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EVIDENCE-BASED REVIEWS OF COGNITIVE
REHABILITATION FOR INDIVIDUALS WITH
TRAUMATIC BRAIN INJURY: WHAT CLINICAL
QUESTIONS DO THEY ANSWER?

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Cite this document as:

Kennedy, M. R. T. (2007). Evidence-based reviews of cognitive rehabilitation for individuals with traumatic brain injury: what clinical questions do they answer? *EBP Briefs*, 1(6), 1–12. Bloomington, MN: Pearson.

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Evidence-Based Reviews of Cognitive Rehabilitation for Individuals With Traumatic Brain Injury: What Clinical Questions Do They Answer?

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Consider this scenario: A 29-year-old man who sustained a traumatic brain injury (TBI) three years ago comes to you for outpatient therapy. His bachelor's degree in business tells you that he had success in formal education. The report from a battery of formal and informal assessment tools revealed cognitive and communication deficits in divided attention, remembering details throughout the day, and identifying alternative solutions when confronted with a problem and changing plans accordingly (Coelho, Ylvisaker, & Turkstra, 2005; Turkstra et al., 2005). While this individual acknowledges that his memory is not as good as it used to be, he cannot articulate the specific reasons he has been released from two jobs since his injury.

Now, let's consider your background as well. As a speech-language pathologist (SLP), you have three years of experience working with adults with acquired brain injury, but most of that experience has been in an acute rehabilitation program working with adults following stroke. You know that there is research evidence that should help guide your clinical decisions for working with individuals with TBI, but you are not sure which reviews of the literature would help you the most. You want to find out answers to fundamental questions such as:

- (1) What kinds of intervention are effective for various cognitive problems and what should those interventions look like?
- (2) Who is likely to benefit most from the various kinds of intervention?
- (3) What outcomes can one reasonably expect following intervention? Are outcomes likely to be maintained over time, and will results of intervention transfer or generalize to other tasks and contexts?

In light of these questions, you conduct a thorough electronic search of the cognitive rehabilitation research literature on TBI hoping to find some answers. You look to the cognitive rehabilitation literature because it focuses on "the assessment and treatment of underlying cognitive

processes (e.g., attention, memory, self-monitoring, executive function) as they interact and are manifest in communication behavior, broadly understood (listening, reading, writing, speaking, gesturing) at all levels of language (phonological, morphologic, syntactic, semantic pragmatic)" (Kennedy et al., 2002, p. x). Using keywords such as cognitive rehabilitation, intervention, attention, social skills, memory, and problem solving, you find several reviews of the intervention literature. But which of these reviews will help you with your questions? It is nearly impossible for clinicians to have extensive experience with all types of clients with brain injury, given the heterogeneity of this clinical population and the diversity of most caseloads. Therefore, clinicians frequently find themselves in the situation of wondering which of the reviews available on cognitive rehabilitation for persons with TBI are most relevant to their specific needs.

The purpose of this article is to provide SLPs with an overview of currently published, systematic reviews of cognitive rehabilitation and, more specifically, to identify those reviews that would provide them with practical recommendations concerning their clinical practice. That being said, an important caveat must be noted at the offset, as any review of intervention research literature only speaks to specific groups of clients who may or may not be similar in abilities and disabilities, values, culture, and goals to the individual client who walks through one's door seeking help. For that, only the joint decision-making between clinician and client will result in a unique treatment approach leading to outcomes that are valued. In some cases, the outcomes valued by clinicians may differ from those valued by clients. Yet both are likely to value improvement in the ability to carry out functional communication tasks, although these can be challenging for clinicians to measure or quantify for third-party payers. Thus, clinicians must rely on formal test measures to document change in addition to keeping track of functional improvement, the latter sometimes called "practice-based evidence."

What is a Systematic Review?

This brief describes systematic reviews that have been conducted in the area of cognitive rehabilitation for individuals with TBI. According to the American Academy of Neurology's Clinical Practice Guideline Process Manual, a systematic review "follows a rigorous methodology to address focused questions, apply explicit eligibility criteria, conduct exhaustive literature searches and critically appraise the evidence" (American Academy of Neurology [AAN], 2004, p. 56). These kinds of reviews search all valid databases for published articles on a given topic. Systematic reviews that attempt to identify effective approaches in a given area of treatment focus specifically on reviewing the results of intervention studies. Studies are identified for review based on a priori inclusionary and exclusionary criteria established by those conducting the review. Once a body of studies is identified for review, two or more individuals read and critique each study or a portion of the studies to assure that the reviews are reliable in their descriptions and judgments of the studies.

The approaches used in systematic reviews can be qualitative (i.e., descriptive) or quantitative (i.e., effect sizes analyzed in a meta-analysis). These approaches can also be combined. Systematic reviews are commonplace in medically related fields, particularly with regard to the usefulness of diagnostic procedures or the effectiveness of medication. Recently, these reviews have been conducted on behavioral intervention, including cognitive rehabilitation for individuals with TBI.

In the cognitive rehabilitation literature, several systematic reviews have been conducted, and these have been either comprehensive or focused. Comprehensive reviews are broad-based. They typically include intervention for numerous cognitive disorders and are heterogeneous in how intervention is delivered. Focused reviews are more specific in purpose and typically review published studies on a particular kind of intervention or intervention for a specific impairment, such as inattention or poor problem-solving skills.

In the sections that follow, both comprehensive and focused systematic reviews of cognitive rehabilitation intervention research are described. Table 1 summarizes important information from each review and is meant to be a reference guide for clinicians who are looking for evidence-based answers to clinical questions. The extent to which each review provides answers to the three clinical questions

identified earlier is described using the terms general and specific. General means that the clinical information presented in the review is basic or vague, whereas specific means that detailed information is provided. For instance, in terms of intervention implementation, a general description neglects to detail the frequency or duration of intervention or how intervention was delivered; in contrast, a specific description would include these important features. A general description of the individuals likely to benefit from intervention would include their medical diagnosis and chronicity of disability (i.e., time since the injury), whereas a specific description of these individuals would include details such as their average age, educational background, and severity of disability (helping one to know, therefore, who is likely to benefit from intervention). General outcomes are those that are reported as "improved" without descriptions of the outcome measurements used in the studies, whereas specific descriptions identify outcomes by the evaluation tool that was used, such as a formal test or functional activity.

Systematic Reviews of Cognitive Rehabilitation

Coelho, DeRuyter, and Stein (1996)

The earliest review of the intervention research literature for cognitive rehabilitation was published in 1996 by Coelho, DeRuyter, and Stein. The purpose of this review was to "summarize the evidence pertaining to treatment efficacy for cognitive-communication disorders secondary to TBI in adults" (p. S5). For this review, specific selection criteria were not reported, although the authors pointed out that it was important to include case reports and single-subject design studies because these often provide detailed descriptions of participants, type and dose of intervention, and include multiple outcomes. Thus, this review included case reports and single-subject design studies as well as group design studies.

In this review, 38 intervention studies published from 1979 to 1992 were summarized. A total of 208 individuals with brain injury participated in the studies reviewed. Studies were grouped into four categories based on the goals of the intervention: 8 attention training studies ($n = 68$), 13 memory intervention studies ($n = 81$); 10 social skills training studies ($n = 22$); and 7 intervention studies aimed at improving executive functions ($n = 37$). Tables of evidence were provided for each category that summarized types of treatment and outcomes.

What does this review tell clinicians about the kinds of cognitive rehabilitation that are effective, the individuals who respond best to these interventions, and the types of outcomes expected? Coelho and colleagues (1996) came to some general conclusions about the kinds of intervention that would result in positive outcomes for persons with brain injury. They concluded that individuals with cognitive-communication disorders from a TBI or stroke could benefit from cognitive rehabilitation aimed at improving specific and discrete impairments. Evidence from early attention training studies (e.g., training discrete attention processes) and memory retraining studies (e.g., use of mnemonics and/or imagery) provided support for these treatments, although concerns about generalization of effects beyond training were noted. Evidence from early intervention studies aimed at improving executive functions also provided some support for self-instruction approaches that included metacognitive strategies (e.g., self-monitoring, self-checking) and use of visual and verbal feedback. Interventions for social skills that included peer and clinician feedback, conversation skills training, and extinguishment of inappropriate communication demonstrated positive outcomes.

Chesnut et al. (1999) and Carney et al. (1999)

Chesnut et al. (1999) and Carney et al. (1999) published two reports on the effectiveness of cognitive rehabilitation for individuals with TBI. Chesnut and colleagues described their comprehensive systematic review process as a means to address general questions such as “Should interdisciplinary rehabilitation begin during the acute hospitalization for TBI?” and “Does the application of supported employment enhance outcomes for persons with TBI?” (p. 178). In a second publication, this same group of researchers (Carney et al., 1999) provided a detailed account of the search and selection process they undertook to determine if cognitive rehabilitation improved outcomes for persons with TBI, specifically health, intermediate outcomes (e.g., test scores), and employment. From the 3,098 abstracts obtained in their initial search, 600 articles were identified as relevant to answering the broad question of whether cognitive rehabilitation improves health, intermediate outcomes, and employment. Strict exclusion criteria were used to narrow the pool of studies reviewed. Studies were only included if they involved at least five or more adults with brain injury and were reasonably well conducted; studies involving children, that reported only descriptive

outcomes, and that involved retrospective analyses or acute rehabilitation of participants were not included.

What does this review tell clinicians about the kinds of cognitive rehabilitation that are effective, the individuals who respond best to these interventions, and the types of outcomes expected? Thirty-two studies were selected and reviewed by Carney et al. (1999; Chesnut et al. reviewed 99). The authors concluded that “two randomized controlled trial studies and one observational study provided evidence that specific forms of cognitive rehabilitation reduce memory failures and anxiety, and improve self-concept and intervention relationships for person with TBI. The durability and clinical relevance of these findings is not established” (Carney et al., 1999, p. 277).

Several experts in cognitive rehabilitation responded critically to this review. For instance, Cicerone (1999) commented on the validity of this review, noting that the authors had assumed that the goal of cognitive rehabilitation is to “restore” cognitive functioning when, in fact, the goal is more often to compensate for impairment. Furthermore, Prigatano (1999) noted that the authors favored studies in which standardized test scores, rather than measures of everyday functional activities and vocational skills, served as outcomes. Unfortunately, answers to clinically relevant questions such as why a specific approach to cognitive rehabilitation works and for whom could not be answered in this review, in part because the authors deemed so many studies unacceptable, and in part because of the emphasis on standardized test outcomes and not on outcomes that had everyday relevance.

National Institutes of Health (NIH) Consensus Conference (1999)

In 1998, a group of researchers from the medical and rehabilitation fields that care for individuals with TBI conducted a review of MEDLINE from 1988 to 1998. The review resulted in a bibliography of 2,563 references drawn from medicine, epidemiology, and various areas of rehabilitation and biostatistics, with an emphasis on cognitive and behavioral rehabilitation. In a consensus conference, these researchers then met with expert clinicians, survivors of TBI, and over 800 members of the public to discuss their review’s findings and to elicit feedback. There were 1.5 days of presentations by the experts with audience participation, followed by a panel review of the evidence. The panel prepared a conference consensus statement, weighing the published evidence

with expert, family, and survivor opinions, which was then published as a comprehensive report.

Recently, Gordon et al. (2006) published a review of the literature from 1998 to 2004 that was intended to be an update to the NIH consensus report. Strict exclusion criteria were used when studies were selected for review. Studies were excluded if they involved fewer than 20 participants with TBI or controls, more than 25% of the participants were children with TBI, and if individuals with TBI made up fewer than 75% of the sample. Few cognitive rehabilitation studies were added to this update given the strict selection criteria. Because the authors reported that “the document does not represent an exhaustive evidence-based review of the literature on the rehabilitation of individuals with TBI, and no attempt was made to integrate the literature specifically to develop care guidelines” (p. 345), its conclusions are not summarized here¹.

What does this review tell clinicians about the kinds of cognitive rehabilitation that are effective, the individuals who respond best to these interventions, and the types of outcomes expected? The NIH consensus report provides clinicians with general descriptions of intervention approaches that had been found to be effective through randomized controlled trials or case studies through 1998. The report indicated that specific interventions for attention, memory, and executive skills were effective for improving these abilities or compensating for them, highlighting in particular the need for sequenced repetition in training. There was no discussion of the characteristics of individuals who were best suited for particular kinds of intervention, nor were the outcomes that one could expect described in any detail. However, this report did identify numerous areas in need of additional research.

Cicerone et al. (2000) and Cicerone et al. (2005)

The purpose of two comprehensive and systematic reviews published by Cicerone et al. (2000, 2005) was to make evidence-based clinical recommendations for working with individuals with TBI or stroke based on intervention studies published through 1997 (Cicerone et al., 2000) and from 1998 to 2002 (Cicerone et al., 2005). These reports were based on a search of MEDLINE that yielded 655 publications, from which 171 intervention

studies were selected (2000); an additional 87 were selected in the later update (2005). Studies were excluded if they were not intervention studies, did not include outcome data, provided limited or no descriptions of intervention, involved participants with diagnoses other than TBI or stroke, involved children, featured pharmacological intervention, and/or were published in a language other than English. Studies were categorized based on the area targeted by intervention: attention; visuospatial (2000 only); language and communication; memory; executive functions and problem solving; multi-modal interventions and comprehensive-holistic interventions; and apraxia (added in 2005).

Studies were classified by the level of evidence based on the American Academy of Neurology (AAN) differentiating Class I, II, and III studies. Specifically, the AAN (Miller et al. 1999) identified three levels of evidence: Class I studies are well-designed randomized controlled trials; Class II studies are prospective group studies with controls without randomization, or case series designs with comparisons of treatment conditions, such as multiple baseline across measures; and Class III studies are case series without concurrent controls, or single-subject designs across interventions with one subject. In 2004, these levels were expanded into four classes (AAN, 2004). In total, the Cicerone reviews included 46 Class I studies, 43 Class II studies, and 169 Class III studies. While many studies were described in the text of the reviews, tables of evidence were not included. Therefore, the details of each study and how reviewers interpreted these details and arrived at their recommendations were not entirely transparent.

What does this review tell clinicians about the kinds of cognitive rehabilitation that are effective, the individuals who respond best to these interventions, and the types of outcomes expected? Cicerone and colleagues made evidence-based clinical recommendations in 2000 and updated them in 2005. Using the AAN's (Miller et al., 1999) descriptions of practice standards, practice guidelines, and practice options, clinical recommendations varied in specificity across categories for adults with stroke or TBI. Examples of the 2005 recommendations for cognitive rehabilitation are summarized below. Readers are referred to these original review papers for more detail.

¹ Gordon et al. (2006) summarized a few cognitive rehabilitation studies, even though some of these studies should have been excluded based on their criteria. Because of this factor and the fact that it was not a systematic review, their conclusions are not summarized here.

- Strategy training for attention deficits was recommended as a practice standard for individuals who are beyond the stage of spontaneous recovery. Some evidence suggests that more complex forms of attention are more responsive to training than simpler forms of attention.
- Internal (i.e., visual imagery) or external (i.e., notebooks) memory strategy training techniques were recommended as a practice standard for individuals with TBI or stroke who have mild memory impairments.
- Training problem-solving strategies that apply to everyday activities were recommended as a practice guideline for individuals with TBI or stroke who have chronic executive functions problems.
- Intervention to “promote internalization of self-regulation strategies through self-instruction and self-monitoring” was recommended as a practice option. These procedures may be useful for individuals with TBI or stroke who have problems with such executive functions as regulating emotion, attention, neglect, and memory (p. Cicerone et al., 2005, p. 1688).

As can be seen, recommendations from these reviews provide clinicians with some specific information about what intervention should look like; however, it is less clear who would be the best candidates for specific types of intervention. For some types of deficits, the authors explicitly described outcomes (e.g., everyday activities when training external compensatory memory aids), whereas the outcomes of intervention for other deficits were more general.

Park and Ingles (2001)

Park and Ingles (2001) conducted a focused, systematic review to investigate the efficacy of attention rehabilitation for 359 adults with brain injury. This review involved careful calculation of effect sizes and analysis of treatment effects using meta-analysis. These researchers compared the two most typical approaches at the time for remediating attention skills. One approach consisted of directly training discrete processes of attention, such as vigilance, focused attention, alternating attention, and divided attention. The other approach consisted of specific skills training. This intervention included activities “that were hypothesized to require attention, and attention was trained either concurrently with or in the context of the

specific skills” (p. 200).

Park and Ingles conducted a comprehensive search using MEDLINE and PsycLIT for studies conducted between 1966 and 1997. To be included in the meta-analysis, studies were required to exhibit these characteristics: (a) the purpose of the study was to determine the effects of attention rehabilitation separate from a broad rehabilitation program; (b) participants had sustained an acquired brain injury (ABI, including traumatic brain injury, stroke, or surgery); (c) outcome(s) were quantitative and reported with sufficient detail to estimate effect sizes; and (d) outcome(s) differed from pre-treatment or during-treatment measures. A total of 30 studies were examined for review, 26 of which investigated direct attention training and 4 that trained attention through specific skills.

What does this review tell clinicians about the kinds of cognitive rehabilitation that are effective, the individuals who respond best to these interventions, and the types of outcomes expected? Park and Ingles (2001) found that outcomes (mostly based on standardized test scores) from direct attention training studies that had no control group or comparison condition (i.e., pre-post comparison only) were greater than chance. However, when studies included a control group or comparison condition, these effects disappeared. The outcomes from studies training specific skills with no control group or comparison condition were greater than chance, and these effects remained when examining studies that included a control/comparison group. As Park and Ingles noted, it is possible that aggregating and averaging the numerous outcomes from direct attention studies could have masked more specific improvements.

This review lacked detailed, specific descriptions of the attention training provided within the specific studies reviewed. For example, the average dose of intervention for attention training was 31 hours, but there was great variability in dosage among the studies. Given this information, it would be difficult for a clinician to specify an appropriate amount and frequency of training for a given client. Likewise, although most participants in the studies reviewed had a TBI (most of which were severe), this review would provide little assistance to clinicians who are looking for recommendations about the characteristics of TBI survivors who are likely to respond best to attention training. What this review does provide is statistical evidence about attention training with and without application to a specific skill, although this finding may be suspect given

that we do not know the dosage of training that was delivered. As Sohlberg and colleagues noted (2003, p. xxiii), “nonetheless, this study reminds us of the importance of analyzing the potential transfer of any observed training effects to related tasks. It also encourages the field to address definitional ambiguities such as the distinction between attention skills and attention processes.”

Sohlberg et al. (2003)

In 2003, Sohlberg and colleagues reviewed the published research literature on direct attention training for individuals with TBI. More specifically, their purpose was to “examine the literature for evidence of the effectiveness of direct attention training to treat attention impairments following TBI” (p. xx). Like Cicerone et al. (2000, 2005), the goal was to provide clinical recommendations to clinicians. Unlike any prior reviews, however, the explicit intent of this review was to answer a series of important clinical questions highlighted throughout the article. These questions were “Who are the participants that received the intervention? What comprises attention remediation? What are the outcomes of the intervention? Are there methodological issues? Are there clinically applicable trends across attention remediation studies?” (Sohlberg et al., 2003, p. xxiii)

MEDLINE, PsycINFO, CINAHL, and ERIC databases (1997 to 2001) were searched for intervention studies relevant to the topic; earlier studies included in prior reviews were included in this review as well (e.g., Cicerone et al., 2000; Park & Ingles, 2001)¹. Studies were selected using a broad set of criteria; namely, they were included if they (a) were written in English; (b) experimentally evaluated direct training of attention for adults; (c) included participants with TBI; (d) explicitly provided outcome data; and (e) comprised Class I (randomized clinical trial) and Class II (other group design) studies. This search process yielded a total of 9 studies with 152 participants. Given these search guidelines, this review deviated in several important ways from those described earlier. First, it included studies with

children. Second, it searched databases of non-medical approaches to cognitive rehabilitation (ERIC, CINAHL) as well as traditional medical databases. Third, it included detailed tables of evidence, thus providing transparency to readers to consider how demographic, design, and methodological variables were described and coded across studies. Fourth, outcomes were classified using the World Health Organization’s International Classification Framework (ICF) (i.e., body/structure/function, activities, and participation; World Health Organization, 2001).

What does this review tell clinicians about the kinds of cognitive rehabilitation that are effective, the individuals who respond best to these interventions, and the types of outcomes expected? This review provided clinical recommendations with regard to attention training based on the available supporting evidence. That is, the report described practice guidelines for using attention training for individuals with TBI, as summarized here:

- Attention training for complex attention processes that incorporates metacognitive strategies and is individualized to the client’s specific attention problems was recommended as a practice guideline. This should be delivered at least once a week.
- Individuals who have chronic cognitive disability (i.e., past the post-acute recovery phase) and who have relatively intact vigilance should be considered candidates for the kind of attention training described above.
- It is likely that the change in attention will be evident on formal attention tests (i.e., impairment level outcomes) or specific tasks that presumably require complex attention (i.e., activity level outcomes). It is unknown if this kind of attention training would result in generalization to untrained “impairment” tasks, although three studies provided some evidence that generalization to participant level tasks is possible.

As is evident, this focused systematic review provides clinicians with answers to specific clinical questions.

¹ This publication was the first in a series of systematic reviews conducted by the Practice Guidelines Writing Committee on Cognitive Communication After Traumatic Brain Injury (Academy of Neurogenic Communication Disorders and Sciences). The committee agreed on inclusion and exclusion criteria used for selecting studies, the format for tables of evidence, and the identification of types of outcomes using the World Health Organization International Classification Framework (World Health Organization, 2001). Details are published in Kennedy et al. (2002). To find additional information about this project, readers are referred to www.ncds.org/practice.html. Other systematic reviews that are near completion include a report of the evidence for managing behavior problems after brain injury (Ylvisaker et al., 2007) and a report of the evidence for managing problem solving and planning (Kennedy et al., 2007).

Likewise, clinicians can review characteristics of specific studies by referring to the tables of evidence provided in the report, resulting in sufficient transparency to the process of creating clinical recommendations so that clinicians can decide for themselves whether their individual clients are sufficiently similar to those who appear to respond favorably to the intervention.

Sohlberg et al. (2007)

Sohlberg et al. (2007) systematically reviewed the intervention research literature to date that focuses on the use of external memory aids to compensate for poor memory in those with TBI. Their purpose was to review and critique the available research literature that pertains to the use of external aids that compensate for memory impairment in individuals with TBI and to create practice recommendations for clinicians who are treating these individuals. External memory aids are also referred to as “cognitive orthoses” or “cognitive prosthetics” and can range from “low-tech” devices such as paper-and-pencil notebooks to “high-tech” devices such as a PDA. All of these were included for consideration in this systematic review.

This review used the same databases and broad selection criteria as Sohlberg et al. (2003) through the publication year 2003. This search process yielded a total of 1,744 studies, from which 54 were identified as intervention studies addressing memory impairment. The research literature was divided into two kinds of memory intervention approaches (external memory aids and internal memory strategies), of which only the former were relevant to this review. In total, 21 studies were found to have focused on the effects of using external memory aids. Detailed tables of evidence were provided in this systematic review, including a table that consolidated the findings of three published surveys that described usage patterns of external memory aids by individuals with acquired brain injury.

Of the 21 studies reviewed, 1 was classified as Class I level of evidence (i.e., randomized clinical trial, RCT), 10 were classified as Class II level of evidence (other group design studies), and 10 were classified as Class III level of evidence (e.g., single case reports). In total, 270 adults and children participated in these studies; 4 studies included children, whereas 17 included only adults. The effectiveness of a variety of memory aids was well documented across these studies, although descriptions of the training procedures used with participants were at best vague and sometimes missing altogether. Activity-level outcomes that measured change in independence or improved consistency

in follow-through were documented.

What does this review tell clinicians about the kinds of cognitive rehabilitation that are effective, the individuals who respond best to these interventions, and the types of outcomes expected? Sohlberg et al. (2007) reported that seven different kinds of external memory aids were identified from the intervention research literature. Over half of the studies reported on the use of memory notebooks or planners. The use of electronic hand-held devices, voice systems for prompting, pagers, cell phones, and a customized guidance system was also studied. According to these studies, a broad range of individuals benefited from their use, including adults and children with TBI and other acquired brain injuries (e.g., stroke). Few studies provided explicitly detailed descriptions of how individuals were trained to use these aids. Positive outcomes were reported in all studies; however, the outcomes varied widely, ranging from laboratory memory measures or measures of task performance aided by the device, to questionnaires about everyday functioning and frequency of use. Based on the literature reviewed, Sohlberg et al. (in press) made specific practice guidelines for individuals with TBI, as summarized here:

- External memory aids will probably be effective for compensating for poor memory given the strong evidence from the research literature. Determining which aid to use is a decision that clinicians and clients should make together, depending on the clients' abilities, needs, and desires. Although the research literature is vague in its description of how to provide training on the use of aids, training that incorporates principles of errorless learning and direct instruction are logical choices (Sohlberg, Ehlhardt, & Kennedy, 2005).
- Individuals who have chronic cognitive disability (i.e., past the post-acute recovery phase) or who have significant memory impairment that affects their level of independence should be considered candidates for using an external memory aid. It is unclear if self-awareness of poor memory is a required for individuals to be successful at using an external memory aid.
- Positive outcomes that reflect compensation for memory impairment should be expected. This may be observed in increased independence throughout the day or during a specific activity, which is the result of using the aid and avoiding a memory failure. Thus, these outcomes reflect changes at the activity and participation level (World Health Organization, 2001).

Summary

This brief described nine reviews that can provide guidance to clinicians who are interested in selecting evidence-based treatments for individuals with TBI. For the clinician who looks to these reviews to help pinpoint the specific type of intervention that should be used, the kind of client who would be a good candidate, and the kinds of outcomes that should be expected, focused reviews provide more specific answers to these questions than comprehensive reviews. Several focused reviews were included here, and the results of these reviews can provide support for making decisions about the client described at the beginning of this article. For instance, the evidence in Sohlberg et al. (2003) suggests that direct attention training provided at least one day per week could be appropriate as long as more complex forms of attention are addressed in tandem with functional everyday activities, perhaps like those this client would need to perform on a job. Likewise, the evidence in Sohlberg et al. (2007) suggests that the use of external memory aids or planners should be explored with this client, although the precise dosage and type of training would need to be determined based on sound clinical judgment. The evidence from Cicerone and colleagues (2005) and Kennedy and Coelho (2005)¹ suggests that addressing problem solving within the context of job activities would be beneficial, particularly using metacognitive strategies that rely on planning alternative solutions and self-reflecting or monitoring one's own performance and modifying the plan for the next attempt.

As the contents of this brief indicate, there are a number of reviews available to provide guidance to the clinician who seeks empirical evidence in support of clinical practices with individuals with TBI. Some reviews provide general information about the aspects of cognitive rehabilitation that have been shown to be efficacious or in some instances, effective, whereas other reviews provide more specific information that is useful to clinicians. When there is a mismatch between a clinician's experience and a client's disabilities, clinicians should be able to turn to published systematic research reviews to find answers to questions such as "What kind of intervention is likely to be most effective with this kind of client (i.e., who exhibits certain disabilities and abilities)?" and "What kinds of outcomes can I expect from this intervention?" However, the answers

to more specific types of questions—such as "How will this individual respond to an intervention approach that reminds him of school?" or "Which relevant activities should be integrated into intervention to keep this individual motivated and interested in using these strategies?"—may require clinicians to rely on their unique relationships with their clients. Regardless of the specificity of the research evidence, clinicians and clients together must make decisions that balance abilities with disabilities, likes with dislikes, motivating situations with non-motivating situations and personal goals with realistic capabilities. Ultimately, it is the clinical relationship balanced with the research evidence that will result in "the best practice" for that client.

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¹ Kennedy and Coelho (2005) specifically addressed this aspect of cognitive rehabilitation in a recent comprehensive summary, and Kennedy et al. (2007) recently critiqued the research literature on intervention for problem solving using qualitative and quantitative methodology.

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Table 1. Systematic, Comprehensive and Focused Reviews of Cognitive Rehabilitation Intervention for Individuals with Traumatic Brain Injury (Presented in Chronological Order)

Authors (Year)	Review Character						Clinical Questions and Answers			
	Purpose or Intervention Areas	Search	Approach	Inclusion of Tables of Evidence	Inclusion /Exclusion Criteria	Number of Studies Reviewed	Total Number of Participants	What Should Therapy Look Like?	For Whom?	Types of Outcomes?
Coelho, DeKuyter, & Stein (1996)	Review and summarize the effectiveness of intervention for attention, memory, social skills, executive functions	NR	Descriptive	Yes	No/No	38	208	General	General	General
Chesnut et al. (1999)	Review the effectiveness of cognitive rehabilitation for persons with TBla	MEDLINE, HealthSTAR, CINAHL, PsycINFO, Cochrane Library	Descriptive	Yes	Yes/Yes	99	NR	NR	General	General
Carney et al. (1999)	Effectiveness of cognitive rehabilitation to improve outcomes (health, intermediate, employment) of individuals with TBI	MEDLINE, HealthSTAR, CINAHL, PsycINFO, Cochrane Library	Descriptive	Yes	Yes/Yes	32	137	NR	General	General
NIH Consensus Conference (1999)	Provide researchers and clinicians with information and recommendations for effective rehabilitation	MEDLINE, 1988–1998	Descriptive	No	Yes/Yes	2,563b	NR	General	General	General
Cicerone et al. (2000)	Review effectiveness of intervention for attention, memory, social skills, language and communication, executive functioning and problem solving; consider multi-modal and comprehensive-holistic treatment approaches	MEDLINE through 1997	Descriptive	No	Yes/Yes	171	1,488c	General	General	General to Specific

continued

Table 1., continued

		Review Character				Clinical Questions and Answers				
Authors (Year)	Purpose or Intervention Areas	Search	Approach	Inclusion of Tables of Evidence	Inclusion /Exclusion Criteria	Number of Studies Reviewed	Total Number of Participants	What Should Therapy Look Like?	For Whom?	Types of Outcomes?
Park & Ingles (2001)	Review and critique effectiveness of attention remediation	MEDLINE, PsycLIT, 1966–1997	Meta-analytic	No	Yes/Yes	30	359	General	General	General
Sohlberg et al. (2003)	Review and critique effectiveness of attention remediation	MEDLINE, PsycINFO, CINAHL, ERIC	Descriptive	Yes	Yes/Yes	9	152	Specific	Specific	Specific
Cicerone et al. (2005)	Review, critique, and make recommendations about intervention for attention, apraxia, memory, social skills, language and communication, executive functioning and problem solving; consider multi-modal and comprehensive-holistic treatment approaches	PubMed, Infotrieve, 1998–2002	Descriptive	No	Yes/Yes	87	761c	General to specific	General	General to specific
Sohlberg et al. (in press)	Review, critique, and make recommendations for the use of external memory aids	MEDLINE, PsycINFO, CINAHL, ERIC	Descriptive	Yes	Yes/Yes	21	270	Specific	Specific	Specific

NR = Not reported or information unavailable.

^a Five questions were asked in this review. Questions 1, 2, 4, and 5 are discussed in Chesnut et al. (1999), and question 3 is discussed in Carney et al. (1999).

^b Number of participants in group studies only

^c Total number of participants across all studies and categories