



Rehabilitation Research Review™

Making Education Easy

Issue 28 – 2013

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Welcome to the twenty-eighth issue of Rehabilitation Research Review.

This month's selection for Rehabilitation Research Review comes from work presented in November 2013 at the American Congress of Rehabilitation Medicine in Orlando, Florida. The conference was held in Disney World and had I been there with a few small children rather than over 1000 rehab researchers and clinicians, maybe I would have enjoyed the environs more (I was a bit bah humbug about it truth be told – even tho it's nearly Christmas). However – thankfully – the conference was great with lots of good conversations and lots of thought-provoking research. You can browse abstracts at: <http://www.archives-pmr.org/content/confabs13>

I hope you enjoy this issue and wish you and your whanau/family/friends a satisfying close to 2013, and a very happy New Year.

Kind regards,

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The intersection of technology and neurorehabilitation

Presenters: Michael Boninger, Michael Goldfarb, Frans C.T. van der Helm

Summary: These internationally renowned researchers described advances in technology related to neurorehabilitation. The session discussed advances in brain computer interfaces, advances in rehabilitation robotics, and the role of multichannel EEG monitoring in assessing neuroplasticity.

Dr Michael Boninger spoke about advances in brain computer interfaces and rehabilitation robotics. Brain computer interface (BCI) technology holds great promise for providing control to prosthetic/robotic limbs and function electrical stimulation systems. The ability to directly record brain signal also means that BCI can potentially be used in the rehabilitation of significant acquired brain injury, such as stroke. Dr Boninger presented results from neurorehabilitative investigations using two different technologies, electrocorticography and single unit micro electrode, which both rapidly achieve a high degree of freedom control.

Dr Michael Goldfarb discussed emerging exoskeleton technology; how it performs as an assistive device for non-ambulatory people; and outcomes from the use of the exoskeleton as a therapeutic intervention for gait retraining following stroke.

Dr van der Helm's presentation focused on the crossroads of technology and neurorehabilitation, and future technology applications, including advances in brain computer interfaces, rehabilitation robotics and the role of multichannel EEG monitoring in assessing neuroplasticity.

Comment: I don't know about you but I have both high hopes for technology in rehabilitation (i.e. in its potential) and a frustration (in its level of delivery to date for many people). I enjoyed and was challenged by Boninger's presentation addressing some of the limits to technology in relation to human movement. Their work is improving how devices operate (in degrees of freedom) to mimic and enhance human movement. They have taken moving in two degrees of freedom (e.g. up and down, side to side) to 10 degrees. Exciting stuff. Also exciting was Indego (an exoskeleton) that was in action much of the conference with emerging evidence of its impact presented by Michael Goldfarb. There are increasing numbers of these devices (including NZ's own Rex Bionics) and whilst currently they are pretty costly and therefore out of the reach of many people, with more players in the market, and stronger collaborations between engineers, researchers and users – devices should improve, and costs should (we hope) come down (maybe).

Reference: *Opening Plenary.*

Merry Christmas and a healthy, happy 2014!

FROM THE TEAM AT
RESEARCH REVIEW



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Rehabilitation Research Review

Why we need more case studies of cognitive rehabilitation

Presenters: Keith D. Cicerone et al.

Summary: This symposium highlighted the important role of single-subject intervention studies in rehabilitation research. The presenters argued that single-subject designs contribute to evidence-based practice and assist with translating research into clinical practice. They illustrated the relevance of single-subject intervention research with examples from PsychBite and ACRM systematic reviews of cognitive rehabilitation. They described how the Model for Assessing Treatment Effects (MATE) develops methodological rigour for single-subject intervention trials and enables researchers to evaluate the effectiveness of the intervention for cognitive impairment. The presentation covered aspects of selection of interventions based on patient characteristics, variations in single-subject design, use of repeated measures, and various levels of outcome assessment.

Comment: We would all like better evidence for what we do in rehabilitation. But – clinical trials large enough to produce that evidence are difficult (whether you be a researcher, a clinician or a participant – trials are demanding!). This presentation brought some of the leading proponents of single-case studies (rigorous n=1 designs using individual cases or a series of them) producing strong arguments about the place of these designs in advancing knowledge. The problem? Well – I think funders and purchasers (and many of us too!) are more persuaded by big numbers. But n=1 designs are increasingly seen as powerful for real-world evidence – and I think they are a great option for clinicians who want to do research, and for countries with small populations – ah – NZ.

Reference: *Concurrent Sessions. #110.*

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Techniques to improve carry-over of clinical improvements to daily activities

Presenters: Edward Taub et al.

Summary: This symposium included three multidisciplinary presentations that discussed how several behavioural and problem-solving techniques, combined with evidence-based approaches to care, facilitate better carry-over of clinical gains from evidence-based treatments and lead to substantial improvements in patient function and engagement within the home/community setting amongst individuals who have experienced neurological injury.

Comment: Constraint-induced movement therapy has its fans and its detractors. But whichever side you are on – I suspect you will have heard of Edward Taub (its developer). Professor Taub and colleagues (Beth Skidmore's presentation was excellent so keep an eye out for her work as well) argued that what seems to be the key ingredient in CIMT (and perhaps any therapy) is using specific strategies that facilitate carry-over. They describe a 'transfer package' they use with CIMT (combining a behavioural 'contract' for practice along with problem-solving around barriers to practice and weekly phone contact) and found that it tripled the amount of daily activity participants undertook compared to CIMT without the package. That is quite an impact and it may be that such a focus is fundamental to enhancing outcome – 'essential' rather than 'desirable'.

Reference: *Concurrent Sessions. #32.*

Symposium in honor of Robert C. Wagenaar, PhD: 1957–2013

Presenters: Douglas I. Katz, Gert Kwakkel, Alan Jette, Daniel K. White

Summary: This symposium was dedicated to the memory of Dr Wagenaar, who contributed enormously to the rehabilitation community. In particular, he is remembered for his work in dynamical systems theory and his investigations into gait patterns of patients with stroke and Parkinson's disease, leading to rehabilitation interventions that modify abnormal movement patterns. He mentored a number of graduate students, post-doctoral students, and junior colleagues, many of whom have become leaders in their own areas of work. Dr Wagenaar served as co-chair of the ACRM Program Committee from 2010 until his death in February 2013 and his efforts helped to dramatically improve the quality of scientific presentations at the annual meeting.

Comment: I mention this presentation for a couple of reasons. Firstly, the ACRM conference has a real focus on 'remembering' key contributors to Rehabilitation over the years. Whilst 'honouring' people is maybe an American kind of thing, it made me think of how we do or don't acknowledge (and remember) some of the real contributors to rehabilitation in NZ. I am still thinking about that.... Secondly – the presenters reminded me of the benefit of stepping out of your comfort zone and into areas you wouldn't always consider (the beauty of conferences I guess). Along with learning (something) about dynamical systems theory – I was reminded of Wagenaar's love of patterns, theory and learning and that this perspective has huge application in most fields. Alan Jette presented some very interesting data from their recent RCT showing (in contrast to previous findings) that a home-based programme of activity (over a longer time than traditional rehab) resulted in better outcomes. His conclusion – traditional hip fracture rehabilitation finishes too soon.

Reference: *Plenary Session.*

ACC 2013 Audiology Survey

ACC regularly surveys its audiology clients to measure satisfaction with this service. The results of the 2013 survey, conducted by Research New Zealand have just been released.

1298 people, for whom ACC had approved funding towards the cost of purchasing hearing aids replied to the mailed survey.

See page 3 of this review for the results.



Best practices in cross-border collaboration in rehabilitation research

Presenters: Koen Putman et al.

Summary: Dr Putman talked about the need and opportunity for cross-border collaborations in rehabilitation research; such collaborative efforts strengthen the validity and value of the science, avoid duplication of research, achieve economies of scale, and lower the cost of acquiring new knowledge. Dr Putman emphasised timeliness and the ways in which these collaborative efforts differ from those undertaken in the past. Panelists shared their experiences with international collaboration, including lessons learnt, advantages, disadvantages, opportunities, barriers, challenges, and best practice suggestions. The panellists encouraged open discussion to develop general recommendations for cross-border collaboration and also specific recommendations for ACRM and the International Networking Group.

Comment: Most governments (including NZ) are very keen on seeing more international collaboration in research and learning. This symposium highlighted some key things to get right if collaboration is to be successful. Like much of life – solid relationships (with face-to-face connection) and good communication are crucial, and yet they don't just happen unless you put significant effort in. But there were also key messages about how difficult it can be to get common or uniform data sets because of the lack of conceptual equivalence across cultures about even basic things like socioeconomic status or – yes – ethnicity. One of the incredible things for me was that although I knew our investment in research was lower than many other countries – I hadn't quite realised the differential. The NZ Government investment for 2012–2016 includes \$326 million in new funding for research, science and innovation. But – Horizon 2020 (an EU initiative also covering a 4-year period) is adding in a cool €70 billion. It's not a direct comparison of course (one country vs the EU) but if you want to know more (about NZ's own funding environment or international) check out <http://www.access4.eu/>.

Reference: *Concurrent Sessions.*

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Investigating the impact of depression on self-reported executive function in individuals with traumatic brain injury

Authors: Pey-Shan Wen et al.

Summary: These researchers analysed data from 3 studies involving 90 individuals with severe traumatic brain injury (sTBI) and 50 veterans with mild TBI (mTBI), in this investigation into executive function (EF) in such individuals. The researchers also sought to determine the impact of depression on EF in individuals with mTBI. This analysis used Rasch analysis person maps to present the distribution of a person's ability on two indexes of EF: Behavior Regulation Index (BRI) and Metacognition Index (MI). Only the individuals with mTBI were administered the Beck Depression Inventory (BDI). Person maps revealed that the majority of individuals with mTBI were located at the lower end of the map on both BRI and MI, indicating less EF ability. The mTBI cohort performed significantly worse than the sTBI cohort. Notably, in the mTBI cohort, BRI and MI scores were significantly worse among depressed veterans versus the non-depressed veterans.

Comment: One of the great things about this conference was that in addition to high quality and stimulating presentations (not all of course – there are some I found tedious and a tad dull!), there were hundreds of posters. This one extends other data emerging about mTBI that is somewhat contrary to expectation and indicating that the 'mild' classification does not indicate (necessarily) the consequences. More to be done in this space for sure if we are to help improve recovery pathways and outcome.

Reference: *Arch Phys Med Rehab 2013;94(10):e40. Poster 84.*

Women living with ABI: Is technology really the answer?

Presenters: Halina Lin Haag et al.

Summary: This poster described data arising from a qualitative, thematic analysis of a focus group involving survivors, formal and informal caregivers of 16 women with acquired brain injury (ABI) from across Canada. This preliminary study sought to better understand the experiences of women with ABI to better understand their general and gender-specific health and well-being concerns. The themes that emerged from the analysis indicate that women survivors with ABI face significant challenges in community re-integration. A key theme was the conflicting value in technology-based supports for addressing functional cognitive deficits. The participants reported bio/psycho/social challenges, which were grouped under the following three inter-related headings:

1. Learning and managing new technologies with impaired mental and physical stamina.
2. Repeated functional failure leads to internalised shame and interferes with the construction of a healthy ABI identity.
3. Technology for supporting women. Can we get past gender norms and think beyond smart kitchens and automated grocery lists?

Comment: This poster included some fabulous quotes demonstrating the apparently basic things that get in the way of using technology, including one woman's observation that 'one of the hardest things about the memory aid is remembering to use it' or another saying 'my husband bought it [a smartphone] for me for a gift – I used it for a bit and then threw it back at him. They're wonderful – they're great but when you can't remember every time you pick it up how to get past turning it on... well.' Whilst we are clearly getting good at inventing clever things, we have to remember that it's people, with impairment, that have to use them.

Reference: *Poster Presentations of Scientific Papers. Poster 117.*

ACC 2013 Audiology Survey

The survey found that:

- Fewer people were satisfied with their new hearing aids when compared with last year's survey (77% in 2013 compared with 82% in 2012)
- Most people who purchased hearing aids were satisfied with the service they received from their audiologist (84%)
- Cost was a big issue: people who had gone ahead with getting an aid were more likely to have been offered a range of aids at various prices by their audiologist

The results of this survey offer some advice for people in the market for a hearing aid:

- Ask your Audiologist for a range of aids at different prices to find the one that is right for you
- Consider getting quotes from more than one audiologist to make sure you get what you need

A full copy of the Audiology Survey report is available at http://www.acc.co.nz/PRD_EXT_CSMP/groups/public/documents/reports_results/wpc119117.pdf



Factors associated with community participation among individuals who are homeless and with disabilities

Presenter: Feng-Hang Chang

Summary: This poster detailed results of an investigation into factors associated with community participation among people who are homeless and with physical, cognitive, or psychiatric disabilities. The study recruited 110 community-dwelling adults from 5 homeless housing placement and housing search programmes in US metropolitan areas. They completed the following surveys: the Survey of Income and Program Participation (SIPP), the Client's Assessment of Strengths, Interests, and Goals (CASIG), the Allen Cognitive Levels Screen (ACLS), and the Impact of Event Scale Revised (IES-R). Community participation was measured by the Community Participation Scale (CPS), which assesses three domains of community participation: work, social and leisure, and healthcare use. In multivariate analysis, overall community participation was predicted by housing status, cognitive ability, and relationship status. These factors also predicted two subdomains of community participation: work and social and leisure participation. Healthcare use was not associated with any variable.

Comment: Homelessness is a big issue and this study highlights that disability is a big issue for homeless people. Along with identifying that housing status was a main predictor of community participation, this study (US-based so surely we wouldn't find anything similar) found that the homeless disabled people had better community participation than those housed through housing programmes. Now that is a challenging thing to think about.

Reference: *Arch Phys Med Rehab* 2013;94(10):e58. Poster 131.

Exploring outcomes of rehabilitation in structured day programs

Presenters: Sonya Kim et al.

Summary: This group of researchers analysed data from a community-based structured day programme involving 13 individuals aged 23–63 years with severe, chronic brain injury who had been enrolled on the programme for a median 5.92 years. This investigation sought to determine whether this model of long-term care affects self-awareness and quality of life outcomes in these individuals. They participated in the following neuropsychological tests: Wisconsin Card Sorting Test (WCST), Category Test (CT), Seashore Rhythm Test (SRT), Problem Solving Inventory (PSI), Satisfaction With Life Scale (SWLS), and Rosenberg Self-Esteem Scale (RSES). Self-reports were associated significantly and moderately/strongly with neuropsychological tests, indicating moderate-to-high self-awareness of cognitive function. Individuals who rated themselves as higher functioning in PSI performed better on objective neuropsychological tests (PSI/CT: $r=0.637$, $p=0.019$; PSI/WCST: $r=0.733$, $p=0.004$; PSI/SRT: $r=-0.549$, $p=0.052$), while those who had greater life-satisfaction and self-esteem also performed better on objective tests (SWLS/CT: $r=-0.665$, $p=0.013$; RSES/CT: $r=-.589$, $p=0.034$; RSES/WCST: $r=0.718$, $p=0.006$; SWLS/SRT: $r=-0.694$, $p=0.008$).

Comment: This was a small study and therefore one should treat the results with great caution, but – I think it is one of a number of pieces of work challenging the perception some have that self-report measures are 'soft' and less valuable than 'observed' or expert-derived assessments. Room for both I suspect but what seems crucial is to know those measures (and variables) for which patients/clients (or groups of patients/clients) are equally or better equipped to measure or assess than experts. Hmm... perhaps a handy resource of these is needed – and the good news – there are some that are worth a look, e.g. <http://www.nihpromis.org/> along with other sites highlighting the care that needs to be taken, including <http://www.uniteforsight.org/global-health-university/self-reporting>.

Reference: *Arch Phys Med Rehab* 2013;94(10):e45. Poster 98.

Disclaimer: This publication is not intended as a replacement for regular medical education but to assist in the process. The reviews are a summarised interpretation of the published study and reflect the opinion of the writer rather than those of the research group or scientific journal. It is suggested readers review the full trial data before forming a final conclusion on its merits.

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Identifying system level rehabilitation indicators

Presenters: Cheryl Cott et al.

Summary: These researchers conducted a search of the literature to identify potential system-level indicators that are sensitive to rehabilitation interventions. They included 52 abstracts that met the inclusion criteria: published since 1999; in English; Conditions and Populations commonly seen in adult rehabilitation. Indicators reported in each study were categorised according to Balanced Scorecard quadrants – Clinical Utilisation and Outcomes, System Integration and Change, Client Perspectives, and Financial Indicators and according to Donabedian's categories of Structures, Processes and Outcomes. The analyses revealed that most rehabilitation indicators focus on inpatient care settings and are directed at clinical utilisation and outcomes at the levels of impairment and activity and are also concerned with organisational structures and processes (admission criteria for rehabilitation, models of care delivery).

Comment: We all seem to agree that the environment, the context and the system of care have a major impact on how we work, the processes our patients/clients engage with and the outcomes that might be attained. However, Cott et al. highlight that despite our rhetoric that things like access, equity and transitions in care matter, our measures still focus on the individual level rather than the system level. Clearly, individual measures have a place but – these authors make a good case that system level measures also matter. Maybe it's time for a resource for these too!

Reference: *Arch Phys Med Rehab* 2013;94(10):e54. Poster 122.

Rehabilitation Research Review

Independent commentary by Professor Kath McPherson.



Kath McPherson is Professor of Rehabilitation (Laura Fergusson Chair) at the Health and Rehabilitation Research Centre, AUT University in Auckland. She completed a PhD at the University of Edinburgh exploring how individuals and their families recover and adapt after moderate to severe brain injury. From 1997-2001, Kath worked at the Rehabilitation Teaching and Research Unit at University of Otago - Wellington, then taking up a post as Reader in Rehabilitation at the University of Southampton. She returned to New Zealand (AUT) in 2004 building a research, teaching and consultancy programme focused on improving interventions and outcomes for people experiencing with disability. Current projects are funded by the Accident Compensation Corporation, the Health Research Council, the UK-NHS and a number of charitable organisations.