or she feels about the treatment and the clinician delivering it.

For the volitional treatments in any of these groups to be effective, the patient must actively perform the exercise, practice the skill, or attend to and process the information presented. The causal sequence leading to change in volitional treatments is depicted in fig 1. The clinician's instructions and actions launch a chain of events that ultimately leads to the desired functional change. The key middle step in this sequence is the patient engaging in the necessary treatment activity. This volitional step is both critical and vulnerable, meriting heightened attention and particular care in treatment planning. Rehabilitation clinicians typically recognize that patient engagement and effort are important, but the focus of clinical decision making is often on those ingredients that directly address the functional problem, with less consistent attention to ingredients that address the patient's *volition*, unless the patient clearly fails to *perform as directed*.

Challenges in defining and specifying volitional treatments

It is relatively straightforward to identify the active ingredients for passive organ function treatments because they act directly on specific physiologic systems—for instance, prolonged tension on soft tissues causes them to lengthen, independent of patient effort. Volitional treatments, however, have additional ingredients with indirect actions. As an example, consider a home aphasia therapy program that has a target of increasing the patient's ability to accurately retrieve the names of functionally relevant items. The clinician instructs the patient to engage in daily practice with a computerized picture naming program that provides error feedback, but this ingredient of *providing instructions* has no direct effect on the patient's picture naming skill, so it has no obvious mechanism of action directly related to the functional target of interest (accurate retrieval of the names of relevant items). The ingredient of providing instructions affects only the patient's volitional performance of the necessary treatment activity, and without this ingredient the patient may fail to perform the activity

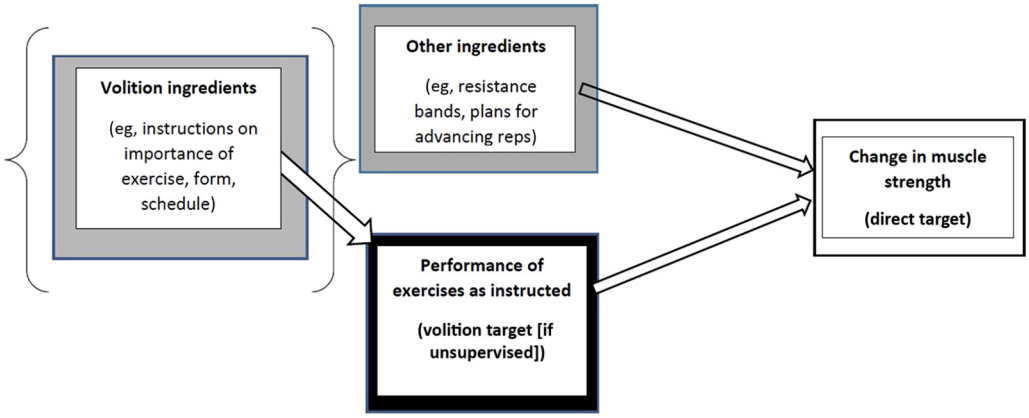

Fig 1 The causal chain in a volitional exercise treatment. Ingredients (gray shaded boxes) are delivered by the clinician. Volition ingredients result in performance of the necessary treatment activity by the patient (black shaded box) and *other ingredients* contribute to the effects of the exercise, as performed. Ultimately, these ingredients lead to an increase in strength, which is the direct target of treatment (unshaded box). The left side of the figure is in brackets to indicate that in the case of supervised treatments, the clinician may need to give relatively little thought to the volition ingredients, because they can be adjusted as required based on the patient's performance. When patient exercise is unsupervised, this side of the figure requires more careful planning and formal articulation of the volition target.

or may perform it incorrectly, such that there will be no effect on word retrieval. This fact complicates the specification of volitional treatments, as highlighted in fig 1.

Many rehabilitation treatments need to be varied in their dose or duration according to variations in patient characteristics, such as the severity of the problem being treated or the presence of comorbidities. Even among individuals without disabilities, adherence to health-related behavioral regimens varies considerably due to individual differences in the ability to learn how to perform a particular activity or the motivation to perform it as recommended. These variations are magnified in medical conditions that alter affective or cognitive functions such as mood, attention, learning, and motivation. Thus, for example, a patient with cognitive impairments might require more instruction to acquire a skill, or a depressed patient might require more encouragement to practice as directed. Importantly, the factors that determine the patient's need for specific *volition ingredients* (those ingredients used to instruct or motivate volitional treatment performance) and their amount may be quite different from the factors that determine variations in the ingredients applied to the functional target (ie, a patient could have a mild strength deficit and a major limitation in the motivation for exercise, or vice versa).

What are the ingredients that affect volitional performance? Recall that the Representations treatment group in the RTSS concerns targets that involve changes in mental representations. Ingredients in the Representations group serve to modify knowledge, attitudes, and propensity to act, including the knowledge of how to perform a treatment activity and the propensity to actually perform it. Thus, volition-enhancing ingredients are a subset of Representations group ingredients and include various forms of instruction, goal setting, and discussions of the rationale and importance of a treatment activity (table 1).

The central role of the patient's behavioral performance in volitional treatments makes such treatments particularly difficult to define or specify, especially when attempting to articulate all treatment ingredients in advance. When providing treatments that do not require active participation of the patient, clinicians directly control the delivery of ingredients that change patient functioning and hence the clinician can specify in advance with great certainty the ingredients that the patient actually receives. In contrast, in volitional treatments, the clinician does not have complete control over all of the ingredients ultimately acting on the functional target, because effects of those can only be measured when the patient performs the prescribed activity. The volition ingredients affect the *probability* that this will occur.

Existing approaches to specifying volitional treatments

To our knowledge, the RTSS is the first conceptual framework to distinguish between ingredients provided by the clinician to alter a functional target and volition ingredients provided to ensure the necessary volitional behavior on the part of the patient. Intervention reporting guidelines like the *Template for Intervention Description and Replication* make recommendations such as, "Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities."[11(p.4)] Volition ingredients may be captured in the *enabling or support activities*, but this is not mentioned in the *Template for Intervention Description and Replication* text. The *Consolidated Standards of Reporting Trials extension for nonpharmacologic treatments* tells authors to "[Provide a] description of the different components of the interventions and, when applicable, description of the procedure for tailoring the interventions to individual participants," as well as "details of whether and how adherence of participants to interventions was assessed or enhanced."[12(p.296)] Again, there is no clear advice that a complete description of an intervention should include 2 classes of ingredients: those associated with direct targets* and volition targets.* The International Classification of Health Interventions, still in draft form,[13] attempts to describe all health interventions on 3 axes: the Target (the entity on which the Action is carried out), the Action (the deed done by a health care professional to the Target), and the Means (the processes and methods by which the Action is carried out). The International Classification of Health Interventions occasionally pair taxonomic entries that appear to label different aspects of an intervention (eg SIK RB FA—practical support with

Table 1 Examples of ingredients used to address volition

Mechanisms to Influence Volition	Ingredients
Knowledge	• Provision of didactic information in various modalities *or* prompting of recipient to acquire information in various ways • Information-organizing methods (eg, chunking) • Repetition or prompting of rehearsal • Socratic methods (eg, directed question-answer) • Mnemonic aids
Performance	• Instructions, cues (verbal, nonverbal, physical), changes in cues (eg, from more to less directive) • Specialized sequence training methods, eg, chaining • Deliberate placement of materials to affect performance • Error management methods (eg, errorless learning, discovery learning, training in self-monitoring) • Methods to promote generalization across contexts
Attitude (propensity to act)	• Appeals based on values, norms, fear, etc • Reassurance • Promotion of alternative interpretations • Elicitation of change talk (ie, motivational interviewing)
Motivation or effort	• Provision of rationale (eg, for treatment or treatment activity) • Persuasion, bargaining, contracting • Methods to instill trust in clinician (rapport, credibility) • Use of recipient's preferred tasks, materials • Goal setting with or for recipient • Feedback of various types or schedules; reinforcement (positive or negative)
Opportunity	• Prompting of problem solving to ensure adequate space or support or other resources to support performance of volitional activity • Collaborative scheduling of volitional activity

walking and moving; and SIK RC FA—emotional support with walking and moving), but there is no suggestion that such a separation aligns with the RTSS's distinction between ingredients directed toward volitional performance versus those focused on the direct target. The Consensus on Exercise Reporting Template does make this distinction but is limited to exercise interventions.[14]

The field of health psychology has long been concerned with the types of treatment targets discussed here: enhancing the probability that people will adopt volitional health-related behaviors such as regular exercise, healthful eating, condom use, and effective disease self-management. Health psychology interventions make use of a wide range of educational and motivational techniques.[15,16] One theoretical model within health psychology is particularly applicable to the RTSS. The Capability, Opportunity, Motivation and Behavior (COM-B) model framework of Michie et al[17] provides a theoretical framework for understanding the factors that affect volitional engagement in rehabilitation treatment activities—the focus of this article. As such, it provides a treatment theory within the Representations group. Accordingly, the COM-B system does not account for changes in the direct targets of organ function, skills or habits, or knowledge or attitudes (except, as in volition, when linked to action).

The COM-B provides a framework for specifying interventions geared toward 1 or more of the 3 elements critical for voluntary behavior: (1) psychological and physical *C*apability; (2) physical and social *O*pportunity; and (3) automatic and/or reflexive *M*otivation. In many health psychology interventions where there is widespread public knowledge of the health effects of particular behaviors and lifestyles (eg, different kinds of diets, smoking, flossing), the patient frequently already has the capability to adopt the necessary behavior, so helping patients identify appropriate opportunities and motivating them to act on those opportunities is key. It may be that rehabilitation patients are more often learning new behaviors, so clinicians may need to pay more attention to the patient's capability (knowledge and skill) to perform the necessary behaviors compared to most health behavior change interventions.

Examples of treatment ingredients that can be used to address capability, opportunity, and motivation are shown in table 1. Note that many of these ingredients may have effects on more than 1 of the 3 COM-B areas. For example, use of familiar treatment materials may increase a patient's capability to perform the treatment and may also increase the patient's motivation by making the treatment more personally relevant. Thus, these 3 dimensions are useful prompts for the clinician to consider all relevant volition ingredients, but the clinician is not required to link each ingredient to only 1 COM-B area.

Many factors beyond planned elements of treatment may affect a patient's volitional behavior, including a range of therapist attributes that are sometimes referred to as *common factors* in the psychotherapy literature to distinguish them from specific treatment orientations. The RTSS seeks only to specify treatment ingredients that are intentionally delivered by a clinician. Thus, although *therapist personality* would not be an ingredient toward volitional performance, if therapists purposefully engage in specific behaviors intended to build trust and warmth, these can and should be specified.

Two-part specification of volitional treatments

The RTSS has a procedure for conceptualizing and specifying volitional treatments that seeks to balance theoretical precision with the clerical burden of specification. In developing this

procedure, we faced an immediate challenge: should it be required that *every* volitional treatment needs 2 targets, first, the direct target, with ingredients hypothesized to make that change in function; and a second, volition target, with another set of ingredients necessary to ensure performance of the treatment activity as directed? Always requiring 2 targets risked adding unnecessary burden and confusion to the specification process. When a clinician *instructs a patient to practice* a behavior and *provides positive feedback* as the patient does so, is the feedback affecting motivation to continue practicing (volition target) or shaping the skill development that results (direct target)? When a clinician provides educational information to a patient, does providing personally relevant examples ensure that the patient listens and pays attention (volition ingredient), or improve encoding of the information (direct ingredient)?

To address this challenge, we made 2 decisions. The first pertains to directly supervised treatments. As just noted, when the clinician is directly supervising the patient it is difficult to sort the clinician's ingredients cleanly into those that ensure performance of the treatment activity (volition) and those that bring about the direct-target effect of the treatment activity when performed. Moreover, in supervised treatments clinicians may give only rudimentary consideration to their instructional and motivational ingredients, knowing that they can adjust them as needed if the patient fails to perform ("Come on, let's get started!") or performs incorrectly ("No, move your hands farther to the side."). In contrast, in treatments assigned for performance at a different time or place, such as home exercise programs, the ingredients that will produce the desired patient behavior must be carefully planned in advance, because they cannot be adjusted in real time to achieve the necessary behavioral performance.

The RTSS requires that regardless of whether patient activity is supervised or unsupervised, specification of all volitional treatment components should include a list of the volition ingredients that will be used to ensure performance of the treatment activity as directed. These will typically include the instructional ingredients designed to impart the knowledge of how to perform the activity correctly, as well as motivational ingredients to help ensure that the patient follows those instructions. The specific volition ingredients will depend on the complexity and difficulty of the required behaviors, as well as the cognitive capacity and baseline motivation of the patient. In supervised treatments, these ingredients may also be summarized more briefly (eg, *directions on proper weight lifting form provided*) in recognition that they may be adjusted on the fly, based on observation of patient performance. For this reason, for supervised treatments we bracket the left side of the causal sequence in fig 1, to indicate that the clinician may be primarily planning the ingredients addressing the direct target but will be ready to *make the volitional behavior happen* by adding whatever ingredients are necessary.

The second decision pertains to unsupervised treatments. When the patient's performance of the treatment activity cannot be directly confirmed by the clinician in real time (ie, when it is unsupervised), the RTSS requires an additional volition target to be explicitly specified as *performance of (treatment activity) as directed*, as well as the direct target of change in function (eg, *increased muscle strength*). Because the patient's behavioral performance is removed in time and space from the clinician's delivery of ingredients, it becomes easier to sort the clinician's ingredients into those that affect the volition target (those ingredients that ensure correct and timely performance of the activity) and those that affect the direct target, assuming satisfactory performance of the treatment activity. Accordingly, in a specification of any unsupervised treatment, we would expect to see ingredients directed toward the volition target such as those included in table 1 and expect to find ingredients characteristic of 1 or more of the 3 treatment groups associated with the direct target, as shown in table 2. In unsupervised treatments, the entire causal sequence should be carefully considered, the occurrence of the necessary volitional behavior in the middle of fig 1 is formally articulated as a volition target, and the clinician's ingredients are sorted between those that primarily drive the volitional behavior and those that primarily drive the change in the direct target.

To summarize, the RTSS process is as shown in fig 1. Volitional treatment components begin with a set of instructional and motivational ingredients from the clinician (left side of fig 1, shaded gray), which set into motion the treatment's mechanism of action *which includes patient performance* (middle of figure, shaded black). This, in turn, (potentially coupled with additional ingredients provided by the clinician, such as resistance bands for strengthening exercise or a cane for gait treatment—middle box shaded gray) leads to subsequent functional change (right side of figure, unshaded).

In this conceptualization, effective volition ingredients provided by the clinician will produce the necessary behavior on the part of the patient, which will, in combination with additional ingredients selected by the clinician, lead to functional change. Thus, in the RTSS framework, specific patient behaviors are part of the mechanism of action by which the clinician's directions lead to functional improvements. Returning to the example of a home program of muscle strengthening exercises, the clinician may provide a compelling rationale for the importance of the exercises, and directions for how to perform them correctly, and may discuss with the patient a schedule that is most likely to be feasible at home. All these ingredients are intended to result in performance of the exercises as directed. The clinician might also provide several colors of resistive bands, and specific instructions about exercise form, number of repetitions, when to advance the number of repetitions, or when to advance to the next color of band, etc. Assuming satisfactory adherence to treatment, these latter ingredients determine the therapeutic effect of the exercises—what in the RTSS is termed the direct target.

The above manner of specifying volitional treatments puts the responsibility for the outcome on the clinician, in the selection of the necessary instructional and motivational ingredients, and also acknowledges the clinician's decisions about the specific content of the exercises (the color of the band and number of repetitions), which are substantively important to the potency of the treatment activity. In so doing, the RTSS attempts to turn *patient adherence* from an afterthought to a key issue for which clinicians are as responsible as they are for the direct target. In other words, rehabilitation clinicians are not just technicians with specialized knowledge to bring about direct functional targets; they also must be behavior specialists successful at engaging the patient to perform the treatment activities and take ownership for the rehabilitation activities that will be necessary to achieve these targets.

Implications for rehabilitation research and evidence synthesis

Current discussions of the effectiveness of rehabilitation treatments consider each intervention protocol as an individual entity, with *attention training* being as distinct from *ADL training* as

Table 2 Examples of the specification of supervised and unsupervised volitional treatment following RTSS rules

Volition Target	Volition Ingredients	Direct Target	Direct Target Ingredients
Supervised treatments			
N/A	Listed with direct target ingredients	Quadriceps strength or increased	Directions on form and repetitions; verbal correction on form as needed; verbal reinforcement for completing repetitions; red and blue resistance bands; perform 3 sets of 8 knee extensions from 90 to 0 degrees to a count of 5; increase by 1 rep until doing 3 sets of 12, then progress to next band
N/A	Listed with direct target ingredients	Accuracy in picture naming or increased	Directions to name pictures as quickly as possible; set of 20 pictures of personally relevant concepts; verbal praise when correct; initial phoneme cue after 15 s of patient silence or incorrect pronunciation, if still incorrect, patient repetition of clinician verbal model 3 times
N/A	Listed with direct target ingredients	Knowledge of cognitive effects of TBI or increased	Ensure patient attention; verbal description of effect of TBI on attention and memory skills; explanation of the nature and importance of executive function
Unsupervised treatments			
Performance (of knee extension exercises) as directed	Directions to perform 3 sets of 8 knee extensions from 90 to 180 degrees to count of 5; modeling of correct form; request to demonstrate form and provide correction as needed; discussion of the importance of quad strength for chair rise and stair climbing; discussion of opportunities (when, where) to do exercises	Quadriceps strength or increased	Red and blue resistive bands; 3 sets of 8 knee extension contractions from 90 to 180 degrees to count of 5; increase by 1 rep until doing 3 sets of 12, then switch to next band
Performance (of picture naming practice) as directed	Discussion of the importance of home practice for improving word finding skills; selection of personally relevant words; directions to name pictures as quickly as possible for 5 trials through the stack. If can't name, skip and try later; if error made, put aside until correct name is remembered and then repeat 3 times; discussion of opportunities (when, where) to do naming practice	Accuracy in picture naming or increased	20 selected pictures named 5 times each, initial phoneme cue after 15 seconds of patient silence or incorrect pronunciation, skipping trials for omissions and repeating correct responses 3 times after each error (waiting for correct response)
Performance (reading chapter) as directed	Discussion of the importance of understanding the ways that TBI may have affected cognition; recommendation of a useful chapter written for lay people; discussion of proper quiet environment and nonfatigue state conductive to productive reading	Knowledge of cognitive effects of TBI or increased	Chapter with written description of common cognitive consequences of TBI

Abbreviation: TBI, traumatic brain injury.

penicillin is from acetaminophen. Although there are undoubtedly *attention-specific* and *ADL-specific* ingredients in such treatments, it seems likely that there are also broadly shared classes of active ingredients for the volitional aspects of many or all such treatments. It is likely that the effective volition ingredients will vary along general dimensions, rather than direct target-specific ones. For example, some exercises or treatment activities are more complicated to learn than others, and it is likely that effective instructional methods depend on the complexity of the activity being learned—not on whether the activity is to improve ambulation or expressive language. Similarly, it is likely that the efficacy of ingredients intended to enhance motivation to perform treatment activities is related to their perceived value, burden, pain, or effort involved, rather than their specific content. Specific kinds of memory-prompting ingredients may be useful across multiple treatments that require recall of information. In short, it seems both feasible and desirable to pose crosscutting questions about volitional behavior and the ingredients that drive it, rather than examining this question separately for each volitional treatment.

Beyond our patients acquiring the necessary level of performance, many of the skills we encourage them to practice are intended to become ongoing habits. Patients with hemiparesis learn hemi-dressing techniques for life; patients using a cane need to develop a new gait sequence; patients with memory impairments learn how and when to use a notebook to compensate for their memory limitations in certain tasks. In all these cases, the clinician's intent is not simply to instruct the patient how to perform these behaviors, but to help the patient automatize them so that they become habitual routines that no longer demand much mental effort. Here, too, we could pose the more general question about what kinds of volition ingredients facilitate sufficient practice of new and adapted tasks to lead to habit formation.

One recent trend in rehabilitation research illustrates the constructive role that the concepts set forth above could play in the growth of evidence: the increased use of virtual reality (VR) treatments. Research on such treatments often highlights the VR aspect above other aspects of treatment content. But if we are to understand the value of VR treatments, it is important to think of them as *delivery vehicles* for specific therapeutic experiences, and to ask whether any difference in efficacy of VR-based treatments versus traditional treatments is based on differences in the direct ingredients or is based on VR's ability to provide performance feedback and deliver motivational ingredients. In other words, do they differ primarily in their volition ingredients or their direct ingredients?

As it becomes possible and more common to specify rehabilitation treatments in terms of their targets and known or hypothesized ingredients, the RTSS will help support the development of a theoretically and practically useful *taxonomy* of rehabilitation treatments. If categories of treatment are based on theories about shared fundamental ingredients and mechanisms of action, then treatment efficacy research will be derived from, and will also serve to strengthen or refute, those theories. Separately identifying volition targets and ingredients versus direct targets and the ingredients that address them facilitates the process of developing and testing theories of volitional behavior that cut across many individual treatments and the 3 treatment groups. In this way, theory-driven treatment studies of volitional treatments will not only support or refute the effectiveness of an individual treatment; they will provide evidence to support or refute broader underlying theories of volitional behavior, allowing us to identify categories of similar volition ingredients that are effective, without needing to study each treatment and its permutations individually; such studies will identify effective treatment practices that cut across disciplines and patient populations. The RTSS provides a framework that enables clinicians and researchers to articulate their theories about the role of volition in treatment effectiveness and facilitates the conduct of research to identify best practices for maximizing patient engagement and effort. Given the central importance of behavior change and habit formation in both rehabilitation and health psychology, greater exploration of the links between these fields offers promise in advancing volitional treatments within rehabilitation and studying crosscutting questions about how volitional engagement can be maximized.

Conclusion

Most rehabilitation treatments delivered by clinicians are volitional in nature, meaning that they require the patient's active engagement and effort for their effectiveness. This complicates the process of defining the treatment as that which is delivered by the clinician, and places the patient in a role that is central, but somewhat ambiguous: neither passive *recipient* of treatment nor active designer of therapy. The RTSS highlights the important place of volitional behavior in defining and implementing rehabilitation treatments and in understanding the outcomes of those treatments, and proposes conventions for specifying rehabilitation treatments that involve a patient's volitional participation. Moreover, by distinguishing between the successful performance of the treatment activity and the functional effect of performing that treatment activity, the RTSS points the way toward crosscutting research questions that can help us identify volition ingredients that will maximize patient engagement in treatment.

Keywords

Classification; Patient outcome assessment; Patient participation; Rehabilitation; Therapeutics; Treatment efficacy; Volition

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