Cognitive Rehabilitation

Policy

*Please see amendment for Pennsylvania Medicaid at the end of this CPB.

Note: Coverage of outpatient cognitive rehabilitation is subject to applicable benefit plan terms and limitations for physical and occupational therapy (see CPB 0250 - Occupational Therapy and CPB 0325 - Physical Therapy). Please check benefit plan descriptions for details.

I. Aetna considers cognitive rehabilitation as adjunctive treatment of cognitive deficits (e.g., attention, language, memory, reasoning, executive functions, problem solving, and visual processing) medically necessary when performed by a licensed health care professional acting within their scope of practice and all of the following are met:

A. Neuropsychological testing has been performed and neuropsychological results will be used in treatment-planning and directing rehabilitation strategies, and

B. The cognitive deficits have been acquired as a result of neurologic impairment due to moderate to severe...
traumatic brain injury, brain surgery, stroke, or encephalopathy, and
C. The member has been seen and evaluated by a neuropsychiatrist or neuropsychologist, and
D. The member is able to actively participate in a cognitive rehabilitation program (eg, is not comatose or in a vegetative state); and
E. The member is expected to make significant cognitive improvement.

Note: Cognitive rehabilitation may be performed by a occupational therapist, physical therapist, speech/language pathologist, neuropsychologist or other psychologist, or a neuropsychiatrist, psychiatrist or other physician.

Note: According a review article on cognitive rehabilitation (Ciceron et al, 2000), rehabilitation for visuo-spatial deficits generally entails 20 1-hour sessions delivered over the course of 4 weeks. For language and communication deficits, patients usually receive 8 hours of weekly therapy, beginning at 4 weeks post-onset and continuing up to 48 weeks post-onset. Courses of cognitive rehabilitation substantially longer than these durations may be reviewed for medical necessity.

II. Aetna considers cognitive rehabilitation experimental and investigational for all other indications, such as the treatment of epilepsy/seizure disorders, learning disabilities, mental retardation, cerebral palsy, dementia (e.g., from Alzheimer's disease, HIV-infection *, or Parkinson's disease), cognitive decline in multiple sclerosis and chronic obstructive pulmonary disease, memory deficit in multiple sclerosis, mild traumatic brain injury (including sports-related concussion), Wernicke encephalopathy, and behavioral/psychiatric disorders such as addiction, attention-
deficit/hyperactivity disorder, bipolar disorder, depression, schizophrenia, social phobia, substance abuse disorders, and autism spectrum disorders, as it has not been proven to be effective for these indications.

*Note: Cognitive rehabilitation is considered medically necessary for encephalopathy due to HIV when medical necessity criteria in section I above are met.

III. Aetna considers coma stimulation, also known as the "Responsiveness Program" (cognitive remediation of comatose persons), coma arousal program/therapy, sensory stimulation, and multi-sensory stimulation programs, experimental and investigational for coma and persistent vegetative state because its effectiveness has not been established.

**Background**

Cognitive rehabilitation offers retraining in the ability to think, use judgment, and make decisions. The focus is on correcting deficits in memory, concentration and attention, perception, learning, planning, sequencing, and judgment. A neuropsychologist, aided by other specialists (e.g., occupational therapists, speech and language pathologists) may be asked to evaluate the level and kind of cognitive dysfunction following traumatic brain injury (TBI), and they may re-assess the individual over time to measure recovery.

The goals of cognitive rehabilitation are to enhance the person's capacity to process and interpret information and to improve the person's ability to function in all aspects of family and community life. Restorative training focuses on improving a specific cognitive function, whereas compensatory training focuses on adapting to the presence of a cognitive deficit.
Compensatory approaches may have restorative effects at certain times. Some cognitive rehabilitation programs rely on a single strategy (e.g., computer-assisted cognitive training), while others use an integrated or inter-disciplinary approach. A single strategy program can target either an isolated cognitive function or multiple functions concurrently.

Although the interventions falling under the rubric of cognitive rehabilitation are heterogeneous, a Consensus Panel convened by the National Institutes of Health noted that these interventions share certain characteristics in that they are structured, systematic, goal-directed, and individualized and they involve learning, practice, social contact, and a relevant context.

A report of a consensus conference sponsored by the National Institute of Child Health and Human Development (NIH, 1999) concluded that, despite many descriptions of specific strategies, programs, and interventions, limited data on the effectiveness of cognitive rehabilitation programs are available because of heterogeneity of subjects, interventions, and outcomes studied. Outcome measures present a special problem, since some studies use global "macro"-level measures (e.g., return to work), while others use "intermediate" measures (e.g., improved memory). These studies also have been limited by small sample size, failure to control for spontaneous recovery, and the unspecified effects of social contact. Nevertheless, a number of programs have been described and evaluated. Despite these limitations in evidence, the consensus conference report concluded: “Evidence supports the use of certain cognitive and behavioral rehabilitation strategies for individuals with TBI [traumatic brain injury] in particular circumstances. These interventions share certain characteristics in that they are structured, systematic, goal-directed, and individualized and they involve learning, practice, social contact, and a relevant context.”
Cognitive exercises, including computer-assisted strategies, have been used to improve specific neuropsychological processes, predominantly attention, memory, and executive skills. A NIH Consensus Statement notes that both randomized controlled studies and case reports have documented the success of these interventions using intermediate outcome measures. Certain studies using global outcome measures also support the use of computer-assisted exercises in cognitive rehabilitation. An AHCPR Evidence Report/Technology Assessment concluded that there is some evidence that compensatory cognitive rehabilitation reduces anxiety and improves self-concept and relationships for people with TBI.

Compensatory devices, such as memory books and electronic paging systems, are used both to improve particular cognitive functions and to compensate for specific deficits. Training to use these devices requires structured, sequenced, and repetitive practice. According to a NIH Consensus Statement, the efficacy of these interventions has been demonstrated.

Interventions in cognitive rehabilitation are being developed and have only recently been subjected to the scientific inquiry. The efficacy of cognitive rehabilitation so far has been measured by its objective influence on function and the subjective value of these changes to the individual. An NIH Consensus Conference Report (NIH, 1999) stated: “It is important to recognize that a great deal of the scientific evidence to support the use of these approaches derives from relatively limited studies that should be replicated in larger, more definitive clinical trials.”

Amato et al (2006) stated that despite its frequency and high functional impact, very little is known about effective strategies for managing cognitive impairment in patients with multiple sclerosis (MS). Disease-modifying drugs may prevent or reduce the progression of cognitive dysfunction by containing the development of new cerebral lesions. Available evidence
has provided inconsistent findings, with neuropsychological effects documented only in 1 trial. Moreover, pilot studies have tested symptomatic therapies for fatigue, a frequent symptom in MS, which may share a common physiopathological substrate with cognitive dysfunction. Small studies with amantadine, pemoline, 4-aminopyridine and 3-4 aminopyridine have provided mainly negative results. Acetylcholinesterase inhibitors used to treat Alzheimer's disease (e.g., donepezil, rivastigmine, and galantamine) have recently been tested in other cognitive disorders, including MS. The majority of pilot trials with acetylcholinesterase inhibitors in MS have provided promising results, and the donepezil study recently published by Krupp and colleagues represented a major development in this field. As for non-pharmacological interventions based on cognitive rehabilitation, few studies have used an experimental approach and, in general, results have been disappointingly negative. The authors noted that further research is clearly needed in this area.

In an evidenced-based review of cognitive rehabilitation for persons with MS, O'Brien et al (2008) concluded that cognitive rehabilitation in MS is in its relative infancy. More methodologically rigorous research is needed to determine the effectiveness of various cognitive rehabilitation interventions.

A Cochrane systematic evidence review by Thomas et al (2006) found "some evidence of effectiveness" of cognitive rehabilitation on cognitive outcomes in persons with MS who have cognitive impairments, although the authors found that "this was difficult to interpret because of the large number of outcome measures used".

A systematic evidence review by the BlueCross BlueShield Association Technology Evaluation Center (BCBCA, 2008) concluded that cognitive rehabilitation for traumatic brain injury does not meet the TEC criteria. An important weakness in the literature on cognitive rehabilitation is that many clinical trials
report impacts of cognitive rehabilitation on cognitive tests rather than on health outcomes. The assessment stated that "[d]emonstration of the effectiveness of cognitive rehabilitation ... requires prospective, randomized designs that employ validated measures of health outcomes."

Coma stimulation refers to clinical intervention related to cognitive rehabilitation by attempting to improve or increase the rate of recovery and arousal of the comatose patient through increasing sensorimotor input. It has been suggested that increasing baseline stimulation to critical brain structures, including the reticular activating system in particular, promotes arousal and recovery of these patients. Suggestive findings of such approaches include reports of increased arousal and improvement in findings on electroencephalograms in prolonged vegetative states following dorsal column stimulation and improvement of the comatose patient's condition. However, there are no published studies that confirm the overall efficacy of such approaches in altering the recovery patterns of comatose patients. A Cochrane systematic evidence review (Lombardi et al, 2002) concluded that "there is no reliable evidence to support the effectiveness of multisensory programmes in patients in coma or vegetative state."

A guideline of "Guidance on diagnosis and management of the vegetative state" from the Royal College of Physicians (2003) concluded that "there is no evidence that constant stimulation of someone who is in a vegetative state can bring about improvement in the long-term outcome."

In a randomized, controlled study, Incalzi et al (2008) examined the effects of cognitive training in patients with hypoxemic chronic obstructive pulmonary disease (COPD). This study consisted of 105 COPD patients with at rest (n = 36) or effort (n = 69) hypoxemia and free from concurrent dementing diseases. Neuropsychological assessment included a screening test, the Mini Mental State Examination
(MMSE), and a standardized confirmatory battery of neuropsychological tests, the Mental Deterioration Battery (MDB). After baseline assessment, patients were randomized to receive standardized multi-dimensional care (standardization of pharmacological therapy, health education, selection of inhalers according to patient's ability, respiratory rehabilitation, nutritional counseling, oxygen therapy, and control visits) with (n = 53) or without (n = 52) cognitive training aimed at stimulating attention, learning, and logical-deductive thinking. Cognitive performance was re-assessed after 1.5, 4, and 6 months. The analysis of variance for repeated measures (ANOVA) having the group membership (study versus control) as grouping factor was used to assess changes in cognitive performance. Both intervention and control groups showed no significant changes in cognitive performance except for a trend toward improvement in verbal fluency and verbal memory, but cognitive intervention had no significant effect. The authors concluded that cognitive training seems ineffective in COPD.

Brissart and colleagues (2011) noted that cognitive impairment is now well-known in MS. However, few rehabilitation interventions are proposed or really efficient. These investigators presented a review of cognitive rehabilitation intervention research conducted in people with MS, regarding different findings about episodic memory, working memory, attention and executive function disorders in MS. A search of Medline (yield 20 papers) and of PsychInfo (yield 1 article), using combinations of the following terms: cognitive rehabilitation, multiple sclerosis, cognitive therapy, neuropsychological rehabilitation, in the title or in the abstract, from 1960 to March 2010, excluding animal studies. Episodic memory rehabilitation studies appear to be promising. Programs on working memory, attention and executive functions are in the very early phases. The authors concluded that results are encouraging and allow specific recommendations for future research regarding: (i) inclusion
criteria, often not defined, (ii) a specific baseline adapted to the program of rehabilitation, (iii) a control measure regarding program efficiency, and (iv) a role for the psychologist (presence and advice during the program).

**Note:** Cognitive rehabilitation should not be confused with cognitive behavior therapy. Cognitive behavior therapy (also known as cognitive therapy) is a form of psychotherapy that emphasizes the role of thought patterns in moods and behaviors.

Georgiopoulos et al (2010) performed a systematic review of the proposed medical or surgical treatments in patients in chronic vegetative state (VS) or minimally conscious state (MCS), as well as of their mechanisms of action and limitations. For this review, these researchers have agreed to include patients in VS or MCS having persisted for over 6 months in post-traumatic cases, and over 3 months in non-traumatic cases, before the time of intervention. Searches were independently conducted by 2 investigators between May 2009 and September 2009 in the following databases: Medline, Web of Science and the Cochrane Library. The electronic search was complemented by cross-checking the references of all relevant articles. Overall, a total of 16 papers were eligible for this systematic review. According to the 16 eligible studies, medical management by dopaminergic agents (levodopa, amantadine), zolpidem and median nerve stimulation, or surgical management by deep brain stimulation, extra-dural cortical stimulation, spinal cord stimulation as well as intra-thecal baclofen have shown to improve the level of consciousness in certain cases. The authors concluded that the treatments proposed for disorders of consciousness have not yet gained the level of “evidence-based treatments”. Moreover, the studies to-date had led to inconclusiveness. They stated that the published therapeutic responses must be substantiated by further clinical studies of sound methodology.
The American Academy of Neurology's practice parameters on “Assessment and management of patients in the persistent vegetative state” (AAN, 2006) did not mention the use of coma stimulation as a treatment modality. Also, the American Occupational Therapy Association's practice guideline on “Adults with traumatic brain injury” (Golisz, 2009) made no recommendation regarding the use of sensory stimulation or coma arousal programs. Furthermore, the National Institute of Neurological Disorders and Stroke’s “Coma information page” (NINDS, 2012) did not mention the use of coma stimulation as a therapeutic option.

Cognitive enhancement therapy (CET) is a performance-based, comprehensive, developmental approach to the rehabilitation of social cognitive and neurocognitive deficits. Participants work at recovery through structured group and computer exercises. Cognitive enhancement therapy is designed as a recovery phase intervention for symptomatically stable persons with severe mental illness, who nonetheless remain socially and vocationally disabled. This approach is the culmination of more than 30 years of clinical experience and research in schizophrenia treatment. Overall, CET attempts to increase mental stamina, active information processing, and the spontaneous negotiation of unrehearsed social challenges. It does so with a focus on enhancing perspective taking, social context appraisal, and other components of social cognition.

There are 3 basic components in CET: (i) computer exercises to enhance cognitive skills, (ii) a psycho-educational group where interactive work is done through lectures, homework and group exercises. This understanding facilitates a personal process of adjusting to disability and to help participants eventually become more socialized into meaningful adult roles that they identify as goals in their recovery plan, and (iii) 1-on-1 coaching.
Gard et al (2009) noted that a burgeoning area of research has focused on motivational deficits in schizophrenia, producing hypotheses about the role that motivation plays in the well-known relationship between neuro-cognition and functional outcome. However, little work has examined the role of motivation in more complex models of outcome that include social cognition, despite the increased understanding of the critical role of social cognition in community functioning in schizophrenia, and despite new basic science findings on the association between social cognitive and reward processing in neural systems in humans. Using path analysis, these researchers directly contrasted whether motivation (i) causally influences known social cognitive deficits in schizophrenia, leading to poor outcome, or (ii) mediates the relationship between social cognitive deficits and outcome in this illness. A total of 91 patients with schizophrenia or schizoaffective disorder completed interview-based measures of motivation and functional outcome as well as standardized measures of neuro-cognition and social cognition in a cross-sectional design. In line with recent research, motivation appears to mediate the relationship between neuro-cognition, social cognition and functional outcome. A model with motivation as a causal factor resulted in poor fit indicating that motivation does not appear to precede neuro-cognition. The authors concluded that findings in the present study indicated that motivation plays a significant and mediating role between neuro-cognition, social cognition, and functional outcome. Potential psychosocial treatment implications were discussed, especially those that emphasize social cognitive and motivational enhancement.

Titov et al (2010) (i) replicated an earlier trial showing that a self-guided Internet treatment for social phobia is efficacious, and (ii) examined if the addition of self-guided motivational enhancement strategies improves completion rates and clinical outcomes. Randomized controlled trial (RCT) of self-guided Internet-based cognitive behavioral treatment (iCBT), or iCBT plus self-guided motivational
enhancement strategies (iCBT+MS), was conducted. An intention-to-treat and last observation carried forward model was used for data analyses. The participants consisted of 108 volunteers with social phobia. The iCBT intervention consisted of 2 online lessons about symptoms and treatment of anxiety disorders and 6 lessons about management of social phobia (the Shyness program) with complex automated reminders. The motivational intervention was based on traditional techniques including understanding and exploring ambivalence about change using a cost-benefit analysis, developing and resolving discrepancy between values and symptoms, and enhancing self-efficacy for change. The main outcome measures were the Social Interaction Anxiety Scale and Social Phobia Scale. More iCBT+MS group participants completed the 8 lessons than iCBT group participants (75 % versus 56 %, respectively), but there were no between-group differences in outcome measures at post-treatment or at 3 month follow up. Large mean within-groups effect sizes (Cohen's d) for the 2 social phobia measures were found for both the iCBT and iCBT+ MS groups (1.1 and 0.95, respectively), which were sustained at 3 month follow-up (1.06 and 1.07, respectively). Both iCBT and iCBT+MS group participants reported that the procedures were highly acceptable. The authors concluded that both self-guided versions of the Shyness program were reliably effective, confirming that people with social phobia may significantly benefit from a highly structured self-guided intervention. Moreover, they stated that the addition of motivational techniques increased completion rates but did not improve clinical outcomes or acceptability.

In a 2-year, randomized-controlled trial with annual structural magnetic resonance imaging and cognitive assessments, Eack and colleagues (2010) examined differential changes in brain morphology in early schizophrenia during cognitive rehabilitation versus supportive therapy. A total of 53 symptomatically stable, but cognitively disabled outpatients in the early course of schizophrenia or schizoaffective disorder
were included in this study. Cognitive enhancement therapy is an integrated approach to the remediation of cognitive impairments in schizophrenia that utilizes computer-assisted neurocognitive training and group-based social-cognitive exercises. Enriched supportive therapy is an illness management approach that provides psycho-education and teaches applied coping strategies. Broad areas of frontal and temporal gray matter change were analyzed using longitudinal voxel-based morphometry methods employing mixed-effects models, followed by volumetric analyses of regions demonstrating significant differential changes between treatment groups. Patients receiving CET demonstrated significantly greater preservation of gray matter volume over the course of 2 years in the left hippocampus, para-hippocampal gyrus, and fusiform gyrus, and significantly greater gray matter increases in the left amygdala (all corrected p < 0.040), compared with those receiving enriched supportive therapy. Less gray matter loss in the left para-hippocampal and fusiform gyrus, and greater gray matter increases in the left amygdala were significantly related to improved cognition and mediated the beneficial cognitive effects of CET. The authors concluded that CET may offer neurobiologic protective and enhancing effects in early schizophrenia that are associated with improved long-term cognitive outcomes.

Moreover, the authors stated that “Despite the beneficial effects of CET on brain morphology demonstrated in this study, these findings need to be interpreted in the context of a number of important limitations. Although morphometric findings support a neuroprotective effect of CET against the gray matter loss seen during the early course of schizophrenia,6 and in the case of the amygdala, even increase in gray matter, in the absence of functional neuroimaging data the pathophysiological significance of these results for brain function is not clear. Overall structural changes in regional brain volumes were not large, but were reliably detectable, and may reflect functional changes. That
we observed significant relations between increased gray matter and cognitive improvement, and that the effects of CET on gray matter change were significant mediators of CET effects on cognition, would suggest that brain functions subserving neurocognition and social cognition have been improved. Nonetheless, functional neuroimaging data are needed to better understand the effects of CET on brain function. An integration of morphometric and fMRI studies could be particularly informative in this regard. It is also interesting to note that CET effects on brain regions commonly implicated in neurocognitive dysfunction in schizophrenia were quite modest. For example, no effects were seen in the dorsolateral prefrontal cortex, and only modest effects were observed in the anterior cingulate and hippocampus, which were not associated with neurocognitive change. Although gray matter change in the anterior cingulate and hippocampus might be more strongly related to individual neuropsychological tests, this pattern of findings parallels, to some degree, the cognitive effects observed in this trial of early course patients. In this population, we have observed much stronger effects on social cognition and noted a relative preservation of some general cognitive functions (particularly processing speed) among this sample. The absence of morphometric findings could reflect the better preserved neurocognitive capacity of early course patients. It is also possible that the effects of CET on brain regions implicated in neurocognitive impairment cannot be detected at a morphometric level, but that the primary effects of this approach on frontal brain regions is toward a normalization of functioning. To date, many studies have documented frontal hypofunction in schizophrenia, and if cognitive improvement occurs in the disorder it is also likely to be the result of improved brain function. As a consequence, while this study provides important information on the potential neuroanatomical effects of cognitive rehabilitation in early schizophrenia, future studies are clearly needed to continue to characterize the effects of CET on a variety of other neurobiologic parameters. It is important to remember,
however, that significant relations were observed between changes in medial-temporal regions and neurocognition, as well as social cognition, suggesting the relevance of gray matter change in these regions to neurocognitive functioning. However, associations between gray matter and cognitive change were exploratory and not corrected for multiple inference testing, as such these results need to be interpreted with caution until confirmatory replications are available.

This study is also limited by the absence of an appropriately matched group of healthy individuals who could provide data on normative brain development in early adulthood. Although a large body of evidence has accumulated in schizophrenia research indicating a progressive loss of gray matter from the earliest phases of the disorder, healthy individuals also demonstrate some gray matter loss in early adulthood. However, loss appears to be greatest in the frontal cortex, not the subcortical regions demonstrating the most cognitive change in this study, which remain relatively stable or continue to grow after childhood.

In summary, this investigation suggests that CET, a comprehensive cognitive rehabilitation approach, can protect against gray matter loss and may even support gray matter growth in medial-temporal areas of the brain in service of cognitive enhancement among early course schizophrenia patients. Although replication and further neurobiologic characterization is needed, these findings support the potential for cognitive rehabilitative approaches to positively affect the brain in schizophrenia. Further studies are needed to examine the durability of these effects on the brain, as Hogarty and colleagues and Wexler and Bell have both shown that cognitive rehabilitation can continue to confer benefits to schizophrenia patients even after the completion of treatment. Studies of neuronal mechanisms underlying brain change, such as possible effects of cognitive remediation on
dopaminergic function, brain derived neurotrophic factor, as well as the genomic underpinnings of response to cognitive remediation are also needed”.

Jak and colleagues (2013) noted that cognitive enhancement strategies have gained recent popularity and have the potential to benefit clinical and non-clinical populations. As technology advances and the number of cognitively healthy adults seeking methods of improving or preserving cognitive functioning grows, the role of electronic (e.g., computer- and video game-based) cognitive training becomes more relevant and warrants greater scientific scrutiny. This paper served as a critical review of empirical evaluations of publically available electronic cognitive training programs. Many studies have found that electronic training approaches resulted in significant improvements in trained cognitive tasks. Fewer studies have demonstrated improvements in untrained tasks within the trained cognitive domain, non-trained cognitive domains, or on measures of everyday function. Successful cognitive training programs will elicit effects that generalize to untrained, practical tasks for extended periods of time. Unfortunately, many studies of electronic cognitive training programs were hindered by methodological limitations such as lack of an adequate control group, long-term follow-up and ecologically valid outcome measures. Despite these limitations, evidence suggested that computerized cognitive training has the potential to positively impact one’s sense of social connectivity and self-efficacy.

UpToDate reviews on “Mindfulness based cognitive therapy as maintenance treatment for unipolar major depression” (Segel, 2013), “Treatment of co-occurring schizophrenia and substance use disorder” (Campbell et al, 2013), and “Psychosocial interventions for schizophrenia” (Bustillo and Weil, 2013) did not mention the use of cognitive enhancement therapy as a management tool.
There is a clinical trial on “Cognitive Enhancement Therapy for Early-Stage Schizophrenia”; however, the recruitment status of this study is unknown because the information has not been verified recently (last verified August 2008). Also, there is currently a clinical trial on “Brain Imaging, Cognitive Enhancement and Early Schizophrenia (BICEPS)” that is not yet open for participant recruitment (last verified March 2012). Furthermore, there is a clinical trial on “Cognitive Enhancement Therapy for Adults with Autism Spectrum Disorders” that is currently recruiting participants (last verified January 2012).

Bahar-Fuchs et al (2013) noted that cognitive impairments, and particularly memory deficits, are a defining feature of the early stages of Alzheimer's disease (AD) and vascular dementia. Interventions that target these cognitive deficits and the associated difficulties with activities of daily living are the subject of ever-growing interest. Cognitive training and cognitive rehabilitation (CR) are specific forms of non-pharmacological intervention to address cognitive and non-cognitive outcomes. These researchers systematically evaluated the evidence for these forms of intervention in people with mild AD or vascular dementia. Randomized controlled trials, published in English, comparing CR or cognitive training interventions with control conditions and reporting relevant outcomes for the person with dementia or the family caregiver (or both), were considered for inclusion. A total of 11 RCTs reporting cognitive training interventions were included in the review. A large number of measures were used in the different studies, and meta-analysis could be conducted for several primary and secondary outcomes of interest. Several outcomes were not measured in any of the studies. Overall estimates of the treatment effect were calculated by using a fixed-effects model, and statistical heterogeneity was measured by using a standard chi-squared statistic. One RCT of CR was identified, allowing the examination of effect sizes, but no meta-analysis could be conducted. Cognitive training was not associated with positive...
or negative effects in relation to any of the reported outcomes. The overall quality of the trials was low-to-moderate. The single RCT of CR found promising results in relation to some patient and caregiver outcomes and was generally of high quality. The available evidence regarding cognitive training remains limited, and the quality of the evidence needs to improve. However, there is still no indication of any significant benefits from cognitive training. Trial reports indicated that some gains resulting from intervention may not be captured adequately by available standardized outcome measures. The authors concluded that the results of the single RCT of CR showed promise but are preliminary in nature. They stated that further well-designed studies of cognitive training and CR are needed to provide more definitive evidence.

In a Cochrane review, Bowen et al (2013) examined if CR improves functional independence, neglect (as measured using standardized assessments), destination on discharge, falls, balance, depression/anxiety and quality of life in stroke patients with neglect measured immediately post-intervention and at longer-term follow-up; and determined which types of interventions are effective and whether CR is more effective than standard care or an attention control. These investigators searched the Cochrane Stroke Group Trials Register (last searched June 2012), MEDLINE (1966 to June 2011), EMBASE (1980 to June 2011), CINAHL (1983 to June 2011), PsycINFO (1974 to June 2011), UK National Research Register (June 2011). They hand-searched relevant journals (up to 1998), screened reference lists, and tracked citations using SCISEARCH. They included RCTs of CR specifically aimed at spatial neglect. They excluded studies of general stroke rehabilitation and studies with mixed participant groups, unless more than 75% of their samples were stroke patients or separate stroke data were available. Two review authors independently selected studies, extracted data, and assessed study quality. For subgroup analyses, review authors independently categorized the approach underlying the cognitive intervention as either 'top-down' (interventions that
encourage awareness of the disability and potential compensatory strategies) or 'bottom-up' (interventions directed at the impairment but not requiring awareness or behavioral change, e.g. wearing prisms or patches). They included 23 RCTs with 628 participants (adding 11 new RCTs involving 322 new participants for this update). Only 11 studies were assessed to have adequate allocation concealment, and only 4 studies to have a low risk of bias in all categories assessed. Most studies measured outcomes using standardized neglect assessments: 15 studies measured effect on activities of daily living (ADL) immediately after the end of the intervention period, but only 6 reported persisting effects on ADL. One study (30 participants) reported discharge destination and 1 study (8 participants) reported the number of falls. Eighteen of the 23 included RCTs compared CR with any control intervention (placebo, attention or no treatment). Meta-analyses demonstrated no statistically significant effect of CR, compared with control, for persisting effects on either ADL (5 studies, 143 participants) or standardized neglect assessments (8 studies, 172 participants), or for immediate effects on ADL (10 studies, 343 participants). In contrast, these investigators found a statistically significant effect in favor of CR compared with control, for immediate effects on standardized neglect assessments (16 studies, 437 participants, standardized mean difference (SMD) 0.35, 95% confidence interval [CI]: 0.09 to 0.62). However, sensitivity analyses including only studies of high methodological quality removed evidence of a significant effect of CR. Additionally, 5 of the 23 included RCTs compared one CR intervention with another. These included 3 studies comparing a visual scanning intervention with another CR intervention, and 2 studies (3 comparison groups) comparing a visual scanning intervention plus another CR intervention with a visual scanning intervention alone. Only 2 small studies reported a measure of functional disability and there was considerable heterogeneity within these subgroups ($I^2 > 40\%$) when they pooled standardized neglect assessment data, limiting the ability to draw generalized conclusions. Subgroup analyses
exploring the effect of having an attention control demonstrated some evidence of a statistically significant difference between those comparing rehabilitation with attention control and those with another control or no treatment group, for immediate effects on standardized neglect assessments (test for subgroup differences, p = 0.04). The authors concluded that the effectiveness of CR interventions for reducing the disabling effects of neglect and increasing independence remains unproven. As a consequence, no rehabilitation approach can be supported or refuted based on current evidence from RCTs. However, there is some very limited evidence that CR may have an immediate beneficial effect on tests of neglect. This emerging evidence justifies further clinical trials of CR for neglect. However, future studies need to have appropriate high quality methodological design and reporting, to examine persisting effects of treatment and to include an attention control comparator.

In a Cochrane review, Loetscher and Lincoln (2013) examined if (i) stroke survivors receiving attentional treatment show better outcomes in their attentional functions than those given no treatment or treatment as usual, and (ii) stroke survivors receiving attentional treatment techniques have a better functional recovery, in terms of independence in ADL, mood and quality of life, than those given no treatment or treatment as usual. These investigators searched the Cochrane Stroke Group Trials Register (October 2012), Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library October 2012), MEDLINE (1948 to October 2012), EMBASE (1947 to October 2012), CINAHL (1981 to October 2012), PsycINFO (1806 to October 2012), PsycBITE and REHABDATA (searched October 2012) and ongoing trials registers. They screened reference lists and tracked citations using Scopus. They included RCTs of CR for impairments of attention for people with stroke. The primary outcome was measures of global attentional functions, and secondary outcomes were measures of attention.
domains, functional abilities, mood and quality of life. Two review authors independently selected trials, extracted data and assessed trial quality. They included 6 RCTs with 223 participants. All 6 RCTs compared CR with a usual care control. Meta-analyses demonstrated no statistically significant effect of CR for persisting effects on global measures of attention (2 studies, 99 participants; SMD 0.16, 95% CI: -0.23 to 0.56; p = 0.41), standardized attention assessments (2 studies, 99 participants; p ≥ 0.08) or functional outcomes (2 studies, 99 participants; p ≥ 0.15). In contrast, a statistically significant effect was found in favor of CR when compared with control for immediate effects on measures of divided attention (4 studies, 165 participants; SMD 0.67, 95% CI: 0.35 to 0.98; p < 0.0001) but no significant effects on global attention (2 studies, 53 participants; p = 0.06), other attentional domains (6 studies, 223 participants; p ≥ 0.16) or functional outcomes (3 studies, 109 participants; p ≥ 0.21). Thus, there was limited evidence that CR may improve some aspects of attention in the short-term, but there was insufficient evidence to support or refute the persisting effects of CR on attention, or on functional outcomes in either the short- or long-term. The authors concluded that the effectiveness of CR remains unconfirmed. The results suggested there may be a short-term effect on attentional abilities, but future studies need to assess the persisting effects and measure attentional skills in daily life. Trials also need to have higher methodological quality and better reporting.

In a Cochrane review, Chung et al (2013) examined the effects of CR on executive dysfunction for adults with stroke or other non-progressive acquired brain injuries. They searched the Cochrane Stroke Group Trials Register (August 2012), the Cochrane Central Register of Controlled Trials (The Cochrane Library, August 2012), MEDLINE (1950 to August 2012), EMBASE (1980 to August 2012), CINAHL (1982 to August 2012), PsycINFO (1806 to August 2012), AMED (1985 to August 2012) and 11 additional databases. They also searched reference lists and trials registers, hand-searched
journals and conference proceedings, and contacted experts. They included randomized trials in adults after non-progressive acquired brain injury, where the intervention was specifically targeted at improving cognition including separable executive function data (restorative interventions), where the intervention was aimed at training participants in methods to compensate for lost executive function (compensative interventions) or where the intervention involved the training in the use of an adaptive technique for improving independence with ADL (adaptive interventions). The primary outcome was global executive function and the secondary outcomes were specific components of executive function, working memory, ADL, extended ADL, quality of life and participation in vocational activities. They included studies in which the comparison intervention was no treatment, a placebo intervention (i.e., a rehabilitation intervention that should not impact on executive function), standard care or another cognitive rehabilitation intervention. Two review authors independently screened abstracts, extracted data and appraised trials. They undertook an assessment of methodological quality for allocation concealment, blinding of outcome assessors, method of dealing with missing data and other potential sources of bias. A total of 19 studies (907 participants) met the inclusion criteria for this review; these included 13 studies (770 participants) in meta-analyses (417 traumatic brain injury, 304 stroke, 49 other acquired brain injury) reducing to 660 participants once non-included intervention groups were removed from 3 and 4 group studies. These researchers were unable to obtain data from the remaining 6 studies. Three studies (134 participants) compared CR with sensorimotor therapy. None reported the primary outcome; data from 1 study was available relating to secondary outcomes including concept formation and ADL. Six studies (333 participants) compared CR with no treatment or placebo. None reported the primary outcome; data from 4 studies demonstrated no statistically significant effect of CR on secondary outcomes. Ten studies (448 participants) compared 2 different CR approaches. Two studies (82
participants) reported the primary outcome; no statistically significant effect was found. Data from 8 studies demonstrated no statistically significant effect on the secondary outcomes. These researchers explored the effect of restorative interventions (10 studies, 468 participants) and compensative interventions (4 studies, 128 participants) and found no statistically significant effect compared with other interventions. The authors concluded that they identified insufficient high-quality evidence to reach any generalized conclusions about the effect of CR on executive function, or other secondary outcome measures. They stated that further high-quality research comparing CR with no intervention, placebo or sensorimotor interventions is recommended.

Farina et al (2015) reviewed the modalities of CR, outcome end-points, and the levels of evidence of efficacy of different interventions. A systematic research in PubMed, Psychinfo, and SCOPUS was performed assessing the articles written in the entire period covered by these databases till December 2013. Articles in English, Spanish or French were evaluated. A manual research evaluated the references of all of the articles. The experimental studies were classified according to the level of evidence of efficacy, using a standardized Italian method (SPREAD, 2007), adopting the criteria reported by Cicerone et al (2000, 2011). A total of 18 papers were classified into 2 reviews, 4 papers dealing with the principles and efficacy of CR in epilepsy, a methodological paper, a single-case report, a multiple-case report, and 9 experimental papers. Most studies involved patients with temporal lobe epilepsy. Different types of CR were used to treat patients with epilepsy. A holistic rehabilitation approach was more useful than selective interventions to treat memory and attention disturbances. The authors concluded that CR may be a useful tool to treat cognitive impairment in patients with epilepsy. However, the modalities of treatment and outcome end-points are important concerns of clinical care and
research. They stated that controlled studies are needed to determine the efficacy of rehabilitation in well-defined groups of patients with epilepsy.

Addiction

Rezapour et al (2015) stated that despite extensive evidence for cognitive deficits associated with drug use and multiple publications supporting the effectiveness of cognitive rehabilitation treatment (CRT) services for drug addictions, there are few well-structured tools and organized programs to improve cognitive abilities in substance users. Most published studies on CR for drug dependent patients used rehabilitation tools, which have been previously designed for other types of brain injuries such as schizophrenia or TBI and not specifically designed for drug dependent patients. These studies also suffered from small sample size, lack of follow-up period assessments and/or comprehensive treatment outcome measures. To address these limitations, these researchers developed and investigated the effectiveness of a paper and pencil CR package called NECOREDA (NEuroCOgnitive REhability for Disease of Addiction) to improve neurocognitive deficits associated with drug dependence particularly caused by stimulants (e.g., amphetamine type stimulants and cocaine) and opiates. To evaluate the feasibility of NECOREDA program, these investigators conducted a pilot study with 10 opiate- and methamphetamine-dependent patients for 3 months in outpatient setting. NECOREDA was revised based on qualitative comments received from clients and treatment providers. Final version of NECOREDA was composed of brain training exercises called "Brain Gym" and psycho-educational modules called "Brain Treasures" that was implemented in 16 training sessions interleaved with 16 review and practice sessions. The authors stated that NECOREDA will be evaluated as an add-on intervention to methadone maintenance treatment in a randomized clinical trial among opiate-dependent patients starting from August 2015.
Furthermore, an UpToDate review on “Determining appropriate levels of care for treatment of substance use disorders” (Hartwell and Brady, 2016) does not mention cognitive rehabilitation as a management tool.

Bipolar Disorder

Kluwe-Schiavon and colleagues (2015) stated that it has been shown that bipolar disorder (BD) has a direct impact on neurocognitive functioning and behavior. This finding has prompted studies to investigate cognitive enhancement programs as potential treatments for BD, primarily focusing on cognitive reinforcement and daily functioning and not restricted to psycho-education and coping strategies, unlike traditional psychosocial treatments. These investigators presented a systematic review of controlled trials of CR for BD; the main objective was to describe the results of studies of rehabilitation programs for BD and related methodological issues. Electronic database searches (MEDLINE, Web of Science, and Embase) were conducted to identify articles using terms related to BD and CR. The methodological quality of each article was measured using the 5-item Jadad scale. A total of 239 articles were initially identified, but after application of exclusion criteria, only 4 were retained for this review. An average of 17 hours of intervention sessions were conducted, distributed as 0.95 hours per week and 3 of the 4 studies reported better executive function performance after CR interventions. The authors did not find robust evidence to support CR as an effective treatment for BD because of: (i) the variety of intervention designs; (ii) the methodological limitations of the studies; and (iii) the lack of studies in the field.

Computerized Cognitive Rehabilitation

In a pilot study, Kaldoja and co-workers (2015) evaluated the efficiency and usability of computer-assisted FORAMENRehab program for training specific components of attention in
children with mild TBI (mTBI) and partial epilepsy (PE). The second aim was to specify short- and long-term effects of the intervention. A total of 8 children between the ages of 9 to 12 years with attention impairment (3 with PE and 5 with mTBI) and 18 healthy controls participated in this study.

FORAMENRehab Attention software, adapted by the authors, was used for intervention. Strict intervention protocol consisting of patients completing 10 sessions over a 6-week period to train 4 components of attention (dividing, focusing, sustaining, and tracking) was designed and applied. Follow-up assessments were conducted after the end of the last training and 1.63 years later. After the intervention, patients' sustained and complex attention improved. Long-term follow-up revealed continuing positive rehabilitation effects; 100% compliance suggested that the used method is attractive for children. The authors concluded that these preliminary results of the pilot study gave reason to presume that the method is effective in attention impairment remediation. However, they stated that more thorough research is needed.

In an exploratory study, Li and colleagues (2015) examined the occurrence of skill generalization to daily living task for individuals with acquired brain injury (ABI) after completion of 8 modules of a commercially available computer-based cognitive retraining (CBCR) program, the Parrot Software. The study investigated changes in individuals' global cognition as measured by the Montreal Cognitive Assessment, and changes in individuals' performance during a medication-box sorting task, a novel instrumental activity of daily living. The medication-box sorting task resembled real life medication management with daily prescribed and over-the-counter medications. A total of 12 individuals with ABI from a community-based program completed the study. Results indicated that CBCR intervention brought about improvement in global cognition, but the improvement did not appear in any particular cognitive domain. Additionally, the gains in global cognition failed to enhance performance in the medication-box sorting task. The authors noted that this exploratory study
demonstrated that while CBCR may be a promising intervention for improving global cognition in individuals with ABI, additional intervention might be needed for generalization to occur to a novel daily task. The authors stated that future studies should look for the ultimate therapeutic outcome from CBCR interventions or include interventions that could bridge the gap between CBCR intervention and performance improvement in daily living occupations.

Bogdanova and associates (2016) provided a comprehensive review of the use of computerized treatment as a rehabilitation tool for attention and executive function in adults (aged 18 years or older) who suffered an ABI. Two reviewers independently assessed articles using the methodological quality criteria of Cicerone et al. Data extracted included sample size, diagnosis, intervention information, treatment schedule, assessment methods, and outcome measures. A literature review (PubMed, EMBASE, Ovid, Cochrane, PsychINFO, CINAHL) generated a total of 4,931 publications; 28 studies using computerized cognitive interventions targeting attention and executive functions were included in this review. In 23 studies, significant improvements in attention and executive function subsequent to training were reported; in the remaining 5, promising trends were observed. The authors concluded that preliminary evidence suggested improvements in cognitive function following computerized rehabilitation for ABI populations including TBI and stroke. They stated that further studies are needed to address methodological issues (e.g., inadequate control groups, small sample size) and to inform development of guidelines and standardized protocols.

Leo et al (2016) presented the case of a 30-year-old woman who came to their research institute for an intensive CR cycle following a right parieto-temporal stroke. Because the patient was in the chronic phase, these researchers decided to use 3 different rehabilitative protocols: (i) traditional cognitive...
training (TCT), (ii) computerized cognitive training (CCT), and (iii) CCT combined with transcranial direct stimulation (CCT plus) with a 2-week interval separating each session. Cognitive and language deficits were investigated using an ad-hoc psychometric battery at baseline (T0), post-TCT (T1), post-CCT (T2), and post-CCT plus (T3). The patient showed the best neuropsychological improvement, with regard to attention processes and language domain, after T3. The authors concluded that these findings showed that computerized cognitive training plus transcranial direct stimulation should be considered a promising tool in the treatment of post-stroke.

Svaerke and colleagues (2018) identified studies concerning the effects of computer-based CR (CBCR) on visuospatial neglect (VN) after stroke to summarize the current state of knowledge in this research field and make recommendations for future research. A total of 4 electronic databases were systematically searched. Authors of relevant studies were contacted to detect unpublished data or articles not found by searching databases. Data were extracted from included studies using predefined coding schemes and characteristics and results of individual studies were summarized qualitatively. Studies were included if at least 50% of the included patients had a stroke, if the studies explored the effects of CBCR as a primary intervention for rehabilitation of VN and if they included neuropsychological outcome measures for the presence of VN. A total of 7 studies were included; 6 of the 7 studies suggested positive effects of CBCR on VN after stroke. However, the study that did not find these effects was also the study with the strongest methodological quality. All included studies consisted of small samples, varied greatly in design and had various methodological limitations. The authors concluded that because the existing literature is very sparse and studies have various methodological limitations, it is currently not possible to either support or reject the effects of CBCR on VN after
stroke. They stated that future studies should aim to compare CBCR with active and passive control conditions and include larger samples in randomized and blinded designs.

Memory Deficits associated with Multiple Sclerosis and Stroke

In a Cochrane review, das Nair and colleagues (2016a) examined if individuals with MS who received memory rehabilitation showed (i) better outcomes in their memory functions compared to those given no treatment or receiving a placebo control; and (ii) better functional abilities, in terms of ADL, mood, and quality of life (QOL), than those who received no treatment or a placebo. They searched the Trials Specialized Register of the Cochrane Multiple Sclerosis and Rare Diseases of the CNS Group (June 2, 2015) and the following electronic databases: The NIHR Clinical Research Network Portfolio database (NIHR CRN) (from 2010 to June 2015), the Allied and Complementary Medicine Database (AMED) (2010 to June 2015), British Nursing Index (BNI) (2010 to June 2015), PsycINFO (2011 to June 2015), and CAB Abstracts (2010 to June 2015). Start dates for the electronic databases coincided with the last search for the previous review. They also hand-searched relevant journals and reference lists. These researchers selected RCTs or quasi-randomized trials of memory rehabilitation or CR for people with MS in which a memory rehabilitation treatment group was compared to a control group. Selection was conducted independently first and then confirmed through group discussion. They excluded studies that included participants whose memory deficits were the result of conditions other than MS unless they could identify a subgroup of participants with MS with separate results. Three review authors were involved in study selection, quality assessment, and data extraction. They contacted investigators of primary studies for further information where required, and conducted data analysis and synthesis in accordance with the Cochrane Handbook for Systematic
Reviews of Interventions (Higgins 2011). They performed a “best evidence” synthesis based on the methodological quality of the primary studies included. These investigators added 7 studies during this update, bringing the total to 15 studies, involving 989 participants. The interventions involved various memory retraining techniques, such as computerized programs and training on internal and external memory aids. Control groups varied in format from assessment-only groups, discussion and games, non-specific cognitive retraining, and attention or visuo-spatial training. The risk of bias of the included studies was generally low, but these investigators found 8 studies to have high risk of bias related to certain aspects of their methodology. They found significant effect of intervention on objective assessments of memory in both the immediate and long-term follow-ups: SMD 0.23 (95 % CI: 0.05 to 0.41) and SMD 0.26 (95 % CI: 0.03 to 0.49), respectively. They also found significant effect of intervention for QOL in the immediate follow-up (SMD 0.23 (95 % CI: 0.05 to 0.41)). These findings showed that the intervention group performed significantly better than the control group. The authors also found a significant difference for ADL in the long-term follow-up (SMD -0.33 (95 % CI: -0.63 to -0.03)), showing that the control groups had significantly less difficulty completing ADLs than the intervention groups. They found no significant effects, either immediate or long-term, on subjective reports of memory problems (SMD 0.04 (95 % CI: -0.19 to 0.27) and SMD 0.04 (95 % CI: -0.19 to 0.27)); on mood (SMD 0.02 (95 % CI: -0.16 to 0.20) and SMD -0.01 (95 % CI: -0.21 to 0.20)); and on immediate follow-up for ADL (SMD -0.13 (95 % CI: -0.60 to 0.33)) and in the long-term for QOL (SMD 0.16 (95 % CI: -0.03 to 0.36)). These researchers could not complete a sensitivity analysis of intention-to-treat in comparison with per-protocol analysis, due to insufficient information from the included papers. However, a sensitivity analysis of high-risk versus low-risk studies suggested that while quality of the trials did not affect most outcomes, differences were seen in the objective memory outcomes (both at immediate and long-term) and QOL (immediate) outcome, with studies with higher risk of bias.
inflating the overall effect size estimates for these outcomes, and the test of overall effect changing from being statistically significant to not significant when studies at high-risk of bias were excluded. This suggested that lower-quality studies may have positively influenced the outcomes. The authors concluded that there is some evidence to support the effectiveness of memory rehabilitation on memory function, as well as on QOL. However, the evidence is limited and does not extend to subjective reports of memory functioning or mood. Furthermore, the objective measures used were not ecologically valid measures, and thus potentially limit generalizability of these findings into daily life. They stated that further robust RCTs of high methodological quality and better quality of reporting, using ecologically valid outcome assessments, are still needed.

In a Cochrane review, das Nair and colleagues (2016b) examined if participants who have received CR for memory problems following a stroke have better outcomes than those given no treatment or a placebo control. The outcomes of interest were subjective and objective assessments of memory function, functional ability, mood, and quality of life. These researchers considered the immediate and long-term outcomes of memory rehabilitation. They used a comprehensive electronic search strategy to identify controlled studies indexed in the Cochrane Stroke Group Trials Register (last searched May 19, 2016) and in the Cochrane Central Register of Controlled Trials (CENTRAL2016, Issue 5), Medline (2005 to March 7, 2016), Embase 2005 to March 7, 2016), CINAHL (2005 to February 5, 2016), AMED (2005 to March 7, 2016), PsycINFO (2005 to March 7, 2016), and 9 other databases and registries. Start dates for the electronic databases coincided with the last search for the previous review. The authors also hand-searched reference lists of primary studies meeting the inclusion criteria and review articles to identify further eligible studies. They selected RCTs in which CR for memory problems was compared to a control condition. They included studies where more than 75 % of the
participants had experienced a stroke, or if separate data were available from those with stroke in mixed etiology studies.

Two review authors independently selected trials for inclusion, which was then confirmed through group discussion. These investigators assessed study risk of bias and extracted data. They contacted the investigators of primary studies for further information where required, and conducted data analysis and synthesis in accordance with the Cochrane Handbook for Systematic Reviews of Interventions. They performed a “best evidence” synthesis based on the risk of bias of the primary studies included. Where there were sufficient numbers of similar outcomes, the authors calculated and reported SMD using meta-analysis. They included 13 trials involving 514 participants. There was a significant effect of treatment on subjective reports of memory in the short-term (SMD 0.36, 95% CI: 0.08 to 0.64, \( p = 0.01 \), moderate quality of evidence), but not the long-term (SMD 0.31, 95% CI: -0.02 to 0.64, \( p = 0.06 \), low quality of evidence). The SMD for the subjective reports of memory had small-to-moderate effect sizes. The results did not show any significant effect of memory rehabilitation on performance in objective memory tests, mood, functional abilities, or quality of life. No information was available on adverse events (AEs). The authors concluded that participants who received CR for memory problems following a stroke reported benefits from the intervention on subjective measures of memory in the short-term (i.e., the first assessment point after the intervention, which was a minimum of 4 weeks). This effect was not, however, observed in the longer term (i.e., the second assessment point after the intervention, which was a minimum of 3 months). There was, therefore, limited evidence to support or refute the effectiveness of memory rehabilitation. The evidence was limited due to the poor quality of reporting in many studies, lack of consistency in the choice of outcome measures, and small sample sizes. These researchers stated that there is a need for more robust, well-designed, adequately powered, and better-reported trials of memory rehabilitation using common standardized outcome measures.
Govorover and colleagues (2018) updated the clinical recommendations for cognitive rehabilitation of people with MS, based on a systematic review of the literature from 2007 through 2016. Searches of Medline, PsycINFO, and CINAHL were conducted with a combination of the following terms: attention, awareness, cognition, cognitive, communication, executive, executive function, language, learning, memory, perception, problem solving, reasoning, rehabilitation, remediation, training, processing speed, and working memory. A total of 129 articles were identified and underwent initial screening; 59 articles were selected for inclusion after initial screening; and 19 studies were excluded after further detailed review; 40 studies were fully reviewed and evaluated. Articles were assigned to 1 of 6 categories: (i) attention, (ii) learning and memory, (iii) processing speed and working memory, (iv) executive functioning, (v) metacognition, or (vi) non-specified/combined cognitive domains. Articles were abstracted and levels of evidence were decided using specific criteria. The current review yielded 6 class I studies, 10 class II studies, and 24 class III studies. One intervention in the area of verbal learning and memory received support for a practice standard, 2 computer programs received support as practice guidelines (in the area of attention and multi-cognitive domains), and several studies provided support for 5 practice options in the domains of attention and learning and memory. The authors concluded that substantial progress has been made since the previous review regarding the identification of effective treatments for cognitive impairments in persons with MS. Moreover, they stated that much work remains to be done to optimize rehabilitation potential by applying the most methodologically rigorous research designs to provide class I evidence in support of a given treatment strategy.

Cognitive Rehabilitation in Parkinson's Disease

Alzahrani and Venneri (2018) noted that cognitive impairments are the most common non-motor symptoms in Parkinson's disease (PD). These symptoms have a negative impact on
patients' quality of life (QOL) and ADL. These researchers reviewed published articles that examined the efficacy of CR in PD. They reviewed the existing literature on the efficacy of CR in PD and highlighted the most effective form of intervention to prevent cognitive decline. This review also pointed out any limitations and provided directions for future research.

Published articles available in the Web of Science and PubMed databases up to November 2017 were reviewed for possible inclusion. These investigators identified 15 articles that examined the effects of CR in PD and met inclusion criteria. The main outcomes of this review indicated that, although previous studies used different CR methodologies, all studies reported cognitive improvements on at least 1 cognitive domain. Additionally, the most frequent cognitive domains showing improvements were executive functions and attention. The authors concluded that this review reported the outcomes of studies that examined the effectiveness of CR in PD. It also pointed out the drawbacks of the studies indicating the limited availability of follow-up data on the long-term effects of CR. The review also highlighted the fact that some of the studies did not include a PD group who did not undergo training. Thus, these researchers noted that there is a need for longitudinal studies to examine the potential long-term benefits of cognitive training. In addition, future investigations should determine if any disease characteristics such as disease stage, degree of cognitive impairment and/or the dominant side (right/left) or specific motor symptoms (rigidity/tremor) influence treatment efficacy.

Appendix

Documentation Requirements
Aetna requires that cognitive therapy and other rehabilitation be provided in accordance with an ongoing, written plan of care created by the therapist. The purpose of the written plan of care is to assist in determining medical necessity and should include the following:

The written plan of care should be sufficient to determine the medical necessity of treatment, including:

- The diagnosis along with the date of onset of the condition;
- A reasonable estimate of when the goals will be reached;
- Long-term and short-term goals that are specific, quantitative and objective;
- Cognitive therapy evaluation;
- The frequency and duration of treatment; and
- The specific techniques to be used in treatment.

The plan of care should be ongoing, (i.e., updated as the patient's condition changes), and treatment should demonstrate reasonable expectation of improvement. Cognitive therapy is considered medically necessary only if there is a reasonable expectation that cognitive therapy will achieve measurable improvement in the patient's condition in a reasonable and predictable period of time.

The therapist should re-evaluate the patient regularly (this is typically done on a monthly basis) and document the progress toward the goals of cognitive therapy in the patient's clinical record. The treatment goals and subsequent documentation of treatment results should specifically demonstrate that cognitive therapy services are contributing to such improvement.
### CPT Codes / HCPCS Codes / ICD-10 Codes

Information in the [brackets] below has been added for clarification purposes. Codes requiring a 7th character are represented by "+":

<table>
<thead>
<tr>
<th>Code</th>
<th>Code Description</th>
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<tbody>
<tr>
<td><strong>CPT codes covered if selection criteria are met:</strong></td>
<td></td>
</tr>
<tr>
<td>97129</td>
<td>Therapeutic interventions that focus on cognitive function (e.g., attention, memory, reasoning, executive function, problem solving, and/or pragmatic functioning) and compensatory strategies to manage the performance of an activity (e.g., managing time or schedules, initiating, organizing, and sequencing tasks), direct (one-on-one) patient contact; initial 15 minutes</td>
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<tr>
<td>+97130</td>
<td>each additional 15 minutes (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>97537</td>
<td>Community/work reintegration training (e.g., shopping, transportation, money management, avocational activities and/or work environment/modification analysis, work task analysis, use of assistive technology device/adaptive equipment), direct one-on-one contact by provider, each 15 minutes</td>
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<tr>
<td><strong>Other CPT codes related to the CPB:</strong></td>
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<tr>
<td>96119</td>
<td>Neuropsychological testing (e.g., Halstead-Reitan Neuropsychological Battery, Wechsler Memory Scales and Wisconsin Card Sorting Test), with qualified health care professional interpretation and report, administered by technician, per hour of technician time, face-to-face</td>
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<tr>
<td>Code</td>
<td>Code Description</td>
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<tr>
<td>96132 - 96133</td>
<td>Neuropsychological testing evaluation services by physician or other qualified health care professional, including integration of patient data, interpretation of standardized test results and clinical data, clinical decision making, treatment planning and report, and interactive feedback to the patient, family member(s) or caregiver(s), when performed</td>
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<tr>
<td>96146</td>
<td>Psychological or neuropsychological test administration, with single automated, standardized instrument via electronic platform, with automated result only</td>
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</table>

HCPCS codes not covered for indications listed in the CPB:

<table>
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<tr>
<td>S9056</td>
<td>Coma stimulation per diem</td>
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ICD-10 codes covered if selection criteria are met:

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<th>Code</th>
<th>Code Description</th>
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<tr>
<td>F07.81</td>
<td>Postconcussion syndrome</td>
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<tr>
<td>G92</td>
<td>Toxic encephalopathy</td>
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<tr>
<td>G93.1</td>
<td>Anoxic brain damage, not elsewhere classified</td>
</tr>
<tr>
<td>G93.40 - G93.49</td>
<td>Other and unspecified encephalopathy</td>
</tr>
<tr>
<td>I60.00 - I62.9</td>
<td>Nontraumatic subarachnoid, intracerebral hemorrhage and other and unspecified intracranial hemorrhage and cerebral infarction</td>
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<tr>
<td>I65.01 - I66.9</td>
<td>Occlusion and stenosis of precerebral and cerebral arteries, not resulting in cerebral infarction</td>
</tr>
<tr>
<td>I67.0 - I67.9</td>
<td>Cerebral atherosclerosis, other cerebrovascular disease, and hypertensive encephalopathy</td>
</tr>
<tr>
<td>Code</td>
<td>Code Description</td>
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<tr>
<td>I69.00</td>
<td>Sequelae of nontraumatic subarachnoid hemorrhage, nontraumatic intracerebral hemorrhage, intracranial hemorrhage, cerebral hemorrhage, intracranial hemorrhage, cerebral infarction, and other and unspecified cerebrovascular diseases</td>
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<td>I69.228</td>
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<td>I69.30</td>
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<td>I69.328</td>
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<td>S02.0xxS</td>
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<td>S02.119S</td>
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<td>S06.0x1+</td>
<td>Intracranial injury</td>
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<tr>
<td>S06.9x9+</td>
<td></td>
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<tr>
<td>B20</td>
<td>Human immunodeficiency virus [HIV] disease</td>
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<td>E51.2</td>
<td>Wernicke's encephalopathy</td>
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<td>Mental disorders</td>
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<td>F99</td>
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<td>Parkinson's disease</td>
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<td>G40.001</td>
<td>Epilepsy and recurrent seizures</td>
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<td>Code</td>
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<td>R40.3</td>
<td>Persistent vegetative state</td>
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<tr>
<td>R41.840 -</td>
<td>Other symptoms and signs involving cognitive functions and awareness</td>
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<td>R41.89</td>
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<tr>
<td>R62.50,</td>
<td>Other and unspecified lack of expected normal physiological development in childhood</td>
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<td>R62.59</td>
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<tr>
<td>S06.0X0+ -</td>
<td>Concussion without loss of consciousness [mild traumatic brain injury (including sports-related concussion)]</td>
</tr>
</tbody>
</table>

The above policy is based on the following references:


34. Granholm E, McQuaid JR, McClure FS, et al. A randomized, controlled trial of cognitive behavioral...


controlled trial. Arch Gen Psychiatry. 2010;67(7):674-682.


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AETNA BETTER HEALTH® OF PENNSYLVANIA

Amendment to
Aetna Clinical Policy Bulletin Number: 0214 Cognitive Rehabilitation

There are no amendments for Medicaid.

www.aetnabetterhealth.com/pennsylvania

updated 04/17/2020