

FROM THE EDITORS' DESK

Brief Overview and Assessment of the Role and Benefits of Cognitive Rehabilitation



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Abstract

Cognition is one of our most important attributes. Arresting its decline, whether in association with normal aging or a diagnosis of mild cognitive impairment, acquired brain injury, or dementia, concerns everyone, regardless of whether their role is that of spouse, child, or clinician. This article provides a brief, and by necessity, somewhat superficial appraisal of the status of our knowledge of the benefits of cognitive rehabilitation in these conditions and the authors' assessment of its strengths and weaknesses. In summary, there is support for the belief that participation in exercise as well as socially and cognitively stimulating activities (whether or not rehabilitative in nature) is beneficial for all but perhaps those with the most severe dementia. Focused efforts at cognitive training/rehabilitation also appear potentially helpful but are best established for those with acquired brain injury. There are, however, caveats to this assessment. For example, cognitive retraining is resource and time intensive while, even for those most likely to benefit, its impact on their daily activities and quality of life remains unclear. In addition, responses to training may vary from person to person and are likely to be influenced by factors such as an individual's acceptance of the need for assistance. Future research may benefit from continued efforts to treat the patient holistically, fit the treatment to those most likely to benefit, and encouraging the translation of training effects to functioning in the real world.

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It is likely that if a group of people were asked to define cognition, they would provide a variety of answers. However, at their heart, most definitions would be likely to focus on attending to, processing, and responding to information. If pushed to be more specific, processing efficiency, decision making, and the use of language might be mentioned. However it is defined, cognition is central to our identity and societal roles.

Two questions related to the importance of cognition are (1) how can it be maintained or improved? and (2) how can its decline be arrested or slowed after brain injury, the onset of dementia, or "normal" aging? With children the path is set—we give them as rich and stimulating an environment as possible. This is the role of the parent, the teacher, and in part, society. How to help adults who have typically plateaued in terms of their cognitive development improve or slow the decline of their abilities forms the topic of the following discussion.

In essence, this requires an assessment of the utility of cognitive rehabilitation. The topic is broad, but it seems useful to

explore its spectrum, as even specialists may know a great deal about one of its aspects (eg, cognitive rehabilitation after brain injury) but surprisingly little about its role in other settings. The goal of this short analysis is, therefore, to provide a wide-ranging but limited-depth commentary on the effectiveness of cognitive rehabilitation in a number of clinical populations.

Normally aging adults

The potential of arresting the cognitive changes that occur with "normal" aging is a concern with both individual and societal ramifications. As such, it has become an area of significant public and research interest. Although interpretation of research findings is complicated by varying study designs, differing outcome measures, and often less than optimal study quality, a number of commonalities exist. First, study sizes vary from as low as the tens to the low hundreds and occasionally into the thousands,¹ with subjects typically ranging in age from their 60s to their 80s or 90s. Second, memory, executive skill training (eg, reasoning, problem-solving, and divided attention tasks), and cognitive speed and efficiency are emphasized, with outcomes assessed in terms of

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psychometric measures. Third, follow-up tends to be limited and dose response difficult to assess.² Overall, the findings support the idea that cognitive training, at least in a study setting, is beneficial² and associated with effect sizes in areas such as processing speed and executive function that are larger than those found in either active or passive control subjects. More specifically, it appears that training with a focus on reasoning may attenuate age-associated cognitive losses and that memory gains can persist for a prolonged period.³ Practical benefits, unfortunately, are less clear as maintenance of gains beyond a few months after training is not well documented,² and their generalizability to day-to-day living remains poorly established.³ The take-home message seems to be that while cognitive training is effective in a research environment, its functional benefits remain unclear. On the other hand, the risks—other than its expense and the opportunity cost of a participant being diverted from other activities—appear minimal.

An interesting issue is that to our knowledge, the effects of an individual's recognition and psychological response to cognitive decline have not been systematically studied. This leads to the question of whether interventions assisting people cope with normal cognitive decline might be more effective than formal cognitive training in improving both cognitive efficiency and life satisfaction. Future research, thus, might address whether the appropriate intervention in a given case is counseling to build acceptance and adjustment, cognitive rehabilitation to shore up declining function, or both.

Mild cognitive impairment

The situation with respect to assessing the benefits of cognitive training in adults with mild cognitive impairment (MCI) is in many ways similar to that involving their normally aging counterparts. Study sizes tend to be a bit smaller but again range from the tens to a hundred or so. Participant ages (50s to the late 70s) are similar but perhaps somewhat younger than those in the “normally aging” investigations. Dose effects remain elusive,² and both actively and passively controlled designs have been used. Interventions are apt to emphasize memory strategies, processing speed, attention, and lifestyle changes either alone or in combination. Outcome choices emphasize memory (both strategies and recall) but may also involve global cognitive function as measured by instruments such as the Mini-Mental State Examination or the Montreal Cognitive Assessment, neither of which is designed to assess interventions targeted at specific cognitive processes. Benefits are more likely to be found in studies involving passive rather than active control groups.² Given this, it appears that while older adults with MCI may benefit from cognitive training, its value beyond maintaining an active, stimulating environment is less clear.

The discrepancy between the effect sizes of cognitive training seen in studies involving active rather than passive controls, however, raises another aspect of behavioral intervention research. Many variables (eg, enthusiasm for the treatment, belief in its efficacy, and alliance with the therapist) that are controlled for in drug and other rehabilitation studies are important components in a behavioral intervention. With this in mind, it is interesting that more holistic and comprehensive rehabilitation programs in MCI

that address the adjustment of patient and family, as well as potentially beneficial adjunctive interventions such as exercise, are only beginning to be systematically explored.⁴ The findings of this research may have profound effects on the field's future directions.

In summary, the practical implication of our current knowledge with respect to people with MCI appears to be that it may be worthwhile to focus on activities designed to assist them in improving or working around their cognitive problems. However, future research might be best directed at identifying effective components of a program more broadly aimed at maintaining their emotional, cognitive, and physical functioning.

Acquired brain injury

Cognitive impairment is the hallmark of traumatic brain injury, and it is not surprising that rehabilitation efforts have focused on its treatment. Traditional rehabilitation procedures have cognitive components, but numerous more targeted approaches placing emphasis, for example, on attention, memory, problem solving, compensation, insight, or judgment appear beneficial. For example, a number of studies support the idea that strategies devoted to attending to solving a problem are more effective than drills aimed at merely improving attention.⁵ The picture with memory seems similar in that a focus on compensation strategies and “work-arounds” such as journal keeping are more effective in improving performance than those aimed at enhancing memory per se.³ Problem solving also appears amenable to training,⁶ although the degree to which emotional and attitudinal factors may interfere with effective problem solving needs to be concomitantly addressed.⁷

More specifically, Cicerone et al⁸⁻¹⁰ note in their systematic reviews that cognitive rehabilitation provides clinical benefits relative to control groups receiving conventional or alternative rehabilitation efforts in 80% to 90+% of the studies reviewed, regardless of whether the subjects had an acquired brain injury (ABI) as the result of trauma or a stroke. These same authors note that “in no case” was there evidence that an alternative treatment was more effective than cognitive rehabilitation. Although research is more limited, some support exists for the efficacy of cognitive rehabilitation interventions with ABI diagnoses other than traumatic brain injury or stroke.¹¹ Studying these systematic reviews as well as the American Congress of Rehabilitation Medicine's *Cognitive Rehabilitation Manual*¹² should be useful in assisting researchers and providers to translate research into practice.

In summary, cognitive rehabilitation has become a recommended practice in many cases of ABI. However, it should be remembered that the approach encompasses a broad range of cognitive processes and techniques. As such, the success of a specific treatment will depend not only on fitting an intervention to an individual's deficits, but also on taking into account other factors such as the individual's emotional and behavioral control, self-awareness, and the involvement of family and significant others.

Dementia

The development of cognitive interventions designed to slow the progression of dementia and improve the behavior/quality of life of those with the condition is not new. In fact, efforts extend back at least to the mid-1900s¹³ and include interventions directed both toward generalized cognitive stimulation (in distinction to the formalized cognitive rehabilitation approaches that are the focus of this commentary's discussion) as well as to specific cognitive

List of abbreviations:

ABI acquired brain injury

MCI mild cognitive impairment

domains.¹⁴ Work has, in large part, focused on mild to moderate dementia and supports the idea that stimulation can be beneficial in slowing the loss of cognitive function and improving quality of life. Unfortunately, extension to these benefits from a structured and controlled research setting to demonstrating a clear impact on a person's daily life again remains difficult.¹⁵ Despite this limitation, the National Institute for Health and Clinical Excellence and the Social Care Institute for Excellence¹⁶ have each recommended that people with mild to moderate dementia should participate in cognitive stimulation activities.

Other populations

This review focused on the normally aging, the mildly cognitively impaired, people with ABI, and those with dementia. These are large groups, but even here we were constrained in the amount of information that could be presented in this summary. Cognitive rehabilitation, however, is not restricted to these populations. In fact, intriguing findings are arising in other conditions. Multiple sclerosis, a condition in which memory and learning deficits are attributed to inefficient acquisition of information, may be a case in point. While a recent Cochrane review¹⁷ concluded that there was little evidence supporting the benefits of memory rehabilitation in multiple sclerosis, a more recent well-controlled trial¹⁸ did show improvements in objective and everyday memory with a duration of benefits of at least 6 months. Another example may be Parkinson disease, a condition in which 20 years after diagnosis as many as 80% of patients will display dementia.¹⁹ Unfortunately, a recent systematic review²⁰ found that there were suggestions that cognitive rehabilitation could produce improvements in executive function, but study quality and size concerns prevented a more definitive judgment on its benefits.

Implications for research

In summary, the question of whether cognitive rehabilitation is effective seems to be a qualified "yes," with the most definite support coming from work with ABI and the biggest limitation being the lack of studies designed to assess its impact on a person's daily life. Much remains to be done. In particular, investigators need to better determine what works best for whom and under what circumstances. That is, what characteristics of individuals support the use of one intervention over another, and what other factors, such as their emotional status and social environment, may need to be addressed to enhance an intervention's success?

Research in cognitive rehabilitation may benefit from a more active exchange among researchers that have focused on separate but related issues and populations. For example, advancements in brain imaging have opened the possibility of studying the impact of cognitive rehabilitation at both the functional and physiological levels.²¹ It may be possible to examine biomarkers or common neural pathways that underlie or predict functional cognitive changes across normal and various diagnostic patient groups. If a neuroimaging biomarker indicating a positive response to an intervention can be identified, it may ultimately prove useful in determining whether the cognitive rehabilitation intervention fits the individual patient or needs to be modified in order to obtain a positive response.

Another concern is that researchers should be cautious about measuring outcomes that are only tenuously tied to the intervention. For instance, it is important to know whether improvement on neuropsychological tests of attention translates into better performance in everyday activities such as driving or listening to a

conversation. However, expecting that such an intervention will impact more global outcomes, such as general quality of life, that are affected by many factors is probably an overenthusiastic expectation.

Although the last 30 years have seen substantial gains, progress has been hampered by limited funding. Since it seems unlikely that this situation will improve in the near term, researchers may need to explore additional options for research support. For example, participating in commercially supported ventures to design evidence-based interventional software with market value is an intriguing possibility. However, there are potential pitfalls to such collaborations given that research suggests that engaging patients in computer-based cognitive rehabilitation without therapist supervision is unlikely to be beneficial. As a result, while the widespread distribution of software that can be independently accessed by users may be commercially attractive, it may also be far less effective than when administered under professional oversight.

Conclusions

There is support for the belief that participation in cognitively stimulating activities is beneficial for all but perhaps those with the most severe dementia. Focused efforts at cognitive training/rehabilitation also appear helpful but are best established for those with ABI. However, there is a qualification to this assessment in that cognitive retraining is difficult and often time intensive, while its ability to meaningfully influence day-to-day activities remains unclear. It may be that continued efforts to fit the treatment to the patient, attend to the patient's holistic needs, and a focus on the translation to real-world functioning should be the goal of future efforts.

Keywords

Acquired brain injury; Cognitive rehabilitation; Mild cognitive impairment; Normal aging; Rehabilitation

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