

Synapse

OFFICIAL JOURNAL OF THE ASSOCIATION OF CHARTERED PHYSIOTHERAPISTS IN NEUROLOGY

INSIDE

An action plan for production of the next generation of movement rehabilitation technologies

Abstracts from the 2018 ACPIN International Conference in Manchester

Editorial



Dear members,

A warm welcome to your new look Synapse.

ACPIN's Board continually strives to develop and improve the quality of its peer-reviewed journal. The Board's aim is to separate news related items from peerreviewed publications and in this attempt I present the first peer-reviewed journal to our members.

We aim to produce two peer-reviewed journals a year, published in June and December. This year due to various reasons this, the first edition, has been delayed. The second edition for 2018 is due in December.

If you are interested in submitting your work for publication in *Synapse*, please follow the guidelines for manuscript preparation presented on page 39 and send your work for inclusion in the peer-review process.

We look forward to receiving high quality work for publication in *Synapse*.

naven Kunas

Dr Praveen Kumar EDITOR

Synapse SEPTEMBER 2018

Key aspects to *Synapse's* publication and dissemination strategy are :

- 1. To provide a platform for publication of high quality research studies.
- 2. To provide peer-review feedback for novice researchers.
- 3. To have special/ supplementary editions on specific topics/areas/student related projects.
- 4. To have a clearly defined editorial board.
- To have a review board that includes both national and international reviewers.
 (This includes academics, researchers, clinicians, ACPIN members, non-ACPIN members/experts in the field of neurology/neurological rehabilitation, physical medicine and rehabilitation).



Synapse

Official journal of the Association of Chartered Physiotherapists in Neurology www.acpin.net

ISSN 1369-958X

Contents

- 4 An action plan for production of the next generation of movement rehabilitation technologies
- 10 Abstracts from 'ACPIN on the move', international conference, 19th–20th March 2018, Manchester
- 10 Facial palsy in Stroke developing an integrated multidisciplinary therapy pathway
- 10 Design of a study to create a webbased intervention to retrain balance following traumatic brain injury.
- 11 Caring relations at the margins of neurological care home life
- 11 The effectiveness of the Nintendo Wii on balance in multiple sclerosis
- 12 Upper limb rehabilitation after Stroke
- 12 Falls prevention for people with multiple sclerosis
- 13 The development of a Parkinson's specific exercise framework to guide and shape practice
- 13 Perceived levels of physical activity amongst people with Parkinson's
- 14 An exploration of the association between falls and dual task cost among people with multiple sclerosis
- 14 Standing Practice In Rehabilitation Early after Stroke (SPIRES)
- 15 'Staying safe' -the need for an integrated, multi-dimensional model for falls prevention in people with Parkinson's
- 15 Camptocormia in Parkinson's Disease
- 16 Evaluation of a daily cardio-vascular fitness group within a hyper-acute rehabilitation setting for individuals with acquired brain injury
- 16 Service evaluation exploring the incidence of vestibular and balance dysfunction in people with mitochondrial disease
- 17 Evidence based practice 'on-the-go': using the Viatherapy app as a tool to enhance clinical decision making in upper limb rehabilitation after stroke
- 17 Patterns of exercise prescription and utilization amongst people with progressive multiple sclerosis who are participating in a trial of a safe mobility, balance and falls programme

- 18 Balance, mobility and fear of falling in older adults with diabetic neuropathy
- 18 Improvement in over active bladder symptoms in patients using Functional Electrical Stimulation (FES) for walking
- 19 Effect of exercise-based falls prevention course on mobility and confidence in fall-prone community dwelling adults with neurological conditions
- 19 The experience of standing frame use in people with progressive multiple sclerosis
- 20 The effects of wearing usual indoor and outdoor footwear on balance and gait performance in people with Parkinson's disease
- 20 A qualitative study of the views and experience of people with Parkinson's Disease regarding their footwear
- 21 A review of the effectiveness of exercise groups within the Northwick Park Hospital Physiotherapy Stroke Service
- 21 A review of vestibular group therapy in an outpatient department using a self-reported outcome measure
- 22 The FoRDTTM, GradDTTM and StepDTTM: reliability and validity of three novel tests of lower limb somatosensory discrimination in stroke
- 22 Experiences of physiotherapist independent prescribers
- 23 A single case-study exploring the use of the MindMotion[™] PRO as part of a physical exercise programme to maintain upper limb motor control in a patient with Huntington's disease
- 23 Perceptions of therapists towards a higher intensity intervention in stroke rehabilitation
- 24 An assessment of physiotherapy-led neurological rehabilitation pilates classes in the community setting
- 24 What's in a handshake?
- 25 Trunk exercise to improve trunk and upper limb performance post stroke

25	Physiotherapists personal perspective of the use of Functional Electrical Stimulation (FES) for the management of drop-foot in Stroke	
26	Pilot project of a six day therapy service in a neurorehabilitation unit	
26	A feasibility study of a vestibular screening tool in an acute traumatic brain injury (TBI) population	
27	Intensive gait training within the first three months post-stroke	
27	Exploring falls and physical activity in Parkinson's through a different lens	
28	Using a visual cueing device, Path Finder, after stroke to improve stride length, walking symmetry and walking speed	
28	Gait rehabilitation by outdoor rhythmic haptic cueing using wearable technology for neurological conditions	
29	The Queen Square intensive upper limb rehabilitation programme – what's in the box?	
29	The evidence for the clinical effectiveness of electrical stimulation to prevent and reduce shoulder subluxation after Stroke	
30	Changes in cortical connectivity from the affected and unaffected hemisphere due to high repetition reaching training in the acute period after stroke	
30	Neural correlates of motor response to virtual reality-aided exercise- based training for the upper limb after stroke	
31	The neurology therapies upper limb service at St Thomas' Hospital shows positive patient outcomes with low intensity input	
31	The effects of an electrical stimulation suit on the functional mobility of an individual with a traumatic brain injury	
32	Is a lycra sleeve an acceptable treatment for glenohumeral subluxation in people with stroke	
32	Use of portable diagnostic ultrasound to inform treatment choices for hemiplegic shoulder pain in people with chronic stroke	

- 33 The effects of lycra sleeves on acromion-greater tuberosity distance, muscle activity and scapula position in people with post-stroke hemiplegia
- 33 Assessment approaches for hemiplegic shoulder pain
- 33 An exploration of the physical activity life cycle in Huntington's disease
- 34 The reliability of a hand held dynamometer in patients with HTLV associated myelopathy
- Using the Computer Assistive Rehabilitation Environment (CAREN) Virtual Reality to enhance recovery following an AVM
- 35 Measuring activity and sedentary behaviour in people with Muscle Ion Channelopathy and Myotonic Dystrophy type 1, and assessing the use of individual goal setting to support increasing habitual physical activity
- 35 Implementation of the 'PD Warrior' programme in a clinical setting in the UK
- 36 The use of augmented feedback and virtual reality technology in neurorehabilitation
- 36 Innovative use of nordic walking poles for improving mobility, balance and promoting active living for Stroke and Parkinson's patients
- 37 A guide to the use of electrical stimulation in paediatric neurodisability
- 37 Supporting neurological communities to live well
- 38 Call for reviewers
- 39 Submission to Synapse

An action plan for production of the next generation of movement rehabilitation technologies

Nicola J Hancock¹, Valerie M Pomeroy¹, Charlie Dorer², Peter Jarritt³, Niamh Kennedy⁴, Kathryn Mares¹, Ian Ferris⁵ and David Robinson⁶; for the ACPIN-East Move-Tec group, ABIRA and NIHR HTC Brain Injury

Technology promises to revolutionise physiotherapists' provision of movement rehabilitation in the 21st century.

Just consider the increase of publications in PubMed from 24 in 2001 to 415 in 2017 (search terms 'rehabilitation' and 'technology' and 'physiotherapy'; Figure 1). The global interest in rehabilitation technology was clearly evident by 2012^[2]. Physiotherapists' interest has continued^[3,4] driven by clinical challenges such as how to provide sufficient intensity of therapy to improve patient outcomes in the face of increasing financial pressures^[5]; over-stretched resources mean that therapists are searching for creative ways to deliver evidence-based rehabilitation^[6]. The use of rehabilitation technologies promises opportunities for: increasing intervention intensity^[7]; enhancing ongoing assessment and measurement^[8]; monitoring adherence to prescribed interventions^[9]; improving motivation for participation in rehabilitation activities through enhanced interest ^[10,11] or immediate biofeedback^[9]; providing opportunities for



Figure 1 Physiotherapy rehabilitation technology publications per year 2001-2017

1 Acquired Brain Injury Rehabilitation Alliance, School of Health Sciences, University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ, UK

- 2 Clinical Manager, Neuro Rehabilitation, Cambridgeshire
- and Peterborough NHS Foundation Trust

3 Department of Clinical Neurosciences, University of

4 School of Psychology, Ulster University 5 Insight to Innovate, Design Associate - Design Council

Cambridge

6 London Associates Design Ltd.

self-management^[7,8,10]; provision of intervention in peoples' own environments^[7]; enhancing rehabilitation efficiency^[5]. All of these advantages are expected to lead to enhanced interventions and outcomes and potential for efficient redesign of existing rehabilitation pathways. Such advantages are within reach, especially as the popularity of smartphones and tablet computers mean that mobile health technologies such as apps and computer games, virtual or otherwise, may be more feasible than ever^[10]. Indeed, specific evidence-based apps for stroke rehabilitation are available^[12,13]. Yet, widespread everyday use of movement rehabilitation technology is not evident in clinical practice and governance around the introduction of such technology can pose challenges to ensuring a robust safety framework exists^[14]. This situation is worthy of further debate.

So, to explore the current landscape of the use of rehabilitation technology in everyday practice the Acquired Brain Injury Rehabilitation Alliance (ABIRA) hosted a workshop for the East of England section of the Association of Chartered Physiotherapists in Neurology (ACPIN-East; Appendix 1). Subsequently, ABIRA and the NIHR Healthcare Technology Co-operative for Brain Injury (NIHR HTC-BI) held a multi-professional workshop that focused on the current landscape for linking research and practice around rehabilitation technology (Appendix 2). An action plan for future developments, which emerged from these workshops, is proposed, and we invite comment and contribution on this outcome from the workshops.

The rehabilitation technology innovation and implementation landscape

Despite a wealth of technological advances in rehabilitation in recent years, and the myriad of products commercially available, there is variable uptake and use of new rehabilitation

technologies by end-users^[eg 15], defined here as clinicians, service users, commissioners and social care providers. Part of the challenge is reflected in four categories of knowledge of rehabilitation technologies: non-awareness; awareness; interest; and use^[16]. In addition, delegates at both events reported that they experienced a confusing landscape not least because of the multiple stakeholders in rehabilitation technology evaluation and adoption.

Within this current landscape, translating 'laboratory'-generated technology into clinically viable products and vice-versa is multi-faceted. This challenge is not unique to rehabilitation technologies; indeed, it echoes that already described for the two-way translation between findings of fundamental science and clinical practice in neurorehabilitation^[17]. In effect, a disconnect exists. This is despite:

- an explosion in the use of accessible, health-related technologies in everyday life eg smartphone apps for health and activity monitoring^[18]
- an alignment of the desire to use new rehabilitation technologies with national policy^[1,19]
- the knowledge that safe, affordable, well-designed technologies have the potential to meet clinical and service challenges, including optimisation of care pathways for improved patient outcome^[20]

The reason for the disconnect between the development and use of rehabilitation technology too is multi-faceted. Not least in importance are the different drivers and timelines of the multiple stakeholders. In addition, engaging with rehabilitation technologies brings its own challenges including: incorporation of rehabilitation technology into evidenced-based clinical services; maintenance of a current awareness of the fast-paced development of ICT-enabled rehabilitation technology^[8,21]; understanding of how to combine different rehabilitation technologies for best therapeutic benefit for individuals and for services; and lack of an organised system for provision of rehabilitation technology^[7]. Participants in the workshop highlighted their experience that the NHS has a wide variety of service delivery models that are often time- and resource-limited. This is frequently at odds with service users' ambitions for their rehabilitation, who are well-informed about the benefits of therapy and often seek on-going input from neurorehabilitation professionals. This situation has been eloquently articulated by Andrew Marr following his stroke and lack of expert physiotherapy soon afterwards^[22]. All of these factors are thought to underlie reports that people participating in rehabilitation do not have access to rehabilitation technology through statutory services and therefore obtain

this from manufacturers without any professional advice and guidance^[7].

Participants at both workshops expressed a need to diminish, and hopefully demolish, the current challenges to the implementation of evidenced-based rehabilitation technology. But for this to happen, an understanding of best practice for rehabilitation technology design is required, not only by research teams and product design engineers but, more importantly, by those who will be using the technologies on a daily basis. This requires work across agency, professional and institutional boundaries and the development of a shared language to ensure effective communication, from the early generation of ideas, through concept design and onwards to safe implementation.

Best practice for rehabilitation technology design

A solution-focused design should be the primary goal of any rehabilitation technology development process. Moreover, the investment of limited resources should be centred on technologies that have emerged via such a process. The current best design practice stipulates that the 'solution' should be defined by the end-user. Indeed, users should generate the initial questions to underpin prototype developments. Essentially, researchers and engineers need to work with users to design solutions for problems identified by the user themselveshence we lose 'end-user' and simply engage the 'user' - the end is, after all, far too late for engagement in the technology development and transfer pipeline. This also reduces the risk of 'concept death blows' being delivered far down the design pipeline when considerable resource has already been expended. A joined-up, inclusive, iterative approach to device design and evaluation can result in the generation of rich data to inform every step of the process, from evolving ideas to end product. Indeed, the Accelerated Access Review^[1] drives clinicians to lead, support and publish clinical evaluation of technologies in real world settings, to facilitate easier access to potentially life-changing innovations for patients. Hence, user involvement must reflect true partnership working, not cursory consultation about an already fixed idea. Usability is key to successful implementation, and usability can only be defined by users engaged to drive development, prioritisation, evaluation and adoption at the earliest stages in the life of an innovation.

The action plan

Physiotherapists are well placed to contribute to the development of rehabilitation technologies^[23]. Indeed, a knowledge-to-action framework has already been used to support The current best design practice stipulates that the 'solution' should be defined by the end-user.

...what is needed now is truly collaborative, joint working between end-users. product engineers and clinical researchers to develop specific rehabilitation technologies to address rehabilitation needs directly.

clinical decision-making for selection and application of Kinect games for individuals ^[24] and a valid and reliable Level of Knowledge survey tool is available ^[16]. Emphasised is the need to integrate technologies into rehabilitation programmes rather than for stand-alone use^[5] and therefore choice of technology requires consideration of: what is important to stroke survivors and their caregivers; that equipment is easy to set up; and that usability is a top priority^[25]. However, there is a need to move beyond such frameworks that help with appropriate selection of existing rehabilitation technologies. We propose that what is needed now is truly collaborative, joint working between end-users, product engineers and clinical researchers to develop specific rehabilitation technologies to address rehabilitation needs directly. This innovative approach will avoid the often encountered situation that available rehabilitation technologies were developed primarily for another use^[2].

Workshop participants devised an action plan for end-users to work alongside researchers and product designers to form a platform for development and evaluation of rehabilitation technologies (Figure 2). Such a plan aligns with current government advice that the NHS must collaborate with innovators to generate valuable evidence of impact and efficacy^[1]. The key nodes in the action plan are an ACPIN-East MoveTec group within ABIRA and with NIHR HTC-BI connectivity. Each node has a different key role. The NIHR HTC-BI provides the link to emerging technologies, design engineers and technology producers. ABIRA is the network linking rehabilitation researchers with rehabilitation providers. The MoveTec Group forms the practice test-bed. Essentially, this is a co-production action plan devised to reduce the current translational disconnect and promote experiential learning by all concerned. Arguably of greatest importance is having the potential to



Figure 2 Schematic – a blueprint for the use and development of rehabilitation technology

pool and focus resources on the problems that matter most to end-users.

The action plan has three key areas of activity for an inclusive approach: generation, development and evaluation of rehabilitation technology; implementation of safe and efficacious technology into practice; and dissemination. Recognised is that there is unlikely to be any 'quick fix'. Developing a rehabilitation technology from idea, through to prototype, proof-of-concept, clinical evaluation and finally implementation is likely to take several years. The action plan meets current leading design principles by engaging end-users iteratively in the earliest stages of technology development to ensure that implementation of evaluated technology is optimised.

Next steps

ACPIN East MoveTec is now poised to work within ABIRA and with NIHR HTC-BI to operationalise the action plan. Work is progressing to identify prototype rehabilitation technologies that could be evaluated in real world settings for usability and potential clinical benefit, including optimisation of care pathways. Whatever the results of the initial examination/s there is no doubt that the experience will refine the action plan. Work to date represents initial steps made within one geographical region towards a suite of rehabilitation technology designed specifically to provide solutions to the challenges faced by end-users. It is expected that with use and refinement the action plan would be transferable to other health conditions. To that end, we would be delighted to participate in open conversation and correspondence, via Synapse or email to Dr Nicola Hancock, n.hancock@uea.ac.uk, about the proposals herein.

APPENDIX 1

The ACPIN-East workshop

In 2015, the ABIRA team at the University of East Anglia (UEA) hosted the inaugural meeting of the ACPIN-East Movement Technology Cluster (MoveTec), with a follow-up meeting in autumn 2017. ACPIN-East MoveTec consists of clinicians with a special interest in neurorehabilitation and rehabilitation technologies. The inaugural workshop centred on the question: 'What is the role of technology for rehabilitation of movement control and function after acquired brain injury?' Approximately 20 clinical physiotherapists participated in 'café conversations' to focus on the clinicians' views on what was crucial for delivery and measurement in neurorehabilitation practice, with a particular emphasis on co-creation of new technology. Hence, the meeting engaged clinical partners to generate questions first, then explore possible solutions - the ACPIN members acting as 'technology conduits'. The open discussion allowed the exploration of both tacit and explicit knowledge, enabling a deeper understanding of experiences and views, not only those of the clinicians but also recognising the expertise of the ABIRA team in understanding rehabilitation and recovery. A truly interactive, two-way learning opportunity was exploited.

Participants highlighted that as many clinicians take steps to increase the use of technologies in their rehabilitation practice, they want:

- to know that they have been evaluated rigorously for safety and efficacy and
- to use them for capture of objective performance data.

The latter is key to the measurement of small changes which in turn would allow accurate treatment progression. Therapists wanted data to provide targeted, personalised feedback in a meaningful and accessible manner, thus allowing a common language to be used to discuss and progress interventions and self-management strategies. They recognised the importance of activity monitoring and that user ownership of this evaluation could, potentially, enhance motivation and engagement in the rehabilitation process.

The MoveTec discussion further considered the vital role of informal caregivers in neurorehabilitation and recognised their engagement with rehabilitation technology was an essential consideration in its development. Additionally, it was felt that technology offered a potential solution for service users who do not have carers, by offering alternative support solutions and potential remote access to tracking and support. Technology was recognised as a way of achieving more targeted and personalised rehabilitation, in particular allowing tailoring of input to the appropriate level and providing ownership and autonomy of participation. Members expressed the importance of variety and adaptivity to aid motor learning and increase motivation, and recognised that technologies have a part to play in supporting learning.

APPENDIX 2

The call-to-action event of the Acquired Brain Injury Rehabilitation Alliance (ABIRA)

In June 2016, an interdisciplinary, inter-sectorial 'call to action' workshop on rehabilitation technology was hosted by ABIRA and the NIHR HTC Brain Injury. This subsequent workshop again enabled dynamic interaction between delegates, this time from wider professional backgrounds and organisations. The aims were to explore the landscape for linking rehabilitation technology research and practice, identify opportunities to support innovations, and to determine the actions needed to deliver the development, evaluation and implementation pathway for people with an acquired brain injury.

Participants identified a confusing landscape in terms of the rehabilitation technology development, evaluation and adoption pathway, with many stakeholders involved. This was reported to be further complicated by a mismatch of clinical, academic and industrial timelines and drivers. A key challenge identified was that many technologies have insufficient end-user involvement during the development stage and that this needed to change.

Two key actions were identified centred around strengthening the linkage between ABIRA and the NIHR HTC-BI to:

- enhance bi-directional communication between end-users and rehabilitation technology developers
- identify rehabilitation technology with proofof-concept and promise for clinical benefit, working collaboratively towards securing sufficient funding for robust cost-effectiveness evaluation.

ACKNOWLEDGEMENTS

The workshops were funded by the National Institute for Health Research (NIHR) Brain Injury Healthcare Technology Co-operative based at Cambridge University Hospitals NHS Foundation Trust and University of Cambridge. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

We would like to thank Jakko Brouwers, Hon Chair of ACPIN, and members of ACPIN East Anglia, for their support for this work.

The authors declare no conflicts of interest in relation to this work.

REFERENCES

1. Taylor H (Independent Chair) (2016) Accelerated Access Review of innovative medicines and medical technologies. Available at: https://www.gov.uk/ government/uploads/system/uploads/attachment_data/ file/565072/AAR final.pdf downloaded December 2016.

2. Harms M (2012) Advancing technology in rehabilitation. *Physiotherapy* 98 pp181-182.

3. Huber ME, Seitz AL, Leeser M, Sternad D (2015) Validity and reliability of Kinect skeleton for measuring shoulder joint angles: a feasibility study. *Physiotherapy* 101 pp389-393.

4. Taylor D, Saywell N (2015) **Telerehabilitation** – is connecting with your patient still meaningful? *Physiotherapy* 101 e1494.

5. Morone G, Masiero S, Werner C, Paolucci S (2014) Advances in neuromotor stroke rehabilitation. *BioMed Research International* Article ID 236043.

6. The Chartered Society of Physiotherapy (CSP) (2016) Code of Members' Professional Values and Behaviours. London, 2011. Available at: http://www.csp.org. uk/publications/code-members-professional-values-behaviour. Downloaded September 2016.

7. Demain S, Burridge J, Ellis-Hill C, Hughes AM, Yardley L, Tedesco-Tricas L, Swain I (2013) **Assistive technologies after stroke: self-management or fending for yourself? A focus group study.** *BMC Health Services Research* 13 pp334.

8. Proffitt R, Lange B (2015) **Considerations in the** efficacy and effectiveness of virtual reality interventions for stroke rehabilitation: moving the field forward. *Physical Therapy* 95 pp441-448.

9. Horak F, King L, Mancini M (2015) **Role of body-worn** movement monitor technology for balance and gait rehabilitation. *Physical Therapy* 95 pp461-470.

10. Dicianno BE, Parmanto B, Fairman AD, Crytzer TM, Yu DX, Pramana G, Coughenour D, Petrazzi AA (2015) **Perspectives on the evolution of mobile (mHealth) technologies and application to rehabilitation.** *Physical Therapy* 95 pp397-405.

 Hung YX, Huang PC, Chen KT, Chu WC (2016) What do stroke patients look for in games-based rehabilitation. A survey study. *Medicine* 95 pp1-10.
 Wolf SL, Kwakkel G, Bayley M, McDonnell MN for the Upper Extremity Stroke Algorithm Working Group (2016) Best practice for arm recovery post stroke: an international application. *Physiotherapy* 102 pp1-4.

13. Zhang MW, Yeo LL, Ho RC (2015) Harnessing smartphone technologies for stroke care, rehabilitation and beyond. *BMJ Innov* 1 pp145-150.

14. Charani E, Castro-Sanchez E, Moore LSP and Holmes A (2014) **Do smartphone applications in healthcare** require a governance and legal framework? It depends on the application! *BMC Medicine* 12 p1. 15. Standen PJ, Threapleton K, Connell L *et al* (2015) Patients' use of a home-based virtual reality system to provide rehabilitation of the upper limb following stroke. *Physical Therapy* 95 pp350-359.

16. Stone VI, Nobrega AR, Lane JP, Tomita MR, Usiak DJ, Lockett MM (2014) **Development of a measure of knowledge use by stakeholders in rehabilitation technology.** *SAGE Open medicine* 2:2050312114554331.

17. Cumberland Consensus Working Group: Cheeran B, Cohen L, Dobkin B, Ford G, Greenwood R, Howard D, Husain M, Macleod M, Nudo R, Rothwell J, Rudd A, Teo J, Ward N, Wolf S (2009) The future of restorative neurosciences in stroke: Driving the translational research pipeline from basic science to rehabilitation of people after stroke. *Neurorehabilitation and Neural Repair* 23 (2) pp97-107.

18. Pugh R (2015) **Do the latest wave of health apps really improve patient care?** Available at: https://www. theguardian.com/healthcare-network/2015/jul/29/do-thelatest-wave-of-health-apps-really-improve-patient-care. Downloaded September 2016.

19. NHS England (2014) **Five Year Forward View** Available at: https://www.england.nhs.uk/wp-content/ uploads/2014/10/5yfv-web.pdf. Downloaded August 2016.

20. Fager SF, Burnfield JM (2014) **Patients' experiences** with technology during inpatient rehabilitation: opportunities to support independence and therapeutic engagement. *Disability and Rehabilitation: Assistive Technology* 9 (2) pp121-127. 21. Forczek E, Makra P, Lanyi CS, Bari F (2015) **The internet as a new tool in the rehabilitation process of patients** – **education in focus.** *International Journal of Environmental Research and Public Health* 12 pp2373-2391.

22. The Chartered Society of Physiotherapy (2016) Broadcaster Andrew Marr argues for more NHS physiotherapy. Available at: http://www.csp.org. uk/news/2016/03/21/broadcaster-andrew-marr-argues-more-nhs-physiotherapy. Accessed March 2016.

23. Winstein C, Reqeujo P (2015) **Innovative technologies for rehabilitation and health promotion: what is the evidence?** *Physical Therapy* 95 (3) pp294-297.

24. Levac D, Espy D, Fox E, Pradhan S, Deutsch JE (2015) 'Kinect-ing' with clinicians: a knowledge translation resource to support decision making about video game use in rehabilitation. *Physical Therapy* 95 pp426-440.

25. Hughes AM, Burridge JH, Demain SH, Ellis-Hill C, Meagher C, Tesesco-Tricas L, Turk R, Swain I (2014) Translation of evidenced-based assistive technologies into stroke rehabilitation: users' perception of the barriers and opportunities. *BMC Health Services Research* 14 p124.

Oral, platform and poster presentation abstracts from 'ACPIN on the move'

ACPIN INTERNATIONAL CONFERENCE, 19TH–20TH MARCH 2018, MANCHESTER

Facial palsy in stroke – developing an integrated multidisciplinary therapy pathway

Naomi Bold and Liz Mariner Pennine Care NHS Trust, Manchester, UK

Introduction: We noticed a trend of stroke survivors with facial palsy receiving little or no therapy to target their facial droop. When provided, it was usually by a speech therapist (SLT) and generally consisted of rapid alternating movements ('oo-ee'). If speech or swallowing were not an issue, it was never addressed at all. The research in stroke provided little evidence on best practice. A stroke survivor with a severe facial palsy challenged our current practice and resulted in the physiotherapist and SLT finding out more.

Method: We applied the evidence from general conditions and attended a facial palsy training course in East Grinstead. The team were trained and, armed with new techniques and outcome measures, we applied our learning to stroke, starting with the gentleman who inspired this process. A facial palsy pathway was created with the creation of information and advice sheets. Facial massage, facial taping and gentle focused movements (not 'oo-ee'!) became standard advice. We defined the roles of the physiotherapist and SLT in facial therapy and developed a case history form which grew to include MDT questions on dental hygiene, taste changes, self-perception, eye health and more

Results: With a focus on symmetry and careful timing of gentle and targeted exercises, we saw improvement in outcome measures for all patients. Informally we saw the benefits of information and advice on confidence and adjustment.

Conclusion: The lessons learnt have changed our practice and improved outcomes for patients. We continue to evaluate the process and plan to develop more outcome measures.

Design of a study to create a web-based intervention to retrain balance following traumatic brain injury

Hannah Marshall^{1&2}, Prof Jane Burridge¹ Dr Ann-Marie Hughes ¹ and Dr Juliette Truman¹ ¹ University of Southampton, Southampton, UK ² Ministry of Defence, Epsom, UK

Background: Traumatic Brain Injury (TBI) is the leading cause of death and disability in young people (Basso et al 2007). Due to the demographic of military personnel and the tasks they undertake, TBI is the most common neurological injury treated at the Defence Medical Rehabilitation Centre accounting for approximately 80% of referrals to the neurological rehabilitation team (Dharm-datta et al 2015). Balance problems are often associated with TBI. An existing web-supported programme called 'Balance Retraining' assists for older people to overcome balance problems and symptoms of dizziness through self-management (Essery et al 2015). In this study, we will amend the programme so that it is appropriate for engagment with TBI patients who often have cognitive, behavioural and executive function difficulties, as well as different demographics.

Aims: Using the person-based approach, adapt 'Balance Retraining' for use with military TBI patients.

Method: Focus groups (FGs) will be conducted with experts to identify the challenges and opportunities facing healthcare professionals when working with people with TBI to improve balance. Using 'Balance Retraining' as a platform, FG data will be used to create new prototype web pages. This prototype intervention will then be presented to participants with TBI in think-aloud studies, generating data to redesign the 'Balance Retraining' programme using an iterative process to make it accessible to people with TBI.

Evaluation: Thematic analysis of FG data and think-aloud studies will be used to develop the

website. Feedback from the interviews will be used to make adaptations to the intervention as part of an iterative process.

Further work: A prospective study will be required to determine the safety and feasibility of the programme within a range of rehabilitation settings.

Caring relations at the margins of neurological care home life: the role of 'hotel service' staff in brain injury rehabilitation

Julie Latchem-Hastings Cardiff University, Cardiff, UK

Purpose: This paper examines the work of neurological long-term care 'hotel service staff' (in catering, domestic, maintenance, finance and administration) and explores how the way in which they conduct their work and interact with brain-injured residents contributes to residents' care and rehabilitation.

Methods: This research draws on in-depth ethnographic data collected over five months at two neurological rehabilitation settings in England which includes interviews and broad and close observations of day-to-day happenings in the lives of around 60 brain injured residents and work of 16 hotel service staff. The data was subject to a situational analysis (Clarke 2011), which is underpinned by grounded theory and discourse analysis, to foreground the collective multiplicity of actors in context.

Results: Hotel service staff contribute to and compliment the rehabilitation of residents' cognitive skills, communication and physical functioning and provide opportunities for occupation, interaction and everyday activity. The therapeutic accomplishments achieved by these workers through carrying out, and involving residents in, mundane tasks of everyday life (such as gardening, managing money, sharing food), fit with the aims of more formalised rehabilitation - to restore patients' abilities to carry out 'activities of daily living'. In doing this work, however, hotel service staff are open to and experience physical and emotional harm, and require training and support about neurological conditions, just as other care staff do.

Conclusions: Hotel service staff in residential care for people with severe brain injuries are not marginal to caring relations but central. They play a key but often relatively unnoticed role in rehabilitation. This has implications for service design, care provision and healthcare education.

The effectiveness of the Nintendo Wii on balance in multiple sclerosis: added value or added luxury?

Callum Hughes ¹ and Julie Jones ² ¹ NHS Tayside, Dundee, UK ² Robert Gordon University, Aberdeen, UK

Introduction: Poor balance is a hallmark of multiple sclerosis (MS) with over 50% of people affected reporting monthly falls. There are several balance rehabilitation approaches used within MS; however, few integrate a sensory component which is hypothesised to lead to greater balance improvements. The Nintendo Wii offers a novel approach to balance rehabilitation, with systematic reviews within Parkinson's and stroke demonstrating significant improvements benefits. This narrative review aims to provide a consensus view on whether the Nintendo Wii has a positive impact on balance within the MS population.

Methods: A comprehensive search of medical literature databases from 2006-2017 was performed using keywords; MS, static balance, dynamic balance, postural control, Nintendo Wii, exergaming and virtual reality. To be included, articles had to investigate the effects of Nintendo Wii on balance in patients with MS. Both controlled and non-controlled studies were included.

Results: Six studies met the inclusion criteria which suggested that Nintendo Wii-based balance training resulted in statistically significant improvements in static postural sway parameters, sway area, path length, displacement, and sway velocity. Additionally, Nintendo Wii-based training appears to be associated with improvements in dynamic balance including the BBS, DGI, TUAG, FSST and the 25-FWT. The relationships between exercise principles and the observed improvements could not be identified due to heterogeneity in Nintendo prescription.

Conclusions: Engagement with the Nintendo Wii resulted in significant improvements in static and dynamic balance and could be a novel method of delivering specific balance exercise programmes. Additionally, Nintendo Wii-based training may be useful to target specific postural sway parameters, given the high incidence of falls within the MS population; further investigation of the clinical relevance of these parameters are essential. Finally, integration of technology into rehabilitation may be beneficial to maintaining compliance and extending access to physiotherapy; however, further research is required to clarify this.

Upper limb rehabilitation after stroke, an exploration of barriers and enablers perceived by physiotherapists when implementing evidence based practice

Renee Groenevelt^{1&2} and Dawn Pickering² ¹ Hywel Dda University Health Board, Haverfordwest, UK ² Cardiff University, Cardiff, UK

Background: Two thirds of stroke patients regain the ability to walk again; unfortunately less than half recover upper limb function. Research has been published which has shown promising results for rehabilitation interventions to improve upper limb function. Applying this evidence in clinical practice could improve functional outcomes for stroke survivors. National clinical guidelines for stroke have been developed to inform and guide practice and adherence to these guidelines has demonstrated improved patient outcome and function. Regrettably, when evaluating daily practice it has been suggested that the available evidence is not always being fully implemented. This study aimed to distinguish barriers and enablers for implementing best practice stroke guideline recommendations for upper limb rehabilitation.

Methods: A qualitative study design, conducting five semi-structured interviews, via web-ex, of experienced physiotherapists working in stroke upper limb rehabilitation. This textual data provided meaningful insight into therapists' perceived barriers and enablers in relation to best practice, on individual, organisational and extra-organisational level. A thematic analysis informed the inquiry.

Results: Four themes emerged, illustrating barriers and facilitators to the implementation of evidence-based practice. These were demonstrated at patient, individual, organisational and extra-organisational levels. Suggestions are proposed for potential implementation strategies to facilitate the achievement of evidence-based practice and improve patient outcomes.

Conclusion: To consistently change these barriers into facilitators, a systematic approach will be necessary. For example, promoting self-management will encourage maximal engagement from the patient's perspective and by changing individual attitudes, uptake of best practice might improve. Managerial support could be given by providing easy access to research papers, by allowing protected time for further development and by creating opportunities to network and share information. Research uptake may be improved by providing closer links between universities and clinicians and creating different job roles that enable information sharing.

Falls prevention for people with multiple sclerosis: the development of a multicomponent theory based intervention

Laura Comber, Rose Galvin and Susan Coote University of Limerick, Limerick, Ireland

Background: Approximately 56% of people with multiple sclerosis (pwMS) will fall in any three-month period. Falls prevention interventions for pwMS is an area that is in its infancy. There is a need to develop robust interventions based on theory in line with Medical Research Council (MRC) guidance for complex interventions.

Aim: To describe the development of an evidence-based and user-informed falls prevention intervention for pwMS.

Methodology: The evidence based practice triad of research evidence, clinical expertise and patient values and expectations was used to guide the development of a multicomponent falls prevention intervention for pwMS. The findings were mapped onto the framework for intervention development presented by Campbell et al (2007) which serves as a supplementation to the MRC framework for the development of complex interventions. Research evidence included scoping reviews, systematic reviews and a prospective cohort study of pwMS (n=100). Clinical expertise was gathered through semi-structured interviews with practising physiotherapists and occupational therapists (n=12). Patient values and expectations were gained through a structured phone survey (n=140).

Results: The three evidence sources informed the framework components: defining and quantifying the problem, identification and quantification of target population, identification of pathways by which the problem is caused and sustained, exploration of whether pathways are amenable to change, quantification for potential improvement, mechanisms of action of intervention, key processes and outcomes, consideration of best achievable combination of intervention components and intensities, identification of barriers to application and identification of feasible and valid outcome measurements.

Conclusions: The resulting intervention is a theory based multiple component exercise and education programme for pwMS who have had a fall and who have minimal disability, addressing physiological, psychosocial and behavioural factors associated with falls.

The development of a Parkinson's specific exercise framework to guide and shape practice

Julie Jones¹, Katherine Baker²,

- Bhanu Ramaswamy³ and Beccy Oliver⁴
- ¹ Robert Gordon University, Aberdeen, UK
- ² University of Northumbria, Newcastle, UK
- ³ Sheffield Hallum University, Sheffield, UK
- ⁴ Bracknell Parkinsons UK Branch, London, UK

Introduction: There is global recognition that people with Parkinson's (PwP) need to participate in more targeted exercise and regular physical activity (PA), with clear documented evidence suggesting positive effects upon motor and non-motor symptoms. Further, recent literature suggests that there is a correlation between PA and neuronal health, suggesting a neuroprotective effect, yet a large proportion of PwP are known to be inactive. Therefore the need to instil a culture and behavioural change towards a more active lifestyle is essential. However, inconsistencies exist to guide both clinicians and PwP with what is best to meet their individual needs.

Methods: A panel of specialist physiotherapists from the UK Parkinson's Excellence Network using a consensus approach undertook a review of current literature and current practice to inform an exercise framework designed to guide both professionals and PwP on exercise engagement.

Results: The framework advocates that PwP should participate in a minimum of 2.5 hours of targeted specific exercise each week, with tailored guidance for three individual stages of Parkinson's promoting PA; engaging in exercise (preferably at diagnosis); exercise to stay active; exercise to manage mobility challenges. The framework provides direction on the focus, type, intensity, and frequency of exercise, while encouraging individual preferences and choice. The exercise framework can be downloaded from the Parkinson's UK website, along with supporting resources and animations to inform both professionals and PwP about exercise.

Conclusions: Exercise is a fundamental component of the management of Parkinson's, with not only health associated benefits but established benefits in relation to Parkinsonian symptoms. It is essential that Healthcare professionals signpost PwP to engage in exercise which target their symptoms as well as motivate them to firmly embed PA in their everyday activities.

Perceived levels of physical activity amongst people with Parkinson's: impact of age, gender and geography

Julie Jones and Lyndsay Alexander Robert Gordon University, Aberdeen, UK

Introduction: It is widely recognised that physical inactivity accelerates motor decline in Parkinson's and consequently current guidelines advocate regular participation in physical activity (PA) for people with Parkinson's (PwP). However, little is known about their perceptions of their PA levels.

Objectives:

- To gauge PA levels amongst PwP, and establish whether this population is meeting PA guidelines.
- To explore perceptions of PA levels amongst PwP and examine whether a relationship exists between PA, age, time since diagnosis, and gender.

Methods: Members of the Parkinson's UK Research Support Network were sent an electronic questionnaire containing the International Physical Activity Questionnaire (IPAQ) to gauge current activity levels. Further, the questionnaire consisted of open and closed questions to determine perceptions of PA levels, as well as collect basic demographic information.

Results: 354 participants responded, with a mean age of 66, of which 53% were male. Over 70% of PwP perceived themselves to be highly active, with males perceiving themselves to be more vigorously active than females. Conversely, the IPAO suggested that only 14% participated in high levels of weekly PA. Both the frequency and intensity of PA were found to decline with age. However, only 9% of those under the age of 50 participated in high levels of regular PA. Regional differences in PA levels existed with those in the North East of England being the most active. 70% identified physiotherapists as beneficial to encourage PA. Qualitative comments support the need for more physiotherapists who understand Parkinson's to inform guidance on exercise prescription.

Conclusions: PwP perceive themselves to be more physically active than they are, with both gender and increasing age associated with a decline in the amount and intensity of PA. Geographical differences exist in PA uptake as well as access to expert opinion and services which PwP perceive as essential to engagement.

An exploration of the association between falls and dual task cost among people with multiple sclerosis

Gillian Quinn, Susan Coote, Rose Galvin Laura Comber and Nicola O'Malley University of Limerick, Limerick, Ireland

Objective: To explore the relationship between dual task cost (DTC) and falls in people with Multiple Sclerosis using both objective and subjective measures and prospective falls monitoring.

Methods: Consecutive patients with MS attending the neurology service in a tertiary hospital were recruited. Data collected included the Expanded Disability Status Scale score (EDSS), time since diagnosis, type of MS and walking aid(s) used. Consenting participants completed a questionnaire of falls risk factors and the timed up and go test (TUG) under single and dual task conditions. DTC was the percentage change in performance between TUG and TUG-Cognitive. Falls were prospectively recorded for three months using falls diaries.

Results: 34% of the total sample (N=100) had \ge 2 falls. The median EDSS was 6 (IQR 2) with a median disease duration of 14 (IQR 13.75) years. 72% of the group had progressive MS and 73% used a mobility aid. The median DTC was -13.2% (IQR 21.6) and the objective measure of DTC was not associated with increased risk of falls (p=0.90, odds ratio=1.00). 65% of fallers subjectively reported problems dual tasking and answering yes to a question about whether doing two things at once increased the likelihood of falls (risk ratio=2.07, CI 1.15, 3.71).

Conclusion: A single question asking about dual tasking ability may be a useful screen for falls risk assessment. Future research using a standardised method of DTC assessment will give a clearer insight into the role of DTC in falls risk assessment and the potential relevance of dual task training as a component of falls interventions for people with MS.

Standing Practice In Rehabilitation Early after Stroke (SPIRES): a feasibility randomised controlled trial

Angie Logan¹, Bridie Kent¹, Jennifer Freeman¹, Jill Pooler¹, Siobhan Creanor^{2&3}, Doyo Enki^{2&3}, Andy Barton⁴, Jane Vickery² and Jonathan Marsden¹

- ¹ Plymouth University, Plymouth, UK
- ² Peninsula Clinical Trials Unit, Plymouth, UK
- ³ Medical Statistics, Peninsula Schools of Medicine and Dentistry, Plymouth, UK
- ⁴ NIHR Research Design Service, Peninsula Schools of
- Medicine and Dentistry, Plymouth, UK

Background: The most common physical deficit caused by a stroke is muscle weakness which limits a person's mobility^{*}. Mobility encompasses activities necessary for daily functioning: getting in/out bed, on/off toilet, sitting, standing and walking. These activities are significantly affected in people with severe stroke who typically spend most of their time in bed/chair and are immobile. Immobility is primarily caused by neurological damage but exacerbated by secondary changes in musculoskeletal and cardiorespiratory systems. These secondary changes can theoretically be prevented/minimised by early mobilisation, in this case standing up early post-stroke. However, for people with severe stroke, early mobilisation is often limited to sitting and opportunities to practise standing and sit-tostand is often lacking.

Aims:

- Primary aim: determine whether a randomised controlled trial of a functional standing frame programme for people with severe stroke in an inpatient sub-acute stroke rehabilitation setting is feasible.
- Secondary aim: explore experiences of the functional standing frame programme (enjoyment, fatigue, effort etc.) and being recruited and randomised to the trial, from the perspective of the person with stroke and their relative; explore physiotherapists' experiences delivering the intervention and trial processes using semi-structured interviews, focus group and process evaluation.

Methods: A multi-centre, mixed methods, feasibility randomised controlled trial with blinded outcome assessment. Fifty participants in four Stroke Rehabilitation Units across Cornwall and Devon.

Results: N=45 recruited in total. N=20 individual interviews (n=6 control group; n=4 intervention group; n=4 relatives; n=6 physiotherapists). One focus group (n=5 physiotherapists). Early results and baseline characteristics will be presented. Conclusions: Follow-up data collection will close October 2018. The functional standing frame intervention combines two existing evidence-based interventions. Evaluation was warranted to determine the feasibility of implementing this novel combination for people with severe stroke.

* Warlow C et al (2008) Stroke: Practical Management Third edition. Oxford: Blackwell Publishing.

'Staying safe' – the need for an integrated, multi-dimensional model for falls prevention in people with Parkinson's

- Sophia Hulbert^{1&2}, Lynn Rochester³ Alice Nieuwboer⁴, Vicki Goodwin², Carolyn Fitton¹ Kim Chivers-Seymour¹ and Ann Ashburn¹
- ¹ University of Southampton, Southampton, UK
- ² University of Exeter, Exeter, UK
- ³ Newcastle University, Newcastle, UK
- ⁴ KU Leuven, Leuven, Belgium

Background: Parkinson's Disease is a spectrum of motor and non-motor symptoms. Falling is common and disabling. Current medical management shows minimal impact to reduce falls, or fall related risk factors such as deficits in gait, strength and postural instability. Despite strong evidence supporting rehabilitation in reducing fall risk factors, the most appropriate intervention to reduce overall fall rate remains inconclusive.

This paper aims to:

- Synthesise current evidence and conceptual models of falls rehabilitation in Parkinson's in a narrative review; and
- Introduce the treatment protocol used in the falls prevention, multi-centre clinical trial 'PDSAFE' based on this evidence.

Method: Search of four bibliographic databases using the terms 'Parkinson*' and 'Fall*' combined with each of the following; 'Rehab*, Balanc*, Strength*, Strateg*and Exercis*'.3557 papers were identified, 416 were selected for review. The majority report the impact of rehabilitation on isolated fall risk factors. Twelve directly measure the impact on overall fall rate.

Discussion: Results were used to construct a narrative review with conceptual discussion based on the 'International Classification of Functioning' (ICF), leading to presentation of the 'PDSAFE' intervention protocol.

Conclusion: Evidence suggests training single, fall risk factors may not affect overall fall rate. Combining with behavioural and strategy training in a functional, personalised multi-dimensional model, addressing all components of the ICF is likely to provide a greater influence on falls reduction. 'PDSAFE' is a multi-dimensional, physiotherapist delivered, individually tailored, progressive, home-based programme. It is designed with a strong evidence based approach and illustrates a model for the clinical delivery of the conceptual theory discussed.

Camptocormia in Parkinson's Disease: case study of a three-week intensive therapy admission

Jenny Parker and Christine Tooke National Hospital for Neurosugery and Neurology, London, UK

Background: Camptocormia is an axial postural deformity characterised by an abnormal flexion of the thoracolumbar spine appearing in the standing position (Srivanitchapoom *et al* 2015). The pathogenesis of camptocormia is not very well understood and both central and peripheral mechanisms have been proposed. There is currently limited evidence to support physiotherapy in this population and most research has focused on the use of orthotics (Ye *et al* 2015, Seze *et al* 2008).

Aims/purpose: To review whether intensive therapy input focusing on improving postural control and alignment would change a variety of outcome measures.

Methods: This was a single patient case study of a sixty-year-old male with Parkinson's Disease diagnosed at the age of 38. The patient was able to mobilise independently with a four-wheeled walker; however, he had reduced exercise tolerance and difficulty maintaining upright postures. He completed a three-week admission with daily physiotherapy sessions. These sessions consisted of improving midline, muscle length and activity in different postural sets. We incorporated handling to try and reduce muscle over activity. We also focused on education and 24-hour management.

Results: The patient showed good subjective and objective changes over the three-week admission. The patient was then referred for outpatient therapy. On the six-week review he continued to show positive changes. This included postural measurements, VAS scales, mobility times and the Lindop score.

Conclusion: In conclusion we found positive benefit for a short intensive therapy programme with results maintained at six weeks post discharge. We found good engagement with the therapy programme. This highlights that we can influence postural abnormality and it deserves our further attention and early treatment. This case study also highlights the need for further research into physiotherapy in camptocormia.

Evaluation of a daily cardiovascular fitness group within a hyper-acute rehabilitation setting for individuals with acquired brain injury

Michele Walsh, Sophie Bannon, Michael Shiels and Aideen Steed

Regional Hyper-acute Rehabilitation Unit, Northwick Park Hospital, London, UK

Background: Increased sedentary behaviour and reduced physical activity (PA) have health and psychosocial consequences. Early exposure to exercise can establish behaviour change for long-term PA post-neurological injury. National Stroke guidelines recommend 150 minutes/week of PA. On the Regional Hyperacute Rehabilitation Unit (RHRU), a daily 30-minute fitness group is run using seated bike, static bike or treadmill. It is led by an experienced physiotherapy assistant, supported by a qualified physiotherapist. All patients require assistance to/from the gym, on/off equipment and constant supervision.

Aims: To evaluate the efficiency of the fitness group.

Methods: A cross-sectional analysis was completed (n=6, 172 sessions). Evaluation included time spent exercising, exercise parameters and documentation standards. Observational analysis was carried out on the group. Working party consensus regarding documentation, timing and lay-out of the gym was reached. Clear aims and roles were identified and disseminated to the team. Re-evaluation was carried out at three months (n=5, 64 sessions) and six months (n=7, 105 sessions).

Results: Patient demographics: average age = 44 years (range: 19 - 62); diagnoses included stroke, TBI, tumour, AVM and GBS; mean time since onset = 4.6 months (SD: 1.78, Range: 3 - 9). Initial analysis showed mean time spent exercising per class was 12.0 minutes (SD: 3.28, Range 7.9 - 15.3). Issues identified were unclear aims and staff roles, documentation and timing of the group. Changes were implemented and re-evaluated at three and six months. Repeat analysis showed an increase in mean exercise time to 17.4 minutes (SD: 3.78, Range 12.2 - 21.6) at three months. This was maintained at six months (mean =17.1 minutes, SD: 3.72, Range10.4 - 21.8).

Conclusion: High intensity physical activity is possible in a hyper-acute rehabilitation setting with a significantly impaired cohort. To be effective it requires a focused, structured format with clearly identified staff roles.

Service evaluation exploring the incidence of vestibular and balance dysfunction in people with Mitochondrial disease

Sarah Holmes, Amanda Male, Gita Ramdharry Ros Quinlivan, Enrico Bugiardini, Olivia Poole Natalie James and Michael Hanna Centre for Neuromuscular Disease, University College London Hospitals, London, UK

Introduction: A wide range of phenotypes are seen in people with Mitochondrial diseases (MD), although treatment options are limited (Chinnery 2015). The benefits of rehabilitation for vestibular disorders (VD) are well documented (McDonnell and Hillier 2015, Whitney *et al* 2016). Little is known or published about the incidence of balance problems and vestibular dysfunction in people with MD (Cardenas-Robledo *et al* 2016, Iwasaki *et al* 2011, Kim *et al* 2016). Improved understanding may inform therapy prescription and outcomes for those affected.

Objectives: To capture the incidence of vestibular disorders for people with MD seen by physiotherapist in the Mitochondrial clinic.

Methods: Details of any balance problems, unsteady gait, lightheadedness or dizziness, were captured on an evidence based audit tool. Patients were referred for neuro-otological investigation if symptoms were not explained by peripheral neuropathy or cerebellar ataxia.

Results: 89% (n=32/36) of patients reported dizziness. 61% (n=22/36) underwent neuro-otological testing with 86% of these having a vestibular diagnosis identified.

Conclusions: Whilst data is not reflective of absolute incidence in population, this data suggests that consideration of a neuro-otological diagnosis is required in people with MD who report dizziness or balance problems. Specific questioning is therefore recommended. Further data collection is planned.

Evidence based practice 'on-the-go': using the Viatherapy app as a tool to enhance clinical decision making in upper limb rehabilitation after stroke

Nicola Hancock¹, Kathryn Collins², Charlie Dorer³ and Valerie Pomeroy¹

- ¹ Acquired Brain Injury Rehabilitation Alliance, School of
- Health Sciences, University of East Anglia, Norwich, UK
- ² Department of Human Sciences and Public Health, Bournemouth University, Bournemouth, UK
- ³ Cambridge and Peterborough Foundation Trust,
- Cambridge, UK

Background: Clinical therapists are working in increasingly demanding, fast-paced stroke services. This presents a challenge to finding sufficient time for engagement with evidence supporting interventions for best patient outcomes (evidence-based practice, EBP). 'Viatherapy' has been developed to meet this challenge: a new, freely-available digital app, designed by a collaboration of international experts in stroke rehabilitation research and practice, providing accessible evidence-based intervention recommendations for upper limb management after stroke. As with any such new rehabilitation technology, user experience underpins successful adoption and future design iterations.

Aims: To investigate

- User acceptability
- Potential service impact of the Viatherapy app with a group of physiotherapists (PT) and occupational therapists (OT) working in community settings.

Methods: A collaborative service improvement project with the University of East Anglia in partnership with Cambridge and Peterborough Foundation NHS Trust. A Plan Do Study Act, (PDSA) cycle was used to trial the technology with twelve community therapists working with people with stroke. Semi-structured interviews were carried out prior to, and after, a four-week period during which the clinicians trialled the app. Interviews were transcribed and thematic analysis carried out.

Results: Pre-Viatherapy interviews identified a wide range of resources currently used to develop treatment plans, including patient assessment findings, guidelines, attending courses and peer support. Post-Viatherapy interviews identified that clinicians found Viatherapy accessible, easy-to-use, and supportive of clinical decision-making. Service development impacts included increased: use of outcome measures, therapeutic dose, confidence in everyday use of EBP; and shifts to using non-routine interventions whilst using the app. **Conclusions:** This service improvement project found the Viatherapy app to be an acceptable, user-friendly tool aiding clinical decision-making in community stroke rehabilitation. Positive service.

Patterns of exercise prescription and utilisation amongst people with progressive multiple sclerosis who are participating in a trial of a safe mobility, balance and falls programme

Hilary Gunn¹, Jackie Andrade¹, Lorna Paul² Linda Miller³, Siobhan Creanor¹, Colin Green⁴ Jonathan Marsden¹, Paul Ewings⁵, Margie Berrow¹ Jane Vickery¹, Andy Barton⁶, Ben Marshall⁷ Zajicek John⁸ and Jenny Freeman¹ ¹ Plymouth University, Plymouth, UK

- ² Glasgow Caledonian University, Glasgow, UK
- ³ Douglas Grant Rehabilitation Unit, Irvine, UK
- ⁴ University of Exeter, Exeter, UK.
- ⁵ NIHR Research Design Service (South West), Taunton, UK
 ⁶ NIHR Research Design Service (South West), Plymouth, UK
 ⁷ Service User, Cornwall, UK
- ⁸ University of St Andrews, St Andrews, UK

Background: Impairments in balance and mobility, and increased risk of accidental falls are common problems for people with Multiple Sclerosis (MS). Our ongoing research has led to the development of Balance Right in MS (BRiMS), a 13-week programme of exercise and educational activities intended to improve balance, encourage safer mobility and use of falls management strategies. This presentation examines the use of the exercise component of the programme, which is designed to achieve 120 minutes' practice per week of progressive gait and balance activities. Exercises are prescribed by a physiotherapist and provided to the participant through an online resource. Each participant's plan is developed from a 'menu' of core exercises, which can be customised and amended during the programme to maintain an appropriate level of challenge.

Method: Mixed methods process evaluation as part of a randomised controlled feasibility trial (n=56).

Results: The 27 intervention group participants (all with progressive MS, 20=female, mean age 59, SD 11 years) were prescribed a range of exercises, with 42 of the 48 available exercises being prescribed at least once. Participants logged in to the web-based BRiMS exercise programme an average of four times a week (IQR 2-6). There were variations in login behaviour between the four sites and across the 13 weeks of the programme. Eight participants continued to log exercise after the completion of the programme, with four continuing to do so weekly up to the

completion of the trial. Qualitative feedback indicated satisfaction with the programme amongst participants and therapists, as well as highlighting suggestions for improvement in the utility and accessibility of the resource.

Conclusion: Initial evaluation suggests the BRiMS exercise programme is feasible and supports participants to undertake their prescribed exercise. Further development of the programme is required to address logistical issues and enhance user satisfaction.

Balance, mobility and fear of falling in older adults with diabetic neuropathy

- Asha Hansika Wettasinghe¹, Dilshani Nadira Dissanayake², Lara Allet^{3&4}, Prasad Katulanda⁵ and Stephen Ronald Lord⁶
- ¹ Department of Allied Health Sciences, Faculty of
- Medicine, University of Colombo, Colombo, Sri Lanka
- ² Department of Physiology, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka
- ³ Department of Community Medicine, University Hospitals and University of Geneva, Geneva, Switzerland
- ⁴ Department of Physiotherapy, School for Health Sciences, HES-SO, University of Applied Sciences and Arts of
- Western Switzerland, Geneva, Switzerland
- ⁵ Department of Clinical Medicine, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka
- ⁶ Neuroscience Research Australia, UNSW, Sydney, Australia

Introduction: Older adults with diabetic peripheral neuropathy(DPN) have a higher incidence of falls compared to type2 diabetes mellitus(DM) patients without DPN. The aim of the study was to assess the balance, mobility and fear of falling(FoF) in DM and DPN patients.

Methods: A cross sectional study was conducted in 46 patients with type2 DM for more than five years and aged between 50-70 years attending diabetes clinics in Colombo, Sri Lanka. Balance abilities were measured by unipedal stance time(UST), Romberg balance test with feet in three positions (feet together(ft), near tandem(fnt) and full tandem(fft)). Mobility was assessed with Timed-up and go test(TUG). FoF was assessed with Iconographical Falls Efficacy Scale(Icon-FES).

Results: The sample comprised with DPN-(n=23; age=60.9years±5.8mean±SD) and DM patients without DPN(NDPN)-(n=23;age=60.5years±6.2mean±SD) with a DM duration of 17.5years±7.0 and 14.0years±6.8 respectively. UST was reduced in DPN group compared to NDPN group-(DPN=16.0sec±11.4SD; NDPN=24.1sec ±8.6SD, P= 0.01). There was no time difference in Romberg fitest, whereas fnt-(DPN=18.6sec±4.7SD; NDPN=30.0sec, p=0.166) and fft-(D-PN=24.7sec±9.0SD; NDPN=28.50sec±4.3SD, p=0.076) times were shorter in DPN compared to NDPN. TUG completion times were higher in DPN group compared to NDPN group-(DPN=9.1sec±2.6SD; NDPN=7.7sec±1.7SD, P= 0.036). Icon-FES scores were higher in the DPN group compared to the NDPN group-(DPN=29.2±6.0SD; NDPN=24.5±6.2SD, P= 0.013), and Icon-FES scores correlated with TUG completion times (p=0.008).

Conclusions: DPN patients have significant impairment in balance, mobility and demonstrate a significant increase in FoF compared with NDPN patients. It is recommended that the patients with DM, and particularly those with DPN, should undergo fall risk assessments comprising balance, mobility and FoF tests.

Improvement in overactive bladder symptoms in patients using Functional Electrical Stimulation for walking

Nicola Hare¹, Kate Phillips¹, Joanne Johnson¹ Coralie Seary¹, Petros Georgopoulos^{1&2} Jalesh Panicker^{1&2} and Valerie Stevenson^{1&2} ¹ The National Hospital for Neurology and Neurosurgery, London, UK

 $^{\rm 2}$ University College London, Institute of Neurology, London, UK

Introduction: Functional Electrical Stimulation (FES) is used to improve walking speed and reduce falls in people with upper motor neuron foot drop. Following anecdotal observations of changes in overactive bladder (OAB) symptoms, an observational study was performed to explore this further.

Method: 47 patients attending for set up with FES at the National Hospital for Neurology and Neurosurgery (NHNN) during a six-month period were asked to complete a questionnaire on their bladder function (the ICIQ-OAB) at baseline and three months during their routine appointments. Walking speeds and a Visual Analogue Scale (VAS) of satisfaction with walking were also collected.

Results: There was a significant improvement in OAB symptoms in the subset of Multiple Sclerosis (MS) patients (35 patients, 74.5%. p=0.043). A significant correlation within the MS cohort between baseline walking speed with FES (a proposed surrogate marker of FES usage) and the subsequent change in ICIQ-OAB was also seen (r=0.406, p=0.017).

Discussion: The Common Peroneal Nerve (CPN) is stimulated during FES; this has

the same innervation as the Posterior Tibial Nerve (L4-S3) which is stimulated during Posterior Tibial Nerve Stimulation (PTNS), a recognised treatment for OAB symptoms. We postulate that FES through CPN stimulation has a similar neuromodulatory effect to PTNS and impacts positively on the neural control of bladder voiding. This association is important for FES practitioners to be aware of and warrants further investigation.

Effect of exercise-based falls prevention course on mobility and confidence in fall-prone community dwelling adults with neurological conditions

Anna Ziemer and Susan Pattison SP Therapy Services, Bury, UK.

Background: The population of fall-prone people, risk factors and effectiveness of interventions are well researched, although still not routinely accessible in some areas especially for people with complex needs like neurological conditions. Multifactorial interventions with emphasis on behavioural change impacting the lifestyle choices and addressing environmental factors are deemed to have the highest effectiveness.

Objective: To design and share outcomes from the development of a not diagnosis-specific, clinically reasoned, and effective falls prevention group intervention programme led by neurological physiotherapist.

Method: Three course groups at mixed age (55-93), gender and mobility. Over half of participants with neurological conditions. All participants reported the history of fall or/and fear of falling with its negative impact on motor behaviour and participation.

Intervention: Clinic-based six-week falls prevention course based on a one-hour weekly session in small groups led by an experienced neurological physiotherapist. The course outline was planned on initially gained information about physical abilities and history of falls. The physical exercises included strength, flexibility and balance training with on/off the floor practice. Education addressed multifactorial risks and the need for home-based practice. Supporting resources were designed by a physiotherapist.

Outcome measures: Participants were assessed prior to the course and immediately after the course using:

- 30 seconds Sit to Stand test
- Timed up and go

The activities-specific Balance Confidence Scale.

Results: The intervention led to improvement in all three outcome measures despite limited intervention time.

- 30 seconds STS demonstrated significantly positive trend (p = 0.05).
- The confidence of not falling during various ADLs demonstrated significantly positive trend (p = 0.0001).
- TUG assessment showed a positive trend; however, statistical significance was not determined (p = 01332).

Conclusion: Although six weeks' intervention is not consistent with the evidenced dose, the programme was effective in treating motor skills and confidence. The specific needs planning, neurorehabilitation expertise, small group size and education proved to be effective for this group of patients.

I'm in a very good frame of mind: the experience of standing frame use in people with progressive multiple sclerosis

- Wendy Hendrie^{1&2}, Rachel Dennett¹, Louise Jarrett^{1&3}, Siobhan Creanor⁴, Andrew Barton⁵ Jonathan Marsden¹, Colin Green⁶ and Jennifer Freeman¹
- ¹ School of Health Professions, Plymouth University, Plymouth, UK
- ² Norwich MS Centre, Norwich, UK
- ³ Mardon Neurorehabilitation Centre, Royal Devon and Exeter NHS Foundation Trust, Exeter, UK
- ⁴ Medical Statistics, Peninsula Schools of Medicine and Dentistry, Plymouth, UK
- ⁵ Research and Design Service, Peninsula Schools of
- Medicine and Dentistry, Plymouth, UK
- ⁶ University of Exeter Medical School, Exeter, UK

Background: People with severe multiple sclerosis (MS) often find it difficult to stand independently, spending most of their day sitting down. Disabling complications resulting from immobility can be minimised if physical activity is increased. This qualitative study explored the impact of a home-based, self-managed standing programme using an Oswestry standing-frame on people with severe MS and their carers.

Methods : We report on the qualitative component of a multi-centred randomised controlled trial (RCT) evaluating the effectiveness of a home-based standing programme. We explored the experiences of twelve people with progressive MS (six female, aged 35 - 71 years) and eight carers (four female), who used an audio diary to record their thoughts and feelings about using a standing frame over 36 weeks. Recordings were transcribed verbatim and data analysed thematically. Data was triangulated with informal exit interviews from 126 persons participating in the RCT.

Results: Four themes emerged:

- 'Feeling like the old me' encompasses the sense of normality gained from standing, and the physical, psychological and social benefits experienced
- Noticing a difference' captures the variety of changes people reported in their function as well as wide-ranging symptoms such as spasms, strength, bladder and bowel function
- 'I want to do it right' reflects the value placed on having guidance and support in establishing a standing programme that worked for them
- 'You have a good day, you have a bad day' highlights the issues faced by people living with a progressive and fluctuating condition in implementing a self-management programme.

Conclusions: The use of a standing frame enabled people to incorporate regular standing within their lives, which was an activity many hadn't achieved for some time. Associated with this they reported wide-ranging physical, psychological and social benefits. Guidance and support is important to consider with programmes of this nature.

The effects of wearing usual indoor and outdoor footwear on balance and gait performance in people with Parkinson's Disease using clinical tests and instrumented movement analysis

Dorit Kunkel, Ann Ashburn, Malcolm Burnett Louis Mamode, Ruth Pickering, Cathy Bowen Dan Bader, Judy Robison, Maggie Donovan-Hall and Mark Cole

University of Southampton, Southampton, UK

Objective: We explored balance and gait in people with Parkinson's (PwP) in their indoor compared to outdoor shoes.

Background: Falls impact negatively on PwP; often happening indoors during walking, turning and sit to stand. Footwear is a risk factor for falls; research to date focused on the general elderly population.

Methods: Thirty PwP (15 men, mean age 69, 16 fallers, Hoehn and Yahr stage 1-3, mean freezing of gait score 7 (SD: 7.3) and mean UPDRS motor score 13 (SD:7.5) attended a single assessment at the gait laboratory. Time

since diagnosis ranged from seven to 192 months (mean 64 months). Balance and gait was assessed in usual indoor and outdoor footwear (shoe order was randomised) using clinical tests (five metre walk, timed get up and go test and the Mini-BESTest) and instrumented movement analysis (Codamotion, force plate and F-Scan).

Results: Indoors most wore slippers (n=17, 57%), socks/barefoot (n=4), sandals (n=4), walking shoes (n=2), moccasins, ballerina or athletic shoes (all n=1). Outdoors most wore walking shoes (n=15, 50%), boots (n=3), oxford shoes (n=6), surgical bespoke (n=1) moccasins (n=1) or court shoes (n=4). Both clinical tests and instrumented movement analysis generally favoured balance and gait performance in outdoor shoes. In comparison to outdoor shoes, walking in indoor shoes resulted in significantly slower walking speeds (five metre walk time p=0.007, walking speed m/s as (p=0.012) and reduced stride length (p<0.001). When stepping over an obstacle participants' second foot got closer to the obstacle (p=0.022) and participants took more steps during turning (p=0.001). During the sit to stand task, increased rear foot peak pressures were observed (p=0.015).

Conclusions: Balance and gait performance was worse in indoor shoes. Improved balance performance in outdoor shoes suggested that it may be possible to improve indoor balance performance in PwP through improved indoor shoe choices.

A qualitative study of the views and experience of people with Parkinson's Disease regarding their footwear

Ann Ashburn, Maggie Donovan-Hall, Judy Robison, Mark Cole, Cathy Bowen Malcolm Burnett, Louis Mamode, Ruth Pickering, Dan Bader and Dorit Kunkel University of Southampton, Southampton, UK

Background: Footwear choices and inappropriate shoes have been consistently associated with mobility issues and falls risk in elderly populations. Due to the increased mobility and falls risk associated with PD, it is surprising that little is known about the footwear challenges faced by this group.

Objectives: A qualitative study determining what footwear people with Parkinson's Disease (PwPD) wear at home and outdoors with the positive and negative issues relating to footwear.

Method: Semi-structured interviews with 15 PwPD (8 men, 7 women) ranging in age from 57-84 years. Participants were purposively sampled from a pool of 154 participants who completed a screening questionnaire to ensure variation in age, gender and disease severity. Data was analysed thematically using Framework analysis.

Results: Four categories of themes related to:

- Impact of PD and foot problems
- Footwear choices and priorities
- Challenging issues
- Strategies and resources of support.

Participants discussed the impact of PD on mobility and balance and a combination of foot problems predominantly relating to PD, such as toes curling upwards, swelling, stiffness, and loss/altered sensation. Changes in priorities, choices of footwear and making compromises (such as comfort, convenience and security over appearance) were associated with progressive and changing PD symptoms. Participants discussed the challenges of choosing appropriate footwear throughout the progression of the disease, poor shopping experiences and accommodating oedema and orthoses. These issues were reported by some as leading to an overall sense of loss of identity. Half of the participants received footwear care but none reported receiving advice about footwear.

Conclusions: These findings provide an initial understanding of the specific challenges, experiences and footwear needs of PwPD. In addition to the complexities of a progressive neurological disease, PwPD face foot and footwear problems that require changes and decisions with important physical, social and psychological implications.

A review of the effectiveness of exercise groups within the Northwick Park Hospital Physiotherapy Stroke Service

Sophie Kempsford, Madeleine Bates Charlotte Elsmore and Ioan Morgan London North West University Healthcare NHS Trust, Harrow, UK

Introduction and background: The efficacy of group therapy in stroke rehabilitation is widely documented (English and Hillier 2010). On the stroke unit at Northwick Park, exercise groups are used to deliver appropriate therapy intervention and aid the physiotherapy team to achieve the recommended 45 minutes per day (Royal College of Physicians Guidelines for Stroke, 2016) whilst reducing the impact of the caseload on staffing efficiency. This project was aimed at assessing the efficacy and efficiency of the groups with the aim to create a clearly defined role for each group within the service. **Method**: All physiotherapists completed a questionnaire about the efficacy of the groups. An observation audit tool was used to evaluate the groups between April and July 2017. This assessed patient activity; levels of dependence; time efficiency of the group and appropriateness of referrals.

Results: Qualitative questionnaire analysis suggested groups:

- Were used to meet RCP standards 78%
- Could be more effective 51%
- Often or occasionally were referred to inappropriately 100%

The observation audit shows:

- A 48% group cancellation rate
- A positive correlation between patient activity and referral appropriateness (r=0.55)
- Patients were active for 50% of allocated group time
- Patients required assistance for 42% of group time

Conclusion: The more appropriate the referral the more active the patients are in the group. When patients are more dependent, the efficacy of the group drops. Groups are cancelled when there is a lack of appropriate referrals.

Further work: Staff education and a new groups' protocol is required to ensure appropriate referrals; to boost therapist productivity and to create a clearly defined role for each group to improve patient activity.

A review of vestibular group therapy in an outpatient department using a selfreported outcome measure

Charlotte Elsmore, Samantha Duncan and Ioan Morgan

London North West University Healthcare NHS Trust, London, UK

Introduction and background: The benefits of group therapy for the treatment of balance impairments are well documented (Gillespie *et al* 2012, English and Hillier 2010), but there is a lack of evidence for the efficacy of a group approach in treating patients with vestibular impairments.

Method: This project reviews the benefits of group therapy for patients with vestibular impairments, and whether the chronicity impacts on the level of positive outcomes from group therapy.

Results: Sixteen patients remained within the same handicap category, six made a positive change in their level of handicap, and two negative. A third of chronic patients demonstrated a clinically relevant improvement in the overall total score; no acute patients did so. Greatest change was seen in the emotional subscale for chronic patients.

Impact on service:

- Classes reduce the number of individualised physiotherapy treatments, making them cost-effective
- Self-funded patients provide revenue to the service

Conclusion: This service review has shown group therapy has a positive impact on the emotional response to symptoms in patients with chronic vestibular impairments. Acute patients may not show clinically significant changes, therefore a different treatment plan should be considered.

Further work:

- Triage service for chronic patients
- Review class protocol
- Patient satisfaction questionnaire
- Review patients who continue with selffunded classes

The FoRDTTM, GradDTTM and StepDTTM: reliability and validity of three novel tests of lower limb somatosensory discrimination in stroke

Terry Gorst¹, Jenny Freeman¹, Kielan Yarrow² Suzanne Maddocks¹ and Jonathan Marsden¹ ¹ Plymouth University, Plymouth, UK ² City University, London, UK

Background: Establishing the extent, severity and functional relevance of lower limb sensory impairments post stroke is important. Despite this, well established, psychometrically robust and functionally oriented measures of lower limb tactile and proprioceptive sensation are lacking.

Purpose: Evaluate the reliability, convergent and discriminant validity of the FOot Roughness Discrimination Test (FoRDTTM), the GRADient Discrimination Test (GradDTTM) and the Step height Discrimination Test (StepDTTM).

Methods: Discrimination thresholds to roughness perception of the plantar aspect of the foot were quantified using the FoRDTTM. Gradient discrimination thresholds of underfoot slope were quantified using the GradDTTM. Discrimination thresholds of step height were quantified using the StepDTTM. Each measure employed a two alternative forced choice design (2AFC). Inter- and intra-rater reliability and agreement, discriminant and convergent validity of the tests were evaluated.

Participants: 32 chronic stroke and 32 healthy age matched controls.

Results: Intra- and inter-rater reliability and agreement were excellent for the FoRDTTM (ICC =0.86-0.90), the GradDTTM (ICC=0.89-0.93) and the StepDT[™] (ICC= 0.85-0.95). Discriminant validity was demonstrated with significant differences in FoRDT[™], GradDT[™], and StepDT[™] performance between stroke and control participants (p < 0.001). Convergent validity of the novel measures was supported through correlations with components of the Erasmus MC version of the Nottingham Sensory Assessment (EmNSA) (r=0.14-0.69). Measures of dynamic and static balance, walking speed, and falls significantly correlated with novel measure performance (r=0.43-0.60)

Conclusion: The FoRDTTM, GradDTTM, and StepDTTM are simple and functionally oriented tests of foot, ankle and lower limb somatosensory discrimination. They are reliable, valid and clinically feasible for use in an ambulatory, chronic stroke population.

Experiences of physiotherapist independent prescribers: impact, facilitators and barriers

Gary Morris^{1&2} and Molly Courtenay¹ ¹ Cardiff University, Cardiff, UK

² Hywel Dda University Health Board, Carma, UK

Purpose: In 2013 the UK became the first country in the world to grant independent prescribing rights to physiotherapists. UK nurses and pharmacists have had these rights since 2003 with noted positive impact on practice. Despite reported benefits, implementation of independent prescribing has been inconsistent both within and across healthcare organisations. Nurses and pharmacists have experienced multiple barriers and facilitators to their practice which may also impact physiotherapists. The aim of this research was to explore the experiences of physiotherapist independent prescribers with a focus on the impact on their practice, and facilitators and barriers to prescribing.

Methods: A qualitative design using individual semi-structure interviews conducted via telephone was used. Seven independent prescriber physiotherapists were recruited from the physiotherapy department of one rural health board in Wales. Data was analysed using thematic analysis.

Results:

- Impact: Participants reported a number of positive outcomes related to becoming a prescriber which fell into three overarching themes: 'improved care', 'enhanced knowledge and understanding of medicines' and 'impact on role'.
- Facilitators and barriers: Facilitators and barriers to practice where numerous and complex. 14 sub-themes were identified which fell under five overarching themes: 'continuing professional development and support', 'job role', 'organisational factors', 'individual factors' and 'prescribing restrictions'.

Conclusions: Independent prescribing has had a positive impact on the practice of physiotherapists included in the study. Multiple barriers and facilitators to prescribing practice were identified. Consideration of these factors by those wishing to implement and maintain services which utilise independent prescribing will ensure the physiotherapy profession makes best use of this new ability to benefit the people it serves.

A single case-study exploring the use of the MindMotionTM PRO as part of a physical exercise programme to maintain upper limb motor control in a patient with Huntington's disease

- Nathalie Brodie¹, Lisa Matthews¹ and Imogen Keane²
- ¹ The Royal Hospital for Neuro-Disability, London, UK ² Mindmaze, London, UK

Introduction: Huntington's disease (HD) is a progressive neurodegenerative disorder that results in significant motor control impairments. Physical exercise is promoted to optimise motor control and function throughout the disease progression (Frese et al 2017). The MindMotion[™] PRO (MMPRO) provides a therapeutic training programme by mapping a person's upper limb (UL) movements onto a 3D avatar, facilitating intensive goal oriented interactive exercises (Mindmaze 2017). This single case-study explores whether increased therapy dosage, using the MMPRO, for rehab in HD would positively impact on UL coordination specifically in relation to end-point accuracy (EPA) and speed of movement (SoM).

Methods: The patient received 45-minute sessions on the MMPRO, over an eleven week period, in addition to their standard physical exercise programme. Each session included four task orientated programmes completed independently with the left and right UL. The EPA and SoM data were collected each session. Patient experience feedback was also gathered. **Results**: 16 sessions were completed, totalling 261 minutes of active MMPRO usage and 1,343 repetitions. Per session an average of 84 task repetitions was achieved within 16 minutes of active therapy, representing 53% of the session. Preliminary results suggest positive projections in both EPA and SoM. An example from data for the right UL 'Fruit Champ' task generated 33% EPA improvement and 3.2 sec SoM improvement. The patient self-reported '...my hands, I could control them better' and 'Helped outside of playing the games, more control.'

Conclusion: In combination with a standard physical exercise programme, the MMPRO has contributed to actual and perceived improvements in accuracy and speed of movement of the UL. The role of technology, such as the MMPRO, could be considered within the physical management of patients with HD. Further consideration of treatment variables impacting intensity and dose, cost-effectiveness and long-term functional implications require ongoing investigation.

Perceptions of therapists towards a higher intensity intervention in stroke rehabilitation

- Jessie Janssen¹, Tara Klassen^{2&3}, Louise Connell¹, Clare Thetford¹ and Janice Eng^{2&3}
- ¹ Faculty of Health & Wellbeing, University of Central Lancashire, Preston, UK
- ² Department of Physical Therapy, University of British
- Columbia, Vancouver, Canada
- ³ Rehabilitation Research Program, GF Strong Rehab
- Centre, Vancouver, Canada

Background: Despite high level evidence and recognition of rehabilitation therapists that aerobic exercise and hence higher intensity rehabilitation in the stroke population is important, clinical implementation remains challenging.

Aims/purpose: To explore rehabilitation therapists' perceived enablers and barriers of implementing a higher intensity intervention in stroke rehabilitation settings.

Methods: In this cross-sectional qualitative study, 15 rehabilitation therapists were interviewed about their experiences in delivering a higher intensity intervention as part of a clinical trial (DOSE). The Consolidated Framework for Implementation Research (CFIR) was used to guide data analysis.

Results:

Enablers: The higher intensity intervention was generally perceived as positive. Therapists were more confident to motivate the patients to work hard due to the included graded exercise test and use of heart rate monitors in the DOSE protocol.

Barriers: Therapists struggled to fit their beliefs about quality of movement within the higher intensity intervention. The graded exercise test, monitors and increased demand in staff availability created additional barriers for implementation in everyday practice.

Conclusions: Despite positive experiences of delivering a higher intensity intervention in the stroke population, rehabilitation therapists wanted to adapt it for clinical practice. In order to facilitate implementation of higher intensity rehabilitation in practice, changes in therapists' beliefs and system level changes (staffing and resources) are likely to be required to facilitate higher intensity rehabilitation in practice. Hence it is important to be clear when designing an intervention which aspects are key components and which aspects can be modified to improve implementation fidelity.

An assessment of physiotherapy-led neurological rehabilitation pilates classes in the community setting

Joanne Pritchard Retford Physiotherapy and Pilates Practice Limited, Retford, UK

Background: Neurological rehabilitation Pilates classes in Retford cater primarily for multiple sclerosis, but also accept clients with other neurological conditions. They were initially set up to support the local community; funding from local Rotary club resulted in reassessments for all members. Classes are led by a neurological physiotherapist certified in APPI Pilates, and consist of seated warm-up and cool-down exercises, and a circuit of ten modified Pilates exercises tailored to benefit the neurological client. Circuit exercises can be performed in standing or sitting for those less able. As each member is performing different exercises at any one time, no one feels isolated or less able than other class members, and each participant is challenged to achieve their full potential in a safe environment.

Aims: To reassess neurological rehabilitation Pilates class participants to determine the effectiveness of their classes in the community setting.

Subjects: Eight members with multiple sclerosis, and two members with Parkinson's Disease. Time attending classes varied from three months to 28 months.

Results: Average 'Tinetti Problem Orientated Assessment of Mobility' score (eight subjects) improved from 17.6/28 (with five at high risk, two at moderate risk and one at low risk of falls), to an average score of 22.6/28 (with two at high risk, two at moderate risk and four at low risk of falls). These results indicate an overall move from high risk of falls to moderate risk of falls. Average 'timed up-and-go' (ten subjects) was 27.25 seconds at initial assessment and 21.11 seconds at reassessment (average improvement of 22.5%). Subjective comments included 'improved my overall confidence', 'improved my posture', 'improved my strength', 'improved my body awareness', 'improved control of my weaker leg', 'reduced number of falls' and 'attending the classes keeps me going'.

Conclusion: Retford's neurological Pilates rehabilitation classes resulted in improved confidence, improved walking and improved balance.

What's in a handshake?

- Jade Donnelly¹ and Sunitha Narayan^{1&2} ¹ University Hospital Southampton NHS Foundation Trust, Southampton, UK.
- ² Muscular Dystrophy UK, London, UK

Background: Working with patients with neuromuscular diseases requires one to be creative, and find unique solutions. The progressive loss of muscle strength means it is a fine balance between the effort of movement and functional gain.

Subject: X was diagnosed with facioscapulohumeral muscular dystrophy, a muscle wasting condition predominately affecting facial, scapular, humeral muscles, with abdominal weakness and distal weakness. The weakness can be often asymmetrical in presentation and progressive in nature (Brouer OF *et al* (1993) Facioscapulohumeral muscular dystrophy the impact of genetic research *Clinical Neurology and Neurosurgery* 95 (1) pp9-21).

X was considering flexor tendon transfer surgery to improve hand function. Examination showed profound finger extension weakness with preservation of flexors. He had resting splints to maintain range, with limited hand function. How would a splint that passively extended his fingers impact function?

The SaeboGlove helps patients with neurological and orthopaedic injuries incorporate their hand functionally. There is no documented use for patients with FSHD. The splint positioned his hand into passive extension, from where hand function improved. Reaching his hand out for a handshake was a 'wow' moment for X! 'I appreciate most being able to open and close my fingers, it feels so natural! I loved getting this function back.'The glove helped him take books off shelves, pick up small objects and clap his hands!

What now? X has reconsidered surgery and is off the waiting list.

Results: Will we be prescribing this splint to others? The SaeboGlove should be considered in those with neuromuscular disease causing isolated finger extension weakness preventing optimum use of preserved hand muscles.

Conclusion: Sharing knowledge, understanding what is important to our patients and lateral thinking is what therapists do well. These skills are what is needed for us to thrive in this challenging healthcare climate.

Trunk exercise to improve trunk and upper limb performance post stroke: A systematic review and meta-analysis

Norah Alhwoaimel^{1&2}, Ruth Turk¹, Martin Warner¹, Geert Verheyden³, Liselot Thijs³, Seng Kwee Wee^{4&5} and Ann-Marie Hughes¹

- ¹ University of Southampton, Southampton, UK
- ² Prince Sattam University, Alkharj, Saudi Arabia
- ³ University of Leuven, KU Leuven, Belgium
- ⁴ Tan Tock Seng Hospital, Novena, Singapore
- ⁵ Singapore Institute of Technology, Dover, Singapore

Background: Post-stroke trunk control is reported to be associated with trunk performance and recovery of the upper limb, but the evidence for the influence of trunk exercise on both of these is unclear.

Objective: To evaluate the effect of trunk exercises on trunk performance post-stroke, and to determine if these exercises result in improved upper limb function.

Methods: A comprehensive search of the literature published between January 1990 and February 2017 was conducted using the following electronic databases; AMED, CINAHL, Cochrane Library, EMBASE, MEDLINE, PsychInfo and SPORTDiscus. Only randomised, controlled trials, published in English, evaluating the effect of trunk exercises on trunk performance and/or upper limb function in stroke survivors, were included.

Results: A total of 17 studies involving 599 people with stroke were analysed. Type of exercise ranged from exercises related to the trunk impairment scale tasks, use of technology (eg Smartphone-Based Visual Feedback Trunk Training), to those using training on a stable or unstable surface. Meta-analysis showed that trunk exercises had large significant effect on trunk performance post-stroke (SMD=0.85; 95% CI=0.58 to 1.12). This significant effect varied from very large for acute stroke (SMD= 1.57; 95% CI= 0.76 to 2.47), to medium for subacute (SMD= 0.67; 95% CI= 0.44 to 0.90) and chronic stroke (SMD= 0.74; 95% CI= 0.42 to 1.05). The optimal intensity of trunk exercise remains unclear, due to heterogeneity of the frequency and duration of exercise programmes in the included studies. No evidence currently exists for the effect of trunk exercise on upper limb function because none of the included studies had measured the effect of trunk exercise on upper limb impairment or functional activity.

Conclusions: Trunk exercises improve trunk performance for people with acute, subacute and chronic strokes. There is no evidence to support the effect of trunk exercise on upper limb function.

Physiotherapists' personal perspective of the use of functional electrical stimulation (fes) for the management of drop-foot in stroke: a qualitative study

Kirsty Scales, Katherine Baker and Jenni Monaghan Northumbria University, Newcastle Upon Tyne, UK

Background: FES has been identified within the literature to be a successful intervention in the management of drop-foot in stroke; however, there is an imbalance in the current evidence base. A wide range of the literature is from the patients' perspective with individuals expressing FES reduces walking effort, improves confidence and independence enabling some individuals to return to previous activities and work. Despite a wide range of literature identifying patients' positive experiences of FES, there is a dearth of research identifying physiotherapists' personal perspective - which is important to understand given the varied utility of FES in practice. This research was developed to explore physiotherapists clinical experience of FES for drop-foot in stroke.

Method: Ethical approval was granted by the University of Northumbria. A qualitative phenomenological approach was utilised and data was collected through an online focus group performed through the social media platform Facebook. A homogenous sample of eight physiotherapists with specialist experience in stroke rehabilitation were recruited. Data was analysed through the thematic analysis approach identifying patterns and themes emerging from repetitive responses of participants experiences. **Results**: The three overall themes emerging from the data were:

- Accessibility
- Impact on the recovery of gait and
- Challenges associated with the use of FES.

Discussion: Overall, participants expressed a preference towards FES due to its ability to provide a greater recovery on gait with improved sensory and motor feedback, reduced secondary complications and the carry over effect, resulting in some patients no longer requiring the device. Despite the perceived benefits of FES being established, participants identified challenges closely associated with adverse effects of pain, skin irritation and set up. Accessibility was another reoccurring theme with participants identifying that funding, time, experience and provision of FES may be significantly impacting practitioners' ability to access FES.

Pilot project of a six-day therapy service in a neurorehabilitation unit

Christina McNeil, Carly Elphick and Natalie Wallace Oxford Centre for Enablement, Oxford, UK

Background: The neurological rehabilitation service at Oxford Centre for Enablement is a Level 1 tertiary service which offers intensive multi-disciplinary rehabilitation to 27 inpatients historically five days a week. The following national evidence-based recommendations guide our therapy practice:

- BSRM Rehabilitation Guidelines (2013)
- SIGN: Brain injury rehabilitation in adults (2013)
- RCP Stroke Guidelines (2016)

Aims/purpose:

- Increase intensity and opportunity for functional task practise and exercise
- Promote self-management
- Integrate a 24-hour approach to rehabilitation

Methods: A Saturday physiotherapy service was piloted between March and May 2015 with very positive feedback. A physical activity audit found that patients were more active during evenings and Saturdays compared with a 2013 audit following this pilot. Two part-time Band 3 Enablement Assistant posts were created for 11 months from September 2016 to work one week day and every Saturday. A physical activity audit and patient/carer and nursing satisfaction questionnaires were repeated.

Results: An average of 18 patient sessions was completed each Saturday. Patient feedback

questionnaires highlighted it was helpful to support their therapy practice at the weekend and staff also reported patients appeared more motivated. The 2017 physical activity audit found that activity levels were still low on Saturdays. Reasons may include higher visitor contact and many more mobile patients, who have more opportunities for self-management, left the ward.

Conclusion: The six-day service has been successful and funding for these posts has been secured for another twelve months. Our aim is to utilise more groups to further increase intensity of practise and social integration as well as increase involvement in functional tasks. We also plan to use practice diaries to promote practice outside of therapy time with support of family.

A feasibility study of a vestibular screening tool in an acute traumatic brain injury (TBI) population

Elizabeth Williamson and Abigail Newdick St Georges University Hospitals NHS Foundation Trust, London, UK

Background: Dizziness and balance problems are significant issues for individuals with TBI. Vestibular dysfunction is often a delayed diagnosis at the chronic stage of recovery. At this stage, it is more difficult to treat with significant economic impact.

Aim: To assess the feasibility of a vestibular screening tool within the TBI population in acute inpatient neurological services.

Methods: A vestibular screening tool was developed integrating subjective assessment, benign paroxysmal positional vertigo (BPPV) testing, vestibulo-ocular reflex (VOR), vestibulospinal reflex (VSR) and vestibular oculomotor screening (VOMS) (Mucha et al 2016). Designated therapists (n=4) across three specialist acute services were trained to implement the screening tool. Suitable individuals (N=19) with acute TBI were assessed over a seven-month period. Individuals were treated either acutely and/or referred to specialist vestibular outpatient services.

Results: 63% of participants (N=12, male/ female 8/4, mean age 53.67, severity mild/ moderate 4/8, length of time post injury 2-59 days) were diagnosed with vestibular and balance abnormalities. 67% with BPPV (N=8), 17% abnormal VOMS (N=2), 33% abnormal VOR (N=4) and 42% abnormal VSR (N=5). 17% (N=3) required onward referrals to specialist vestibular outpatient services. Interestingly only 37.5% (N=3) of participants with BPPV reported subjective dizziness. There were no adverse events noted. Confidence levels of therapists increased from 3.75 to 9.25/10 during the study (N=4). Time taken to complete screening reduced from 25 to 15 minutes (N=4).

Conclusion: Vestibular screening in the acute setting is feasible within the TBI population. The majority were treated acutely with no increased burden on local physiotherapy services and no need for onward referral. Importantly in the absence of subjective dizziness, a vestibular assessment should still be considered within this population. Further research should explore the follow-up of TBI survivors in relation to continued resolution of dizziness and the feasibility of screening in non-specialist units.

Intensive gait training within the first three months post-stroke: a systematic review and meta-analysis on feasibility and efficacy

- Jonas Schröder¹, Steven Truijen¹, Wim Saeys^{1&2} ¹ University of Antwerp, Rehabilitation Sciences and
- Physiotherapy, Antwerp, Belgium

² Revarte Rehabilitation Hospital, Antwerp, Belgium

Introduction: Animal models suggest a limited time window of heightened plasticity post-stroke^{*}, in which the brain is most receptive to motor training[†]. In human stroke care, this early phase is described as a time of being inactive and alone[‡], which might explain disappointing rehabilitation outcome. Already described therapeutic strategies allowing intensive gait training and an increase of physical activity in this early phase are collected, to investigate feasibility and efficacy.

Methods: RCTs investigating gait training with an emphasise on a high dose of step-repetitions to non-ambulatory stroke patients within the first month post-stroke are included.

Results: In total, 16 studies are included. Training can safely be initiated early post-stroke by the use of body-weight support systems and robotics-assisting locomotion. No major adverse events are reported and adherence to therapy was good despite the demanding nature of the intervention. Beneficial immediate effects on walking endurance (MD=26.93; 95% CI, 2.69-51.17) and long-term effects on functional walking ability (MD=0.77; 95% CI, 0.28-1.27) are found. Analysis on impairment-level was impossible due to lack of data.

Conclusions: Even at a very early stage, additional therapy hours of high-intensive training is well tolerated and can lead to long-term functional improvements. Underlying mechanisms remain unkown. Future research on robotic-assisted training emphasising higher participation of the user and environmental enrichment is highly encouraged, besides the systematic use of impairment-measures.

* Murphy TH and Corbett D (2009) Plasticity during stroke recovery: from synapse to behaviour *Nature Reviews Neuroscience*10 (12) pp861-872.

[†] Zeiler SR and Krakauer JW (2013) The interaction between training and plasticity in the post-stroke brain. *Current Opinion in Neurology* 26 (6) pp609-616.

[‡] Bernhardt J et al (2004) Inactive and alone: physical activity within the first 14 days of acute stroke unit care *Stroke* 35 (4) pp1005-1009.

Exploring falls and physical activity in Parkinson's through a different lens

- Katherine Baker¹, Jenni Monaghan¹, Julia Das¹, Marguerite Harvey², Silvia Del-Din³ and Lynn Rochester³
- ¹ Northumbria University, Newcastle, UK
- ² Northumbria Healthcare NHS FoundationTrust, North Shields, UK
- ³ Newcastle University, Newcastle, UK

Background: Falls and balance are a clinical and research priority for PwP, reflecting the major impact of falls; 45-68% of people with Parkinson's (PwP) fall annually, twice as many as the general older population. Falls impact across several domains including quality of life, carer stress, fear and physical function. There is a complex association between falls and physical activity. PwP do not achieve optimal levels of physical activity, even in early stage disease.

Aims/purpose: This study aimed to explore barriers and facilitators to physical activity in PwP who have fallen and to understand the context within which that activity occurs.

Methods: A mixed methods approach using body worn cameras (Autographer), physical activity monitors (Axivity) and semi structured interviews was used. Camera images allowed exploration of the environmental and social context. Interviews were used to explore barriers and facilitators to physical activity and examine the relationship with falls. Twelve people with PwP and twelve older adults, all who had fallen in the previous year, were recruited through specialist Parkinson's and falls clinics.

Results: Preliminary analysis shows that participants are not achieving recommended physical activity levels, with PwP being slightly less active with shorter more variable bouts of activity. Interviews and camera images showed that the physical environment, social factors, comorbidities, previous engagement in activity/ exercise and fear of falling influenced activity. For PwP the unpredictability of symptoms and impact of medication regimes were additional influences.

Conclusion: It is important to address limited levels of physical activity in those who have fallen due to the impact on primary and secondary symptoms but also quality of life and social inclusion. However any intervention must recognise the complex array of factors which influence activity and ensure appropriate support is in place to empower positive behaviour change.

Using a visual cueing device, Path Finder, after stroke to improve stride length, walking symmetry and walking speed: a case study

Anke Robijns¹, Lise Pape² and Tamsin Reed¹ ¹ The Wellington Hospital, Neuro Rehabilitation, London, UK ² Walk with Path, London, UK

Background: Available literature supports the use of visual cues to help those with neurological disorders, including stroke. Studies have shown visual cueing to increase stride length, improve walking symmetry, walking speed and functional mobility in those recovering from stroke by more than 10% (Hollands *et al* 2015). Both symmetry and walking speed increased in patients after only one or two sessions of visual cueing. Visual cueing has been found to be a safe ambulatory method, with only non-injurious stumbles reported.

Path Finder: Path Finder is a shoe attachment that projects a visual cue onto the floor to initiate walking and to help regulate walking. The cue projected is a green laser line in front of the opposing foot. The distance and angle of the line from the foot can be adjusted to a comfortable distance for the user to aim for. Cueing is automatic and constant, every step the user takes triggers the laser projection.

Method: The purpose of this case study is to investigate the potential of using Path Finder with patients recovering from stroke, who are ambulating with or without assistance and/ or walking aid in an in-patient rehabilitation setting.

- Gait videos and 10 Meter Walk Test (10MWT) completed before using Path Finder
- Gait practice with Path Finder
- Gait video and 10 MWT with Path Finder

Gait video and 10 MWT after having used Path Finder

Results: 10 MWT results demonstrate the increased stride length and walking speed. Videos demonstrate improvements in walking symmetry and quality of gait.

Conclusion: This case study showed promising results of the benefits of visual cueing in stroke population. Path Finder is user-friendly and easy to set up, therefore further trials with patients recovering from stroke will be carried out at the rehabilitation unit.

Gait rehabilitation by outdoor rhythmic haptic cueing using wearable technology for neurological conditions: a case study

Riasat Islam, Simon Holland, Theodoros Georgiou, Blaine Price and Paul Mulholland The Open University, Milton Keynes, UK

Background: For people with neurological conditions such as stroke and brain injury, gait rehabilitation can lead to a significantly more independent lifestyle. Existing gait rehabilitation studies with stroke survivors using rhythmic haptic cueing via wearable devices have demonstrated improvements in temporal symmetry, increase in stride length and walking speed. However, these studies have been limited to laboratory settings and focused on short-term improvements only. By contrast, we present results from the first longitudinal case study on the self-managed use of wearable haptic devices for gait rehabilitation via entrainment in outdoor settings.

Methods: A longitudinal pilot study was conducted with a brain injury survivor, providing rhythmic haptic cueing using a wearable haptic device for a two-week period. The participant was asked to walk in synchrony to the haptic rhythm at a suitable outdoor setting for a minimum of ten minutes each day. Gait data was measured before and after the two-week intervention using lab-based IMU sensors.

Results: On comparing the before and after gait characteristics, preliminary results showed improvement in temporal symmetry, walking speed and stride length.

Conclusions: Implications for long-term benefits in gait rehabilitation using rhythmic haptic cueing for various neurological conditions are considered. Improvements in temporal symmetry, increase in stride length and walking speed could improve confidence, independence and overall quality of life for patients, with implications for reduction of costs associated with care and rehabilitation.

The Queen Square intensive upper limb rehabilitation programme – what's in the box?

Fleur Vella¹, Fran Brander², Kate Hayward^{3&4&5}, Amanda Strawson², Ali Norfolk², Sally Davenport⁶, Kate Kelly² and Nick S Ward^{2&7}

- ¹UCL Institute of Child Health, London, UK
- ² The National Hospital for Neurology and Neurosurgery, London, UK
- ³ Stroke Division, Florey Institute of Neuroscience and Mental Health, University of Melbourne, Melbourne, Australia
- ⁴ NHMRC Centre of Research Excellence in Stroke
- Rehabilitation and Brain Recovery, Melbourne, Australia ⁵ Department of Physical Therapy, University of British Columbia, Vancouver, Canada
- ⁶ UCL GOS Institute of Child Health, London, UK
- ⁷ UCL Institute of Neurology, London, UK
- OGE Institute of Neurology, London, Of

Background: While the clinical outcomes for the Queen Square intensive upper limb rehabilitation (ULR) programme for chronic stroke survivors had previously been reported to be statistically and clinically significant, knowledge of the three-week programme was limited to scheduled duration of therapy sessions. Within this study the dose and type of upper limb (UL) training has been detailed.

Methodology: Observation of 108 hours of ULR was carried out over six weeks. Observation captured information about dose (number of repetitions and duration), and type of training (movement category, subcategory and goal-directed training). Upper limb capacity of the stroke survivors attending the programme was indexed using the Action Research Arm Test (ARAT).

Results: The median number of UL repetitions ranged from 682-922 per day, depending on the phase of UL rehabilitation. Within the UL-based training, 94% of repetitions consisted of active training. In general, as the programme progressed from the first to final week there was an increase in unassisted and functional repetitions. This pattern was shown to apply to those with higher UL capacity (ARAT 22-57), as well as those with lower UL capacity (ARAT 0-22).

Conclusion: This study describes the dose and type of training within an intensive upper limb rehabilitation programme. Documenting the programme's content has improved the understanding of the complex intervention, allowing more informed future research, and encourages more widespread implementation.

The evidence for the clinical effectiveness of electrical stimulation to prevent and reduce shoulder subluxation after stroke: a systematic review

- Patricia Edwards¹, Nigel Williams² and Julie Sellars²
- ¹ Walsall Integrated Stroke Team, Walsall Healthcare NHS Trust, Walsall, UK
- ² Faculty of Health and Life Sciences, Coventry University, Coventry, UK

Background: Inferior shoulder subluxation (ISS) after stroke is a common problem and is thought to contribute to the development of pain and other secondary complications, limiting recovery.

Question: Is Electrical Stimulation (ES) a clinically effective adjunct to treatment in the prevention and reduction of ISS in adults after stroke?

Design: A systematic review of randomised controlled trials in English, where ES has been used to prevent and/or reduce ISS, published from inception to June 2017. An estimate of what a clinician would consider the smallest clinical effect from the use of ES was used to guide the narrative synthesis.

Participants: People with stroke who would be considered at risk of/or diagnosed with ISS.

Intervention: ES reduces ISS by relocating the humeral head in the glenoid fossa by nerve stimulation from surface electrodes applied to the shoulder muscles.

Outcome measures: Vertical distance of the sub-acromial gap measured by A-P x-ray was used in all the trials. The remaining outcome measures were categorised by impairment and activity.

Results: Eight eligible trials were identified. Overall quality of the trials was moderate to poor. ES and conventional treatment (CT) appears to prevent and reduce ISS by at least $\frac{1}{2}$ finger width of palpation of the sub-acromial gap if applied within 122 days post-stroke. The reduction in ISS was not maintained on withdrawal of the ES. There is weak evidence to suggest motor impairment may also be improved if applied within 21 days post-stroke; there was no improvement in activity or pain. No assessment could be made if the CT offered in the trials was efficacious.

Conclusion: ES appears to have limited clinical effectiveness as an adjunct to CT, but may be useful early after stroke with people who cannot participate in active upper limb therapy.

Changes in cortical connectivity from the affected and unaffected hemisphere due to high repetition reaching training in the acute period after stroke

Ulrike Hammerbeck¹, Kristen Hollands², John Rothwell³ and Sarah Tyson¹ University of Manchester, Manchester, UK University of Salford, Salford, UK University College London, London, UK

Background: Chronic stroke survivors present with greater ipsilateral connections from the unaffected hemisphere to proximal shoulder muscles. The presence of these connections is however not correlated to functional outcomes. In this study we map connections to proximal arm muscles involved in reaching movements and investigate whether high repetition reaching training alters the prevalence of these connections and their functional relevance.

Method: This is a randomised controlled trial of stroke survivors with arm weakness at three weeks after stroke. Contralateral and ipsilateral corticospinal connections to triceps and anterior deltoid are assessed at three, six and twelve weeks after stroke using transcranial magnetic stimulation (TMS) during muscle activation. Individuals are randomised to high repetition reaching training between three and six weeks and a control group. In addition arm function (Fugl-Meyer) is related to changes in connectivity.

Results: Recruitment was completed on 10th January 2018 and 38 acute stroke survivors (19 in each group) participated (mean age= 61.2 years \pm 14.9 SD, 16 female). Baseline measures were performed at an average of 23.5 days after their stroke. The average Fugl-Meyer upper limb score was 30.5/66. Analysis will commence to report on the presence of contralateral and ipsilateral connections (>100microVolt MEP in ³50% of stimulations) in both triceps and deltoid muscle. We will further demonstrate whether this connectivity changes during the recovery process and whether training impacted on this.

Conclusion: Stroke survivors agreed to participate in this intensive investigative trial early after stroke. Our results will demonstrate recovery mechanism early after stroke and thereby potential targets for therapeutic interventions like brain stimulation.

Neural correlates of motor response to virtual reality-aided exercise-based training for the upper limb after stroke: a systematic review

Fiona Ellis¹, Niamh Kennedy², Nicola Hancock¹ and Valerie Pomeroy¹ University of East Anglia, Norwich, UK Ulster University, Belfast, Ireland

Background: Virtual reality, when used as an adjunct to exercise-based training, is a potential means of enhancing upper limb motor recovery after stroke. However, the neural mechanisms of this potential effect are unclear. Identification of the neural correlates of motor response to virtual reality is expected to enable targeting of therapy closer to mechanisms of impairment, so enhancing therapeutic benefit for people with stroke.

Objectives: To identify the neural correlates of upper limb motor response to virtual reality-aided exercise-based training after stroke and to find whether these differ between:

- virtual reality and comparator therapies and
- virtual reality and no therapy

Method: A systematic review with two researchers working independently to identify relevant studies, assess potential risk of bias and extract data. The search strategy was compiled in collaboration with a medical librarian. Eight databases were searched including the Cochrane Trials Register, MEDLINE and Open Grey. The search concluded in October 2017. All experimental study designs are included. Relevant studies investigated a virtual reality-aided exercise-based training for the upper limb recovery in adults with stroke. Studies were excluded studies if participants had neurological conditions other than stroke and/or evaluated other technology (eg robotics). Outcomes of interest included measures derived from electromyography and neuroimaging. The Down's and Black (1998) tool was used to assess the potential risk-of-bias. If there is sufficient commonality in extracted data then a meta-analysis will be undertaken in addition to a critical narrative synthesis.

Progress to date: Twelve studies from the 581 identified references met the inclusion criteria. Of these, three showed a high risk, six a medium risk and three a low risk of bias. Data extraction is underway. The review will be completed by February 2018 and therefore full results will be available for presentation.

The neurology therapies upper limb service at St Thomas' Hospital shows positive patient outcomes with low intensity input

Laura Douglas and Rebecca Mullin St Thomas' Hospital, London, UK

Background: Improving upper limb function is a key aim of rehabilitation to reduce long-term disability in neurological conditions. Physical rehabilitation is effective in recovery of upper limb function after stroke (Pollock *et al* 2014) but consistent evidence on the dose of input required to achieve gains is lacking.

Aims: To summarise the outcomes of the upper limb service one year after introducing treatment pathways based on functional level at assessment.

Method: The therapies upper limb service assesses disability related to CNS pathology. Three management pathways are available: disability management, one-to-one physiotherapy sessions or six sessions at the fortnightly 'Reach Out', task based upper limb rehabilitation group programme. Outcomes include the ArmA, Fugl-Meyer and ARAT.

Results: In 2017 55 people were assessed, 43% of patients received disability management and of these 54% required splinting. The Reach Out programme was offered to 25% of patients. Input is ongoing for some patients and a total of 17 have been discharged after rehabilitation or management, seven of whom completed the Reach Out programme. Over the whole group the ArmA showed a median positive change in passive function of 1.5 points and a median positive change in active function of 5 points. Of those completing the six sessions of Reach Out a mean positive change of 5.4 points was seen on the active function scores of the ArmA.

Conclusion: This review shows positive outcomes in upper limb care and function can be achieved with only moderate available resources and without the intensive input suggested by other research in the area. Further study is required to look at long-term outcomes of the pathways with a larger total population and also condition-specific sub-populations. A case study to assess the effects of an electrical stimulation suit on the functional mobility of an individual with a traumatic brain injury

Scott Reed

Hobbs Rehabilitation, Winchester, UK. Intervention, Stockholm, Sweden

Background: Sensory level electrical stimulation is widely employed in TENS devices to control pain. Research has also established that this treatment can modulate central nervous activity to reduce spasticity (Mills and Dossa 2016). Employing 29 pairs of electrodes, the Mollii Suit has the ability to deliver sensory stimulation across the whole body. As a home treatment, or as preparation for physiotherapy in a clinic, the intervention has the potential to improve global postural activity and motor function.

Aims: The aim of this case study was to use the LiteGait Litesens 2000 analysis treadmill to record objective gait markers and see whether a single hour's use of the Mollii Suit would improve these measures.

Method: The patient was assessed by a clinical specialist and mobilised on the Litesens 2000 treadmill (using the litegait body suspension) with gait parameters recorded. The patient then wore the Mollii Suit for a single hour, during which time he sat in his wheelchair and did not receive any thereapy. After one hour the suit was removed and the patient was mobilised on the treadmill again. The amount of suspension was the same pre- and post-assessment as was the treadmill speed.

Results: Significant changes were observed most importantly a decrease in difference of step length, a decrease in percentage of time spent in double support, an increase in stride time, step length asymmetry decreased, cadence decreased and a narrower base of support was observed. The centre of load mapping charts also demonstrated a more symmetrical hourglass pattern and a clear increase in forward position of the left leg.

Conclusion: In this single case the objective markers demonsrated significant changes which had a direct impact on his transfers and mobility at home. A larger study would be beneficial to guide specific Mollii Suit programming in the future.

Is a Lycra sleeve an acceptable treatment for glenohumeral subluxation in people with stroke: patients, clinicians and family members' perspectives

Praveen Kumar¹, Robert Jones², Chris Easton² and Ailie Turton¹

¹ University of West of England, Bristol, UK

² University Hospital Bristol NHS Foundation Trust, Bristol, UK

Background: Glenohumeral subluxation (GHS) is a common post-stroke complication reported to occur in up to 81% of patients. It presents considerable challenges to the rehabilitation of the upper limb, impeding recovery of shoulder function. There is limited evidence to support the effectiveness of current approaches for management of GHS. Wearing a Lycra sleeve on the affected arm has shown promise for reducing GHS in our small preliminary studies involving people with chronic stroke (n=5; n=6)

Aims: The primary aim of this feasibility study is to explore the acceptability of Lycra sleeves as a treatment, applied early after stroke, from the point of view of patients, carers and ward staff. We will also test acceptability of some outcome measures of upper limb movement, pain and spasticity, for use in a future trial.

Method: In this prospective cohort study, we aim to recruit 50 patients from an acute stroke ward and rehabilitation unit. Patients aged over 18 years, with a first stroke resulting shoulder muscle strength ≤2 on Medical Research Council scale, medically stable and able to provide informed written consent, will be included. Patients will be randomised to immediate Lycra sleeve use or delayed Lycra sleeve application (after three months) groups. After three months of intervention, patients, carers and staff will be asked to complete a questionnaire to determine the acceptability of the Lycra sleeve intervention.

Outcome measures: Will be completed before application of the sleeve and three months later.

Results: Ethical approval received.

Use of portable diagnostic ultrasound to inform treatment choices for hemiplegic shoulder pain in people with chronic stroke: a case series

Praveen Kumar¹ and Jakko Brouwers² ¹ University of West of England, Bristol, UK ² Morrello Clinic, Newport, UK

Background: Hemiplegic shoulder pain (HSP) has a reported incidence of up to 84% of patients. HSP is multi-factorial in nature and interventions are very varied but are generally unsatisfactory. The objective of this case series study is to report findings on patients with HSP who underwent scanning using portable diagnostic ultrasound and received problem-specific treatment.

Method: Six patients with HSP were receiving rehabilitation (over-arm exercises, electrical stimulation, stretches, Saebo exercises) in a private clinic but were not showing any improvement. Ultrasound scanning was undertaken and the following problems were identified: glenohumeral subluxation (GHS), supraspinatus atrophy (diameter of supraspinatus), rotator cuff tears, and bicipital tendinitis. Treatment included:

- Ultrasound guided electrical stimulation to supraspinatus; lateral deltoid (GHS, supraspinatus atrophy)
- Rotator cuff training/isometric exercises (Rotator cuff tears, supraspinatus atrophy)
- Avoiding of over-arm activities
- Other treatment included scapula setting exercises (for posture and muscle imbalance)

Results: At twelve weeks, patients showed 50-75% reduction in pain, 40-60% improvement in GHS (up to 1cm affected to unaffected difference), increase in diameter of supraspinatus at rest (0.4cm) and contracted state (0.8cm), increase in range of movement (flexion - 30 degrees, abduction - 45 degrees, external rotation - 40 degrees), improved use of arm for function/rehabilitation, and patients reported improvement in activities of daily living. Clinicians reported improvements in designing and delivery of exercise programme.

Conclusion: Portable diagnostic ultrasound has potential to inform treatment choices for HSP and improve patient outcomes.

The effects of Lycra sleeves on acromion-greater tuberosity distance, muscle activity and scapula position in people with post-strokehemiplegia

Praveen Kumar, Lindsay Macleod, Priya Mohan, Catherine Wheeler and Grace Wai Tse University of West of England, Bristol, UK

Introduction: Glenohumeral subluxation (GHS) is reported in up to 81% of patients with stroke. Our previous studies found that a Lycra sleeve can reduce acromion-greater tuberosity distance (used for assessment of GHS) in people with chronic stroke (n=5). In a recent study on healthy people (n=31), we report reduction in AGT, change in scapula measurements and change in muscle activity after the application of Lycra sleeve. The aim of this study was to investigate the effect of Lycra sleeves on the acromion-greater tuberosity (AGT) distance, muscle activity around the shoulder region and scapular position in people with stroke.

Method: People with stroke who gave informed consent were recruited. Measurements were taken before and immediately after application of the sleeve. Portable diagnostic ultrasound, electromyography and a tape measure were used to measure AGT distance, muscle activity (biceps, triceps, deltoid, and supraspinatus) and position of the scapula respectively.

Results: Six participants with mean age 53 ± 8 years were recruited. Mean \pm SD and 95%confidence intervals for AGT distances on the affected side before and after the application of sleeve were 2.1 \pm 0.3 (1.8-2.5cm) and 2.0 \pm 0.4 (1.6-2.4cm) respectively. There was a very slight increase in muscle activity after the application of Lycra sleeve in all muscles tested. Likewise there was reduction in scapula position (posterior tilt). Mean difference 0.75 \pm 0.2cm after the application of sleeve.

Discussion: Findings from this study are in agreement with the previous research. Further research is required to establish the effectiveness of the Lycra sleeve using a well-designed randomised controlled trial.

Assessment approaches for hemiplegic shoulder pain: a scoping review

Praveen Kumar, James Hugman, Ceri Owen, Emily Smith, Maddy Redfern and Sophie Trenouth University of West of England, Bristol, UK

Introduction: Hemiplegic Shoulder Pain (HSP) is reported between 16% and 84% in people with stroke. A recent survey of therapists in the UK reported that clinicians are using a

wide range of assessment approaches irrespective of the underlying pathology. The main aim of this scoping review was to gather all potential assessment approaches available for adults with HSP and to identify how frequently each assessment approach occurred.

Method: Five researchers were involved and each researcher conducted a search in one of the databases that were selected: Embase, CINAHL plus, Medline, Cochrane library and AMED. All outcome measures/assessments that were used in relation to HSP were extracted based on the set inclusion/exclusion criteria.

Results: A total of 122 out of 585 studies were found that met the inclusion criteria and 43 assessment methods of HSP were identified. The most commonly reported measures included Visual Analogue Scale (VAS) (66 times), Passive Range of Motion (51 times), Fugl-Meyer Assessment (29 times), Modified Ashworth Scale (26 times) and Numerical Rating Scale (23 times). A less commonly reported but a potentially useful tool, Shoulder Q, was reported only five times.

Discussion: Both general and stroke specific assessment approaches were used to measure HSP. There are several limitations with the current assessment approaches as they do not encompass all domains. Several measures lacked reliability/validity in stroke population. A fully comprehensive assessment that considers subjective, objective and functional elements is needed in this area to inform appropriate treatment choices and to improve patients' outcome.

An exploration of the physical activity life cycle in Huntington's disease

Katy Hamana¹, Monica Busse² and Tina Gambling¹ ¹School of Healthcare Sciences, Cardiff University, Cardiff, UK

² Centre for Trials Research, Cardiff University, Cardiff, UK

Background: Huntington's disease (HD) is a neurodegenerative, genetic disorder. Progressive physical, behavioural and cognitive impairments eventually lead to inability to function independently. Evidence highlights the potential of physical activity (PA) for HD symptom management and improved quality of life. Criticism of previous PA interventions in HD research includes lack of underpinning theory, recognised as vital for successful complex intervention development. This is due to lack of qualitative research that has explored PA in HD.

Aim: To explore how living with Huntington's disease (HD) impacts on the experience of physical activity (PA) across the stages of the disease.

Method: Eight focus groups were conducted across the UK. Participants included people with prodromal to late stage HD, caregivers (family members/formal), healthcare professionals. Data was analysed using framework analysis method. An analytical coding framework was developed from the data and the self-regulation model (SRM) to assist analysis.

Results: Key themes include 'the evolving representations of HD and physical activity', 'the varying social environment of the person with HD and the impact on physical activity' and 'achieving PA participation while coping with the nuances of HD'. The SRM facilitated understanding of PA experiences; however, self-regulation of activities becomes more collaborative with the caregiver as HD progresses.

Conclusions: A modified SRM is suggested which accounts for increasingly collaborative regulation of representations and PA participation with HD progression over time. Social and familial context of individuals with HD is a key consideration for health care professionals supporting PA participation. Strategies such as using PA as a way of taking control, and adjusting expectations can help people with HD continue to be active and adapt PA from high level to more functional activities with symptom progression. The findings provide a theoretical foundation to underpin development of a wide range of PA management and research interventions in HD.

The reliability of a handheld dynamometer in patients with HTLV associated myelopathy

Adine Adonis¹, Graham P Taylor² and Caroline Alexander² ¹ National Centre for Human Retrovirology, London, UK ² Imperial College, London, UK

Background: An important component of clinical management in HTLV-1-associated myelopathy (HAM) is detecting early, evolving change and responses to treatment. Loss of muscle strength is an early sign of onset/ worsening HAM.Manual muscle testing (MMT) is routinely used to test muscle strength; however, low reliability means that alternative methods are required. A Handheld Dynamometer (HHD) could be more accurate than MMT and can be used in a clinical setting.

Methods With ethical approval 20 patients with HAM were recruited. The study is conducted on two occasions four weeks apart. Hip, knee and ankle flexors and extensors were assessed bilaterally. The patient was asked to do a maximum voluntary contraction three times per muscle group, with a ten second rest between each test. The testing procedure was repeated four weeks later. The force is presented as the mean of three contractions. Standard error of the mean and Intra-Class Correlation Coefficient (ICC) are used to describe the reliability of the data for each muscle group. Acceptability of the dynamometer was assessed using a patient-reported experience questionnaire.

Results: First 20 patients with HAM: 14 female; mean age: 58 years (\pm 10.8). Duration of disease: 13.85 years (\pm 7.2). Walking aids: walking frame n=5; two elbow crutches n=8; two walking sticks n=1; one walking stick n=2; no walking aid n=4. Average testing time: Visit 1:19min 05 sec (\pm 3.6); Visit 2:17min (\pm 1.9). Pain scores: Visit 1: before:2.5 cm (\pm 2.9) after:2.1cm (\pm 2.5) p=0.16.Visit 2: before:1.8 cm (\pm 2.7) after:1.3cm (\pm 2.1) p=0.09.

Using the HHD is acceptable to all patients tested to date.

In this preliminary evaluation, reliability between sessions is not always good and therefore a HHD may not be appropriate to measure strength over time for hip musculature.

Using the Computer Assistive Rehabilitation Environment (CAREN) Virtual Reality to enhance recovery following an AVM: a case study

Sylvia Moss Brain and Spinal Injury Centre, Salford, UK

Introduction: The prevalence of stroke following an AVM is approximately 1% and of those 63% will be classed as haemorrhagic^{*}. Advanced technology such as virtual reality[†] or immersive environments increases the complexities and challenges therapists can impose on their patients.

Aim: To improve balance, gait, visual field and cognition in a patient following discharge from therapy services by using the CAREN.

Method: Case study: Military veteran JH, a 31-year-old sustained an AVM on 24th August 2017, collapsed and went to A/E where he was put in an induced coma and then had surgery for embolisation. Post surgery he had dense left hemiparesis, peripheral visual loss, hyper-sensitivity and was totally dependent. Eight weeks later he was discharged from hospital, attended the Brain and Spinal Injury Centre (BASIC) for an initial assessment to use the CAREN (18 sessions, twice weekly). He was independent with mobility,but with a reduced high-level balance. He still required supervision with the activities of daily living and remaining visual problems. He

found multi-tasking difficult and his mood was low. His goals were to run, increase social participation and well-being and return to employment. Clinical outcome measures were completed preand post-intervention: Mayo-Portland, Dynamic Gait Index, six metre walk, Nottingham Extended Activities of Daily Living (NEADL). On completion of the intevention an evaluation form was completed. The physiotherapist identified VR apps and progressed appropriately. He was harnessed for safety.

Result: The clinical outcome measures improved: his NEADL was significant. He achieved running, independency in his personal care, social integration and volunteering at the equestrian centre. He stated that the CAREN was motivational, challenging and exciting.

Conclusion: The CAREN can be an additional rehabilitation tool that can enhance further recovery in stroke. The gains may be small yet significant in function and well-being for this client who previously was fit, and served in the armed forces and then in maritime security.

* Mohr JP *et al* (2015) Management of unbled brain arteriovenous malformation study *Neurologic Clinics* 33 (2) pp347-359.

[†] Darekar *et al* (2015) Efficacy of virtual reality-based intervention on balance and mobility disorders post-stroke:a scoping review *Journal of NeuroEngineering and Rehabilitation* 12 p46.

Measuring activity and sedentary behaviour in people with Muscle Ion Channelopathy and Myotonic Dystrophy type 1, and assessing the use of individual goal setting to support increasing habitual physical activity

Sarah Holmes and Charlotte Massey UCLH, London, UK

Background: The benefits of keeping active, and of limiting sedentary behaviour, are well established in terms of extending health-span for the general population and for people with long-term conditions. Maintaining activity has been shown to reduce risk of falls, morbidity and mortality. Activity levels are reduced in patients with neuromuscular disorders compared to healthy individuals. Habitual physical activity, which includes sedentary behaviour, has not been assessed in people with Muscle Ion Channelopathies (MIC) or Myotonic Dystrophy type 1 (DM1). Many patients with these conditions describe avoiding activity, and therefore improving habitual activity in these patients would potentially reduce morbidity and mortality.

Aims:

- To measure habitual physical activity (HPA) in people with genetically confirmed MIC or DM1 using a stepwatch activity monitor (SAM)
- To use individual HPA data, information sheets and telephone support, to set goals to increase daily steps by 10% over twelve weeks and assessing changes in HPA with SAM at the end of the intervention

Method: Patients with genetically confirmed Muscle Channelopathies or Myotonic dystrophy type 1, who can independently put activity monitors on/off, will be invited to participate in the study. Baseline assessments, including fatigue and balance confidence questionnaires will be completed, and SAM will be set up for each patient. Activity monitors will be worn for ten days. Telephone support will then help patients to set goals, to identify challenges and barriers, and to increase activity (daily steps) over a twelve-week period. Activity monitors will be worn for ten days at the end of the study.

Results: We will statistically compare HPA data at the start and end of the study, between individuals and diagnoses - to examine the effect of a telephone based intervention on HPA.

Conclusion: We have received ethical approval to perform the study and recruitment will start in January 2018.

Implementation of the 'PD Warrior' programme in a clinical setting in the UK. (Service evaluation using series of case studies in six month postintervention follow-up)

Jason King and Jakko Brouwers Morrello Clinic, Newport, UK

Background: Recent studies have described evidence in support of potential neuroprotection in patients with Parkinson's Disease by forced use amplitude based exercise, precisely targeting the motor symptoms of this progressive condition. The PD Warrior (PDW) programme established in Australia has been supported in the latest 'Parkinson's Exercise framework' by Parkinson's UK. We are presenting a twelve-month follow-up on setting up a service and evaluating results from our latest participants alongside long-term outcome measures from our original participants.

Method: Patients were assessed at an initial appointment followed by a one-on-one session before beginning the ten-week programme that is concluded with a final assessment. The programme included a prescribed daily home exercise programme and twice-weekly one hour clinic-based group sessions based on 'neuroactive exercise' following the seven core principles of PD Warrior: specificity, power, complexity, high effort, frequency, saliency and fun. Participants were asked to join a focus group in which they could discuss their experience with the programme.

Results: Our results indicate improvements in the following outcome measures (ten-metre timed walk step number with and without dual task, mini-best balance scores, six-minute walk, PDQ-39). Only the nine-hole peg test did not show a trend towards improvement. Of the original participants who were given a six-month follow-up assessment, most of these improvements were maintained and no participants returned to baseline results.

Discussion: The results and patient feedback from our latest participants follow the positive trend of our initial cohort and support the outcomes seen in Australia. The six-month follow up results from our initial cohort are promising considering the degenerative nature of Parkinson's Disease as they could indicate a slowing down or a delay in progression of the condition.

The use of augmented feedback and virtual reality technology in neuro rehabilitation. (series of case studies evaluating improvements in gait in chronic stroke using the Motek Forcelink C-Mill treadmill)

Jakko Brouwers and Sarah Harling Morrello Clinic, Newport, UK

Background: Studies have proposed intensive massed practice may be necessary to modify neural organisation and improve motor skills following stroke. Knowledge of result (KR) is an important element to motor learning and enhancing performance. Augmented feedback (AF) offers the ability to show result of performance either real-time or afterwards (terminal feedback) in a meaningful way. Real-time feedback may offer a route to bypass possible sensory deficit which otherwise limit outcomes in rehabilitation. Virtual reality (VR) technology has the capability of creating an interactive, motivating environment in which practice intensity and feedback can be manipulated to create personalised and challenging treatment.

Aims: To evaluate AF/VR treadmill training on the provision of gait rehabilitation following stroke. This equipment is costly and dissemination of results will help others in decision-making and business cases. **Method**: Three retrospective case studies of stroke patients who attended clinic for at least a year prior to AF/VR treadmill training. All had difficulty developing independent mobility during NHS rehabilitation but expressed a desire to improve functional mobility. They attended clinic at least once a week. The Motek Forcelink C-Mill treadmill is a medical grade treadmill offering: Full walk area force-plate analysis, interactive projection on the walk area and on a screen in front, ceiling track. Recorded were: gait speed, step length, power, weight distribution, distance, steps, total time walked.

Results: Comparison of treatment records prior to treadmill training with C-Mill assessment and treatment data over a period of up to twelve months, showed considerable improvements in gait speed and in distance/time walked. All achieved their functional goals.

Conclusion: VR/AF treadmill training allows patients to increase intensity of training needed to make gains in the chronic phase of stroke. Significant functional improvements in gait are still possible long after stroke with a high intensity rehabilitation programme.

Innovative use of nordic walking poles for improving mobility, balance and promoting active living for stroke and Parkinson's patients

Mandy Shintani¹ and James Somerset² ¹ Urban Poling Inc, North Vancouver, Canada ² Walton Centre NHS Trust, Liverpool, UK

Background: Over the last eight years, specialised nordic walking poles have been prescribed extensively by physiotherapists in Canada as a dynamic therapeutic alternative to traditional devices, such as canes, and for individual and group exercise programmes. Walking poles are emerging internationally as an effective new intervention for neurorehabilitation with outcomes demonstrated by several randomised control trial (RCT) studies on Parkinson's and stroke. This session will highlight how nordic walking poles promote functional gait patterns and significantly improve treatment outcomes for balance, core strengthening and walking tolerance while promoting active living for neurological clients.

Aims/purpose:

- Discuss RCT studies on nordic walking as it relates to key areas of mobility including improvement in posture, stride and gait for Parkinson's patients and arm swing and balance for stroke patients.
- Summarise two case studies to demonstrate how specialised Nordic walking poles are used

for mobility as well as seated, standing and pre-gait exercises for Parkinson's and stroke clients in Canada. Demonstrate the Activator technique developed for rehabilitation clients and its use in six current independent studies in Canada and one ongoing study on postspinal surgery posture at the Royal National Orthopaedics Hospital in the UK.

Review the outcome of a pilot group nordic walking programme at the Wandsworth Community Neuro Team implementing the Six-Minute Walk Test.

Outcomes from the session: Participants will learn how specialised nordic walking poles are revolutionizing rehabilitation and are extensively and successfully used in Canada, in place of passive mobility devices such as canes, and for dynamic individual and group exercise programmes.

A guide to the use of electrical stimulation in paediatric neurodisability

Kirsten Hart¹ and Matthew White²

¹ Buckinghamshire Healthcare NHS Trust, Aylesbury, UK

Background: Electrical Muscle Stimulation (EMS) involves the application of an electrical current, usually across the surface of the skin using adhesive or rubber electrodes positioned on the skin in direct proximity to the muscles to be stimulated, to generate a muscle contraction. There is a huge variety of terminology and approaches to EMS but many share the same basic principles and largely rely upon the same physiological processes to work effectively. This poster aims to consolidate current knowledge and clinical practice to provide guidance for novice EMS clinicians working in the field of paediatric neurodisability.

There is a wealth of evidence about the effects of EMS for a range of neuromuscular conditions in adults and children including stroke, spinal cord injury, ABI and cerebral palsy; in some areas EMS is more evidence based than some more conventional physiotherapy adjuncts.

EMS application centres around the manipulation and balance of three main parameters: Frequency (the number of stimulation pulses delivered per second, measured in Hertz (Hz)), Amplitude (the strength of the stimulation delivered, measured in milliamps (mA)) and Pulse Width (the length of time each group of pulses of stimulation is set to, usually measured in microseconds (us)). Further considerations for EMS application include treatment goals, device selection, contraindications, electrode selection and placement, skin surface preparation and time. This introduction to the use of EMS within clinical paediatric neurodisability is intended to stimulate interest amongst physiotherapists to incorporate EMS into their everyday practice. Further collaboration and education is required to provide a deeper understanding of the indications, applications and effects of EMS. The authors propose the next step to be a collaborative guidance document to support the clinician in optimal usage of EMS technologies within their clinical practice.

Supporting neurological communities to live well. A successful pathway provides cost-effective and safe ways for persons living with a neurological condition to self-refer to hydrotherapy and take ownership of their health and well-being

Susan Pattison Bolton Neuro Voices, Bolton, UK

Background: A local umbrella charity Bolton Neuro Voices (BNV) approached SP Therapy Services to design and deliver a five-week self-referral hydrotherapy programme to persons living with neurological conditions in the Bolton area within a specific budgetary and time constraint of a specified charity bursary. The brief was to be safe, inclusive and effective and provide sufficient evidence to enable applications for future bursary funding. This was achieved by:

- Interviewing the Chairs of the various neurological charities re expectations
- Designing an online referral form ensuring safety, and empowering participants to set own goals
- Follow-up telephone call from a physiotherapist
- Division of participants into ability based groups based on dry land mobility
- Delivery of five weeks of a 30-minute hydrotherapy course
- Weekly written feedback from participants to physiotherapists
- Identification of participants who were safe and able to participate in a non-physiotherapy led weekly continuation programme
- Annual review and feedback to participants, Chairs and funders

Attendance was high (83%) as was satisfaction with the facilities, course, organisation and support. Participant-reported outcome measures showed impressive evidence of improvements, especially in social contact and psychological well-being, but also in pain,

² Cyclone Technologies Ltd, Widnes, UK

stiffness, mobility, balance and posture.

The data secured further bursary funding and to date 160 participants of all ages, with different levels of ability from independent walker to full-time wheelchair user, with 20 different neurological conditions, have had the opportunity to participate in the five-week hydrotherapy course. Participants pay £25.00 for the five-week course. The cost to deliver the five-week course is £158.00 and this continues to be met by charity bursary and fund raising; the continuation programme is now self-sustained by participant contributions of £3.00 per week.

Call for reviewers

Peer review is a key part of the academic publishing process.

As Synapse enters a new era, we are taking this opportunity to invite professionals in the field of neurological rehabilitation to join our reviewer's board. If you are interested in joining the review board, then please send a short CV (two pages) including your areas of interest and expertise. In addition, please send a 500-word statement explaining how your experience would be an invaluable contribution to the peer-review process of our journal. Please send your CV and statement to Dr Praveen Kumar (Editor) at: synpase@acpin.net

Submission to Synapse

CASE REPORTS

Synapse is pleased to accept case reports that provide information on interesting or unusual patients, which may encourage other practitioners to reflect on their own practice and clinical reasoning. It is recognised that case studies are usually written up retrospectively. The maximum length is 3,000 words and the following structure is suggested:

Title: this should be concise and reflect the key content of the case report

Introduction: this sets the scene giving background to the topic, and why you consider this case to be important; for example, what is new or different about it? A brief overview of the literature or the incorporation of a few references is useful so people can situate the case study against what already is known.

The patient: give a concise description of the patient and condition that shows the key physiotherapeutic, biomedical and psychosocial features. Give the patient a name, but not their own name; photographs of the patient will need to be accompanied by explicit permission for them to be used. Only relevant information to the patient's problem should be included.

Intervention/method: describe what you did, how the patient progressed and the outcome. Aims, treatment, outcomes, clinical reasoning and the patient's level of satisfaction should be addressed. Indications of timescales need to be considered.

Implications for practice: discuss the knowledge gained, linking back to the aims/purpose, and to published research findings. Consider insights for treatment of similar patients, and potential for application to other conditions.

Summary: list the main lessons to be drawn from this example. Limitations should be clearly stated, and suggestions made for clinical practice.

References: the Harvard style of referencing should be followed (please see Preparation of editorial material).

ORIGINAL RESEARCH PAPERS

These should not exceed 4,000 words and papers should include the following headings:

- Abstract (maximum of 300 words)
- Introduction
- Method to include design, participants, materials and procedure
- Results
- Discussion
- Conclusion including implications for practice
- References

ABSTRACTS OF THESIS AND DISSERTATIONS

Abstracts from research (undergraduate and postgraduate) projects, presentations or posters will be welcomed. They should be up to 500 words, and broadly follow the conventional format; introduction, purpose, method, result, discussion, conclusion.

AUDIT REPORT

A report which contains examination of the method, results, analysis, conclusions of audit relating to neurology and physiotherapy, using any method or design. This could include a Service Development Quality Assurance report of changes in service delivery aimed at improving quality. These should be up to 2,000 words.

REVIEWS

Course, book or journal reviews relevant to neurophysiotherapy are always welcome. Word count should be around 500. This section should reflect the wealth of events and lectures held by the ACPIN regions every year.

PREPARATION OF EDITORIAL MATERIAL

Copies should be produced in Microsoft Word. Wherever possible diagrams and tables should be produced in electronic form, eg Microsoft Excel, and the software used clearly identified.

The first page should include:

- The title of the article
- The name of the author(s)
- A complete name and address for correspondence
- Professional and academic qualifications for all authors and their current positions

For original research papers, include a brief note about each author that indicates their contribution, and a summary of any funds supporting their work.

- All articles should be well organised and written in simple, clear, correct English. The positions of tables and charts or photographs should be appropriately titled and numbered consecutively in the text.
- All photographs or line drawings should be at least 5"x 7".
- All abbreviations must be explained.
- References should be listed alphabetically, in the Harvard style eg:
 Pearson MJT et al (2009)

Validity and inter-rater reliability of the Lindop Parkinson's Disease Mobility Assessment: a preliminary study *Physiotherapy* (95) pp126-133.

- If the article mentions an outcome measure, appropriate information about it should be included, describing measuring properties and where it may be obtained.
- Permissions and ethical certification; either provide written permission from patients, parents or guardians to publish photographs of recognisable individuals, or obscure facial features. For reports of research involving people, written confirmation of informed consent is required.

SUBMISSION OF ARTICLES

An electronic and hard copy of each article should be sent with a covering letter from the principal author stating the type of article being submitted, releasing copyright, confirming that appropriate permissions have been obtained, or stating what reprinting permissions are needed. For further information please contact the *Synapse* editor:

Dr Praveen Kumar: synapse@acpin.net



Synapse

Official journal of the Association of Chartered Physiotherapists in Neurology

SEPTEMBER 2018

ISSN 1369-958X

Editor Dr Praveen Kumar synapse@acpin.net Editorial advisory committee Members of the ACPIN Board and national committees as required. Design kwgraphicdesign 44 (0) 1395 260398 kw@kwgraphicdesign.co.uk Printers Henry Ling Ltd The Dorset Press Dorchester



SEPTEMBER 2018 OFFICIAL JOURNAL OF THE ASSOCIATION OF CHARTERED PHYSIOTHERAPISTS IN NEUROLOGY WWW.ACPIN.NET ISSN 1369-958X