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REVIEW

Cognitive rehabilitation in epilepsy: An evidence-based review

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Summary
Aim of the study: To review the modalities of cognitive rehabilitation (CR), outcome endpoints, and the levels of evidence of efficacy of different interventions.
Methods: 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).
Results: Eighteen papers were classified into two reviews, four papers dealing with the principles and efficacy of CR in epilepsy, a methodological paper, a single-case report, a multiple-case report, and nine 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.
Conclusions: CR may be a useful tool to treat cognitive impairment in patients with epilepsy. However, the modalities of treatment and outcome endpoints are important concerns of clinical care and research. Controlled studies are needed to determine the efficacy of rehabilitation in well-defined groups of patients with epilepsy.

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Introduction

What is cognitive rehabilitation?

Cognitive rehabilitation (CR) was defined as ''Any intervention strategy or technique which intends to enable clients or patients, and their families, to live with, manage, by-pass, reduce or come to terms with cognitive deficits precipitated by injury to the brain'' (Wilson, 1989). Therefore, CR is not a restoration of cognitive functions but a complex of activities aimed to compensate impaired functions by incorporating individual and context-related demands. The nature and severity of a cognitive handicap does not only derive from the type and extent of brain damage but also from a combination of positive and negative affects, personality, behavioral changes, motivation, compliance, family support, and physical environment. Recent literature (Choi and Twamley, 2013; Ueda et al., 2013) maintains that CR should respond to three main needs: a compensation of dysfunction, coping to psychosocial problems, and a limitation of drug or surgery side effects. Moreover, the goals of CR should be tailor-made, small, and concrete and its modality should reflect a patient's perspectives and expectations (e.g., return to work, schooling or homework, participation in leisure and social activities), which may be a source of strength or weakness. Specific cognitive gains and a generalization of improvement to other cognitive functions are other important goals of CR.

The benefits of CR have been described in patients with traumatic brain injury (TBI) (Sohlberg et al., 2000), stroke (Cicerone et al., 2000, 2011; Poulin et al., 2012) or Alzheimer's disease (Spector et al., 2003; Sitzer et al., 2006; Orrell et al., 2014). The positive effects have been assessed using the levels of evidence adopted in pharmacological trials which are divided into class I (well-designed prospective randomized controlled trials), class Ia (almost-randomized trials), class II (prospective non-randomized controlled trials), and class III (clinical series) with the possibility to graduate the class II and III studies by adding positive or negative signs (e.g., class II++) (SPREAD, 2007; Cicerone et al., 2011). Level A evidence is based directly on class I studies, level B on class II studies, and level C on class III studies. A recent review including 112 studies from 2003 to 2008 rated 14 studies as class I, five as class Ia, 11 as class II, and 82 as class III (Cicerone et al., 2011); the authors concluded that there was a sufficient evidence to support standard interventions for attention, memory, social communication skills, and executive functions and a comprehensive-holistic CR after TBI. Visuospatial rehabilitation after right hemisphere stroke and selective interventions for aphasia and apraxia after left hemisphere stroke were also considered useful by a consensus group (Làdavas et al., 2011) and guidelines of the European Federation of Neurological Society (Cappa et al., 2005). Particular recommendations regarded CR for selective neuropsychological deficits in the post-acute stage after stroke or TBI, describing an evidence level A, B or C.

Why cognitive rehabilitation in epilepsy?

Patients with epilepsy (PWE) may develop cognitive disturbances in relation to cortical dysfunctions caused by the repetition and propagation of epileptic discharges, underlying brain pathology, age of seizure onset, epilepsy duration, seizure frequency, anti-epileptic drugs (AEDs) or surgery (Dodrill and Matthews, 1992; Jones-Gotman et al., 1993; Devinsky, 1995; Giovagnoli and Avanzini, 1999; Rausch, 1991). Mental slowing, anomia, decreased verbal fluency, and executive, theory of mind, attention, and memory disturbances are frequently observed in patients with drug-resistant temporal (TLE) or frontal lobe epilepsy (FLE), (Bell and Giovagnoli, 2007; Hermann et al., 2010; Jones-Gotman et al., 2010; Klove and Matthews, 1966; Giovagnoli, 2014; Giovagnoli et al., 1996, 2011; Prevey et al., 1998; Rausch, 1991). The prevalence of memory impairment in patients with drug-resistant epilepsy is estimated around 20—50% (Halgren et al., 1991). Left TLE bears a significant risk of memory deficits compared with right TLE (Hendriks et al., 2004). Moreover, patients with long-lasting TLE may show a chronic cognitive deterioration (Hermann et al., 2008, 2010). Although perceived cognitive failures inconstantly correspond to objective deficits (Giovagnoli et al., 1997; Hendriks et al., 2002; Ponds and Hendriks, 2006; Helmstaedter and Elger, 2008; Giovagnoli, 2013), both self-rated and neuropsychological impairments may affect quality of life (QoL) (Perrine et al., 1995; Giovagnoli et al., 2014).

Different non-pharmacological interventions have been used to alleviate the interictal disturbances associated with epilepsy. Most studies have focused on psychosocial failures (Gramstad et al., 2001; Suurmeijer et al., 2001; Tedman et al., 1995), suggesting that a generic psychological support