

## Introduction to the *JINS* Special Issue on Rehabilitation

Jennie Ponsford<sup>1,2</sup>, Angelle Sander<sup>3,4</sup> and Joke Spikman<sup>5</sup>

<sup>1</sup>Turner Institute of Brain and Mental Health, School of Psychological Sciences, Monash University, Melbourne, Australia

<sup>2</sup>Monash Epworth Rehabilitation Research Centre, Epworth Healthcare, Melbourne, Australia

<sup>3</sup>Baylor College of Medicine, Houston, TX, USA

<sup>4</sup>TIRR Memorial Hermann, Houston, TX, USA

<sup>5</sup>University Medical Center Groningen (UMCG) and University of Groningen (RUG), Groningen, The Netherlands

Cognitive and behavioral impairments arguably represent the greatest impediment to independence and participation in work, study, social, and leisure activities for individuals with brain injury. Despite this, research on remediation of cognitive, behavioral, and emotional consequences still lags far behind that on physical functions in rehabilitation of individuals with neurological dysfunction. Nevertheless, in the last few decades, there has been exponential growth both in practice and research on the rehabilitation of these disorders.

There are many definitions, but Wilson (1989, p. 117) defined cognitive rehabilitation 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.” We prefer the broader term neuropsychological rehabilitation, which, according to Shany-Ur et al. in this issue, may be conceived as interventions aimed at mitigating or compensating for cognitive, behavioral, and psychosocial deficits, and enhancing independence and integration into employment and society.

Creating the science to underpin these practices represents a significant challenge. Guidelines have been developed for the treatment of specific acquired cognitive impairments in domains including attention, language, memory, visuo-spatial, and executive functions, as a result of traumatic brain injury or stroke (Bayley et al., 2014; Cicerone, 2000, 2005, 2011; Ponsford et al., 2014; Tate et al., 2014; Togher et al., 2014; Velikonja et al., 2014). Although there is evidence in support of interventions across each of these domains of impairment, these guidelines have identified very few rigorous controlled trials and, as a consequence, guidelines for clinical practice are limited. Most outcomes have been assessed on neuropsychological measures, with limited assessment of generalization to meaningful everyday activities. This criticism is equally applicable to cognitive rehabilitation efforts in individuals with psychiatric disorders,

specifically schizophrenia (Bryce, Sloan, Lee, Ponsford, & Rossell, 2016). There has also been limited evaluation of psychotherapeutic interventions in these groups.

A survey of international practice in cognitive rehabilitation (Nowell, Downing, Bragge, & Ponsford, in press) recently reported that clinicians don’t just want to know whether an intervention works, but how it works and in what contexts. Clearly, brain injuries are complex and not everyone responds in the same way. There is a need to identify the factors that impact an individual’s capacity to respond to treatment. There has been limited comparison of modes of therapy delivery – for example, individual *versus* group; in person or *via* telehealth. There is growing use of exciting new technologies in a rehabilitation context, but limited evaluation of the functional impacts of these.

This *JINS* Special Edition on Rehabilitation takes some steps toward addressing many of these issues. It includes papers representing the application of specific rehabilitation treatments to impairments in a broad range of domains, including language and communication, memory, attention, and challenging behavior, as well as depression, anxiety, and posttraumatic stress disorder (PTSD). These interventions have been applied across diverse populations, including groups with stroke, traumatic brain injury, mild cognitive impairment, and schizophrenia. The papers in this issue can be categorised into four thematic areas: application of technology to cognitive rehabilitation; comparison of modes of treatment delivery; factors impacting response to treatment; and maintenance of treatment gains.

### APPLICATION OF TECHNOLOGY TO COGNITIVE REHABILITATION

There is an encouraging increase in the application of technology in delivering or understanding the mechanisms underpinning gains in cognitive rehabilitation. This has been evaluated across several papers in this issue. The paper by Guillouet and colleagues investigates, in a randomized controlled trial, whether adding Transcranial Direct Current Stimulation (tDCS) to speech-language therapy yields extra

Correspondence and reprint requests to: J. Ponsford, Turner Institute of Brain and Metal Health, School of Psychological Sciences, Monash University, Wellington Road, Clayton, 3800, VIC, Australia. Email: [Jennie.Ponsford@monash.edu](mailto:Jennie.Ponsford@monash.edu)

gains. The application of bi-hemispheric stimulation differed from previous studies applying tDCS with speech therapy, and this was not associated with greater therapeutic benefit in the current study. Importantly, outcomes were assessed on a more functionally meaningful communication activity of spontaneous speech, rather than the less ecologically valid measure of naming, which has been the most frequently used outcome measure in previous studies of this nature.

The paper by Casteluccio and colleagues investigates whether EEG measures of brain activation may indicate which individuals with schizophrenia are more likely to profit from cognitive rehabilitation treatment, alongside other factors such as antipsychotic medication dosing. Findings suggest that biologically-based features could interact with learning to either facilitate, or rate-limit, cognitive gains from training. Both of these studies are aimed at more directly influencing or measuring brain activation than by means of cognitive tasks and tests alone.

The critical review of neurofeedback therapy interventions for cognitive rehabilitation applied across a broad range of conditions by Ali and colleagues provides a much needed critical focus on the use of technologies which do not have a clear theoretical basis. Due to reporting bias and suboptimal study design, there appears to be insufficient evidence to comment on the efficacy of neurofeedback therapies within a brain injury rehabilitation context at this time. There is little clarity regarding mechanisms of action or guidance for how to begin establishing one. This review highlights the need for increased theoretical and methodological rigor if meaningful advancements are to be made in understanding and evaluating neurofeedback therapy applications to brain injury populations.

## COMPARISON OF MODES OF TREATMENT DELIVERY

This edition also highlights issues relating to modes of delivery of rehabilitative interventions. With a growing realization that a significant proportion of the brain injury population reside in regional or remote areas, providing access to therapies potentially represents an important step in broadening service delivery.

The qualitative study by Ownsworth and colleagues explores the perspectives of rehabilitation coordinators, individuals with ABI and family caregivers on the usability and acceptability of videoconferencing in community-based rehabilitation. Despite the growth in availability of such technologies and some positive views of their potential benefits, it appears that there may be limited uptake of them.

On the other hand, Lawson and colleagues demonstrated that memory strategy training could be delivered to stroke patients with memory problems as effectively by means of videoconferencing as it can in person. Participants showed improvement on the primary outcome measure of functional goal attainment, as well as on everyday memory and prospective memory measures. This study also supported the need for booster sessions to enhance gains from such therapies.

Another important consideration in modes of delivery is the relative effectiveness of treatment delivered in a group setting versus individually. Group treatment presents a cost-effective service delivery model. In the context of language therapy, it provides a more naturalistic context for therapy delivery, allowing for functional communication. The study by Mason and colleagues investigates the effects of group treatment on the communication skills of people with aphasia with a focus on word retrieval. This study, along with that of Guillouet and colleagues, highlights the challenges in assessing meaningful changes in connected speech in everyday situations in an objective fashion.

Most of the papers in this volume have used outcome measures that relate to everyday function more closely than the purely cognitive measures that have been used in so many studies in the past. However, it has become apparent that the more one moves away from measures that resemble the tasks being trained (so-called near transfer tasks), toward tasks that are more functionally meaningful in everyday life (far transfer), the more challenging it becomes to demonstrate effectiveness of interventions. Clearly, there are many challenges yet to be overcome in developing sensitive measurement tools that are also functionally relevant.

## FACTORS IMPACTING RESPONSE TO TREATMENT

Identification of the factors that influence response to an intervention represents another important aspect of rehabilitation research. Most commonly, the focus is on factors relating to the individual with brain injury who is undertaking the therapy or the impacts of the injury. An example of this comes from the work of Lin and colleagues, who investigated differences between amnesic and non-amnesic mild cognitive impairment (MCI) subtypes in memory strategy use in daily life, and how factors associated with cognition, general health, and psychological wellbeing might relate to strategy use. They found that increased reliance-type strategy use (relying on others for reminders) was significantly related to poorer verbal learning and memory, whereas better working memory was significantly associated with less reliance on others and more self-initiated internal or external compensatory strategy use. Such findings may inform clinician choice of strategies to support memory difficulties in people with MCI.

There is also a need to consider the potential influence of therapeutic process factors on response to therapy. This is particularly pertinent in the context of psychological therapies. The study by Zelencich and colleagues represents one of the first efforts at secondary analysis of therapy tapes from clients with TBI and clinically significant anxiety and/or depression who had received cognitive behavioral therapy (CBT) adapted for brain injury. The study aimed to identify the demographic, injury-related, and CBT process variables (working alliance, client engagement with homework, and therapist homework competence in using homework) associated with anxiety and depression symptom reduction. In addition to older client age

and longer post-TBI recovery period and better executive functioning, higher levels of client homework engagement and beliefs, as well as higher levels of therapist competence in reviewing homework, were associated with greater improvement in anxiety and/or depression symptoms.

The study by Jurick and colleagues examines the influence of failed performance validity testing on engagement in psychological therapy for PTSD, showing that those who fail performance validity tests can still make meaningful gains in therapy, albeit slower than those who show valid test performance, and their performance validity test performances also improve.

Another key aspect of cognitive rehabilitation requiring greater investigation is the implementation of therapies following cessation of treatment and factors influencing this. Treatment enactment refers to patients' application of skills and concepts from treatment sessions into everyday life situations. Hart and colleagues examined treatment enactment in a two-arm, multi-center trial comparing two psychoeducational treatments addressing anger problems in persons with chronic moderate to severe traumatic brain injury. The study also identified factors associated with better treatment enactment, including higher baseline executive function and IQ.

## MAINTENANCE OF TREATMENT GAINS

Finally, we need to consider the long-term impacts of integrated, multifaceted community-based rehabilitation programs. Unfortunately, there are few controlled evaluative studies of such programs (Cullen Chundamala, Bayley, Jutai & Eerabi Group, 2007; Turner-Stokes, Pick, Nair, Disler, & Wade, 2015). The study by Shany-Ur and colleagues provides comparative data on functional outcomes in terms of self-reported employment, community integration, perceived quality of life, and mood in individuals with ABI over 3 years following treatment in three programs in Israel: individual neuropsychological rehabilitation, vocational focused neuropsychological rehabilitation, and comprehensive-holistic neuropsychological rehabilitation. Although not controlled, this study suggests that employment status and stability, community integration, and perceived quality of life may continue to improve after program completion, providing some support for provision of such programs.

This special issue thus reflects some important new directions in research focused on the rehabilitation of cognitive, behavioral, and psychiatric sequelae of brain disorders, particularly in taking steps toward identifying what works for whom and the mechanisms and therapy process factors that may underpin gains and their maintenance. There are, however, many remaining challenges in this field. Study samples remain small and heterogeneous. Whilst the move away from reliance on cognitive tests as outcome measures is promising, there is still considerable variability in outcome measures across studies and a need for greater exploration of functional measures that are sensitive to change in response to therapy

and more consistent use of such measures. It is essential to take a critical approach to the application of technologies, being clear about the theoretical and biological bases for the application of such technologies. Identifying the effective elements of comprehensive, multifaceted rehabilitative programs could enhance the efficiency and effectiveness of such interventions. Meeting these challenges will be essential to improve the lives of individuals with brain injury.

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