Autumn/Winter 2013

Syn'apse

www.acpin.net

Improving distal activation in a limb to enhance proximal control and selective movement

Does improving the strength of the kinetic chain of stance result in increased gait speed?

Sharing good practice: **The Warrington stroke categories**

JOURNAL OF THE **ASSOCIATION OF CHARTERED PHYSIOTHERAPISTS IN NEUROLOGY**

Syn'apse

JOURNAL OF THE **ASSOCIATION OF CHARTERED PHYSIOTHERAPISTS IN NEUROLOGY**
Autumn/Winter 2013
ISSN 1369-958X

Contents

Forethought

Articles

Sharing good practice

Focus on

Five minutes with…

Reviews

Resources

Cover image: Representation of neuron cell cluster by Christian Anthony (iStock)

ACPIN'S AIMS

1. To promote and facilitate collaborative interaction between ACPIN members across all fields of practice including clinical, research and education.
2. To promote evidence informed practice and continuing professional development of ACPIN members by assisting in the exchange and dissemination of knowledge and ideas within the area of neurology.
3. To provide encouragement and support for members to participate in good quality research (with a diversity of methodologies) and evaluation of practice at all levels.
4. To maintain and continue to develop a reciprocal communication process with the Chartered Society of Physiotherapy on all issues related to neurology.
5. To foster and encourage collaborative working between ACPIN, other professional groups, related organisations ie third sector, government departments and members of the public.

Executive Committee

President
Dr Fiona Jones
president@acpin.net

Honorary Chair
Gita Ramdharry
chair@acpin.net

Honorary vice chair
Jakko Brouwers
vicechair@acpin.net

Honorary Treasurer
Chris Manning
treasurer@acpin.net

Honorary secretary
Adine Adonis
secretary@acpin.net

Honorary research officer
Jane Petty
research@acpin.net

Honorary membership secretary
Sandy Chambers
memsec@acpin.org

Honorary minutes secretary
Fran Brander
minutessecretary@acpin.net

Honorary PRO
Jennifer Barber
pro@acpin.net

***Syn'apse* co-ordinator**
Lisa Knight
synapse@acpin.net

Diversity officer
Lorraine Azam
diversityofficer@acpin.net

iCSP link and Move for Health champion
Chris Manning
iCSP@acpin.net

Committee member 1
Ralph Hammond
ralph.hammond@sompar.nhs.uk

Committee member 2
Nikki Guck
kent@acpin.net

Committee member 3
Lisa Bunn
lisa.bunn@plymouth.ac.uk

Forethought

From the Chair

Dr Gita Ramdharry
Senior Lecturer, St George's School of Rehabilitation Science, Faculty of Health and Social Care Sciences, St George's University, London, and Kingston University

It's official: ACPIN has been re-recognised!

ACPIN responded to an approach by the CSP to undergo a pilot re-recognition of the network using the Pebblepad platform. The pilot was successful and will be rolled out to other networks. I must add that ACPIN were commended by the CSP for the breadth of work we do for our membership and neurophysiotherapy practice. A big pat on the back for all of the hard-working committee members and ACPIN representatives nationally.

We have been working with the CSP in other areas. ACPIN have been helping to develop the new PhysioWorks document for stroke. A big thank you to Michelle Price, our UK Stroke Forum representative for her involvement in this project. The document was launched at the PhysiotherapyUK 2013 conference. We also contributed to a draft consultation document to the Department of Work and Pensions (DWP). The CSP wanted to emphasise concerns about the reduction of the mobility aspect of the newly launched Personal Independent Payment (PIP). The DWP propose a reduction from the 50 metres threshold, that features in the existing Disability Living Allowance, to a person being able to walk 20 metres in the new PIP. ACPIN members responded with excellent evidence-based examples of how people would be disadvantaged under these new proposals. A big thank you from ACPIN and the CSP to all contributors, and we will keep alert for any news on the outcome of the consultation.

In recent years ACPIN has been increasingly approached to be involved in the development or consultation of practice guidelines eg NICE and RCP. In order to better co-ordinate this work, the committee felt it would be advantageous for one person to oversee our involvement. It was felt that this would be an excellent role for the vice chair of ACPIN so Jakko Brouwers has taken on this responsibility. We hope this will help our responsiveness to requests and also promote our involvement in appropriate guideline development, giving neurophysiotherapy a voice in key practice areas.

Finally, you will see in the following pages an advert for the 2014 ACPIN conference. ACPIN has successfully run this conference for a number of years, but also play a key role in the neurology strand of PhysiotherapyUK. We have been discussing the role of these two events in providing CPD, challenging thinking and developing practice for the spectrum of our membership. We appreciate your feedback on this so please send thoughts, comments and ideas to me at chair@acpin.net.

Failure, algorithms and conundrums

from the ACPIN President

Dr Fiona Jones
Reader in Rehabilitation, School of Rehabilitation Science, Faculty of Health and Social Care Sciences, St George's University, London, and Kingston University

I write this second piece as president of ACPIN with an admission of failure. In the course of becoming president I completely failed to pick up on the signs that I had my own 'president's email address' in which, I recently discovered, were a number of emails asking me to write my piece for *Synapse*. So if your *Synapse* is late coming through the letter box this year please blame me. Nonetheless it can be possible to construe failure as something of a success, more of which to follow.

I now turn to the subject of algorithms. For those of us that profess to be maths-phobic (unlike our current chair – who seems to like numbers) the concept of using step by step calculations to solve a problem has always been a bit of a mystery, especially when applied to people and how we should expect them to behave after a neurological event. But I have now been coaxed into thinking that they could be of use. As a visitor to Emory University in Atlanta, Georgia this year I had the privilege of a conversation with Professor Steve Wolf. Steve is a physical therapist, prolific researcher and one of the most sought after, consistent and productive lecturers in the United States. Over his career he has been part of 37 funded peer reviewed grant proposals at a total of a staggering $30 million. Not surprisingly Steve's career has included numerous awards, but one of his great gifts is the art of the challenging question. I was on the receiving end of one of them after I gave a lecture in his Centre for Rehabilitation Medicine. His question was 'How do you decide who to direct your efforts to when facilitating self-management?' How does this relate to algorithms? Well one of the discussions we had following the lecture concerned the subject of gatekeeping – to put it bluntly it's when we decide whether *we* think a patient is right for something and, in the case of my research, when a patient is ready or not for self-management. Steve challenged me to extend my research to develop an algorithm, not to constrain or ration how self-management principles are applied in neurorehabilitation, but to illustrate the number of self-management possibilities, 'an algorithm of possibilities' – I like it! He is part of an international collaboration of neuroscientists and physiotherapists to develop a clear algorithm, or decision-making tree regarding the best evidence for upper limb training after stroke – more of this to come in future months I am sure – I will keep a look out and let you know.

[By the way - check out this YouTube clip of his explanation of an accelerated skills acquisition programme for upper limb training http://www.youtube.com/watch?v=DvDoOQRDE7U]

Professor Wolf is not only an awe-inspiring researcher, he is also an aficionado on Simon and Garfunkel – as the Americans would say 'who knew?' Bewilderingly, I was also lucky enough to become Steve's 'date' for the night, during my visit, as his wife was unable to attend an audience with Paul Simon held at Emory. You may be wondering where this is going but bear with me. I will understand if the majority of *Synapse* readers aren't that familiar with Paul Simon for reasons of age, but surely most of you will have heard of Simon and Garfunkel – *Bridge over Troubled Water*? Well, amidst my struggles to get some of the in-jokes told by Simon, I was struck by the overarching theme of his talk which concerned conundrums. He reflected on the conundrum of 'flow' and how to achieve it (for more on the concept of 'flow' look up work by Mihaly Csikszentmihalyi) – and his recent experience of writer's block. The conundrum, he explained, was why a creative activity could happen sometimes and not others the more he put pressure on himself to write, the worse it got. How after hitting complete and utter block, he tried to find a reason why, even developing the idea that it must be because he had Lyme disease! (It wasn't). He was then forced to explain to his Brazilian musical collaborators and all his investors that he had no songs to show them after months of trying. They said, 'That's OK, just come to the studio and sing "la, la, la" and we'll take it from there.' Thinking that this was crazy, he did it anyway, and then they said- 'Why not try and get one line of the song', one line was produced, then a second, and after a few hours he had a song. He had gone from bed rest, inactivity, and lack of creativity to energy, activity, creative writing, and no longer believing he had Lyme disease. The conundrum, as he put it, is that sometimes it's best not to try too hard, just let things happen, make an effort, see what takes place and don't be too worried about failure. He eventually wrote a successful album (with the Brazilians) which was a number one best-seller in the UK in 1990.

Enough about Paul Simon, back to failure. Overleaf you will see a picture of me on a split treadmill; this was in the lab of another prolific researcher Professor Dave Brown based in Birmingham Alabama, US. His research is asking some very interesting questions about robotic treadmill training and the whole concept of failure. He is currently working on studies whereby people are challenged to go beyond their comfort zone. When walking, for example, they are not to worry about what walking looks like or whether they fall, walk backwards, uphill, downhill, sideways, or trip – the most important aspect of the research is to feel uncomfortable and challenged: failure is not seen as a problem. The robot senses weight shift and gives just the right amount of reassurance, but the demands and challenges are all controlled by the user. The picture you see of me is on Dave's treadmill, being encouraged (to walk backwards and run) by a 70-year-old stroke survivor who loved it. 'Don't be frightened,' she said. 'Just try stuff out; it's fun!' So that was a great example that failing can be construed in different ways and in many cases the effort taken to try and achieve something is itself a success even if the ultimate goal is not achieved. Well, that's how I have reconfigured my lack of understanding of my president's role and failure to get this piece of writing done on time.

Have a great autumn and winter and watch out for Professor Wolf coming to London in June 2014 – more details to follow.

Improving distal activation in a limb to enhance proximal control and selective movement

two patient case studies

AUTHOR

Anna King
MCSP

The study aim was to determine whether selective movement in the limb can be improved through distal activation, applying the principle of feed-forward neural networks. A literature search was conducted to investigate the significance of somatosensory input, kinematic postural control and postural body schema on motor output and functional movement.

Two patients were selected, both with relapsing-remitting multiple sclerosis (MS) with recent relapses within the last six months. Both were independently mobile but had somatosensory deficits and predominantly unilateral weakness. They presented with altered postural alignment and reduced selectivity of the affected lower limb during functional activities such as gait. Written consent was gained to participate in the case study.

Outcome measures were used in line with the International Classification of Function (WHO 2001). Photographs and postural analysis in sitting and standing were used to measure impairment, and the Functional Reach Test and Berg Balance Scale (patient A) were used to measure function. The 10-Metre Timed Walk test was used to measure function and participation. Patient B completed the MS Impact Scale questionnaire (MSIS-29) which measures participation. The patients were assessed and treated following the Bobath concept, utilising the systems theory approach and handling skills learned on the basic Bobath course. (Crewe October 2012-January 2013).

A 'distal to proximal' approach was taken, although initial preparation of the patient's alignment and body schema was carried out in order to give an appropriate reference frame for activity (Perennou *et al* 2000, Massion *et al* 2004). It was found that geometric and kinetic postural alignment improved in both patients, and this had an impact on selective lower limb function and efficiency during sit to stand and gait.

I chose this topic as the literature demonstrates the importance of sensory feedback information for the control and modulation of activity and movement. Previously I had adopted the 'proximal to distal' approach with patients, and had not prioritised distal components such as range of movement and soft tissue length in the foot to improve activities such as sit to stand or stepping.

Appropriate distal somatosensory information provides essential feedback via the spinocerebellar pathway to activate the reticulospinal and corticospinal systems, and to provide a more 'informed' choice of motor activity (Frey 2011). Somatosensory feedback to the cortex via the thalamus can then increase the influence of the sensory cortex in planning movement – to produce a more effective feed-forward system and more controlled movement (Buschges and Manira 1998, Perennou *et al* 2000, Rothwell and Rosenkranz 2005, Lindberg *et al* 2007, Fisher *et al* 2012).

LITERATURE REVIEW AND EVALUATION OF THE EVIDENCE BASE

Many of the studies refer to stroke. Although the main principles of neurophysiology and neuroplasticity can be applied to multiple sclerosis, the variety and recurrence of CNS demyelinating lesions can lead to more global symptoms, and the disease has a progressive nature.

Shumway-Cook and Woolacott (2007) state that 'co-ordinated movement requires information about the position of the body relative to the environment and the position of one body segment relative to another.' Perennou *et al* (2000) discuss the role of the tempero-parietal junction in constructing a 3-D map of the postural body schema. Somatosensory information from joint and cutaneous receptors, muscle spindles and Golgi tendon organs is integrated with visual and vestibular information to form this schema (Perennou *et al* 2000, Massion *et al* 2004). This internal model takes into account both geometric and kinetic alignment in relation to gravity to produce spatially-oriented behaviour, generating preparatory (pAPAs) and associated (aAPAs) anticipatory postural adjustments as part of a feedforward mechanism.

Synaptic connectivity is highly use-dependent and when there is reduced somatosensory afferent input, the vestibulospinal system is relied upon more when there is a sudden challenge to balance. This 'reactive' system stimulates postural extension which is less controlled, as it has no direct modulation from the cortex. The pAPAs therefore require integration of all sensory input projected to the premotor cortex, back down the reticulospinal and corticospinal systems to form a feedforward postural control mechanism (Shumway-Cook and Woollacott 2007).

Stimulating and activating sensory receptors increases the amount of information via the medial lemniscal and spinocerebellar tracts to the somatosensory cortex via the cerebellum and thalamus. This is projected to the primary sensory cortex and sensory association areas in the posterior parietal lobe for cross-modality and multi-modal sensory processing. This information is then transferred via projection neurones to the motor areas of the frontal lobe. This system has an important role in sensory initiation and guidance of movement but requires summation (Shumway-Cook and Woolacott 2007) to cause a longer-term neuroplastic effect. Raine *et al* (2009) state that sensory stimulation has to be combined with active movement, to produce more refined movement patterns.

Schabrun and Hillier (2009) imply that preservation of cortical representations of body parts is reliant on sensory input, and disruptions in this system can have a significant impact on function. The authors conducted a systematic review of the literature to assess the evidence for retraining sensory function, either passively using electrical stimulation, or actively such as practicing localising and detecting body parts in space. Whilst there was clear evidence to suggest that passive sensory retraining improved hand function, active sensory training failed to demonstrate a significant improvement in impairment or function.

Morgen *et al* (2004) found that after short-term training (one 30 minute training session) of thumb movements, the activity in the primary motor and sensory cortices and the inferior parietal lobe was reduced in healthy volunteers which may have implied skill acquisition but was not reduced in patients with MS. It was proposed that the patients had a reduced ability to process spatial information and increased effort was required to monitor accurate movements due to more diffuse neuronal damage.

Roll *et al* (2002) found that stimulating the cutaneous plantar receptors using vibration in standing evoked a kinaesthetic perceptive response that the body was being displaced in a specific direction, dependent on the area stimulated. The skin covering the heels, metatarsal heads and lateral borders of the feet contain a large number of cutaneous mechanoreceptors. This study proposed that these receptors play a key role in balance control, by informing the somatosensory and sensory association cortices via the cerebellum and thalamus about body position and the supporting surface. The foot cutaneous receptors feed into the internal body schema to evoke the appropriate postural response via the premotor and supplementary motor cortices to prepare the body segments for postural perturbation. Although very informative regarding the effects on perception of body position, the above intervention could not be reproduced in conventional therapy sessions without specialist equipment. In this case study, manual stimulation to the foot was applied in supine and sitting positions.

Meyer *et al* (2004) also looked at the role of plantar cutaneous sensation. They hypothesised that information regarding ankle torque, weight transfer, limb loading and the nature of the support surface could be provided by plantar cutaneous afferents. They also predicted that the direction of forces (ie shear or perpendicular) onto the plantar surface may provide information regarding the body centre of mass location. The study found that when only the forefoot was anaesthetised, there was a significant increase in velocity of postural sway in the medio-lateral direction in bipedal stance with eyes closed, and in all directions in unipedal stance. In anaesthesia of the whole foot, an increase in anterior-posterior sway occurred in bipedal stance without vision only. The authors concluded that when there is reduced plantar sensitivity the other mechanisms of sensory feedback are unable to fully compensate when the balance control mechanism is challenged, although proprioceptive inputs from the foot are recognised as important in stance control (Van Deursen *et al* 1998).The study concluded that lack of cutaneous sensation on the plantar surface of the foot with the presence of intact proprioception of the toes and ankle was not enough to produce a significant balance deficit when vision was available.

Valliant *et al* (2008) found that an over-activation of somatosensory information induced by therapeutic manipulation of the feet and ankles allows an elderly person to temporarily partially compensate for the destabilising effect of visual suppression in quiet standing. The subjects used were however selected for absence of any musculoskeletal, neurological or vascular conditions and was not therefore representative of my patient population. The authors used techniques such as manual massage of the feet and mobilisation of both the feet and ankle joints for 20 minutes. However the study did not indicate that the mobilisations were tailored to the individual, indicating lack of selectivity of treatment and absence of assessment and clinical reasoning.

APPLIED CASE STUDIES

Following are two case studies. Treatment sessions were one hour in duration. For the period of this project, both patients participated in six sessions.

Patient A

- 40-year-old man
- Self-employed joiner (unable to work at present)
- Lives in house with stairs, with partner and eight-year-old son
- Diagnosed with multiple sclerosis March 2013
- **Symptoms** (began six years ago):
  - Blurred vision
  - Reduced balance and dizziness when walking
  - Mild increased extensor tone bilateral lower limbs
  - Reduced sensation bilateral lower limbs in stocking distribution
  - Reduced sensation left medial forearm and right fingers.
- **MRI**: widespread intracranial and spinal cord demyelination with lesions in both temporal lobes, left middle cerebellar peduncle, medulla, and also on the under-surface of the corpus callosum. Also abnormalities in cerebellum. Right-sided C4/5 central disc prolapse, and left-sided C5-6 postero-lateral disc prolapse.
- **Medication**: Baclofen 10mg BD, Amantadine for fatigue.

PROBLEM LIST	TREATMENT PLAN
Asymmetry in trunk	Dynamic trunk work in different postural sets
Poor left hip stability for stance affecting terminal stance and preparation for swing phase	Hip alignment and activation in different postural sets, distal activation to improve initiation of swing phase
Decreased balance	Dynamic standing activities in alignment

OBJECTIVE MARKERS	ASSESSMENT	AFTER PHYSIOTHERAPY INTERVENTION
10 metre timed walk (fastest speed)	10.0 seconds (1.0m/s)	7.66 seconds (1.31m/s)
Functional reach	23cm	30cm
Berg Balance Scale (<56)	50	53

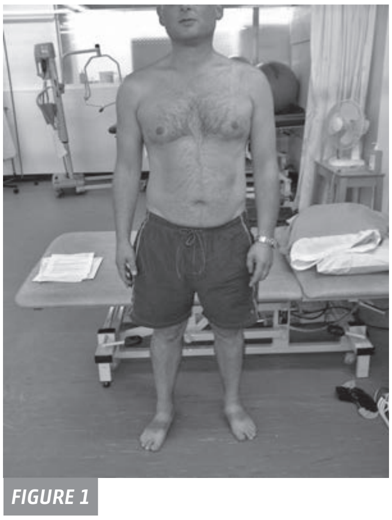


FIGURE 1

Initial systematic postural analysis in standing and sitting (*Figure 1*) indicated that he had reduced activation of his left side. He had a very low medial longitudinal arch on the left foot in sitting and standing, and his feet are pronated at the subtalar joint, left more than right. He was unable to interact with the base of support (BOS) with either foot effectively. Knees were hyperextended in standing with pelvis in anterior tilt and he had a wide base of support. He was geometrically mal-aligned with his pelvis displaced and 'propped' over his left leg and his trunk side flexed to the right. His head was displaced to the right.

During more dynamic tasks such as stand to sit, Patient A demonstrated altered kinetics by compensations such as fixing with the right trunk, and weight bearing predominantly through the right lower limb by 'pushing' from the left lower limb. During gait he was unable to gain sufficient linear extension of the right hip and trunk or to produce a selective swing-through of the left leg due to poor activation of the hip flexors and lack of propulsion of left gastrocnemius. He tended to externally rotate the left hip during both stance and swing phases, as a compensation to increase his level of stability against gravity.

He was unable to dissociate his left lower limb from his pelvis, and tended to rotate the left side of his pelvis backwards during backwards step. He was unable to 'leave his leg behind' during the stance phase of gait (Shumway-Cook and Woollacott, 2007). The left hip flexors were tight and the left hip 'sucked up' towards the pelvis and trunk; during gait the muscle spindles in the left hip flexors were unable to be activated to initiate swing (Busches and Manira 1998). Lack of controlled de-loading of the stance limb to reduce the excitatory extensor activity led by the Golgi tendon organs (Shumway-Cook and Woollacott 2007)

FIGURE 2

resulted in poor selectivity of left swing phase, using circumduction to clear the foot from the floor.

Treatment involved mobilising and realigning the subtalar joint from excessive pronation. Mobilisations to the mid foot and forefoot into pronation were carried out, as joint stiffness biased towards supination was preventing dynamic loading through the foot and there was reduced contact of the first metatarsal head with the floor. Soft tissue mobilisations (STM) were performed to realign the medial head of gastrocnemius from medial rotation and to improve the length of soleus.

STM to the plantar fascia included manual vibration and pressure over the insertion point at the calcaneum to stimulate the Golgi tendon organs to inhibit the muscles. (Shumway-Cook and Woollacott, 2007, Raine *et al*, 2009). Activation of the lumbricals and lateral borders of both feet was done in sitting and supine, to increase the afferent somatosensory information travelling via the medial lemniscus to the cerebellum and thalamus, to increase the cortical representation of the right foot and lower limb. This is thought to lead to improved motor output (Roll *et al* 2002, Vaillant *et al* 2008).

To address the issues regarding length and lack of selective activity of the hip flexors, realignment and then activation of the proximal lower limb muscles and abdominal core stability was achieved in crook lying. Specific activation of the left hip abductors and extensors was performed in side lying in a closed-chain activity to maintain maximal sensory feedback from the foot and to give the limb a loading sensation. Simple verbal instructions were given to 'push down through your heel into me' and my handling was variable, meaningful and specific. This was aiming to influence 'implicit' learning by the patient experiencing the correct movement and muscle activity in a supported, controlled postural set, to allow transfer of the skill into functional tasks eg backwards step (Shumway-Cook and Woollacott 2007).

Treatment was progressed to facilitation of backwards step using the foot as a distal key point of control, to improve gastrocnemius and soleus activity for terminal stance and pre-swing, to aid propulsion (*Figure 2*).

I facilitated propulsion at the gastrocnemius towards plantarflexion and slight medial rotation of the hip. I maintained stability of the subtalar joint whilst facilitating an element of pronation, to encourage weight transfer to the weight-bearing leg. Then my hand moved down to soleus to give a 'down' reference at the end of the movement to improve loading of the foot. This is repeated for a minimum of five minutes to build up summation.

Summation is required to increase the amount of selective muscle activity being performed. This is a result of short-term synaptic plasticity in which there is more neurotransmitter available from a recent depolarisation, increasing the neuron's readiness to fire, and improving the efficiency of synaptic connections (*Figure 3*). I used temporal summation by repetitively working on the same component and building up the intensity. This increased synaptic efficiency gradually gives way to structural changes, which leads to longer term neuroplasticity (Shumway-Cook and Woollacott).

Treatment was progressed into standing with weight transfer practice incorporating a functional reach. This involves the premotor and supplementary motor areas, as this increases motivation and participation of the individual. I facilitated right gluteus medius 'down' to improve linear extension and loading in the right lower limb. I also facilitated the transversus abdominis to maintain an active trunk–pelvic association, and to facilitate pAPAs and aAPAs in the trunk. This was also aiming to improve ecccentric activity in the right trunk and concentric activity in the left trunk by stimulating the reticulospinal and medial corticospinal tracts via reciprocal innervation and the contralateral lateral corticospinal tract.

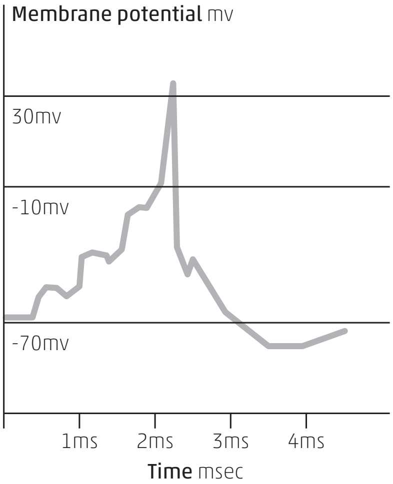


FIGURE 3 Temporal summation to reach synaptic threshold

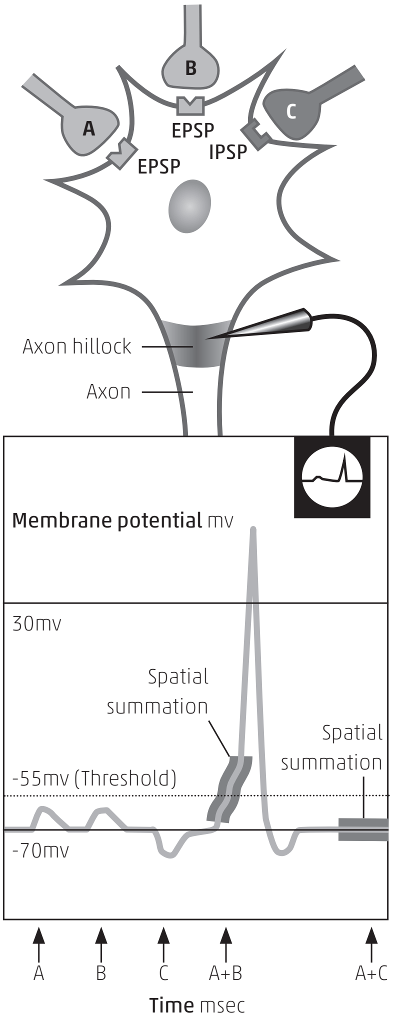


FIGURE 4 Temporal summation

We then progressed to facilitation of forward step with the left leg by facilitating right hip and transversus abdominus. This was to recruit abdominal activity to promote pAPAs and aAPAs (Shumway-Cook and Woollacott, 2007). Patient A was now able to initiate swing distally with dorsiflexion of the left ankle as a result of improved postural control.

Spatial summation was also incorporated into my treatment by facilitating different components simultaneously. Multiple excitatory

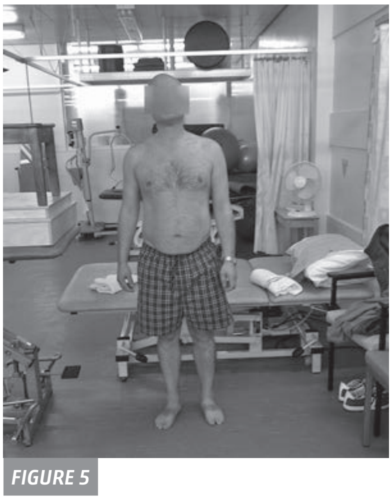


FIGURE 5

postsynaptic potentials (EPSPs) at different sites can cause the threshold to be reached more effectively (*Figure 4*), resulting in a higher level of activity (Shumway-Cook and Woollacott 2007).

As a result of my intervention Patient A was able to stand with a narrower base of support with more efficient alignment. He had improved interaction with the base of support, and he reported that he was able to feel the floor (*Figure 5*).

The swing-through phase of gait had become more efficient. It was initiated distally by dorsiflexion of the ankle, and the left hip was more in alignment. Stance had improved bilaterally. Overall gait speed had increased, indicating improved geometric and kinetic postural control as a result of improved feed-forward mechanisms.

Functional balance had also improved with a better Berg Balance score and ability to walk whilst texting. This indicates longer-term neuroplasticity, as skills learned have become automatic with decreased reliance on cognitive input (Morgen *et al* 2004, Shumway-Cook and Woollacott 2007).

Patient B

- 33-year-old woman
- Lives with partner and two young children in a house with stairs
- Works in an office three days per week
- Diagnosed with MS 6 months ago.
- **Symptoms** for past few years:
  - Lower limb weakness right more than left. More recently right knee frequently giving way, thighs ache after climbing stairs
  - Cramps in right foot
  - Right hand seizes up when writing.
  - Unable to tandem walk and found right-sided single leg stance very difficult.
  - Moderate weakness (Oxford Grade 3) in her right hip flexors and knee extensors.
  - Mild weakness in her right hip extensors (grade 4) and full power in both ankles.
  - Reduced light touch sensation in her lateral right thigh and knee
  - Reduced proprioception in her right hallux.
- **MRI Brain**: Multiple white matter abnormalities within a periventricular distribution. Further lesions within midbrain bilaterally, the pons, the cerebellar peduncles, and both cerebellar hemispheres. Also further abnormalities within the upper cervical cord. Findings typical for demyelination.
- **Medication**: Capaxone (Glatiramer Acetate) as a Disease Modifying Therapy

PROBLEM LIST	TREATMENT PLAN
Weakness in right hip and knee, Trendelenburg in right stance	Activation of right hip in different postural sets, partcularly in weight-bearing
Poor postural alignment	Distal activation of lower and upper limbs, dynamic movement patterns in different postural sets
Decreased balance, unable to tandem walk or single leg stand	Improve geometric and kinetic alignment, progressing from sitting to standing to stepping

OBJECTIVE MARKERS	ASSESSMENT	AFTER PHYSIOTHERAPY INTERVENTION
10 metre timed walk (fastest speed)	7.81 seconds (1.28m/s)	6.28 seconds (1.60m/s)
Functional reach	30cm	30cm
MSIS-29	Total = 49 Physical = 37 Psychological = 12	Total = 59 Physical = 42 Psychological = 17

FIGURE 6

On initial postural analysis Patient B had poor geometric alignment of key points (She had a pronounced sway-back posture and poor activation of her postural core stability muscles (*Figure 6*). Her trunk was slightly rotated to the left and displaced to the right. Her right scapula was more protracted and winged, indicating poor co-operation with the thorax. Her head was slightly displaced to the right. She tended to weight bear more over her right leg but did not have linear extension at either hip as she tended to 'prop' on her right leg and 'push' from her left leg with hyperextended knees. She had a narrow base of support due to hip adduction and medial rotation and 'braced' the knees together during sit to stand and vice versa. She was inefficient standing on both legs, right worse than

FIGURE 7

FIGURE 8

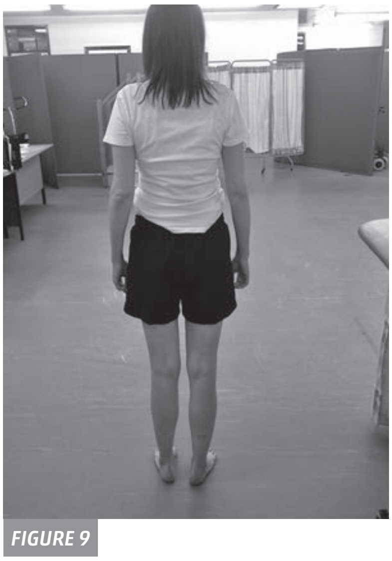


FIGURE 9

left. She had low medial longitudinal arches in her feet with reduced interaction with the base of support.

Initial treatment involved preparing the body segments in standing, stand-to-sit and sitting to improve geometric alignment and improve the postural body schema from which to work. We also worked in crook lying and side lying to activate the gluteal and abdominal muscles. The patient was actively placed in unsupported sitting and the upper limbs were activated and placed on towels on the plinth on either side of the pelvis to provide an egocentric reference frame (Massion *et al* 2004).

I used handling skills to give an abundance of sensory stimulation to the cutaneous receptors in the feet and ankles, including repeated stimulation and activation to the lateral border of the foot and abductor digiti minimi, as it is known to have an important role in body posture awareness and stability (Roll *et al* 2002, Vaillant *et al* 2008). Facilitation of plantarflexion in the gastrocnemius and soleus was carried out in preparation for propulsion, by holding gastrocnemius heads 'up' whilst facilitating 'down' with the soleus on the return movement, to actively lengthen soleus.

Facilitation of a step up was then carried out to improve linear extension and loading in the weight-bearing limb. The stepping was initially performed with distal facilitation and activation of the right lower limb to increase afferent somatosensory information in a functional postural set, to increase postural control via the feedforward system (Shumway-Cook and Woollacott 2007). Linear activation during stance of the right lower limb was then performed, with proximal facilitation 'down' at right gluteus medius and maximus, and at transversus abdominis to facilitate APAs.

Despite short-term improvements in alignment and movement patterns within the session, there was still limited carry-over. I decided that the right upper quadrant was interfering with kinetic alignment during gait. Range of movement of the thoracic spine was limited and was addressed with stretching and mobilising exercises. No limitations in range were found in the ribs or into scapular retraction or rotation and so it was hypothesised that the primary problem was reduced activation of the axioscapular muscles including serratus anterior, rhomboids, lower trapezius, and pectoralis minor.

We commenced work on aligning the trunk in relation to an actively placed right upper limb (*Figure 7*), introducing dynamic weight bearing through the limb by incorporating a reach across midline with the left upper limb. This encourages spindle afferent information from the upper limb to synapse with the sensorimotor cortex and then modulate via descending pathways the motoneurone pool of the scapulothoracic muscles (Alexander 2010). With my handling I facilitated alignment of the scapula and triceps extension. This was repeated to build up temporal summation (*Figure 8*).

This was progressed into standing to incorporate lower limb loading and spatial summation to improve the kinetic alignment of the key points. The upper limb motor neurones have more direct synaptic connections with the corticospinal neurons, which originate in areas such as the primary sensory cortex (Fisher *et al* 2012). This implies that somatosensory input from the upper limb may have a greater influence on postural control and motor output. Weight-bearing on both lower limbs and interaction with the base of support was more efficient after five minutes summating this activity. There is evidence that cutaneous input from the hand during simultaneous arm and leg movement (eg gait) may lead to facilitation of extensor muscle activity. This is described as 'inter-limb coupling' (Zehr *et al* 2007).

A further progression from this was to introduce stepping away from the placed right upper limb in a turning motion. This encouraged greater dynamic interaction of the shoulder girdle and trunk to activate proximal control.

Figure 9 shows initial improvements from treating the distal lower limb. There was better geometric alignment of pelvis over feet and shoulder girdles over pelvis. She was able to correct her sway-back posture and maintain it in quiet standing, although found difficulty maintaining this during more dynamic activities.

This may have been the result of improved foot position and therefore better sensorimotor interaction with the base of support, and between body segments.

At the end of the course of treatment, patient B was able to maintain single leg stance on the left leg for over one minute and on the right for 28 seconds. She no longer experienced aching and giving way of the right lower limb or problems with the stairs and she had greater awareness of her postural alignment. Pelvis and trunk kinetic alignment had improved during gait. She had improved interaction of her right shoulder girdle with her trunk in static and dynamic standing but reduced right arm swing and trunk rotation during gait. She felt more confident with her mobility and no longer feared falling.

CONCLUSIONS

Both patients made improvements in alignment, gait and balance and had significantly improved their walking speed (Perera *et al* 2006) using a distal-to-proximal approach. Patient B's MSIS-29 score was 10 points higher (5 point increase each on both physical and psychological) although a minimum change of 8 points in the physical component is regarded as significant (Costelloe *et al* 2007). This may have been because she was more aware of her deficits following intensive physiotherapy. Fatigue and the fluctuating nature of the condition could have made responses to the questions variable.

Patient A's head position remained slightly tilted to the right despite improvements in trunk and lower limb alignment. This could be as a result of soft tissue changes or a mismatch between vestibular and visual information resulting in a distorted perception of midline (Perennou *et al* 2000). For future intervention I would focus on soft tissue lengthening of the left sternocleidomastoid and right scalenes and activation of the deep neck flexors to enable more 'normal' information to be fed back via the vestibulospinal tract and work more on retraining more normal righting and equilibrium reactions in the neck in sitting and standing. Mal-alignment could account for the lack of a significant clinical improvement in Berg Balance Score (Flansbjer *et al* 2012), although he had surpassed the minimal detectable change in his Functional Reach (Mann *et al* 1996).

The use of Baclofen in patient A may have reduced the effectiveness of the treatment. It is a derivative of the neurotransmitter gama-aminobutyric acid which has an inhibitory influence, as it is an agonist for the GABAb receptors. It may have interfered with the ability to recruit global muscle activity by influencing synaptic activity and therefore inhibiting excitatory pathways. Through increasing the ratio of negative inhibitory neurotransmitters in the synaptic cleft, it would cause the cell to hyperpolarise rather than depolarise (Davidoff 1985, Chou *et al* 2004).

Fatigue was a major interfering factor with both patients. This may have reduced carry-over and longer-term effects of treatment due to less efficient replenishment of the neurotransmitter vesicles during the synaptic cycle (Sternberg 2012).

Patient A was frequently frustrated by his perceived lack of functional progress, as his main goal was to return to work. Consistent positive feedback was given throughout the sessions and both patients were pleased with their progress by the end of the course of intervention. Motivation was a key factor, as both patients were young and in employment, and were carers for young children.

Further elements I would have considered looking at would have been more work on the upper limb during weight bearing and gait, particularly in Patient B. This would further reinforce distal activation through spatial summation and feedforward postural stability activity into the trunk, and therefore improved lower limb selectivity.

The rubrospinal and reticulospinal tracts originate from the midbrain and pontomedullary reticular formation and have a role in distal selective movements and activation of axial and lower limb extension. These areas were affected in the patients within this case study. The neural damage may have had an impact on the amount of muscle activity generated and the level of integration of information between the pons, cerebellum, thalamus and basal ganglia to produce co-ordinated and refined movements (Morgen *et al* 2004).

I will consider the use of Functional Electrical Stimulation (FES) or Transcutaneous Electrical Nerve Stimulation (TENS) in future treatments as an adjunct to improve sensory awareness (Schabrun 2009). I would also consider the use of the MS 12-Point Walking Scale or the Dynamic Gait Index (Bethoux and Bennett 2011) as a more sensitive gait assessment in patients similar to Patient B, as she already demonstrated a fast gait speed but was not highly efficient. I would have used the MSIS-29 on Patient A to capture more holistic and functional information but did not as the patient was not formally diagnosed with MS until halfway through the treatment. After reviewing the limited evidence for the validity of the Functional Reach Test (Henriksson and Hirschfeld, 2003), I would have used a more valid and reliable balance measure such as the Timed Unsupported Stand.

The Bobath Concept is a systematic and evidence-based approach, encouraging problem solving and depth of thought regarding underlying neurophysiology. Raine *et al* (2009) state that facilitation and handling must 'make it possible' (alignment and activity), 'make it necessary' (put patient into a situation which requires a movement strategy or response), and 'let it happen' (allow movement to take place). I feel that I have demonstrated these components throughout my patient management. There were constraints to this case study in that a single method of treatment (distal activation) was investigated, but several approaches were adopted including improving ipsilateral trunk and proximal control to allow greater selectivity of movement on the contralateral side (Fisher *et al* 2012), and improving the awareness of midline and the internal postural body schema (Perennou *et al* 2007).

I have enjoyed carrying out this piece of work and have improved my personal knowledge of neurophysiology and the systems approach and become acutely aware of the importance of adequate somatosensory feedback to improve distal activation and selectivity of movement of the limb. I endeavour to further develop my understanding of the integration of information within the central nervous system, specifically looking at the role of the basal ganglia and cerebellum. I propose that with more developed knowledge and clinical reasoning, and further practice of handling skills learned on the Bobath course, my patient assessments and treatments will be more effective and efficient. Further research is needed to examine the efficacy and modality of distal stimulation to improve postural control and selectivity of movement.

REFERENCES

Alexander CM (2010) *Shoulder girdle control; some mechanisms of function to dysfunction* **Manual Therapy** 16 pp42-43.

Bethoux F, Bennett S (2011) *Evaluating walking in patients with multiple sclerosis. Which assessment tools are useful in clinical practice?* **International Journal of MS Care** 13 pp4-14.

Blum L, Korner-Bitensky N (2008) *Usefulness of the Berg Balance Scale in stroke rehabilitation: a systematic review*. **Physical Therapy** 88(5) pp559-66.

Buschges A, El Manira A (1998) *Sensory pathways and their modulation in the control of locomotion* **Current Opinion in Neurobiology** 8 pp733-739.

Chou R, Peterson K, Helfand M (2004) *Comparative efficacy and safety of skeletal muscle relaxants for spasticity and musculoskeletal conditions: A systematic review* **Journal of Pain and Symptom Management** 28(2) pp140-174.

Costelloe L, O'Rourke K, Kearney H, McGuigan C, Gribbin L, Duggan M, Daly L, Tubridy N, Hutchinson M (2007) *The patient knows best: Significant change in the physical component of the Multiple Sclerosis Impact Scale (MSIS-29 Physical)* **Journal of Neurology, Neurosurgery and Psychiatry** 78(8) pp841-844.

Davidoff RA (1985) *Antispasticity drugs: Mechanisms of action* **Annals of Neurology** 17(2) pp107-116.

Fisher KM, Soteropoulos DS, Witham CL (2012) *The motor cortex and descending control of movement* **Advances in Clinical Neuroscience and Rehabilitation** 11(6) pp11-13.

Flansbjer V, Blom J, Brogardh C (2012) *The reproducibility of the Berg Balance Scale and the Single-Leg Stance in chronic stroke and the relationship between the two tests* **Physical Medicine and Rehabilitation** 4(3) pp165-170.

Frey (2011) *Neurological principles and rehabilitation of action disorders: CAP model* **Neurorehabilitation and Neural Repair** 25 pp6s.

Hobart J, Lamping D, Fitzpatrick R, Riazi A, Thompson A (2001) *The Multiple Sclerosis Impact Scale (MSIS-29) A new patient-based outcome measure* **Brain** 124 pp962-973.

Horak F (2006) *Postural orientation and equilibrium: what do we need to know about neural control of balance to prevent falls?* **Age and Ageing** 35 s2 ppii7-ii11.

Henriksson M, Hirschfeld H (2003) *Does the functional reach test reflect stability limits in elderly people?* **Journal of Rehabilitation Medicine** 35(1) pp26-30.

Kibler WB, Press J, Sciascia A (2006) *The role of core stability in athletic function* **Sports Medicine** 36(3) pp189-198.

Lindberg G, Schmitz C, Engardt M, Forssberg H, Borg J (2007) *Use-dependent up-and-down-regulation of sensorimotor brain circuits in stroke patients* **Neurorehabilitation and Neural Repair** 21 pp315.

Mann GC, Whitney SL, Redfern MS, Borello-France DF, Furman JM (1996) *Functional reach and single leg stance in patients with peripheral vestibular disorders* **Journal of Vestibular Research** 6(5) pp343-353.

Massion J, Alexandrov A, Frolov A (2004) *Why and how are movement co-ordinated?* **Progress in Brain Research** 143 pp13-27.

Meyer PF, Oddsson LIE, De Luca CJ (2004) *The role of plantar cutaneous sensation in unpertubed stance* **Experimental Brain Research** 156(4) pp505-512.

Morgen K, Kadom N, Sawaki L, Tessitore A, Ohayon J, McFarland H, Frank J, Martin, R, Cohen L (2004) *Training-dependent plasticity in patients with multiple sclerosis* **Brain** 127 pp2506-2517.

Paltamaa J, Sarasoja T, Leskinen E, Wikström J, Mälkiä E (2007) *Measures of physical functioning predict self-reported performance in self-care, mobility, and domestic life in ambulatory persons with multiple sclerosis* **Archives of Physical Medicine and Rehabilitation** 88(12) pp1649-1657.

Perennou D, Leblond C, Amblard B, Micallef J, Rouget E, Pelissier J (2000) *The polymodal sensory cortex is crucial for controlling lateral postural stability: Evidence from stroke patients* **Brain Research Bulletin** 53(3) pp359-365.

Perera S, Mody SH, Woodman RC, Studenski SA (2006) *Meaningful change and responsiveness in common physical performance measures in older adults* **Journal of the American Geriatric Society** May 54(5) pp743-749.

Richardson JK, Hurvitz EA (1995) *Peripheral neuropathy – a true risk factor for falls* **Journals of Gerontology Series A: Biological Sciences and Medical Sciences** 50 ppM211-M215.

Roll R, Kavounoudias A, Roll JP (2002) *Cutaneous afferents from human plantar sole contribute to body posture awareness* **Neuroreport** 13 pp1957-1961.

Rothwell JC, Rosenkranz K (2005) *Role of afferent input in motor organization in health and disease* **IEEE Engineering in Medicine and Biology** 24 pp40-44.

Schabrun SM, Hillier S (2009) *Evidence for the retraining of sensation after stroke: A systematic review* **Clinical Rehabilitation** 23 pp27-39.

Sternberg Z (2012) *Sympathetic nervous system dysfunction in multiple sclerosis, linking neurodegeneration to a reduced response to therapy* **Current Pharmaceutical Design** 18 pp1635–1644.

Vaillant J, Vuillerme N, Janvy A, Louis F, Braujou R, Juvin R, Nougier V (2008) *Effect of manipulation of the feet and ankles on postural control in elderly adults* **Brain Research Bulletin** 75(1) pp18-22.

Van Deursen RW, Sanchez MM, Ulbrecht JS, Cavanah PR (1998) *The role of muscle spindles in ankle movement perception in human subjects with diabetic neuropathy* **Experimental Brain Research** 120 pp1-8.

World Health Organisation (2001) *International Classification of Functioning, Disability and Health (ICF)* Geneva WHO.

Zehr EP, Klimstra M, Dragert K, Barzi Y, Bowden, MG, Javan B, Phadke C (2007) *Enhancement of arm and leg locomotor coupling with augmented cutaneous feedback from the hand* **Journal of Neurophysiology** 98 pp1810-1814.

The Brouwer strap

developing a new item of equipment for use in stroke rehabilitation

AUTHOR

Annelies Brouwer
Clinical Specialist
Physiotherapist, Luton
Community Services

Gait training after stroke has been a major part of my job as a physiotherapist on a stroke unit and in a community rehabilitation unit. Over the years I have felt that there should be an easier way to assist patients to walk early after stroke, other than crawling on the floor assisting the affected leg, or using a 'sock' on the patient's toes and then sliding the leg forward, without compromising the biomechanics of gait. I would like to share the development of the Brouwer Strap; an easy to apply piece of equipment that I currently use for gait training after stroke that I feel allows a more normal gait pattern with heel rise and knee flexion at the start of swing phase and heel strike and knee extension at the end of swing phase.

Following a stroke, the ability to walk is often impaired or lost, and the functions of standing, transferring and walking are major components of rehabilitation.

Improved walking is one of the most frequently stated goals by people with stroke (Bohannon 1988). A review (Van de Port 2007) showed that gait-oriented training is effective in improving walking competency after stroke. *The National Clinical Guidelines for Stroke* also advise that a task-specific approach should be used to rehabilitation and that a patient should be given as much opportunity to practise the task as possible. No current technique or treatment approach is considered superior to another (*National Clinical Guidelines for Stroke* 2008).

Over the last 20 years, treadmill training has been introduced for stroke patients to allow for repetitive practice of the functional task of walking. However, a Cochrane review in 2003 showed there is no evidence that treadmill training is more beneficial than overground training in dependent walkers early after stroke. Some physiotherapists working with stroke patients in the NHS will not have access to a treadmill.

Over the last 15 years I have worked in stroke rehabilitation and regularly found myself crawling on the floor supporting patients to give them the opportunity to practise walking. Over time this has gradually become harder and I feel I am risking my back and knees during these activities. The Chartered Society of Physiotherapists has published a study (CSP 2005) showing that 68% of members have suffered work-related musculoskeletal disorders.

MY APPROACH

To allow patients to practise walking and to protect myself from potential physical injury, I occasionally used a rope tied to the patient's shoelaces to assist with swing phase by lifting the affected leg from the forefoot. For this technique, the patient must have some extensor activity in the trunk and hips, and ideally quadriceps, to hold them up against gravity with assistance. I would position myself to the side and slightly behind the patient. This technique seemed to work well for me and the patient and I felt this gave several patients the opportunity to become mobile using this technique.

However this technique did not allow a good biomechanical gait pattern as it lifted the leg from the forefoot therefore preventing heel rise at the start of swing phase and maintaining knee extension throughout the swing phase. Also patients didn't always have shoes with laces! So I started to think about designing a strap that would achieve a better gait pattern during practice, allowing the foot to move from plantar flexion to dorsiflexion and the knee from flexion to extension during swing phase.

The design of the strap looks like this (*Figure 1*) (the model in the picture is holding the strap whereas in training it would be the therapist holding the strap):

One loop of the strap attaches around the

FIGURE 1

FIGURE 2 Therapist's hand position at start of swing phase

FIGURE 3 Patient's leg position at start of swing phase

FIGURE 4 Therapist's hand position at end of swing phase

FIGURE 5 Patient's leg position at end of swing phase

patient's heel, secured with Velcro. The other loop is attached around the ball of the foot. Both ends of the strap are adjustable to allow for differences in patients' biomechanics as well as variability in heights of patients and therapists. Via the handle, the movement of the leg can be controlled from knee flexion and heel rise at start of swing phase (*Figures 2* and *3*) to knee extension and heel strike at end of swing phase (*Figures 4* and *5*). The therapist stands slightly to the side and behind the patient.

The therapist can control the leg through swing phase and start off by passively moving the patient's leg where required, or assisting to control the movement where a patient has some active movement. The patient is encouraged to actively participate in stepping and the idea is that when a patient gets more activity in the leg, the therapist can reduce the amount of help given via the Strap.

BROUWER STRAP – TWO CASE EXAMPLES

Case example 1: SH

SH is a 54-year-old man who suffered a right middle cerebral infarct in January 2012. In hospital, low motivation limited progress; he found it difficult to engage in rehabilitation and carry over was poor. He was transferred to our local community rehabilitation unit for a six-week period in March 2012. At this time he presented with a dense left sided weakness, was PEG fed, and had very poor sitting posture and balance. Although he was able to transfer with a Rotastand and assistance of two people, he had mobility problems associated with weakness, soft tissue shortening and continued low motivation.

Initially treatment was aimed at retraining head and trunk movements and trunk control in sitting. After two weeks, symmetry was improved but it became clear that SH was very reluctant to actively participate in rehabilitation. He refused passive movements of the left upper and lower limb, and anticipated discomfort with every movement so chose not to move while in his chair or in the bed.

To try and improve motivation, we moved on to practising sit to stand and standing with a bar on the right side and therapist supporting left hip and knee. In standing, SH immediately put all his weight on the right leg and was fearful of using the left leg in case it was going to cause him pain. During sit to stand increased quadriceps activity was noted in the left leg, and there was some inconsistent quadriceps activity in sitting. Trying to step with the right leg failed as SH was not prepared to stand on the left leg, fully focussing on any discomfort that might occur.

It was then that we moved to walking with the Brouwer Strap. The assistance of the Strap, coupled with the patient feeling he was walking, improved his participation in rehabilitation and within one week he walked in the parallel bars without the Strap and a week later he walked about 15 meters in the gym with a tripod and minimal assistance for balance.

See video *Case study 1* www.youtube.com/watch?v=-7CQ-1GjLTc&feature=channel&list=UL (at this stage the Strap did not yet have the handle).

Case example 2: JI

JI is a 65-year-old man who arrived in our rehabilitation unit about three weeks after suffering a stroke in October 2012 and presented with severe right sided weakness and dysphasia. English was not his first language. Compliance with rehabilitation was poor until we started practising standing. After two weeks, there was no improvement in limb movements but trunk control had improved, although the patient found it difficult to participate in individual limb exercises. After a further week we introduced the Brouwer Strap and JI's participation in rehabilitation improved. He was then keen to come to the gym and practise walking. We continued with this gait training using the Brouwer Strap for about three weeks.

JI never did gain enough movement in his right leg to achieve independent walking but balance and standing tolerance improved together with his transfers and upon discharge he was able to transfer with minimal assistance of one person.

See video *Brouwer Strap 2012* (www.youtube.com/watch?v=TWpHdotXcSc&list=UL-7CQ-1GjLTc

In both cases the patients have been anonymised in the videos but we also obtained written consent to allow us to share the clips with colleagues via the Internet.

CONCLUSION

Most patients who have suffered a stroke are keen to practise walking, and walking practice is an important part of physiotherapy especially when working with patients who have low motivation towards rehabilitation or have difficulty following instructions due to cognitive/perceptual problems or language difficulties. Motivation in my patients tends to increase when they feel they are able to practise standing and walking as they can see it as a way to achieving independence. Where cognitive or language problems are present it is often very difficult to get patients to perform specific exercises to improve strength and function, but most of them understand the practice of walking. Both case examples illustrate improved motivation and participation in rehabilitation and associated gains in function.

Evidence from research (*National Clinical Guidelines for Stroke* 2008; *Cochrane Review* 2003) shows there is no gold standard treatment approach to achieve goals in stroke rehabilitation but that task specific exercises and repetition have positive effects on outcome. The use of the newly developed Brouwer Strap in the case studies has shown to be task specific and has helped to achieve improved functional outcomes. I developed the Brouwer Strap to allow me to practise walking with stroke patients, in the absence of other equipment like a treadmill in the unit where I work, and to protect my own body from injury. I feel the Brouwer Strap could be an additional tool to the existing physiotherapy repertoire in stroke rehabilitation.

COMMENTS

I initially shared the development of the Brouwer Strap with some of my neuro physiotherapy colleagues and they have all been very positive about its potential. Some of their comments are:

> 'I like the idea of the strap but I would like a closer look at the handle.'
>
> 'I like the fact that you have been innovative. I like the customisation for patient and therapist.'
>
> 'How about collecting data on how long to use it, or on therapists' back problems?'
>
> 'Looks like a great help in stroke rehabilitation.'
>
> 'Have you thought about patenting the Strap.'
>
> 'Make sure you give it your name!'

I then shared one of the videos on the discussion forum of iCSP, and although the response rate was low, the general comment from there was that colleagues around the country feel they use a 'sock' over the patient's toes to achieve the same results. I hope that with this article I have shown that as therapists we could possibly improve outcomes by reflecting on our own practice.

I also looked into getting a patent for the Brouwer Strap, but after talking to The East of England Health Enterprise and to a friend who runs a rehabilitation equipment company, I have decided not to take this forward. Apparently it is very difficult to patent something as simple as a 'strap' as it would be easy for others to design a similar strap with minimal adjustments to bypass any patent. Obtaining a patent and getting the CE mark necessary for the European market is also very costly, resulting in an expensive product. This would go against my idea of offering a relatively simple tool to therapists who think it benefits them and their stroke patients

So I continue to use my own Strap in clinical practice and I am very happy with the results. It is easy to replicate and anyone can feel free to do so if they wish. I would be happy to discuss the Strap further with any interested colleagues and welcome further feedback.

REFERENCES

Bohannon RW, Andrews AW, Smith MB (1988) *Rehabilitation goals of patients with hemiplegia* **International Journal of Rehabilitation Research**. 11(2) pp181–183.

Chartered Society of Physiotherapy (2005) *Work-related musculoskeletal disorders affecting members of the Chartered Society of Physiotherapy* available at www.csp.org.uk/physio-journal/91/3/work-related-musculoskeletal-disorders-affecting-members-chartered-society-physiotherapy

Cochrane Review (2003) *Treadmill training and body weight support for walking after stroke* available at http://stroke.ahajournals.org/content/34/12/3006.full

National Clinical Guidelines for Stroke 3rd edition 2008.

Van de Port IG *et al* (2007) *Effects of exercise training programs on walking competency after stroke: a systematic review* **American Journal of Physical Medicine and Rehabilitation** 86(11) pp935-951.

With thanks to Simon Lovett and Jennifer Greenwood for their valuable advice during the development stages of the Brouwer Strap.

Does improving the strength of the kinetic chain of stance result in increased gait speed?

AUTHOR

Michael Walsh
BSc (Hons) MCSP
Specialist Physiotherapist, Warrington and Halton Hospitals Foundation Trust

One of the main impairments after stroke is reduced muscle strength and movement (Ng and Shepherd 2000) with studies recording losses of muscle power greater than 50% (Bohannon and Andrews 1998, Lin 2005, Neckel *et al* 2006, Gerritis *et al* 2009). This post-stroke muscle weakness is a major contributor to motor performance and activity limitations related to mobility. Several studies have shown muscle weakness after stroke correlates significantly with measures of gait performance and specifically gait speed, concluding the importance of improving strength clinically (Bohannon and Andrews 1998, Nadeau *et al* 1999, Kligyte *et al* 2003, Patten *et al* 2004, Lin 2005, Flansbjer *et al* 2006, Yang *et al* 2006, Kluding and Gajewski 2008, Gerritis *et al* 2009).

Reduction in gait performance may prevent return to activities of daily living (Pound *et al* 1998), reducing participation by between 28% and 40% (Flansbjer *et al* 2006).

Bipedal walking is complex and a unique evolutionary development of humans; control of stance and gait requires specific neuronal mechanisms to maintain the body in an upright position against gravity (Dietz and Duysens 2000). In order to take the first step from quiet stance it is necessary to have enough strength to create axial extension on a background of postural control anchored to the vertical (Grasso *et al* 2000, Raine *et al* 2009).

A number of studies have demonstrated positive effects of strength training on post stroke weakness (Weiss *et al* 2000, Kim *et al* 2001, Flansbjer *et al* 2008). Weiss *et al*, (2000) reported strength gains of 48% on the non-paretic side and 68% on the paretic side using a progressive resistance strength training programme. Whether strength training is also effective in improving functional activities has been questioned (Morris *et al* 2004). Some studies have found no convincing effect of strength training on functional outcome, gait performance or participation (Kim *et al* 2001, Flansbjer *et al* 2008). This may have been due to the fact they only strengthened one muscle group or they had patients with sufficient strength to perform an activity where further improvements may not lead to any substantive gains. Also the relationship between strength and function may not be linear. Most likely, the effective transfer between strength training and function will differ depending on the degree of post-stroke weakness (Patten *et al* 2004).

It appears strength training in a task orientated, functional way results in a more significant improvement in performance. The lower limb strength gain was shown to be significantly associated with gain in functional tests such as gait velocity, cadence, stride length, six-minute walk test, step test and timed up and go test (Yang *et al* 2006).

The evidence supports the need to integrate specific strength training as part of regaining efficient movement. This is supported in the Bobath Concept by Raine (2007) although muscle strength can be increased in several ways after stroke and the evidence is insufficient to infer one treatment is more effective than another. However it appears a combination of progressive resistance training and task orientated functional training may be most effective.

The aim of this project is to investigate whether therapy based on the Bobath Concept improves the strength of the kinetic chain (foot upwards) of stance and therefore positively influences gait speed following a stroke.

Stance phase is fundamental for generating and building up the kinetic energy for the next swing. Clinical observation suggests the stronger and longer the stance phase, the better the swing

(Raine *et al* 2009). If this occurs then it is reasonable to suggest gait speed would increase. The work of Higginson *et al* (2006) supports this and suggests that inappropriate timing and level of muscle activation are responsible for the observed asymmetries in kinematics and kinetics and that reduced paretic stance duration may reflect the impaired ability of muscles to provide support.

THE PATIENT

- A 66-year-old presented on 14 February 2012 with right-sided weakness, facial droop, drowsiness, dizziness, right-sided visual deficit and was unable to walk.
- MRI revealed an infarct in the right cerebellar hemisphere extending to the right side of the medulla oblongata.
- PMH – hypertension.
- SH – previously fully independent, drives, works part-time, attends gym and enjoys holidays.
- Discharged home on 1 March 2012 with daily therapy on Early Supported Discharge.
- Patient then transferred to the Neuro Community Team on 23 March 2012 following a couple of handovers.

Pre – treatment

Figures 1 to *3* show Patient A prior to treatment and *Table 1* summarises the problem list and goals for Patient A according to the International Classification of Function, Disability and Health as produced by the World Health Organisation (WHO) 2001.

The Medical Research Council Strength Scale (MRC 1978) is commonly used in practice to measure strength and is supported in Raine *et al*. 2009. The Timed Up And Go (TUAG) (Podsiadlo and Richardson 1991) has been shown to have good reliability and validity (Flansbjer *et al* 2005) and is used in many studies when looking at gait performance. I also recorded the number of steps required to complete the TUAG. This would indicate a change in gait kinematics such as improved stance and therefore step length. The Berg Balance Scale (BBS) (Berg *et al* 1989) was used as an overall assessment of balance. It has been used extensively in individuals recovering from stroke, and has been shown to have very good reliability and validity (Tyson and DeSouza 2004).

Treatment Hypothesis 1

That through the facilitation of contactual hand orientating response (CHOR) midline orientation for symmetrical sit to stand would be achieved. Jeka 1997, Raine *et al* 2009

In total, treatment was carried out over 20 sessions. The main bulk of the treatment was carried out in the patient's home environment, as they were unable to sleep in hospital and therefore desperate to return home.

Initial preparatory treatment as an inpatient worked to improve trunk alignment and postural control in sitting using CHOR to a plinth in front in order to gain appropriate key point alignment, body schema, sensory information and to reduce compensatory activity. This would allow optimum effects from subsequent treatments in order to produce efficient movement (Kandel *et al* 2000, Kibler *et al* 2006, Raine *et al* 2009).

FIGURE 1 UL compensation, midline shift to right, right trunkal and hip weakness

FIGURE 2 Midline shift to right, right side forward, weakness right hip/trunk/abdominals, hyperextended right knee

FIGURE 3 Compensatory fixation UL's, adducted right LL, hips shifted to right, right hip/trunk weakness, flexed on stance

IMPAIRMENT	ACTIVITIES	PARTICIPATION
Problem list	**Problem list**	**Problem list**
1 Reduced postural control trunk – weak abdominals	1 Requires close supervision and assistance of arms to stand	1 Unable to walk independently
2 Reduced LL activity – movement with facilitation proximally, lacked grading distally	2 Stand and step with 2	2 Unable to perform ADLs independently eg toileting, cook, clean etc
3 Altered key point alignment sitting and standing	3 Unable to mobilise out of therapy	3 Unable to perform stairs
4 Unable to achieve stance (SLS) bilaterally		
5 Compensatory fixations left > right		
Goals	**Goals**	
Short-term – improve proximal LL strength to grade 4 (MRC) in 3/52	Short-term – walk with aid and assistance of 1 in 2/52	
Improved key point alignment 3/52	An improvement in TUAG	
	Long-term – mobile independently with/without aid	

TABLE 1 Problem list and goals for Patient A

FIGURE 4

FIGURE 5

FIGURE 6

FIGURE 7

FIGURE 8

FIGURE 9

Treatment Hypothesis 2

The facilitation of selective pelvic movement during sit to stand repetitions strengthens the kinetic chain (Lin *et al* 2007)

The improved alignment and appropriate activity was then incorporated into perched sit to stand and small range stop standing, in order to recruit abdominal activity/posterior pelvic tilt, to control knee hyperextension and strengthen the kinetic chain through loading. It also improved midline orientation and reduced compensatory fixation on the left side. The improvements gained allowed the patient to be discharged home, mobile, with a stick in left hand and an assistant on the right.

Treatment Hypothesis 3

Through the treatment of the components of stance phase in part task practice, the whole task becomes more efficient (Kibler *et al* 2006, Raine *et al* 2009).

Treatment then involved assessing and exploring the strength, range of movement, alignment and muscle length with subsequent strengthening through the kinetic chain in supine. It involved facilitating appropriate muscle recruitment in functional patterns of movement on a stable base and background of postural stability to facilitate positive neuroplastic changes and motor learning (Kibler *et al* 2006, Raine *et al* 2009). See *Figures 4* to *6*.

From the position of active crook lying, I was then able to focus treatment into the patient's main area of deficit of proximal weakness and reduced postural control. It was noted that it was difficult to recruit central stability in order to free the left leg (*Figure 7*). Bridging was therefore progressed by increasing the activity required at right hip and pelvis in order to free the left leg, and working asymmetrically to strengthen (*Figure 8*). I also worked on right hip abduction in left side lying.

Although some improvements in gait and strength could be seen it was still difficult to achieve right stance from quiet stance due to:

- Centre of mass (COM) being forward (weak abdominals).
- Midline shifted to right.
- Reduced postural stability, pelvic stability and anticipatory postural adjustments (APAs).
- Altered alignment and recruitment of activity for right stance.

Treatment Hypothesis 4

Working in the functional situation with guided practice strengthens the patient's learning (Yang 2006)

I therefore worked on the above components in a more functional and task specific way (Yang 2006) by:

- Strengthening the kinetic chain through stop standing – recruiting abdominals for COM back, to gain posterior pelvic tilt and knee flexion. (*Figure 9*).
- Working back onto right LL, with and without CHOR (*Figure 10*).
- Improving lateral weight transfer to the left via CHOR on the left and in front, facilitating through right LL activity to unload and load it. This was difficult to achieve likely due to compensatory activity distally for the lack of postural/proximal stability (*Figure 11*).
- Working to improve the alignment and strength for right stance through a variety of ways in order to free the left leg and take the 1st step from quiet stance (*Figure 12*).
- All the above had an impact on postural stability, pelvic stability and (APA's).

Post – Treatment

Figures 13 to *15* show the patient post-treatment. The main changes are improved symmetry, midline awareness, lateral weight transfer to the left, postural control, extension and stability of the pelvis for right stance.


FIGURE 10


FIGURE 11


FIGURE 12


FIGURE 13

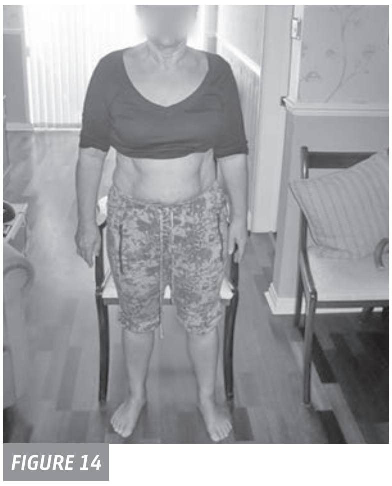


FIGURE 14


FIGURE 15

OUTCOME MEASURE	PRE-TREATMENT	POST-TREATMENT
MRC	D/F – 4	D/F – 4
	P/F – 4	P/F – 4
	Knee ext – 4	Knee ext - 4
	Knee flexors – 4	Knee flexors – 4
	Hip ext – 2	Hip ext – 4
	Hip flexors – 3	Hip flexors -4
	Hip abd – 2	Hip abd – 4
	Hip abd – 2	Hip add – 4
TUAG (3 metre)	37 seconds (assistance of 2)	1 Stick and assistance of 1 on right – 18.18 2 Stick with no support – 20.42 3 Independent – 23.72
No. of steps in TUAG	40	1 Stick and assistance of 1 on right – 19 2 Stick with no support – 24 3 Independent – 32
Berg Balance	18	44

TABLE 2 Outcome measures for Patient A

DISCUSSION

In response to treatment involving strengthening of the kinetic chain in functional patterns of movement and task specific strengthening, the patient demonstrated improved strength. There was also improvement in TUAG, number of steps in TUAG, Berg Balance Score and ability to perform stance, supporting the relationship in the literature between strength and gait (Yang 2006).

However, I feel the following factors were also vital in this improvement; improved left lateral weight transfer, improved key point alignment and body awareness, and better postural control. It may be that the increased strength in the right side also had a direct effect on these components.

Despite these improvements the patient continued to find stance difficult bilaterally and therefore gait.

I was reluctant to introduce a stick; however, clinically with this patient it was important as a perceptual reference to enable improved lateral weight transfer to the left. This facilitated her discharge and enabled the family to help her to mobilise appropriately at home. On handover to the community she had achieved her goal of being mobile with a stick and assistance of one ,and was beginning to mobilise with a stick independently in therapy. She could complete stairs safely and returned to upstairs living.

CONCLUSIONS

My study supports the evidence that stroke patients can improve in strength with training which can in turn lead to improvements in stance, gait speed, and balance.

My case study highlights the importance of other key aspects of motor control and function including key point alignment and body awareness to provide correct sensory information to the cerebellum. This enables it to regulate descending pathways appropriately and therefore impact on postural control and movement (Lundy-Ekman 1998).

I conclude that specific strength training of the kinetic chain for stance is an important aspect of treatment post-stroke involving mechanical factors and the interaction and co-ordination of many neurological systems. To recruit the strength and movement components necessary for stance is a challenge to all therapists and could take many months. The Bobath Concept provides me with a greater knowledge and an evidenced-based approach to tackle movement dysfunction and will significantly aid my practice in future. I feel it is also important to recognise that treatment based on the Bobath Concept can be extremely effective and specific in a patient's home environment for example in Early Supported Discharge environments.

REFERENCES

Berg KO, Wood-Dauphinee SL, Williams JI, Gayton D. (1989) *Measuring balance in the elderly: Preliminary development of an instrument* **Physiotherapy Canada** 41 pp304-311.

Bohannon RW, Andrews AW (1998) *Relationships between impairments in strength of limb muscle actions following stroke* **Perception and Motor Skills** 87 pp1327-1330.

Dietz V, Duysens J (2000) *Significance of load receptor input during locomotion: A review* **Gait and posture** 11 pp102-110.

Flansbjer UB, Downham D, Lexell J (2006) *Knee muscle strength, gait performance, and perceived participation after stroke* **Archives of Physical Medicine and Rehabilitation** 87pp974-980.

Flansbjer UB, Holmback AM, Downham D, Patten C, Lexell J (2005) *Reliability of gait performance tests in men and women with hemiparesis after stroke* **Journal of Rehabilitation and Medicine** 37 pp75-82.

Flansbjer UB, Miller M, Downham D, Lexell J (2008) *Progressive resistance training after stroke: Effects on muscle strength, muscle tone, gait performance and perceived participation* **Journal Rehabilitation Medicine** 40 pp42-48.

Gerritis KH, Beltman MJ, Koppe PA, Konijnebelt H, Elich PD, de Haan A, Janssen TW (2009) *Isometric muscle function of knee extensors and the relation with functional performance in patients with stroke* **Archives of Physical Medicine and Rehabilitation** 90 pp480-487.

Grasso R, Zago M, Lacquaniti F (2000) *Interactions between posture and locomotion: Motor patterns in human walking with bent posture versus erect posture* **Journal of Neurophysiology** 83 pp288-300.

Higginson JS, Zajac FE, Neptune SA, Kautz SA, Delp SL (2006) *Muscle contributions to support during gait in an individual with post-stroke hemiparesis* **Journal Of Biomechanics** 39 pp1796-1777.

Jeka JJ (1997) *Light touch contact as a balance aid* **Physical Therapy** 77 (5) pp476-487.

Kandel ER, Schwartz JH, Jessell TM (2000) ***Principles of Neural Science*** 4th Edition, McGraw Hill, New York.

Kibler W, Press J, Sciascia A (2006) *The role of core stability in athletic function* **Sports Medicine** 36 (3) pp189-198.

Kim CM, Eng JJ, Macintyre DL, Dawson AS (2001) *Effects of isokinetic strength training on walking in persons with a stroke: a double-blind controlled pilot study* **Journal of Stroke and Cerebrovascular Disease** 10 (6) pp265-273.

Kligyte I, Lundy-Ekman l, Medeiros JM (2003) *Relationship between lower extremity muscle strength and dynamic balance in people post-stroke* **Medicina (Kaunas)** 39 pp122-128.

Kluding P, Gajewski B (2009) *Lower extremity strength differences predict activity limitations in people with chronic stroke* **Physical Therapy** 89 (1) pp73-81.

Lin CHJ, Sullivan KJ, Wu AD, Kantak S, Winstein CJ (2007) *Effect of Task Practice Order on Motor Skill Learning in Adults with Parkinson Disease: A Pilot Study* **Physical Therapy** 87 (9) pp1120-1131.

Lin S (2005) *Motor Function and Joint Position Sense in Relation to Gait Performance in Chronic Stroke Patients* ,**Archives of Physical Medicine and Rehabilitation** 86 ,pp197-203.

Lundy-Ekman L (1999) **Neuroscience – Fundamentals for Rehabilitation** WB Saunders Company, Philadelphia.

Medical Research Council (MRC) (1978) **Aids to the Examination of the Peripheral Nervous System** Baillere Tindall, Eastbourne.

Morris SL, Dodd KJ, Morris ME (2004) *Outcomes of progressive resistance training following stroke: a systematic review* **Clinical Rehabilitation** 18 pp27-39.

Nadeau S, Arsenault AB, Gravel D, Bourbonnais D (1999) *Analysis of the clinical factors determining natural and maximal gait speeds in adults with a stroke* **American Journal of Physical Medicine and Rehabilitation** 78 pp123-130.

Neckel N, Pelliccio M, Nichols D, Hidler J (2006) *Quantification of functional weakness and abnormal synergy patterns in the lower limb of individuals with chronic stroke* **Journal of NeuroEngineering and Rehabilitation** 3 p17.

Ng SM, Shepherd RB (2000) *Weakness in patients with stroke: implications for strength training in neurorehabilitation* **Physical Therapy Review** 5 pp227-38.

Patten C, Lexell J, Brown HE (2004) *Weakness and strength training in persons with post-stroke hemiplegia: rationale, method and efficacy* **Journal of Rehabilitation Research and Development** 41 pp293-312.

Podsiadlo D, Richardson S (1991) *The timed 'Up & Go': a test of basic functional mobility for frail, elderly persons*. **Journal of American Geriatric Society** 39 pp142-148.

Pound P, Gombertz P, Ebrahim S (1998) *A patient-centred study of the consequences of stroke* **Clinical Rehabilitation** 12 pp338-347.

Raine S (2007) *The current theoretical assumptions of the Bobath Concept as determined by members of the BBTA* **Physiotherapy Theory and Practice** 23 (3) pp137-152.

Raine S, Meadows L, Lynch-Ellerington M (2009) **Bobath Concept – Theory and clinical practice in neurological rehabilitation** Wiley-Blackwell, Oxford.

Tyson SF, DeSouza LH (2004) *Reliability and validity of functional balance tests post-stroke* **Clinical Rehabilitation** 18 pp916-923.

Weiss A, Suzuki T, Bean J, Fielding RA (2000) *High intensity strength training improves strength and functional performance after stroke* **American Journal of Physical Medicine and Rehabilitation** 79 pp369-376.

World Health Organisation (2001) **International classification of function, disability and health: ICF** Geneva, WHO.

Yang YR, Wang RY, Lin KH, Chu MY, Chan RC (2006) *Task-orientated progressive resistance strength training improves muscle strength and functional performance in individuals with stroke* **Clinical Rehabilitation** 20 pp860-870.

Sharing good practice

The Warrington stroke categories

Jill Wright Clinical specialist Physiotherapist, **Ruth Witham** Clinical specialist Physiotherapist,
Janette Singleton Clinical specialist Occupational Therapist, **Janet Johnson** Clinical specialist Occupational Therapist

Service planning and development, process mapping, research and audit and clinical prognostic discussions with families have always posed problems when dealing with the vast continuum within the stroke population. Over the past six years the therapy team at Warrington have developed a categorisation model: Warrington Stroke Categories (WSC), which allows them to stratify their stroke patients. This enables them to facilitate more meaningful clinical discussions with families, plan services more effectively and to produce relevant clinical audit.

The categories were initially developed through experiential knowledge and are based on a therapy assessment. Over the last six years they have been rigorously audited and refined and their use is now embedded in the clinical management of stroke patients at Warrington Stroke Unit. The WSCs have been disseminated at North West Collaboratives over the last 18 months and have been received with enthusiasm, and many therapists have recognised their potential benefits. Different hospitals across the country are now also beginning to use the model of care. The aim of the therapy team has always been to publish their work and this 'sharing good practice' article forms the starting point for this work. In the future the therapy team is seeking to gain funding and expert assistance to carry out a full research project.

Background

In 2005 a process mapping exercise gave rise to a need to categorise the stroke patients at Warrington Hospital. One of the main drivers of this exercise was that the Trust's length of hospital stay (LOHS) for stroke patients was higher than the national average, which at the time was 27.9 days (compared to 47 days in Warrington). Although the Oxford Classification was in place on the Stroke Unit the patients in the classifications did not follow set pathways and this method only classified ischaemic strokes.

As therapists it was experientially recognised that there were groups of patients that did seem to follow the same pathway. With case history searching and anecdotal evidence six distinct groups of patient were identified along with a set of characteristics for each category. A retrospective study was then carried out to see if past patients could be categorised into the six groups and then the average LOHS was collated for each category. From this data a range was identified so that it gave room for other variables and a proforma was developed to facilitate formulation of estimated dates of discharges (EDDs) on the Stroke Unit.

	PRE CAT	POST CAT 2008	% REDUCTION IN LOHS
AVERAGE	47 days	25 days	46%
Cat 1	17 days	19.5 days	-14%
Cat 2	104 days	83.7 days	22.4%
Cat 3	54.6 days	52.5 days	3.8%
Cat 4	52 days	28 days	46%
Cat 5	32 days	16.7 days	48%
Cat 6	10 days	6.7 days	33%

TABLE 1 Reduction in LOHS pre and post categorisation

Methodology

- In 2005 a service review of the stroke service was undertaken by the local stroke strategy group. This led to the development of the WSCs, as it became apparent that most stroke patients did fall into one of our six stroke categories.
- The therapists defined six distinct categories using case history searching and experiential knowledge of their stroke demographic.
- In 2005 a retrospective study was carried out to ensure that all stroke patients admitted to the Unit in the previous six-month period could be successfully streamed into a category.
- Following retrospective categorisation the average LOHS was calculated for each category and thus the team could begin to formulate accurate EDDs for all new stroke patients.
- The aim was to have more focused discharge planning, making it easier to identify bottlenecks in the individual category pathways.
- The following year the team made continued progress on discharge planning and further reductions were made in LOHS (see *Table 1*).

Table 2 shows the pathways, process and usual progress of patients with an average LOHS for the specific category of patient. The LOHS differs considerably from those in *Table 1* as these are the LOHS for current patients following the development of specialist intermediate care (SIC) and early supported discharge (ESD). We are able to expedite hospital discharge for all patients but particularly those in categories 2, 3 and 4

Alongside the LOHS audits, the team was also regularly auditing by category patients' physical and cognitive functional outcomes at different stages of their stroke journey. The team also looked at discharge destination and used this information to inform discharge planning and discussions with family.

It became apparent that despite improvements in the discharge process,

PRESENTATION	PROGRESS	PROCESSES	AVERAGE LOHS
Category 1	• High mortality rate and palliation. • Little or no improvement in the first three weeks. • Decisions re alternative feeding/ modified diets. • Maximum potential to be hoisted out into a chair fully supported. • On discharge would require 24-hour care/support.	• Initial assessment and on-going daily therapy intervention, by OT and PT. Potential for any improvements identified. • Categorisation, EDD setting and discharge planning commences. • MDT communication with relatives/carers.	28 days • This figure is an average – some of these patients will die very soon after stroke, some patients will become medically more stable and will have the opportunity to explore their potential for improvement and will need time to address alternative feeding and d/c planning to 24-hour care, or home with palliative care support.
Category 2	• These patients make improvements at a slow rate and require a facility to allow slow stream specialist rehab. (a small percentage of these patients improve and are able to mobilise or do a standing transfer with assistance). • Should be sitting out within one to two weeks supported in chair if medically stable. • Begin to tolerate short treatment sessions within one to three weeks. • On discharge all will require either 24-hour care or complex discharge planning with full care package.	• Initial assessment and on-going daily therapy intervention, by OT and PT. Potential for any improvements identified. • Categorisation, EDD setting and transfer to specialist intermediate care or ESD service. MDT communication with relatives/ carers.	35 days • Those that go to SIC may have shorter LOHS, those that go straight to ESD may be slightly longer LOHS.
Category 3	• Can sit out in chair on assessment if medically stable. • Can tolerate active therapy in the first week. • Makes improvements at a steady pace, potential to become mobile with assistance within eight weeks – may have marked upper limb weakness.	• Initial assessment and on -going daily therapy by OT and PT. Potential for improvement identified. Categorisation and EDD setting - transfer to specialist intermediate care and/ or ESD – on-going communication with relatives/carers.	21 days
Category 4	• Respond rapidly to therapy. • Category 4 patients may present physically quite able but treatment may be centred around perceptual and cognitive rehabilitation.	• Initial assessment and on-going daily therapy by OT and PT. Potential for improvement identified. • Categorisation and EDD setting. Rapid communication with relatives and very timely environmental visits and equipment assessments to facilitate ESD.	14 days • This is an average and some patients will be discharged within the week if mildly cognitively impaired and they do not live alone versus a patient who lives alone with gross cognitive/perceptual impairment.
Category 5	• Responds very quickly to therapy and resumes baseline function within one week.	• Initial assessment and on-going daily therapy by OT and PT. • Potential for improvement identified. • Categorisation and EDD setting. Rapid communication with relatives. • Discharge planning. ESD may be necessary for this group of patients particularly if they are elderly and vulnerable.	5 days
Category 6	• Back to baseline on day 1 of admission and are generally fit for discharge the same day.	• Initial assessment, categorisation and discharge with or without follow-up appointment depending on patient's presentation.	1.5 days • Variation in these patients LOHS would be around medical management and prevention eg vascular review and necessary treatment.

TABLE 2

unless there was a change in the way that stroke services were delivered ie the place where the rehabilitation took place, it would be difficult to radically change the LOHS of category 2, 3 and 4 patients.

How categories are used within the patient journey

Patient admitted, assessed and categorised by therapists within 72 hours. (See *Appendix 1*)

↓

Patient pathway determined by category, location and family set up. (See *Table 2*)

↓

Realistic EDD set using categories and extensive audits on EDD setting.

↓

Progress meeting set up with patient, family and MDT. The timing of progress meetings (PM) varies for all categories. Category used to inform prognostic discussions with family and patient and approximate LOHS. Pathway of care also discussed with patient and family in relation to category and suitability for ESD/SIC

Measuring the usefulness of categories

Initially the team audited the efficacy of categories through the reduction in LOHS and the accurate prediction of EDDs. Numerous audits have demonstrated the ability to accurately predict EDD and the Unit has shown a reduced LOHS from 47 to 34 days despite having a comparable cohort of patients and like for like service delivery. Further work on refining the categories and the discharge process within the Unit led to a further reduction in LOHS to 25 days.

At this stage the team recognised that it would be unable to reduce LOHS any further without significant redesign of therapy services and on-going pathways for stroke patients. It could be clearly demonstrated that a significant number of patients could be rehabilitated in an alternative setting and using the categories allowed the team to accurately quantify the number of these patients and therefore the demand for ESD and SIC. The team used categories very effectively to produce highly developed and accurate service delivery models and business plans.

	PRE REDESIGN OF SERVICES 2008	POST REDESIGN NOV 2009 – OCT 2010	% REDUCTION IN LOHS
AVERAGE	25 days	15.3 days	38.8%
Cat 1	19.5 days	12.3 days	37%
Cat 2	83.7 days	46.5 days	44.5%
Cat 3	52.5 days	31 days	41%
Cat 4	28 days	15.6 days	44%
Cat 5	17.7 days	7.4 days	55.7%
Cat 6	6.7 days	2.7 days	60%

TABLE 3 Reduction in LOHS – per category overall

The team collated large amounts of data on demand and capacity, particularly looking at the increase in therapists needed to treat patients in alternative settings. This work demonstrated that only a small number of extra therapists were required to cope with the extra travelling time. The cost of these therapists was offset by the ability to close ten stroke beds as a result of discharging patients to ESD and SIC and reducing the average LOHS to 15 days. This allowed the team to produce a business plan that successfully identified demand on the new services and therefore enabled accurate workforce planning.

Prior to the redesign all patients would have stayed on the Stroke Unit until they could be managed safely at home. Many of these patients were medically stable and only in hospital for rehabilitation. With the development of the new services, patient needs can be identified early allowing transfer to SIC and/or ESD for rehabilitation in an alternative setting.

Following a successful business case, ESD and Specialist Intermediate Care Service for Stroke were implemented in October 2009 leading to a significant reduction in LOHS.

On-going uses of the WSCs

Subsequently the team have continued to develop the service and WSCs are utilised in all areas. They have enabled the team to:

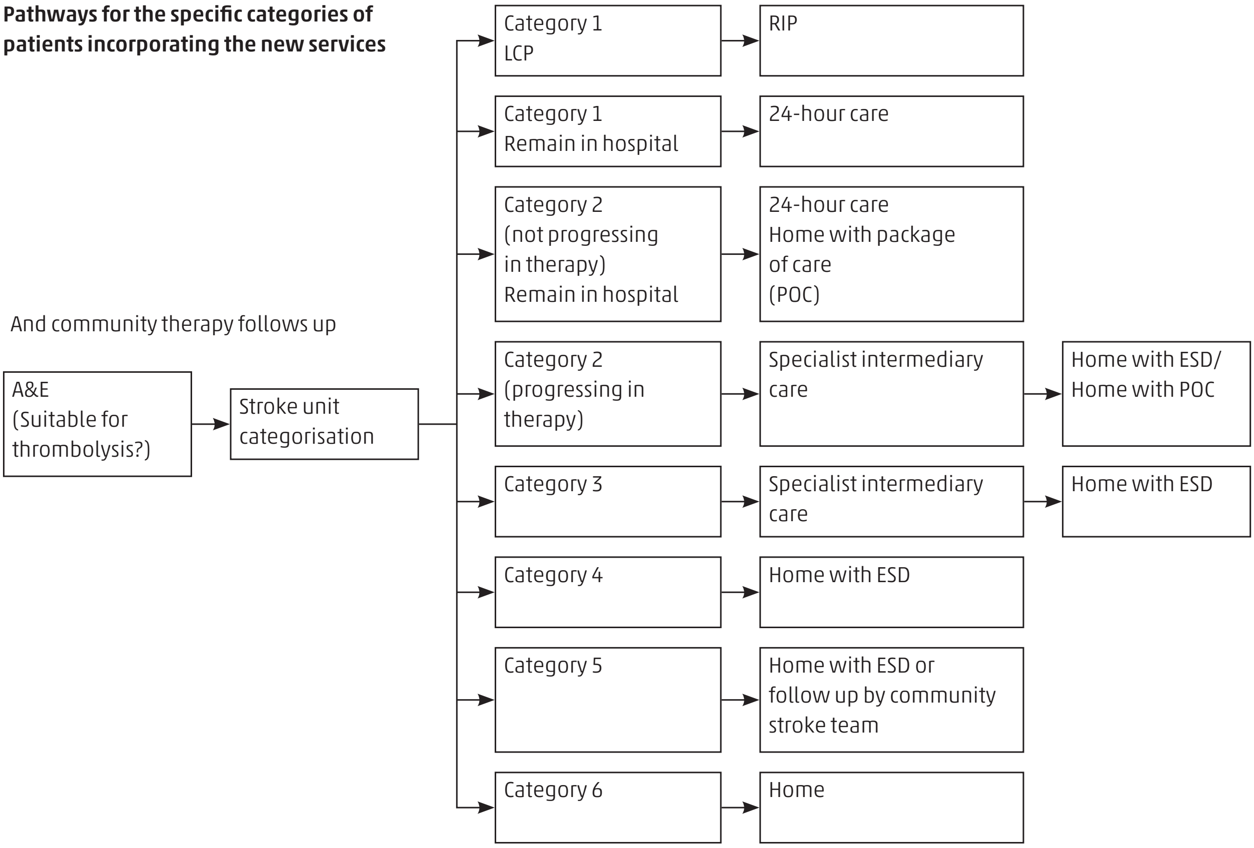
- Audit bed utilisation and categories of patients using the beds.
- Develop category specific pathways of care and protocols for patients. (*Appendix 1*) The team identify potential ESD patients rapidly and reliably and these patients follow a successful seamless patient journey out of hospital on our highly developed ESD pathway.
- Reduce Unit size from 38 beds to 28 beds at a reduction in cost of approximately £500,000. The cost of the extra staff was approximately £150,000 giving a total saving of approximately £350,000.
- Group cohorts of patients for audit which makes the audit more meaningful and effective.
- Foresee that categorisation could focus recruitment to facilitate research.

Although WSCs are a therapy tool, the rest of the MDT use categories and the medical staff find them extremely useful when looking at patients' prognosis. The nursing staff are looking to incorporate them into a nursing dependency tool.

Having initially discussed the WSCs during the Stroke 90.10 Collaborative, and subsequently presenting at 'advancing quality' meetings, therapists from numerous north-west trusts recognised the potential usefulness of this model and showed enthusiasm in developing its use in their own workplaces. Many teams came to discuss the model in more detail and we are currently in the process of gaining feedback on their experiences of using it. Our ultimate aim is to validate the WSC tool and continue to research its many and varied uses.

Appendix 1

Pathways for the specific categories of patients incorporating the new services



Appendix 2

Category 1
- Most severe stroke patients.
- On assessment unconscious/ semi-conscious.
- Dense weakness affecting UL, LL and trunk.
- Severe cognitive/perceptual/speech or visual problems.
- Inability to swallow.
- If / when able to assess in sitting – no selective trunk extension even with facilitation.
- Doubly incontinent.

Category 2
- Severe stroke patient.
- Drowsy but rousable.
- Dense weakness affecting UL, LL and trunk.
- Moderate to severe cognitive, perceptual or visual problems.
- Swallow affected.
- When able to assess in sitting can facilitate extension in trunk but unable to maintain.
- Doubly incontinent on assessment.

Category 3
- Alert and orientated.
- Weakness affecting UL and LL.
- Flickers of activity – movement with facilitation in the lower limb.
- Although weakness in trunk and or fixation, therapists able to facilitate extension. These patients need assistance to remain continent; for example, regular toileting.

Category 4
- Alert. mmay not always be orientated if cognitive problems apparent.
- Mild to moderate weakness.
- Mild – moderate cognitive perceptual speech or visual problems.
- Independent sitting balance on assessment. Can often transfer with two in standing – if difficult it would be due to altered perception rather than physical deficit.
- May be mobile with assistance. These patients need assistance to remain continent; for example, regular toileting.

Category 5
- Alert and orientated mild weakness affecting limbs but not trunk.
- Has functional activity – no higher cerebral involvement. Can stand independently.
- May have mild dynamic balance problems.
- Minimal transfer mobile with one.
- Continent.

Category 6
- Alert and orientated.
- Nil focal weakness but clinical evidence of stroke on medical/ subjective assessment.
- Self-caring, independently mobile and has dynamic balance.
- Fully continent.

Writing an abstract and preparing a poster for conference

Dr Lisa Bunn
Acting Honorary Research Officer

A poster presentation allows you to present an overview of your work to a wide audience, in a fairly relaxed and informal setting. It enables you as the presenter to interact with colleagues and interested parties; to network, share ideas and possibly even forge future collaborations. If you are relatively new to research, a poster presentation provides an ideal catalyst to gather people's opinions of your work and you may even choose to use people's suggestions as feed-forward to refine your future research activity.

A poster presentation may provide an ideal opportunity as a stepping stone to get involved with research if you are short of time, have little paid time to get involved or have never been involved with research before. To print out a typically sized A0 poster, there are many cost-effective online printing services but Research Design Services, funded by universities and the National Institute of Health Research, and linked to NHS trusts, may also have funding available for printing purposes. It is worth remembering that the National Institute of Health Research's objectives include trying to engage clinicians with research and so local Research Design Services may also be available to you to help with abstract and poster design. ACPIN are also very mindful to fund poster production costs in order to disseminate research findings within their research bursary funding.

Step one
Planning your presentation

The first step is to know exactly what message you want to convey in your poster. You may want to report a case study, a local audit, describe a new service or report the evaluation of the new service. You may have some research findings to report or even a research protocol of an intended future project.

Step two
Writing the abstract

The organisers will want to be able to judge the merit of your presentation over that of other applicants. In order to do so they will require an abstract. An abstract is in essence a short summary of your work. Typically there will be instructions concerning the structure, ie whether you should use sub-headings, font type, font size, word count etc. The most important quality of the abstract is that it is clear and concise. You will want to include the most important details concerning your work but it is often best to avoid including fine details. As with all academic styles of writing, statements requiring references within the abstract must be referenced but it is advisable to include the essential referable statements only.

An example of abstract criteria:

- abstract written clearly and concisely
- title clearly describes the abstract
- a clear purpose is stated
- relevance to the conference theme
- context within current evidence base presented
- method/approach applied appropriate to aims
- evaluation/analysis and results appropriately applied and interpreted
- strengths and weaknesses of work highlighted
- relevance and implications to physical therapy clearly expressed
- suggestions for further work made
- of interest to an internationally diverse audience

A typical abstract structure

Title
This should be clear and concise, eye-catching and punchy.

Background
This section needs to use only the key background literature to provide context for the subsequent work reported.

Aims/purpose
This needs to clearly give the reader an impression of the aim/purpose of the research and what they should expect to learn from reading the poster.

Methods
Key information regarding the methods used/proposed should be highlighted here. Typically this would include some mention of the participants involved (the sample), equipment and procedures and timescales over which the study took place.

Results
The key results are often presented in this section. Statistical support is preferred where possible but endless lists of mean values and associated p-values should be avoided. Be selective and make sure that the results selected for presentation fit well with the general story conveyed within the abstract.

Conclusion
This section is used to wrap up the story, to convey the most important interpretation of the results, and to make any important suggestions for relevance to the field, or further work that now needs to be carried out. Avoid finishing with 'further research is now required' as often this is obvious and superfluous to the overall story.

Word count
Typically 250 words.

Step three
Designing your poster

This is the fun part, although there are typically some rules that you may have to abide by before you start. You need to first check on the required size of the poster and the orientation, ie portrait or landscape. If unsure, portrait is often the safest guess as an A0 size poster is more likely to fit on the typically-sized poster boards available at conference.

You need to choose which software is best to design your poster in. Commonly used options include *Microsoft PowerPoint*, *CorelDraw* and *Adobe Illustrator*. In each, the best thing to start off doing is set up the page size. Here's how to change page sizes in *PowerPoint* (see *Figure 1*):

1. Go to the 'Design' tab. Select Page setup.
2. Choose 'Custom' in the 'slides sized for' list of options.
3. A0 = 1189mm (118.9cm) x 841mm (84.1cm) so manually enter these figures into the open boxes provided.

If someone is standing one metre away from the board at a conference to read your poster, then the smallest font size that they will easily be able to read is about 20 point, but this assumes that you have sized your page correctly. otherwise at the printing stage it could be scaled smaller or larger than intended.

In terms of readability, dark writing on light backgrounds or vice versa works best. Limited use of different types of font and size of font also works well. It's a fine balance between using these parameters to provide structure to the presentation and overly complicating the structure making it difficult to navigate.

If you can use diagrams rather than words to describe methods, results and key principles then please do; it's quicker for people to process and more visually interesting. Less text may be more effective in conveying a positive impression of your work than more. People typically spend between 30 seconds and a few minutes reading each poster so the easier the information is to digest, the better.

To present your information on the poster you may want to use features in the software such as 'snap to grid', 'guides' or even draw in some temporary grid lines, which you delete later, to make sure that your work looks neat and aligned. Small differences in alignment on a computer monitor can often be accentuated on a full-sized poster printout so, attention to detail is important.

It's always difficult to proofread a poster when limited to a small monitor size so consider asking a friend/colleague to have a second look for typos.

Remember that all authors of the work should be included in the upper title section of the poster and their institutional affiliations. The most senior author or the principal investigator of the work typically sits as the last author and the presenter and person designing the poster typically comes first. The order of the middle authors needs to be agreed within the team. Any additional acknowledgements to people and organisations who are not authors are added at the bottom of the poster.

Step four

Printing and preparing for the poster presentation

The final step is to print out your poster. This step should be considered almost as soon as you think about designing the poster as it is important to be aware of printing timescales. Your chosen printer could offer a same-day service or could take in excess of a week to turn it around if busy, or if the poster needs to be sent off site for purposes such as lamination. The weight of the paper will determine how expensive the print is, but also how robust the poster is to travel (the thicker, the more robust). Lamination serves as an additional protective layer to the poster, typically increasing the lifespan of your poster, making it more resistant to rain, but also making it heavier to transport and more expensive.

You may want to consider printing out a smaller mock-up version (A4 or A3) in order to check for last minute alignment, design issues and typos before you invest in the final version.

Once you have your poster it is now a good time to prepare to talk through the posters with others. Prepare a short verbal presentation that you can repeat on the day, no more than a few minutes long and this will give you confidence at the conference. When you are there, relax and enjoy the experience. If you want to remember who you spoke to and discussed your work with, take a notepad and write down names and contact details. If you are very keen to network or disseminate your results to the conference audience you may also want to prepare A4 handouts of your poster or business cards.

Overall

Simple stories often make the most effective posters so don't worry if you don't have vast amounts of data for poster presentation purposes.

Poster presentations are brilliant ways of starting to talk about your work and in doing so don't be surprised if you find that you have a better understanding of it by the end of the conference!

Enjoy the experience and remember… There's often a poster prize to be won!

Research bursary application packs and guidance and application templates to present (platform or poster presentations) at the national ACPIN conference are available from jpetty@mssociety.org.uk or bunn_lisa@hotmail.com

Useful references

Coad J, Devitt P (2006) *Research dissemination: The art of writing an abstract for conferences* **Nurse Education in Practice** 6 pp112-116.

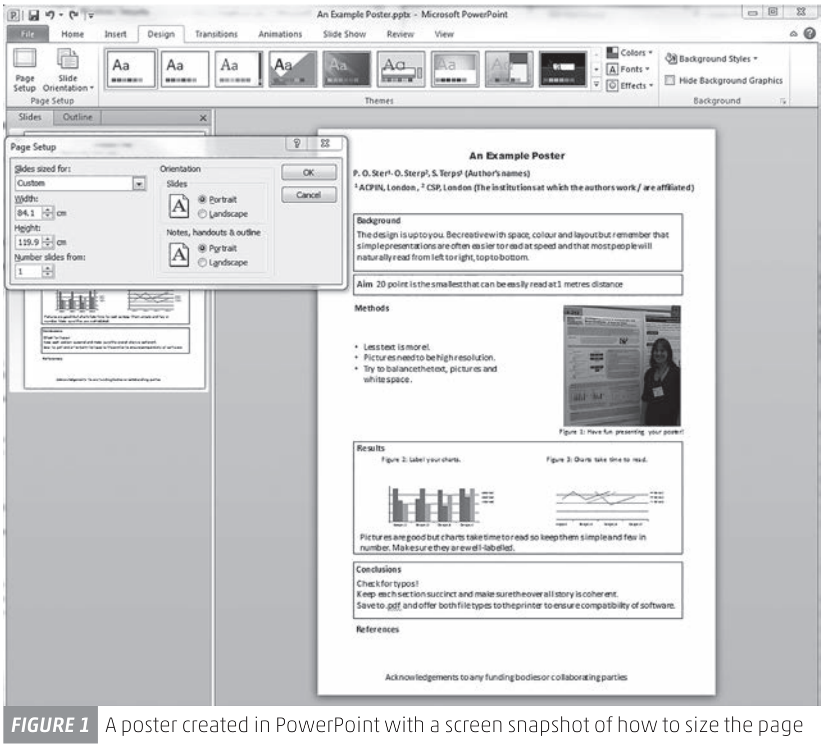
Lunnay B, McIntyre E (2011) *Design Posters for maximum impact* Accessed via: http://www.phcris.org.au/phplib/filedownload.php?file=/elib/lib/downloaded_files/publications/pdfs/phcris_pub_366.pdf

McIntyre E, Katteri R, Anikeeva O (2011) *Writing great abstracts* Accessed via: http://www.phcris.org.au/phplib/filedownload.php?file=/elib/lib/downloaded_files/publications/pdfs/phcris_pub_8375.pdf

Ranse J, Aitken C (2012) ***Australasian Journal of Paramedicine*** 6 (1)pp1-6 Accessed via: http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1277&context=jephc

Thomas JR, Nelson JK, Silverman SJ (2005) ***Research Methods in Physical Activity*** 5th edition Champaign, Ilinois. Human Kinetics Ltd.

Williamson J (2010) *How to prepare a poster* ***Syn'apse*** Spring pp4-5.



Page Setup

Slides sized for: Custom

Width: 84.1 cm

Height: 119.9 cm

Number slides from: 1

Orientation

Slides: ● Portrait ○ Landscape

Notes, handouts & outline: ● Portrait ○ Landscape

An Example Poster

P. O. Ster[1], O. Sterp[2], S. Terps[1] (Author's names)

[1] ACPIN, London , [2] CSP, London (The institutions at which the authors work / are affiliated)

Background

The design is up to you. Be creative with space, colour and layout but remember that simple presentations are often easier to read at speed and that most people will naturally read from left to right, top to bottom.

Aim 20 point is the smallest that can be easily read at 1 metres distance

Methods

- Less text is more!
- Pictures need to be high resolution.
- Try to balance the text, pictures and white space.

Figure 1: Have fun presenting your poster!

Results

Figure 2: Label your charts.

Figure 3: Charts take time to read.

Pictures are good but charts take time to read so keep them simple and few in number. Make sure they are well-labelled.

Conclusions

Check for typos!

Keep each section succinct and make sure the overall story is coherent.

Save to .pdf and offer both file types to the printer to ensure compatibility of software.

References

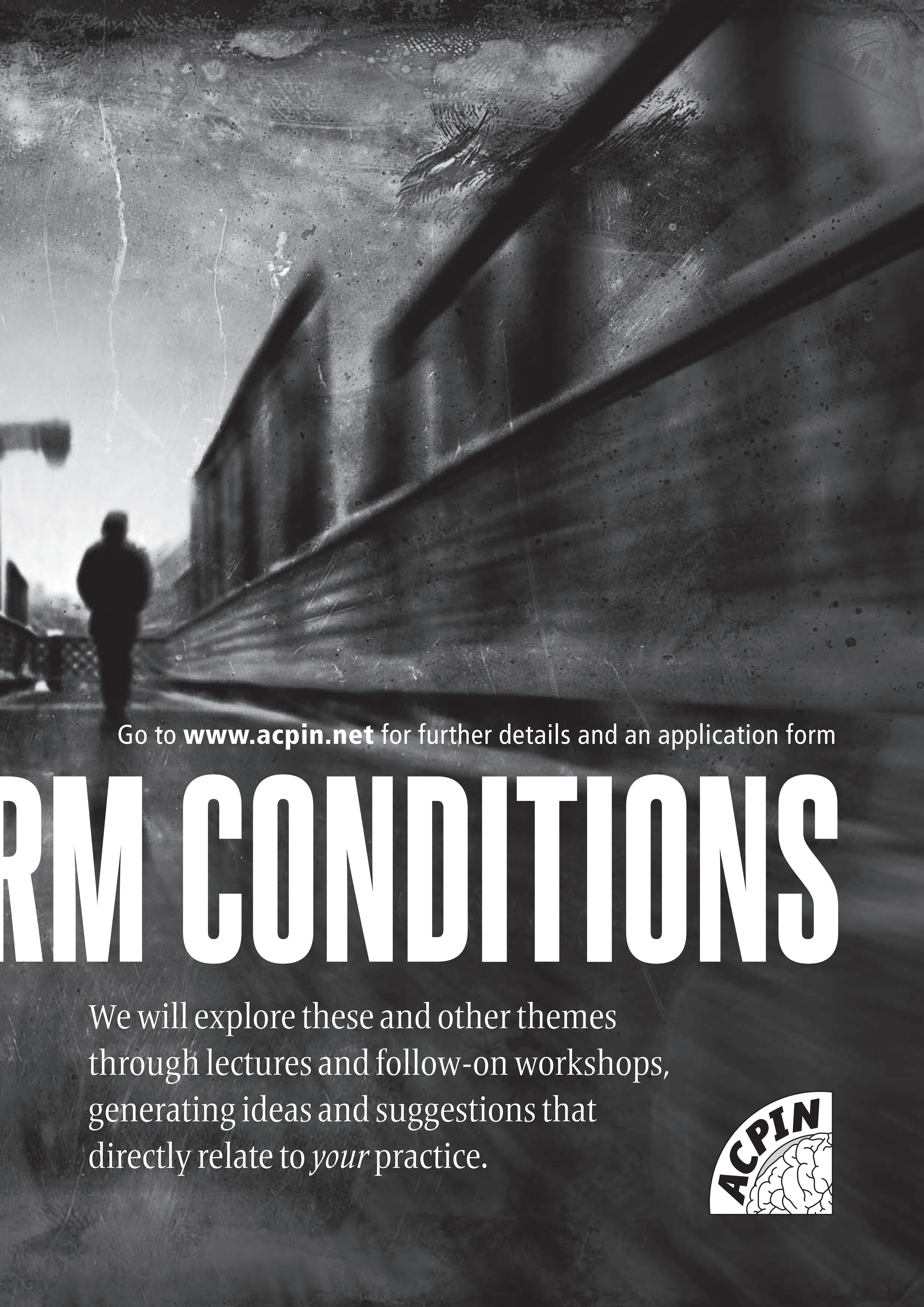
Acknowledgements to any funding bodies or collaborating parties

FIGURE 1 A poster created in PowerPoint with a screen snapshot of how to size the page

ACPIN CONFERENCE 2014
NORTHAMPTON HILTON
22ND MARCH 2014 £80 [ACPIN MEMBER]

LIFE & LONG-TE

Our aim is to stimulate ideas relevant to our everyday management for people with long-term conditions. How can we be mindful of the person when reasoning our interventions? How do we address changing issues through the lifespan?



Go to **www.acpin.net** for further details and an application form

RM CONDITIONS

We will explore these and other themes through lectures and follow-on workshops, generating ideas and suggestions that directly relate to *your* practice.

ACPIN

Focus on

The rare diseases: Ataxia

Ataxia as a diagnosis and as a descriptor of clinical features

Dr Lisa Bunn PhD BSc MCSP
Lecturer in Neurological Physiotherapy and Motor Control, Plymouth University

Ataxia is a diagnostic umbrella term for a wide range of conditions and means 'incoordination of movement' (Wardle and Robertson 2007). The term can also be used to describe a collection of clinical features: incoordinated limb movements, imbalance and gait problems, slurred speech, limb and postural tremor (Jacobi *et al* 2011, Schmitz-Hübsch *et al* 2008, 2006b).

The spino-cerebellar ataxias are a collection of genetically acquired, progressive and degenerative neurological diseases primarily affecting the cerebellum and spinal cord (Whaley *et al* 2011). Spinocerebellar ataxias (SCA) affect 8 to 10.8 per 100,000 people in the UK (Craig *et al* 2004, Muzaimi *et al* 2004). The SCAs are inherited in an autosomal dominant pattern meaning that there is a 50% chance of passing the genetic mutation to offspring if one parent carries the gene (Giunti and Wood 2007). As the onset of symptoms does not occur on average until 45 years of age (+/-14 years), family planning decisions have typically been undertaken by this stage (Manto 2005, Stevanin *et al* 1997). Genetic analysis of blood tests is now available to confirm the genotype of the condition for symptomatic patients and to ascertain the likelihood of inheritance in those presymptomatically (Giunti and Wood 2007, Wardle and Robertson 2007).

Of the 31 known genotypes, SCA6 is the most prevalent in the UK, affecting 1.59 per 100,000 of the population (Craig *et al* 2004) and accounting for 10% of the world's population of SCA ataxias (Craig *et al* 2004, Schöls *et al* 1998, Sinke *et al* 2001). SCA6 presents with a 'pure' or 'uncomplicated' ataxia (Stevanin *et al* 1997) with the pathology solely affecting the cerebellum. As well as poor balance and difficulties with walking the symptoms can progress to affect upper limb function, swallowing, speech and eye movements (Jacobi *et al* 2011). In contrast, other SCAs result in a 'complicated ataxia'; here, as well as pathology affecting the cerebellum and/or its afferent or efferent pathways, there are additional symptoms such as myopathy, peripheral neuropathy, Parkinsonian features and spasticity.

The impact of ataxia

Problems with balance and mobility are common to all types of SCA and have many consequences. Poor balance impairs activities of daily living (ADL) leading to the need for increased levels of care and reduced participation in society (López-Bastida *et al* 2008). Balance impairment is associated with injurious falling leading to hospital admissions and adoption of mobility aids for walking (Craig *et al* 2004). Due to poor balance and incoordination there is increased energy expenditure with ADL and walking (Brusse *et al* 2011, Olgiati *et al* 1988). This contributes to the excessive fatigue reported by patients with ataxia that in turn further limits ADLs and increases the risk of falling (Brusse *et al* 2011). Impaired mobility is also associated with a decrease in lung function, reduced effectiveness of clearance of secretions from the lungs and, compounded by dysphagia, an increased risk of aspiration (Dammeyer *et al* 2013; Gosselink *et al* 2010). Further, as the symptoms of cerebellar ataxia mimic that seen after alcohol intoxication (Sullivan *et al* 2006) – namely poor balance, irregular and slow gait and slurred speech – patients with ataxia are often stigmatised by the perception that they are drunk in public with associated assumptions on their degree of social responsibility (Cassidy *et al* 2011a). Qualitative accounts of patients with ataxia reveal that there is an intimate link between quality of life(QoL), self-efficacy and the perceptions of those with no understanding of ataxia; patients have described feelings of embarrassment and frustration as a consequence of living with ataxia (see additional comments in textbox, unpublished data focus groups, 2013).

> "It's everyone else that bears the true cost of ataxia; the impact on others, family, friends, carers."

> "My iPad is my communication lifeline."

The cost of ataxia per year equates to 18,776 euros (López-Bastida *et al*, 2008) which is on average higher than those costs associated with HIV/AIDS (13,823 euros (Lopez Bastida *et al*, 2005)) and stroke survivors (13, 826 euros (Lopez Bastida *et al*, 2003)). This includes not only healthcare costs but also societal costs associated with an inability to work, the need for carers and additional benefits. These costs increase with increasing levels of disability. Despite including societal costs, this report most likely still underestimates the 'true cost of ataxia' since carer burden and the cost of informal carer roles, taken on typically by friends and family, are not included.

Recent advances

Recent years have seen the development of scales that quantify the range of ataxic symptoms, such as the Scale for the Assessment and Rating of Ataxia (SARA) (Schmitz-Hübsch *et al* 2006b). The psychometric properties of the scale has been established and, as part of a European-wide study group (EuroSCA), used to quantify how the symptoms of these degenerative conditions progress year on year (Schmitz-Hübsch *et al* 2006b, Jacobi *et al* 2011). This has shown that the progression of the complex SCAs tend to be faster than pure types (SCA6) (Schmitz-Hübsch *et al* 2006b, Jacobi *et al* 2011). Additional scales such as the Inventory for Non Ataxic Symptoms (INAS) have been developed to quantify the non-ataxic symptoms in patients with complex SCAs (Schmitz-Hübsch *et al* 2008).

There are no currently approved pharmacological or surgical treatments that target disease progression (AtaxiaUK 2009). Symptomatic management using pharmacological interventions is also limited and the current mainstay of symptomatic management is multi-disciplinary rehabilitation including physiotherapy. Whilst traditionally people have questioned the cerebellum's potential to adapt following injury and relearn motor control, evidence has accumulated in the past 20 years to challenge this idea along with trials exploring adaptation and training effects following therapeutic interventions (Deuschl *et al* 1996, Ilg *et al 2009 and* 2010, Morton and Bastian 2006). Whilst cerebellar pathology is still associated with slow recovery and the need for intensive treatment delivery, therapeutic effect sizes following four to eight weeks duration of treatment programmes are reported to be able to improve disease severity scores reflecting as much as two year's worth of equivalent disease progression. UK based guidelines for the physiotherapy management of the ataxias was established in 2009 and has been recently updated (currently under review by stakeholders, registered with PROSPERO (Marsden *et al* 2013)). To date there is only one randomised controlled trial of rehabilitation in SCA (Miyai *et al* 2012). This involved an intensive physiotherapy/occupational therapy programme of 48 hours of rehabilitation in a four-week period. There was a significant improvement in disease severity (SARA score) and symptoms of ataxia and gait were sustained at twelve and 24 weeks. The intervention provided in this, and other non-controlled trials (Ilg *et al* 2009), consisted of a generic package targeting not only balance but also strength, range of movement and functional activities. To date there have been no programmes that specifically target the fundamental difficulties in balance seen in cerebellar ataxia (Cassidy *et al* 2009, Marsden *et al* 2013). A feasibility study aiming to evaluate the clinical effectiveness of a balance retraining programme in patients with pure cerebellar ataxia was undertaken in 2011 and was the culmination of a mechanistic study investigating sensory mechanisms of balance dysfunction (Bunn 2011). This was awarded the Royal Society of Medicine's Prize for Translational Neuroscience and now requires a fully-powered randomised clinical trial to investigate the effectiveness of the therapy and wider efficacy of use in the National Health Service.

"QoL is being in control and mobile for as long as I can. QoL depends on what you want out of life and what you're prepared to put in to get it."


Ataxia UK members at a recent event in London.

The wider picture

In many ways, it is an incredibly exciting time for researchers and clinicians interested in ataxia. The development of validated and reliable disease severity scales, more recent associations established between these scales and potentially more sensitive continuous measures, such as body sway and gait speed, provide a window of opportunity to evaluate new interventions, as well as tracking longitudinal change at impairment and functional levels (Schmitz-Hübsch *et al* 2006, Bunn *et al* 2013, Ilg *et al* 2007). However, whilst tools with the potential to measure the impact of intervention at impairment and functional levels are of high value, it remains important from a clinical perspective, and from the perspective of the patient with ataxia, to remain mindful of the value of outcome measures across the spectrum: of the International Classification of Function and Disability, and qualitative accounts of the patient lived experience, experience with therapy and experience within trials. In the words of one patient, when asked about how they would ideally like an intervention to be evaluated: 'Measures need to be practical *and psychological* (ie how do I feel before and after, how is my fatigue and tiredness)… It's no good doing 15 minutes of exercise if you feel worse afterwards. Do I perceive there's any improvement, can I *prove to others* that there's any improvement… Am I falling down less, am I less reliant on walking aids? A measure of success would be other people's perceptions because the biggest problem with ataxia is other people's perceptions.'

The future of ataxia management

Advances in molecular science are also of major significance to the world of physiotherapy. In order to effectively target disease processes responsible for impairment, dysfunction and subsequent activity and participation limitations, knowledge of the nature of those limitations seems vital. With the advent of genetic analysis of blood samples defining genotypes and associated physiological investigation defining abnormal patho-physiological mechanisms, we can begin to target therapies informed by genotype and family inheritance patterns around this. Patients with SCA1, for example, may be affected by peripheral neuropathy and distal weakness as axons in the spinal cord die back (Schmitz-Hübsch *et al* 2008), possibly leading us to consider strategies already in place for similar conditions such as diabetic peripheral neuropathy or neuromuscular diseases such as Charcot Marie Tooth Syndrome. Conversely, patients with SCA6 are not known to exhibit spinal cord pathology but rather localised cerebellar atrophy, imbalance, associated gait irregularity (speed, step width, length, cadence, step variability) and problems with visual control of balance and abnormal eye movements (Schmitz-Hübsch *et al* 2008), therefore suggesting very different foci of interventions, possibly involving adaptation of gait, eye movements and re-weighting of sensory contributions. With 32 independent genetic loci reserved for SCA genotypes, this link between mechanisms and intervention is likely to become yet more complex. If we take up the challenge of investigating these links and remaining mindful of these when planning treatment strategies rather than adopting a 'one-size-fits-all' approach then the world of ataxia could become a very diverse, meaningful and rewarding field to work in for future researchers and clinicians alike.

> "The biggest problem with ataxia is other's perceptions. If a therapy helps to improve other's perceptions, it could be useful!"

In an ideal world, every new referral received for a patient with ataxia could be viewed as the opportunity to explore a 'precious' model in line with the age-old philosophy of medicine: linking impaired function to pathophysiology. Where there are still relatively few numbers of patients with ataxia, especially complex types (eg SCA1, 2, 3), the value of the case study still holds and should not be underestimated, evident in the prevalence of this form of evidence in the ataxia physiotherapy management guidelines. In fewer cases, grouping patients with defined SCA types for the purpose of clinical trials has further been facilitated following the development of specialist ataxia centres, themselves originating from organised demand (via the Ataxia UK charity and other similar organisations worldwide) as well as from expert clinicians with an interest in ataxia. In the United Kingdom we are now able to boast four such centres based in Newcastle, London, Sheffield and Oxford.

Organising health care provision

Accreditation of centres by the charity Ataxia UK ensures that these centres are able to offer specialist nurse practitioners and close links with Ataxia UK representatives, who provide a source of support, advice and links to wider sources of disease-specific information. The presence of Ataxia UK representatives in these centres also provides an impartial medium for patients wishing to provide feedback and suggestions for future improvement, which are regularly evaluated and suggestions implemented where possible. The advent of these centres has been instrumental for longitudinal and epidemiological research to date. Linked with European centres as part of the larger EuroSCA project, collaboration of these centres has helped inform our knowledge of disease progression (Jacobi *et al* 2011), falling (Fonteyn *et al* 2010 and 2012) and development of disease-related predictors (Schmitz-Hübsch *et al* 2006), and provides an effective means of informing patients of current research and the potential for them to engage in such research (as stakeholders or more directly as participants). The specialist centres could be considered progressive in the extent by which they engage patients and charitable associations in their development and on-going running. This has equally been critical for the survival and propagation of these services targeting those with such a rare long-term condition.

Survival of the specialist ataxia centres is paramount for on-going development and future running of randomised controlled trials of physiotherapy and disease modifying pharmaceuticals; the ultimate aim for patients with ataxia, Ataxia UK and many with long-term neurological conditions being to find a cure. Whilst physiotherapy is not going to offer a cure, it remains strongly advocated by patients and clinicians as having the potential to provide symptomatic relief and management of the condition (Cassidy *et al* 2009 and 2011b, Wardle and Robertson 2007), with a strong emphasis in line with *NICE guidelines* for long-term conditions on self-management and empowerment (Hopcutt and DoH 2008). Physiotherapy additionally has the potential to 'optimise' and to decipher primary and secondary effects of disease progression. The level of (a) clinical skill required to undertake assessment and (b) knowledge of how to interpret clinical signs and symptoms on which to base treatment and draw from the ever-growing evidence base, is a vital component of current management strategies. It will also be instrumental in evaluating future pharmaceutical therapies since pharmaceuticals that change physiological mechanisms could remain undetected if changes in secondary impairment, dysfunction, reduction in activity and participation cannot be concurrently addressed.

Take home messages

- Ataxia refers to a symptomatic label but is also commonly associated with the group of genetically inherited types featuring progressive cerebellar disease.
- There are no currently approved pharmacological or surgical treatments that target disease progression.
- Physiotherapy has the potential to treat ataxia symptoms and affect function, activity and participation of people with ataxia.
- Ataxia UK provides support and resources for professionals and people with ataxia, their friends and family.
- Physiotherapists can access *Management of the ataxias: Towards best clinical practice*, *Physiotherapy supplement* from the Ataxia UK website http://www.ataxia.org.uk (2013 update available soon).
- Despite being classed as a rare condition, our understanding of the conditions is improving with the accreditation of specialist centres and large-scale coordinated research projects such as the EuroSCA project.

REFERENCES

AtaxiaUK (2009) *Management of the Ataxias : towards best Clinical Practice Development Group*, 2nd edition Specialist Ataxia UK, London.

Brusse E, Brusse-Keizer MGJ, Duivenvoorden HJ, van Swieten JC (2011) *Fatigue in spinocerebellar ataxia: patient self-assessment of an early and disabling symptom* **Neurology** 76 pp953–959.

Bunn L (2011) *Sensory mechanisms of balance control in pure cerebellar disease* University College London.

Bunn LM, Marsden JF, Giunti P, Day BL (2013) *Stance instability in spinocerebellar ataxia type 6* **Movement Disorders** 28 pp510–516.

Cassidy E, Kilbride C, Holland A (2009) *Management of the Ataxias : towards best clinical practice physiotherapy supplement* 1st edition Ataxia UK, London.

Cassidy E, Reynolds F, Naylor S, De Souza L (2011a) *Using interpretative* *phenomenological analysis to inform physiotherapy practice: an introduction with reference to the lived experience of cerebellar ataxia* **Physiotherapy theory and practice** 27 pp263–277.

Craig K, Keers SM, Archibald K, Curtis A, Chinnery PF (2004) *Molecular epidemiology of spinocerebellar ataxia type 6* **Annals of neurology** 55 pp752–755.

Dammeyer J, Dickinson S, Packard D, Baldwin N, Ricklemann C (2013) *Building a protocol to guide mobility in the ICU* **Critical care nursing quarterly** 36 pp37–49.

Deuschl G, Toro C, Zeffiro T, Massaquoi S, Hallett M (1996) *Adaptation motor learning of arm movements in patients with cerebellar disease* **Journal of Neurology, Neurosurgery, and Psychiatry** 60 pp515–519.

Fonteyn EMR, Schmitz-Hübsch T, Verstappen CC, Baliko L, Bloem BR, Boesch S, Bunn L, Charles P, Dürr A, Filla A, Giunti P, Globas C, Klockgether T, Melegh B, Pandolfo M, De Rosa A, Schöls L, Timmann D, Munneke M, Kremer BPH, van de Warrenburg BPC (2010) *Falls in spinocerebellar ataxias: Results of the EuroSCA Fall Study* **Cerebellum** 9 pp232–239.

Fonteyn EMR, Schmitz-Hübsch T, Verstappen CCP, Baliko L, Bloem BR, Boesch S, Bunn L, Giunti P, Globas C, Klockgether T, Melegh B, Pandolfo M, Schöls L, Timmann D, Warrenburg BPC van de (2012) *Prospective analysis of falls in dominant ataxias* **European Neurology** 69 pp53–57.

Giunti P, Wood N (2007) *The inherited ataxias* **Advances in Clinical Neuroscience and Rehabilitation** 7 pp18–21.

Gosselink R, Clerckx B, Robbeets C, Vanhullebusch T, Vanpee G, Segers J (2010) *Physiotherapy in the intensive care unit* **Netherlands Journal of Critical Care** 15 pp66–75.

Hopcutt B, DoH (2008) *The National Service Framework for Long-term Neurological Conditions*.

Ilg W, Brötz D, Burkard S, Giese MA, Schöls L, Synofzik M (2010) *Long-term effects of coordinative training in degenerative cerebellar disease* **Movement disorders** 25 pp2239–2246.

Ilg W, Golla H, Thier P, Giese MA (2007) *Specific influences of cerebellar dysfunctions on gait* **Brain : a journal of neurology** 130 pp786–798.

Ilg W, Synofzik M, Brötz D, Burkard S, Giese MA, Schöls L (2009) *Intensive coordinative training improves motor performance in degenerative cerebellar disease* **Neurology** 73 pp1823–1830.

Jacobi H, Bauer P, Giunti P, Labrum R, Sweeney MG, Charles P, Dürr A, Marelli C, Globas C, Linnemann C, Schöls L, Rakowicz M, Rola R, Zdzienicka E, Schmitz-Hübsch T, Fancellu R, Mariotti C, Tomasello C, Baliko L, Melegh B, Filla A, Rinaldi C, van de Warrenburg BP, Verstappen CCP, Szymanski S, Berciano J, Infante J, Timmann D, Boesch S, Hering S, Depondt C, Pandolfo M, Kang J-S, Ratzka S, Schulz J, Tezenas du Montcel S, Klockgether T (2011) *The natural history of spinocerebellar ataxia type 1, 2, 3, and 6* **Neurology** 77 (11) pp1035-1041.

Lopez Bastida J, Oliva Moreno J, Perestelo Perez L, Serrano Aguilar P, (2005) *Determinants of health care costs in ambulatory patients living with HIV/AIDS* **Value in Health** 8 pA23.

López-Bastida J, Perestelo-Pérez L, Montón-Alvarez F, Serrano-Aguilar P (2008) *Social economic costs and health-related quality of life in patients with degenerative cerebellar ataxia in Spain* **Movement disorders** official journal of the Movement Disorder Society 23 pp212–217.

Lopez Bastida J, Serrano Aguilar P, Monton Alvarez F, Duque González B (2003) *The economic burden of stroke in Spain* **Value in Health** 6 p615.

Manto MU (2005) *The wide spectrum of spinocerebellar ataxias (SCAs)* **Cerebellum** (London, England) 4 pp2–6.

Marsden J, Bunn L, Cassidy E, Kilbride C, Holland A, Watson A (2013)*Management of the ataxias: towards best clinical practice. Physiotherapy supplement* [WWW Document]. PROSPERO. URL http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42013004323#.UdPkAKy0R0g

Miyai I, Ito M, Hattori N, Mihara M, Hatakenaka M, Yagura H, Sobue G, Nishizawa, M (2012) *Cerebellar ataxia rehabilitation trial in degenerative cerebellar diseases* **Neurorehabilitation and neural repair** 26 pp515–22.

Morton SM, Bastian AJ (2006) *Cerebellar contributions to locomotor adaptations during splitbelt treadmill walking* **The Journal of Neuroscience** 26 pp9107–9116.

Muzaimi MB, Thomas J, Palmer-Smith S, Rosser L, Harper PS, Wiles CM, Ravine D, Robertson NP (2004) *Population based study of late onset cerebellar ataxia in south east Wales* **Journal of Neurology, Neurosurgery and Psychiatry** 75 pp1129–1134.

Olgiati R, Burgunder JM, Mumenthaler M (1988) *Increased energy cost of walking in multiple sclerosis: effect of spasticity, ataxia, and weakness* **Archives of Physical Medicine and Rehabilitation** 69 pp846–849.

Schmitz-Hübsch T, Coudert M, Bauer P, Giunti P, Globas C, Baliko L, Filla A, Mariotti C, Rakowicz M, Charles P, Ribai P, Szymanski S, Infante J, van de Warrenburg BPC, Dürr A, Timmann D, Boesch S, Fancellu R, Rola R, Depondt C, Schöls L, Zdienicka E, Kang JS, Döhlinger S, Kremer B, Stephenson DA, Melegh B, Pandolfo M, di Donato S, du Montcel ST, Klockgether T (2008) *Spinocerebellar ataxia types 1, 2, 3, and 6* **Neurology** 71 pp982–989.

Schmitz-Hübsch T, du Montcel ST, Baliko L, Berciano J, Boesch S, Depondt C, Giunti P, Globas C, Infante J, Kang JS, Kremer B, Mariotti C, Melegh B, Pandolfo M, Rakowicz M, Ribai P, Rola R, Schöls L, Szymanski S, van de Warrenburg BP, Dürr A, Klockgether T, Fancellu R (2006a) *Scale for the assessment and rating of ataxia: development of a new clinical scale*. **Neurology** 66 pp1717–1720.

Schöls L, Krüger R, Amoiridis G, Przuntek H, Epplen JT, Riess O (1998) *Spinocerebellar ataxia type 6: genotype and phenotype in German kindreds* **Journal of Neurology, Neurosurgery and Psychiatry** 64 pp67–73.

Sinke RJ, Ippel EF, Diepstraten CM, Beemer, FA, Wokke JHJ, Hilten BJ van, Knoers NVAM, Amstel HKP van, Kremer HPH (2001)*Clinical and molecular correlations in spinocerebellar ataxia type 6* **Archives of Neurology** 58 pp1839–1844.

Stevanin G, Dürr A, David G, Didierjean O, Cancel G, Rivaud S, Tourbah A, Warter JM, Agid Y, Brice A (1997) *Clinical and molecular features of spinocerebellar ataxia type 6* **Neurology** 49 pp1243–1246.

Sullivan EV, Rose J, Pfefferbaum A (2006) *Effect of vision, touch and stance on cerebellar vermian-related sway and tremor: a quantitative physiological and MRI study* **Cerebral cortex** (New York NY 1991) 16 pp1077–1086.

Wardle M, Robertson N (2007) *Progressive late-onset cerebellar ataxia* **DNA Repair** 7 pp2–6.

Whaley NR, Fujioka S, Wszolek ZK (2011) *Autosomal dominant cerebellar ataxia type I: a review of the phenotypic and genotypic characteristics* **Orphanet** 6 p33.

Exoskeletons

A new form of gait rehabilitation for spinal cord injury and stroke

Sandy Laping MCSP
Clinical Specialist Physiotherapist for Ekso Bionics™

There is extensive evidence (for a comprehensive review see the *SCIRE Lower Limb review*) to suggest that both standing and walking are beneficial to those who have suffered a spinal cord injury or other neurological insult, such as stroke or traumatic brain injury.

Body weight support systems and treadmill-based gait rehabilitation are well established in the clinical environment, and gait training with orthoses has been around for a substantial length of time. Advancements in technology now allow physiotherapists a novel method of rehabilitating gait in patients who have suffered lower limb paralysis from spinal cord injury or experience residual weakness as a result of neurological pathology – the exoskeleton.

The aims of this article are:

- To take a closer look at how exoskeleton technology works and how it is currently used in rehabilitation.
- To provide a user's perspective: a patient shares his experience of walking in Ekso and describes the benefits of being upright and mobile.

The simplest definition for an exoskeleton is: 'Rigid or articulated envelope that supports and protects the soft tissues of certain animals.' (*Encyclopedia Britannica*).

Although this definition derives from the world of zoology, it describes the function and explains the rationale and purpose of an exoskeleton. Exoskeletons for rehabilitation are much more than just a shell that supports the wearer, however. Extensive research and development has created a technology that allows individuals to stand and walk through the complex interaction of machine and body.

Exoskeletons for gait rehabilitation have the following features:

- An external frame that supports the user's body and allows standing and walking in an upright position.
- Motors at the hip and knee that provide power to move the joints through normal range and enable the user to mobilise overground.
- Facilitation of full axial loading of long bones and skeletal structures. The wearer does not experience any extra load of the exoskeleton, due to its mechanical design.
- Allows overground walking which is unique to this technology in comparison to traditional forms of mechanised gait rehabilitation.
- The user does not have to support a lot of his weight through the upper limbs. Walking aids are employed to provide balance and assist weight transfer.
- Facilitation of correct physiological movement patterns for gait is such that compensatory strategies (like hip circumduction) are not required to walk.
- Whilst walking, the wearer is constantly training balance and upright stability. This weight transfer is modelled on 'normal' physiological gait and triggers the stepping mechanism of the exoskeleton.
- Provides both the user and clinician with real-time feedback in relation to physiological gait trajectory and enables progress to be monitored.

The use of exoskeletons in practice

Suitable candidates for the Ekso Bionics exoskeleton include:

- Patients with complete spinal cord injury (SCI) up to C7 or incomplete SCI up to C2 depending on residual function.
- Patients following stroke with hemiplegic presentation.
- Patients who suffer from lower limb weakness or paralysis as a result of neurological pathology such as multiple sclerosis, Guillain-Barré syndrome, traumatic brain injury.

Contraindications include orthostatic hypotension, osteoporosis, recent lower limb fractures, marked leg length differences (> 3cm), contractures of the hip and knee, severe cognitive deficits and pregnancy.

To be a candidate for exoskeletons the user requires functional upper limb strength and hand function to manage crutches or a walking frame. For hemiplegic patients, a quad stick can also be used and an arm sling will ensure that the affected upper limb is not compromised. Once a potential candidate has been assessed by a physiotherapist for joint range of motion, upper and lower limb muscle power, spasticity, skin integrity and functional transfer ability, the person's skeletal measurements are taken.

For one such exoskeleton – the Ekso by the company Ekso Bionics – the set up process and its use are described below.

Hip width along with upper and lower leg length are measured to enable the optimal fit for the wearer. This process takes approx. 10-15 minutes. The Ekso™ is secured to the individual by three Velcro™ straps on each leg and a mechanism similar to a snowboard binding captures the foot on the footplates. For the trunk an abdominal binder provides stability and secures the upper body in an upright position. A 'fit kit' comprising specially manufactured memory foam also adds to the comfort of the wearer and prevents pressure sores. Two high-capacity lithium batteries provide the power to the hip and knee motors which replace neuromuscular function.

Walking in Ekso is achieved by the transfer of weight from left to right. When an adequate lateral weight shift is achieved, the first right step is initiated. When the right foot touches the ground, the patient must assist with a weight shift, first to the right and then forward to prepare for the following left step. Progression from a frame to crutches may be appropriate when the patient demonstrates upright posture and possesses balance skills resulting in minimal assistance from the physiotherapist allowing for a reciprocal four-point gait.

Once a user has mastered the correct weight transfer pattern then they can walk independently in Ekso. This is achieved through an easily operated control device that can be programmed to take a step automatically, only when the Ekso has sensed it is safe to do so and the user has carried out the correct weight transfer. Ekso has the unique ability to regulate the motors depending on the user's residual lower limb function. This Variable Assist feature enables Ekso to adjust its motor power allowing an individual with muscle activity (incomplete SCI or any other neurological condition) to assist with their walking. This is dynamically calculated in real time and the user will receive only as much or as little power as is required to complete a step. If this varies during a treatment session

CASE REPORT

Dale M is a 33-year-old who was shot in the spine in October 2009. As a result he sustained an L1 incomplete spinal cord injury (ASIA D) and last year had the opportunity to try both the Ekso and the Re-Walk exoskeletons.

To date Dale has walked approximately 30 hours in Ekso, with breaks of up to eight weeks in between sessions and the longest consecutive treatment block of approximately ten days over three weeks (an average of two to three hours per day)

We developed a questionnaire to capture Dale's experience in the Ekso, and here is a shortened version:

How long did it take you to take the first steps? In Ekso, immediately, and progress to ProStep within 30 minutes (with one physio guiding for safety).

How many steps do you take in the Ekso now on average? 2,500 to 3,000 per hour.

How would you describe walking in Ekso? A fantastic natural experience which provides me with pain relief, also since using Variable Assist I have found that I am able to really work my muscles and build on what I have, unlike any other treatment received.

Did any of your medication needs change after walking in Ekso? Over three weeks of use with Ekso I was able to reduce my Gabapentin dose to nothing (300mg TDS before). I am still tracking my progress after using Ekso and will update my diary accordingly.

Can you describe any effects you have noted from walking in Ekso? Neuropathic pain is completely alleviated; my balance has improved. I have also noticed awareness of my glute muscles since using VA (Variable Assist).

Any additional comments? Ekso opened my eyes to what these systems should be used for.

because of fatigue or improvement in muscle activity the exoskeleton will adjust the motor input accordingly. In addition, Ekso can also be set up to have one leg in 'free leg' mode – this means patients with a hemiplegic presentation are able to have the motor support of Ekso on their affected side, while the unaffected leg can be moved freely.

In the United States investigational studies of the device at the Charter Rehabilitation Centers were completed in 2012. The ten-month programme defined clinical protocols, and provided insights into ways to improve the device. The Charter Hospitals became the first Ekso Centers in the world, conducting ongoing research, and offering the device for the rehabilitation of their patients.

Some of the preliminary results of the investigational studies that were carried out are shown below:

- 70 subjects were chosen by the rehabilitation centres of which 63 were able to take part in the study.
- Seven of the 70 proposed subjects did not pass the preliminary screening due to issues with marked contractures of the hip, knee or ankle, bone density and/or weight issues.
- All 63 patients that passed the preliminary health screening were able to walk 81 to 638 steps during their first session in Ekso.
- The average number of steps taken in a session was over 200.
- 4,000 to 5,000 steps were taken on average per Investigational study week.

Further research on Ekso is imminent with the implementation of a Pan-European Study lead by Professor Fin Biering-Sørensen (Glostrup Hospital, Denmark). Some of the leading spinal cord injury centres in Europe will participate in a six-week trial investigating Ekso and its potential benefits to those with a spinal cord injury.

Based on the experience of a increasing number of patients worldwide who are using exoskeletons, a growing body of anecdotal evidence shows the following:

- Improved neuropathic pain during and after walking (see patient experience).
- Improved circulation and lymphatic drainage (noticed through reduced ankle swelling and increased urine output).
- Improved bowel routine (reduced time taken to void bowel).
- Reduced spasticity (in some cases this has lasted for up to 24 hours).
- Improved general well-being and self-worth (many patients have reported that the feeling of being eye-to-eye with someone has had a positive impact).
- Reduced frequency of urinary tract infections.

In conclusion – exoskeletons provide a new and exciting tool in the physiotherapist's rehabilitation toolbox, and like any other therapeutic approach it is the individual's needs and patient selection and assessment that will decide if it is an appropriate adjunct to their rehabilitation.

It is important to ensure that patient and clinician alike understand the emotional effects the use of an exoskeleton can have on the wearer and his environment. As clinicians we manage patients' expectations on a daily basis and we know how fine the line is between giving hope and making false promises.

For all those involved with exoskeletons it is key to remember that at this stage this is a new technology that can be used as a rehabilitation tool within an in-patient or outpatient setting but it is not going to replace the wheelchair in the near future.

For more information on exoskeletons use the following links:

- www.eksobionics.com
- www.rewalk.com
- www.rexbionics.com

Neurophysiotherapists and our part in ensuring a paralympic legacy

Rob Kinder

Clinical specialist physiotherapist for stroke and brain injury for Somerset Partnership NHS Foundation Trust. Member of the Classification Advisory Group for IPC (International Paralympic Committee) Athletics and classifier at the London paralympic games 2012

On 9th September 2012, London was host to the closing ceremony of the Paralympic games. The British public had spent the last twelve days watching, admiring, and for many, beginning to understand Paralympic sport for the first time. As someone who has been exposed to it for many years, one of the highlights of the games for me was the number of friends and family who told me they had enjoyed watching Paralympic sport for the first time.

In 2012, the powerful British media got behind Paralympic Sport and disabled people all over the country would have watched it. What they were thinking while they watched it would be very interesting but thanks to the media, the perception of disability in the public eye has definitely been enhanced. It will have strengthened the resolve of many to socialise with a greater confidence and for others who are already confident, it will have made them more determined to become the best that they can be with the abilities they have. The big question is, 'How long will this last?' My fear is that unless people feel they have the opportunities and abilities to try new things, it can only be short-lived. For many, the biggest and most frequent obstacle is knowing what is achievable and realistic, and this is clearly an area where neurohysiotherapists can excel.

For a start, when it comes to sport, physiotherapists don't have to 'treat' athletes to be useful. Sports injury is undoubtedly an area that appeals to a lot of young and enthusiastic physiotherapy students. Although they may have enthusiasm to work within sport, with good neurorehabilitation placements they might start thinking of enhancing physical performance in a disabled athlete rather than just treating injuries. In fact, an experienced neurophysiotherapist will spend their entire working life optimising physical performance in someone that has a disability but not necessarily an injury.

My own experience began through working voluntarily with a group of disabled athletes. If we think about the grass roots level of most sports, a lot of the first coaches are very often just enthusiastic and supportive mums and dads. If the child has a disability this is probably even more likely, and whilst they will inevitably learn coaching skills from other experienced coaches, there will be few who will know more about getting the best out of their individual child than a good neurophysiotherapist.

In a sports environment where injuries are not part of the equation, the physiotherapist can become another member of the coaching team, but one who will not shy away from working with people in a wheelchair or with a leg missing, or will not crumble at the thought of having an athlete who has a catheter bag on their leg, or a mild cognitive or behavioural problem. Such a person might also bring expertise on analysing posture and movement and have a good understanding of which things can improve with training and which things probably won't. Where enthusiastic athletes and coaches are struggling, such a person would surely be a dream.

Another vital role that became my own passionis learning about classification and helping people to understand it. In the sport of athletics, in the Paralympics for example, an athlete must have a specific degree of one of the following impairments to be eligible under the physical disability bracket:

- Hypertonia
- Ataxia
- Athetosis
- Limb deficiency
- Impaired passive range of movement
- Impaired muscle power
- Leg length difference
- Short stature

Clearly a neurophysiotherapist has a lot to offer athletes and coaches in understanding the presence, severity and training potential of these impairments, and for people who are particularly keen, there are various opportunities around to train up as a classifier. The best way to start is to identify a sport that appeals and look at their website or contact the national governing bodies for further information.

It is not just the sporting world that needs help. In the same way that Wimbledon gets us all picking up a racket every summer, the fact that disability in the country has had its profile raised by the Paralympics will spur on many disabled people to get out more, get to events, do gardening again, try painting again – the list is endless.

Doing voluntary work will not appeal to all but there are hopefully still plenty of locally funded opportunities out there for holding clubs and social events that encourage full participation, if only to keep people healthier and active for longer.

For everyone out there, we all need to have something to aim for and when hope is lost after a stroke or a long-term diagnosis such as MS, it is a real test of someone's positivity to keep their identity and continue to feel confident in a social context.

For a physiotherapist in a busy working environment, of course there are constant pressures and for many people with a disability, there are just too many obstacles to reach their desired outcome. For those who can, however, and in the interest of long-term sustainable resources, the self-driven management route needs to start from the moment we meet them. We assess them as a person, not just a patient; a person who has dreams of living with a sense of purpose again and a feeling of worth in the environment around them. Perhaps see it as the reason we need to take a good history, why we need to use patient-centred goals and why we need the relevant multidisciplinary team members to have a more communicative and integrated approach from the start.

The life of a PhD student

From a discussion at a national ACPIN research workshop in early 2012, it was felt that entering into postgraduate research can be very daunting with no one knowing entirely what to expect. It was decided to follow two PHD students on their epic journey through the highs and lows that they will inevitably experience, to assist anybody who is thinking of pursuing the research avenue themselves.

Reflections on time

It has been a while since my last blog in the series *The life of a PhD student*. In my previous blog, I was sharing with you my many dramas with finding the research question. Since then I have made some headway along that path and have designed and carried out an actual study

However, it is hard to believe or even comprehend the speed at which things are going at the moment. It seems as though it was just yesterday that I started this journey, and now I am officially in my third year! Yep! I am currently in the final year of my PhD! The more I say '*final year*', the more I can feel shivers running down my spine! Anyway, since things are speeding up at the moment, I have decided to chill out and have a cuppa while I share with you my thoughts on 'time'.

Recently I have found myself reflecting on time. Where does time go? It feels like it was just yesterday we were singing 'We wish you a merry Christmas', and now we are getting ready to sing it again – which means that one year has suddenly gone by.

I am sure we all have 24 hours in one day. However some people can do more with their 24 hours than others. Time and time again I am finding myself in the 'others' category. When I was in clinical practice (not *so* long ago) I worked from 8.00am to 4.00pm or 9.00am to 5.00pm. These were very clear demarcations of time. As a clinician, time management was very important! We strived for it! After all, we needed to have this down on our yearly review that we are good time managers… hmm… But nevertheless I believed I was very good at managing my time as a clinician (*if I may say so myself*).

However, as a PhD student my time management skills are somehow getting the better of me. Just to clarify, I don't think I am wasting my time, but I feel as though I am not as productive as I could be. For starters there are no clear demarcations with my time. For example, some days I work on my research from 8.00am to 6.00pm only taking breaks to eat and do some exercise (smile… because it is the correct thing to say at this point!) Other days I work between 10.00am to 12.00 midnight, but at the end of the day I question what has been accomplished with those long, extended hours.

I've decided (sheer willpower and might speaking!) to really get a grip on my issues with time. After all, I only have one more year left (shivers!). I am now on a mission! My mission is to ensure that I am productive and stay that way. So, I have made some notes to myself to keep me on track!

Note to self 1 – Rest

Adequate rest is important for me. I truly believe in resting.. but maybe not too much resting. Need to balance the rest time with some PhD time.

Note to self 2 – Exercise

It is amazing the benefits associated with exercise. They span beyond physical benefits, such as being mentally alert. Therefore I must remember to exercise. I must admit some days, because every second counts, you feel guilty about stopping to do exercise. But I should remember that once I exercise I feel much better and am able to do more work.

Note to self 3 – Prioritisation

I have come to realise that prioritisation is important. As a physio I do set goals and yes I believe they are SMART goals. But there is another letter that should go into that SMART acronym and that is the letter 'P'. SMARTP – that does not really spell anything, but one should prioritise their activities throughout the day. By prioritising I believe it makes you more productive.

Note to self 4 – Do it!

I like the quotation that states, 'Procrastination is the thief of time so collar it!' I need to take charge of the activity that needs to get done and do it! Delay is a procrastinating tactic that we all use at some point in our life. We sheepishly think that we can put things off and do them another time. 'The fact is that time lost cannot be regained!'

So, in summary, in the final stages of my PhD, I need to ensure that I am using my time productively and wisely. Every minute of every day counts. I only have 24 hours in a day so I need to make every hour count!

Bye for now. Need to go and make some hours count towards my thesis chapters.

The end is not yet nigh!

I am now two years in to the PhD and the end still feels very far away with an awful lot of work to do between now and then. I am still recruiting patients to the study and have reached 90. As I am a blinded assessor I continue to have no idea what effect the trial is having. I am hopeful we will find an effect and clearly the more patients I can recruit the better.

In order to gain as many recruits as possible I am in the process of expanding the trial to other sites. This requires lots of meetings with therapists, consultants, pharmacists and R&D departments to get the trial ready at each new site. As the trial is adopted by the Stroke Research Network I have had great help in this from the research nurses at each potential site. Expanding the trial means that I will have more work to do, as I will remain the only researcher on the study. It is also frustrating as, due to the late starting of these sites, the amount of time taken to get new sites up and running will be disproportionate to the number of recruits I will get.

It would be fair to say that the long slog of a clinical trial like this would be too much if there were no short-term goals to aim for – something to focus on and provide a boost when you achieve it. One such goal has been to begin publishing my work and to actually have something to show for all the work I have been doing over the last few years.

Publishing your work is obviously very important for University staff in ensuring dissemination of their findings and improving job prospects. I am sure many well-published academics find being published a matter of course and insignificant, but when it is your first publication it is exciting. My first publication was a Cochrane Review Protocol and it was a real thrill to see my name in print.

The other way of disseminating your work is through posters and abstracts at conferences. This is usually the first form of publication that researchers will use to publicise their work. Depending on the conference you submit the research to, will govern the exact process.

Most conferences initially require an abstract to be submitted for peer review and you can choose whether to present the abstract in a ten minute presentation or in poster form. I have now presented two posters at conferences and they have been quite different experiences. Posters are usually A0 size and there is time set aside during the conference when you present the poster. In most cases this involves a short, one to three minute presentation to introduce the work and explain the poster in more detail. Larger international conferences however can have A0 computer screens that are linked to an iPad which the presenter can then zoom in and out from, to highlight specific areas.

I am hoping to have some further publications in the next few months but will wait to see if they are accepted. Opportunities are currently limited because we are not able to present any interim data due to the blinded nature of the study. By the next time I write for *Synapse* I will have finished recruitment and be coming to the end – a scary prospect!

Five minutes with…

Stuart Nixon

Stuart Nixon has been a Trustee of the MS Society for six years and is planning to end his tenure in spectacular style. Stuart originally trained and worked as a nurse, has owned and run a nursing home and now works as a manager in NHS Wales. In partnership with his wife Marie he works tirelessly for the MS Society. Stuart is an inspirational speaker and an intensely persuasive and determined campaigner for the cause that is so close to his heart.

Stuart, can you explain what the role of an MS Society trustee involves?
As a trustee you sit on the board of the Society and you are responsible to the regulator, the Charity Commission, for the governance of the charity. In addition to this we are also non-executive directors of the organisation. The formal parts of this role are the six board meetings and the annual general meeting of the Society, but to be effective in these situations there is a significant amount of additional work to understand and get under the skin of the organisation. This starts with understanding the functions of the charity and the needs of the MS community. The former involves a lot of reading, and exploring the Society's constitution and its formal structure; the latter is much more about people.

What do you feel that you have brought to the role?
I firmly believe that a trustee is an ambassador for the Society and MS community in general. I am committed to taking the voice of the Society and the MS community forward in all situations. I have lived with MS for over 30 years; I have been volunteering for the MS Society for 15 years. As a nurse, and now NHS manager, I also bring to the board a clear understanding of health and social care issues in England and Wales. As our research commitment increases, I believe we must maintain and increase the quality and breadth of work supported. My involvement in and commitment to research inform this through membership of the Research Strategy Committee. The increased number of children and young adults with MS brings challenges to which the Society must respond; this, allied to the ever increasing number of ways we are all able to communicate in, demands we find ways to speak to and for the whole MS community across all media. As I was diagnosed in my teens, have a long association with MS and am in regular contact with the MS community, I have a personal perspective in these debates.

Where did the idea for the MS60 challenge come from?
It came from discussions with Nicola Tallett, Director of Fund Raising at the MS Society. The result has been a year of people completing personal challenges, raising money and awareness for the MS Society with a 60-day focus during June and July – the response has been fantastic with people the length and breadth of the UK baking, running, walking, swimming and doing just about anything for their MS60 challenges. With money still coming in we are on target to meet our aim of £250,000.

Tell us about your personal plans to round up the MS60 year.
Christopher Bray, Head of Events at the Society, and I chatted idly about what we could do to celebrate the Society's 60th anniversary; I still do not quite believe what we came up with: a 60km walk. Not too bad, I hear you say, until we factor in that I have had MS for over 30 years, have

used a wheelchair for 15 of those and have a right arm that is next to useless. So here's the plan: over nine to ten days, I plan to walk the Jubilee Greenway from Buckingham Palace to the Olympic Park and back again. This network of pathways goes through the royal parks (Hyde and Regents), along the Regent Canal, on to the Olympic Park before heading down to the river. The return journey will take me along the South Bank, past the O2 Stadium, Greenwich, Tower Bridge and the Palace of Westminster, before I arrive back at the Victoria Memorial, in front of Buckingham Palace. Say it quickly and it sounds easy, but for someone who can only walk ten metres with a stick and the help of his wife, this will be quite a challenge.

That sounds like an unbelievable challenge – how have you tackled the practicalities?

I've worked with two Masters students of design from Northumbria University, who built a walking frame on wheels, that will support me and let me push myself along with my left leg – the only bit that works reasonably well! Rather than keep calling it 'the frame' we nicknamed her Sexy Suzie. When Suzie was ready, I started 'training'; an interesting word for a body that will only do so much. It was really about trying to lift my exercise tolerance, and practicing with Suzie to master what was a very odd movement. It involved keeping my body and right leg secured and stable, supported by my arms, while scooting along with my left leg.

So what of Christopher?

He needed a challenge of his own, so on the last day of my walk, he is going to walk all 60km of the Jubilee Greenway in one go – a mammoth task, with sore feet guaranteed.

What do you hope to achieve with this challenge?

There are two major aims: to raise £60,000 – or more; and to raise awareness of MS beyond the MS community.

So what's next for you, Stuart?

December sees the end of my term as a trustee, a role that has been one of the most fulfilling of my life and it will certainly leave a large hole. Whilst this role has come to an end, I do not think the MS Society will get rid of me that easily, and I have already had requests to keep doing a number of other things, so I guess it's watch this space...

News

Seize the opportunity!

how ACPIN works with NICE

Ralph Hammond DPT MSc MCSP
CSP Research Adviser; Clinical specialist (neuro) Somerset Partnership NHS Foundation Trust; Member ACPIN executive committee

Jakko Brouwers MSc MCSP
Senior Service Improvement Programme manager, University Hospital of Wales; Vice-chair ACPIN

The CSP registers the profession to NICE programmes of work that the profession has a stake in. A challenge the profession faces is finding members with the skills, knowledge, experience and time commitment to engage with this work. This paper outlines how ACPIN members can engage.

NICE was established as a Special Health Authority following a review of health policy which identified the need for a central point of reference on effective clinical practice[1]. NICE guidance helps health and social care professionals deliver the best possible care, based on the best available evidence. NICE makes recommendations in the form of guidance which all NHS organisations are expected to take into account in delivering care. With the exception of technology appraisals (see below) the recommendations are advisory, not mandatory.

Key message

Keep an eye on the ACPIN website/iCSP neurology network for NICE work that ACPIN is involved in. If it is a topic you have specialist knowledge of, and you want to get involved, contact ACPIN: vicechair@acpin.net

Clinical guidelines

Clinical guidelines are recommendations on the appropriate treatment and care of people with specific diseases and conditions within the NHS in England and Wales. Clinical guidelines are based on the best available evidence. Guidelines help healthcare professionals in their work, but they do not replace their knowledge and skills.

Technology appraisals

Technology appraisals are recommendations on the use of new and existing medicines and treatments within the NHS in England and Wales, such as:

- medicines
- medical devices (for example, hearing aids or inhalers)
- diagnostic techniques (tests used to identify diseases)
- surgical procedures (for example, repairing hernias)
- health promotion activities (for example, ways of helping people with diabetes manage their condition)

Unlike other NICE guidance which is advisory, technology appraisals are mandatory, so must be followed.

Medical technologies guidance

Medical technologies guidance is designed to help the NHS adopt efficient and cost effective medical devices and diagnostics more rapidly and consistently. The types of products which might be included are medical devices that deliver treatment such as those implanted during surgical procedures, technologies that give greater independence to patients, and diagnostic devices or tests used to detect or monitor medical conditions.

NICE makes recommendations about whether *interventional procedures* used for diagnosis or treatment are safe enough and work well enough for routine use. An interventional procedure is a procedure used for diagnosis or treatment that involves one of the following:

- Making a cut or a hole to gain access to the inside of a patient's body – eg when

---

[1] The content for this briefing is taken from the NICE website: www.nice.org.uk

	CSP	CSP ALLIANCE (NEUROSCIENCE ALLIANCE)	CSP PROFESSIONAL NETWORK (PN) ACPIN	CSP MEMBERS
1 **Submit topics**	Not routinely	Can do	Can do	Yes (through ACPIN)
2 **Topic published**	Yes – alerts Alliances. Pass to Alliances and posts to website and iCSP Effective Practice network	Yes 1. Informs PNs 2. Identify lead	Yes – ACPIN vice-chair registers ACPIN interest	Yes (academic/clinical researcher should contact ACPIN vice-chair: vicechair@acpin.net
3 **GDG (working party)**	Yes – alerts Alliances	Yes – informs PNs	Yes – encourages members to apply	Senior members with clinical remit can apply direct to NICE
4 **Scope workshop**	Yes – alerts Alliances	Yes – identify main PNs	Yes - identifies attendees	Yes (suggest 1 to 2 senior members eg band 7/8s). Contact ACPIN vice-chair: vicechair@acpin.net
5 **Scope consultation**[2]	Yes – alerts Alliances	Yes; Lead collates PN responses	Yes – prepares response	Yes (suggest x1 academic/ researcher lead with 3 to 4 clinicians' input band 7/8s?). Contact ACPIN vice-chair: vicechair@acpin.net
6 **Draft guideline**	Yes – alerts Alliances	Yes; Lead collates PN responses	Yes – prepares response	Yes (suggest x1 academic/ researcher lead with 3-4 clinicians' input band 7/8s?). Contact ACPIN vice-chair: vicechair@acpin.net
7 **Typo consultation**	No	Not usually	Not usually	Not usually
8 **Guideline published**	Yes 1. Through Alliances 2. Post to website & iCSP Effective Practice network 3. Press release?	Yes; Lead provides quote for press release	Yes – ACPIN informs its members, eg via iCSP network, ACPIN website; *Synapse*	

TABLE 1 A simplified representation of the stages for the development of NICE guidance[3] – when and who should be involved

carrying out an operation or inserting a tube into a blood vessel.

- Gaining access to a body cavity (such as the digestive system, lungs, womb or bladder) without cutting into the body – for example, examining or carrying out treatment on the inside of the stomach using an instrument inserted via the mouth.
- Using electromagnetic radiation (which includes X-rays, lasers, gamma-rays and ultraviolet light) - for example, using a laser to treat eye problems.

Public health guidance

Public health guidance makes recommendations for populations and individuals on activities, policies and strategies that can help prevent disease or improve health. The guidance may focus on a particular topic (such as smoking), a particular population (such as schoolchildren) or a particular setting (such as the workplace).

Quality standards

Quality standards are a set of specific, concise statements and associated measures. They set out aspirational, but achievable, markers of high-quality, cost-effective patient care, covering the treatment and prevention of different diseases and conditions.

Derived from the best available evidence such as NICE guidance and other evidence sources accredited by NHS Evidence, they are developed independently by NICE, in collaboration with NHS and social care professionals, their partners and service users, and address three dimensions of quality: clinical effectiveness, patient safety and patient experience.

Quality standards will be reflected in the new Commissioning Outcomes Framework and will inform payment mechanisms and incentive schemes such as the Quality and Outcomes Framework (QOF) and Commissioning for Quality and Innovation (CQUIN) Payment Framework.

How NICE works

NICE is internationally recognised for the way in which it develops its recommendations; a rigorous process that is centred on using the best available evidence and includes the views of experts, patients and carers, and industry.

NICE does not decide on the topics for its guidance and appraisals. Instead, topics are referred by the Department of Health. Topics are selected on the basis of a number of factors, including the burden of disease, the impact on resources, and whether there is inappropriate variation in practice across the country. Guidance is then created by independent and unbiased advisory committees.

NICE has an 'open and transparent consultation process' throughout the development of our guidance and quality standards which allows individuals, patient groups, charities and industry to comment on our recommendations.

---

[2] Consultation for Guidelines last one month; consultations for other NICE programmes are *frequently shorter*.

[3] The most complex process is for the development of clinical guidelines; other programmes (Technology Appraisals, Medical Technologies Guidance, Interventional Procedures, Public Health Guidance, Quality Standards) are similar but don't necessarily include all eight stages.

How NICE develops clinical guideline – a summarys

1. **Guideline topic is referred**
   The Department of Health refers clinical guideline topics to NICE.
2. **Stakeholders register interest**
   National organisations representing patients and carers, and also health professionals involved in their care can register as stakeholders. Stakeholders are consulted throughout the guideline development process.
3. **Scope prepared**
   The National Collaborating Centre (NCC) commissioned to develop the guideline prepares the scope. This document sets out what the guideline will – and will not – cover. NICE, registered stakeholders and an independent guideline review panel can all contribute to the development of the scope. This is through a scope workshop, a one-off half day event to which clinicians are particularly invited: ACPIN members can contact ACPIN to register an interest in attending this: contact ACPIN vice-chair: vicechair@acpin.net
4. **Development group established**
   This group is made up of health professionals, representatives of patient and carer groups and technical experts. Senior ACPIN members can apply directly to NICE for a post on a guideline development group.
5. **Draft guideline produced**
   To produce the draft guideline, the guideline development group assesses the available evidence and makes recommendations.
6. **Consultation on the draft guideline**
   There is at least one public consultation period for registered stakeholders to comment on the draft. The consultation period is advertised on the NICE website well in advance of the four weeks consultation. ACPIN likes to be able to prime and support a small group of members who are willing to go through the draft and provide comments. ACPIN members can contact ACPIN (vicechair@acpin.net) to register an interest in this stage. ACPIN then provides a collated response through the vice chair. An independent panel reviews the guideline to check that stakeholder comments have been taken into account.
7. **Final guideline produced**
   After the guideline development group finalises the recommendations, the collaborating centre produces the final guideline.
8. **Guidance issued**
   NICE formally approves the final guideline and issues its guidance to the NHS.

Keep moving!

Independent prescribing and medicines management

Davina Richardson
Clinical lead therapist neurosciences, Imperial College Healthcare NHS Trust

Back in Autumn 2011 *Synapse* printed an article entitled '*Don't stand still!'Medicines management. Why does it matter?* True to the physiotherapy profession, we have not stood still. On August 20th 2013 Norman Lamb, the Health Minister, announced that essential legislation covering England has now come into effect which will enable podiatrists and physiotherapists to prescribe medicines to their patients independently. Similar secondary legislation is due to follow soon in Scotland, Wales and Northern Ireland. The landmark ruling is set out in an amendment to the Human Medicines Regulations 2013.

Two years ago we reflected on progress within the profession; autonomous practice, a protected title and self-referral schemes to name some of developments. Now we have the opportunity to move forward again. Karen Middleton, Chief Allied Health Professions Officer for NHS England, said:

'Physiotherapists need to influence local commissioners in terms of how these new prescribing rights can result in significant service redesign, in particular in order to reduce the demand on GP time.'

Phil Gray, Chief Executive of the CSP, identified that it forms part of a radical change in the profession;physiotherapists in the UK are the first in the world to achieve full independent prescribing rights. It is another example of a highly skilled, confident, autonomous and accountable independent profession that can deliver high standards of patient care.

The Government and Department of Health aims to utilise skilled staff in the system to improve timely and appropriate access to medicines when it really matters for our patients. Services are being brought closer to people's homes and commissioning is looking at new services, new providers and how existing services can work more effectively to improve patient care and outcomes. How could Independent Prescribing for Physiotherapists fit into this arena?

It is important to remember that since 2000 physiotherapists have been legally able to administer medications prescribed by their medical colleagues. Since 2005, physiotherapists have been able to train to be supplementary prescribers supporting their medical, nursing and pharmacy colleagues in finding the appropriate medicines management for their patients under agreed clinical management plans. If these mechanisms are meeting all the needs of the patients you see in your service areas, then there is no need for your service to consider training you as an Independent Prescriber. However, if your patients have to return to a different place at a different time in order to book an appointment to see an Independent Prescriber to review their medications, or if you are not able to successfully develop timely and responsive clinical management plans due to geographical locations, time commitments or record-keeping systems, then training to be an Independent Prescriber could improve the patient experience and outcome. It would reduce the number of steps taken, reduce time and potentially save money.

As a group of specialist physiotherapy practitioners in neurology we could identify areas where the patient's care and outcome may be improved. We need to consider raising these issues with our local team.

Innovative colleagues have already trained as Supplementary Prescribers so that they can run parallel clinics with their medical colleagues. Follow-ups and new patients can be seen in the same setting at the same time increasing the capacity of the service, with the therapist running the follow-up clinic and the medical team running the diagnostics. Running fully autonomous follow-up clinics could be a way forward. If prescriptions have run out or changes in medications are required the physiotherapist could manage the situation for the patient in a single visit.

A short story

A 28-year-old male with a longstanding history of difficulty with walking has been given an appointment in the planned investigation unit in the neurology department of a tertiary referral centre. The physiotherapy assessment identifies underlying weakness, spasticity and clonus. Following discussion with the consultant neurologist the plan is to start on a low dose of Baclofen to assist with the stiffness and to enable more effective stretching and strengthening exercises. A follow-up neurology consultation as an outpatient is booked for six months' time. Physiotherapy outpatients is booked for one month's time in a community team in the patient's local borough. The patient attends the local physiotherapy team and has gone to his GP to get the prescription for Baclofen. They had to wait two weeks for the letter from the tertiary centre to get to the GP and then they had to wait two weeks to get an appointment with the GP to get the prescription. At the first visit to physiotherapy he has not yet started the Baclofen. At the second physiotherapy appointment he has started Baclofen but cannot remember the dose that was originally recommended. After a three month period where the patient has been doing their own exercise programme, he returns for a follow-up physiotherapy session. At this point he reports that he has run out of the Baclofen tablets and has still not titrated the dose. The physiotherapist identifies he must go back to the GP to get a repeat prescription and get advice for how to further titrate the medications as there is still troublesome clonus and the stretches are still difficult.

Would the ability to write a prescription and manage the medication for this individual have helped?

Potentially the physiotherapist could have written the prescription with details of how to titrate the medication and could have booked a telephone review of the patient to see how they were getting on, and how it was impacting their ability to do the stretches and walking. This could have improved the pharmacological management of the presentation and identified if the increase was detrimental to overall function or providing benefit. The number of trips to the GP could have been reduced. The medication could have been started earlier and titration achieved more sensitively and accurately.

It is important to identify areas where the skill to prescribe and manage medicines will improve patient experience and outcome. Issues related to neurology often present long-term management issues following a diagnostic period. Where could physiotherapy independent prescribing make a difference?

Next steps

If you are appropriately trained, HCPC registered and tagged as competent to practice as an Independent Prescriber, you can do all of this without having to send the patient back to a doctor or independent nurse prescriber to review and write out the prescription.

If you think that your patients would benefit from your skills in medicines management and the ability to prescribe independently then you need to be able to demonstrate the need. Data on the number of patients and pathways that could be more effective, and any cost savings, need to be considered. You would then need to identify funding for the training and involve your management team and your independent prescribers. Any physiotherapist wishing to train to be an independent prescriber has to identify a mentor who is a medical independent prescriber, who will support their training and be prepared to supervise them for up to a period of twelve days. The courses will be rigorously monitored. Trainees are expected to pass pharmacology exams and provide portfolios of experience with medicine management and have mentorship from an independent provider. The courses are likely to cost in the region of £2,000 for an individual. If health sectors purchase blocks of training this cost may be less.

The Health and Care Professions Council (HCPC) will publish standards that set out the regulatory framework for independent prescribing, which underpin the content of the training courses. After appropriate training, qualified independent prescribers will need to be annotated on the professional register, as is currently the case for supplementary prescribers. The first courses are likely to come on stream by early 2014 and will appear on the HCPC website.

The Department of Health has fully revised and updated the curricula that higher education institutes are required to follow in order to prepare physiotherapists, podiatrists and radiographers for a prescribing annotation with the HCPC. These new curricula are owned by the Allied Health Professions Federation, on behalf of all the professions to which the curricula apply. Individual professions will take it in turns to host the curricula on their professional body websites.

The courses for supplementary prescribing have been 26-week, part-time university courses. Once completed and passed, individuals are then registered with the HCPC. Information is on the Medicines and Prescription section on iCSP which has all the links to the courses and how the HCPC will check the training that will be accredited and monitored closely.

Medicines management may not be for everyone. However, advanced practitioner physiotherapists who are working in a specialist field, focusing on particular presentations or conditions need to be aware that they have the opportunity to work more closely with their medical colleagues.

Check out the iCSP Medicines and Prescribing site to get links to all the relevant documents.

Liverpool
Neuro Physio

Join a winning team

Liverpool Neuro Physio, a multidisciplinary neurolgical rehabilitation service based in Liverpool, are looking to recruit 5 full time therapy staff.

Liverpool Neuro Physio are a private rehabilitation company specialising in providing neurological rehabilitation services to the NHS, TBI units, and private individuals. We are looking for therapists with a passion for neurological rehabilitation to join our growing team of neurological therapists.

Full time vacancies include:

- Neurological Physiotherapist- Band 6
- Neurological Occupational Therapist- Band 6
- Basic grade Physiotherapist- Band 5
- Basic grade Occupational Therapist- Band 5
- Therapy Assistant- Band 2

Successful candidates will have a varied role providing, in-patient rehabilitation units, outpatient clinics, and in the community. Patient caseloads will be varied and include; acquired brain injury, stroke, multiple sclerosis. Treatments include; hydrotherapy, CIMT, FES, Saebo and Botox.

Benefits include:

- ✓ Competitive salary
- ✓ Performance related bonuses
- ✓ Free gym membership
- ✓ Opportunities for progression
- ✓ Funded external courses
- ✓ Regular In Service Training
- ✓ Flexible working hours

For more information please visit **www.liverpoolneurophysio.co.uk/careers** or call **0151 558 0188** and ask for Natalie. To apply please email your CV and covering letter to **office@liverpoolneurophysio.co.uk** or apply online at **www.liverpoolneurophysio.co.uk/careers**

Reviews

Reviews of research articles, books, courses and equipment in *Syn'apse* are offered by regional ACPIN groups or individuals in response to requests from the ACPIN committee. In the spirit of an extension of the ERA (evaluating research articles) project, they are offered as information for members and as an opportunity for some members to hone their reviewing skills. Editing is kept to a minimum and the reviews reflect the opinions of the authors only. We give the authors of the original book or paper the opportunity to respond. We hope these reviews will encourage members to read the original article and not simply take the views of the reviewers at face value.

Welsh Stroke Conference

20th–21st June 2013

Kerian Buck
Neurophysiotherapist, Aneurin Bevan Health Board

The Welsh Stroke Conference kicked off in a new format this year with two parallel workshops held at the excellent venue of Cardiff Metropolitan University on Thursday afternoon.

The Early Supported Discharge (ESD) workshop included a thorough overview of the supporting evidence with Dr Rebecca Fisher; Alex Hoffman from the Royal College of Physicians reported Sentinel Stroke National Audit (SSNAP) data and Jo James from the East Midlands demonstrated how a diverse region with both urban and rural populations had achieved ESD models specific to the needs of the locality.

Dr Kathryn Head presented the process and evidence which Cwm Taf Health Board has used to plan ESD services. The physiotherapists from Wrexham ESD team provided a thought-provoking insight into their practical experience. The workshop was brought to an interesting close by Professor Peter Langhorne discussing international models of ESD.

The full conference on Friday started with a stimulating presentation by the colourful Dr Michael Chopp from Detroit who captivated the audience discussing how restorative cell-based therapy is being used to treat the intact brain post-injury. The treatment has been demonstrated to enhance remodelling.

Professor Langhorne gave an overview of the recent RCP and NICE guidelines for stroke and discussed themes of evidence. He identified five recent Cochrane reviews; *ESD*, *Selective serotonin reuptake inhibitors for stroke recovery*, *Electromechanical-assisted training for walking after stroke*, *Robot-assisted therapy for upper limb recovery* and *Mirror therapy for improving motor function after stroke*.

Dr Peter O'Callaghan provided some interesting statistics on incidence of atrial fibrillation and talked about the development of new oral anticoagulants which could be used for some patients instead of Warfarin.

Professor Tony Rudd presented the findings of the new SSNAP audit reporting from England, which commenced in Wales 1st July 2013. He delivered an interesting insight into stroke care across the world in the Annual Bhomwick Lecture identifying what really makes a difference to outcomes.

The afternoon 'Update on Stroke Rehabilitation' parallel session gave a varied overview of recent and ongoing research studies. Dr Aillie Turton discussed unilateral neglect; Caroline Watkins talked about the results of her study looking at the issue of incontinence post stroke. The pilot study is complete and there are plans to roll out the study to forty sites for a multicentre trial.

Dr Fredericke van Wijck discussed the importance of addressing fitness levels post stroke and engaging patients in exercise. [www.exerciseafterstroke.org.uk].

The results of the 'Getting Out of the House' study were presented by Professor Pip Logan. She concluded patients benefitted from keeping a calendar to measure activity, and advice from a therapist is beneficial.

The afternoon session was brought to a close by speech and language therapist, Carys Holley, who provided an informative session detailing how patients with communication difficulties can be supported to demonstrate capacity.

In conclusion, the Welsh Stroke Conference 2013 was a stimulating setting to inform clinicians of new evidence, which many of the speakers were able to appropriately link to the latest RCP and NICE guidelines.

The pathophysiology and rehabilitation of cerebellar ataxia

Kent ACPIN study day
9th March 2013

The study day was fully subscribed and attended by members and non-members from the Kent area.

The course leaders were Dr Lisa Bunn and Professor Jon Marsden and the study day began with Jon giving a brief overview of cerebellar ataxias, its impact on quality of life, the common functional consequences and the estimated cost in terms of loss of pay, early retirement and medical care costs, as well as rehabilitation. He then went into an in-depth review of cerebellar anatomy and pathophysiology and the signs and symptoms of common ataxias, providing delegates with a good foundation to build on for subsequent lectures.

Both Lisa and Jon emphasised the need for accurate differential diagnosis. As Jon pointed out 'all that wobbles is not cerebellar ataxia'. Patients may have cerebellar, sensory or vestibular ataxia. Lisa talked about the differences between acquired versus inherited cerebellar disease. Inherited cerebellar ataxia requires specific genetic testing to determine which variant a patient has.

There was a very helpful, practical workshop on the use of the SARA (Scale for the Assessment and Rating of Ataxia) for which Lisa had prepared various patient videos to demonstrate how it would be used in practice. She talked about how to overcome the pitfalls and difficulties sometimes associated with performing the SARA in a less well-controlled environment like a patient's home.

We were given a detailed update into the evidence base for management of ataxias. We were also shown practical ideas about treatment techniques to use with patients. The need for multi-disciplinary working was highlighted, due to the wide-ranging signs and symptoms that patients can present with. Each course delegate was given the Ataxia UK publication *Management of the Ataxias: towards best Clinical Practice* (Novemver 2009) to refer to and guide their future clinical practice.

Lisa presented her PhD work *Processing vestibular, proprioceptive and visual information for balance control in pure cerebellar disease (SCA6)*, which was very interesting. The conclusion of the work was that 'disrupted visual control of balance contributes to balance impairment in cerebellar disease'.

Lisa posed the questions 'Should rehabilitation approaches be restorative or adaptive', and 'Can people with cerebellar disease adapt their movement patterns with repetition? Can they train?'

Jon talked in some depth about the negative effects on motor learning, and the potential impact this has on rehabilitation – that patients with cerebellar ataxias can take a lot longer to learn new motor patterns as compared with patients with other neurological conditions.

He talked about the possible surgical and pharmacological management options, including Stereotactic Surgery and Thalamic stimulation.

Both Lisa and Jon made it clear that there is still a great deal of work to be done in improving the evidence base for treatment and management of ataxias. Lisa was very keen to get delegates to contribute to the knowledge base by feeding back some basic information about patients they had treated with ataxia (diagnosis, problems, goals, treatment approaches and outcomes). The fact that Lisa and Jon wanted to draw on our experiences as clinicians, and not just be there to teach, was very refreshing and really reflected the tone of the whole study day. It was an excellent day and has provided those of us who attended with the confidence to accurately assess and treat patients with ataxias. Kent ACPIN would like to thank Lisa and Jon for an informative and enjoyable study day.

Resources

Articles in other journals

Archives of Physical Medicine and Rehabilitation

Volume 94:3

Chuang LL, Lin KC, Wu CY, Chang CW, Chen HC, Yin HP, Wang L *Relative and absolute reliabilities of the myotonometric measurements of hemiparetic arms in patients with stroke* pp459-466.

Dijkers MP *Chasing change: repeated-measures analysis of variance is so yesterday!* pp597-599.

Frisina PG, Kutlik AM, Barrett AM *Left-sided brain injury associated with more hospital-acquired infections during inpatient rehabilitation* pp516-521.

Hsu HY, Kuo LC, Jou IM, Chen SM, Chiu HY, Su FC *Establishment of a proper manual tactile test for hands with sensory deficits* pp451-458.

Kozlowski AJ, Pretz CR, Dams-O'Connor K, Kreider S, Whiteneck G *An introduction to applying individual growth curve models to evaluate change in rehabilitation: a National Institute on disability and rehabilitation research traumatic brain injury model systems report* pp589-596.

Kurowski BG, Wade SL, Kirkwood MW, Brown TM, Stancin T, Cassedy A, Taylor HG *Association of parent ratings of executive function with global- and setting-specific behavioral impairment after adolescent traumatic brain injury* pp543-550.

Lam OL, McMillan AS, Samaranayake LP, Li LS, McGrath C *Randomized clinical trial of oral health promotion interventions among patients following stroke* pp435-443.

Li Z, Peng X, Zhu B, Zhang Y, Xi X *Active mobilization for mechanically ventilated patients: a systematic review* pp551-561.

Pilutti LA, Dlugonski D, Sandroff BM, Suh Y, Pula JH, Sosnoff JJ, Motl RW *Further validation of Multiple Sclerosis Walking Scale - 12 scores based on spatiotemporal gait parameters* pp575-578.

la Porta F, Caselli S, Ianes AB, Cameli O, Lino M, Piperno R, Sighinolfi A, Lombardi F, Tennant A *Can we scientifically and reliably measure the level of consciousness in vegetative and minimally conscious states? Rasch analysis of the Coma Recovery Scale - revised* pp527-535.

Pretz CR, Kozlowski AJ, Dams-O'Connor K, Kreider S, Cuthbert JP, Corrigan JD, Heinemann AW, Whiteneck G *Descriptive modeling of longitudinal outcome measures in traumatic brain injury: a National Institute on disability and rehabilitation research traumatic brain injury model systems study* pp579-588.

Spaulding SJ, Barber B, Colby M, Cormack B, Mick T, Jenkins ME *Cueing and gait improvement among people with Parkinson's Disease: a meta-analysis* pp562-570.

Volume 94:4 supplement

Backus D, Gassaway J, Smout RJ, Hsieh CH, Heinemann AW, DeJong G, Horn SD *Relation between inpatient and postdischarge services and outcomes 1 year post injury in people with traumatic spinal cord injury* ppS165-S174.

DeJong G, Tian W, Hsieh CH, Junn C, Karam C, Ballard PH, Smout RJ, Horn SD, Zanca JM, Heinemann AW, Hammond FM, Backus D *Rehospitalization in the first year of traumatic spinal cord injury after discharge from medical rehabilitation* ppS87-S97.

Dijkers MP, Zanca JM *Factors complicating treatment sessions in spinal cord injury rehabilitation: nature, frequency, and consequences* ppS115-S124.

Hammond FM, Horn SD, Smout RJ, Chen D, DeJong G, Scelza W, Jha A, Ballard PH, Bloomgarden J *Acute Rehospitalizations during inpatient rehabilitation for spinal cord injury* ppS98-S105.

Hammond FM, Lieberman J, Smout RJ, Horn SD, Dijkers MP, Backus D *Missed therapy time during inpatient rehabilitation for spinal cord injury* ppS106-S114.

Hsieh CH, DeJong G, Groah S, Ballard PH, Horn SD, Tian W *Comparing rehabilitation services and outcomes between older and younger people with spinal cord injury* ppS175-S186.

Horn SD, Smout RJ, DeJong G, Dijkers MP, Hsieh CH, Lammertse D, Whiteneck GG *Association of various comorbidity measures with spinal cord injury rehabilitation outcomes* ppS75-S86.

Kozlowski AJ, Heinemann AW *Using individual growth curve models to predict recovery and activities of daily living after spinal cord injury: an SCIRehab project study* ppS154-S164.

Tian W, CHsieh CH, DeJong G, Backus D, Groah S, Ballard PH *Role of body weight in therapy participation and rehabilitation outcomes among individuals with traumatic spinal cord injury* ppS125-S136.

Whiteneck GG, Gassaway J *SCIRehab uses practice-based evidence methodology to associate patient and treatment characteristics with outcomes* ppS67-S74.

Zanca JM, Dijkers MP, Hammond FM, Horn SD *Pain and its impact on inpatient rehabilitation for acute traumatic spinal cord injury: analysis of observational data collected in the SCIRehab stud*y ppS137-S144.

Zanca JM, Dijkers MP, Hsieh CH, Heinemann AW, Horn SD, Smout RJ, Backus D *Group therapy utilization in inpatient spinal cord injury rehabilitation* ppS145-S153.

Volume 94:4

Baetens T, De Kegel A, Palmans T, Oostra K, Vanderstraeten G, Cambier D *Gait analysis with cognitive-motor dual tasks to distinguish fallers from nonfallers among rehabilitating stroke patients* pp680-686.

Chan L, Sandel ME, Jette AM, Appelman J, Brandt DE, Cheng P, TeSelle M, Delmonico R, Terdiman JR, Rasch EK *Does postacute care site matter? A longitudinal study assessing functional recovery after a stroke* pp622-629.

Chang FH, Coster WJ, Helfrich CA *Community participation measures for people with disabilities: a systematic review of content from an international classification of functioning, disability and health perspective* pp771-781.

Coote S, Hogan N, Franklin S *Falls in people with multiple sclerosis who use a walking aid: prevalence, factors, and effect of strength and balance interventions* pp616-621.

Fann J, Hart T *Depression after traumatic brain injury* pp801-802.

Hou WH, Liang HW, Sheu CF, Hsieh CL, Chuang HY *Return to work and quality of life in workers with traumatic limb injuries: a two year repeated-measurements study* pp703-710.

Hsu HW, Lee CL, Hsu MJ, Wu HC, Lin R, Hsieh CL, Lin JH *Effects of noxious versus innocuous thermal stimulation on lower extremity motor recovery three months after stroke* pp633-641.

Jan YK, Liao F, Jones MA, Rice LA, Tisdell T *Effect of durations of wheelchair tilt-in-space and recline on skin perfusion over the ischial tuberosity in people with spinal cord injury* pp667-672.

Levac DE, Galvin J *When Is virtual reality 'therapy'?* pp795-798.

Li L, Ye W, Ruan H, Yang B, Zhang S *Impact of hydrophilic catheters on urinary tract infections in people with spinal cord injury: systematic review and meta-analysis of randomized controlled trials* pp782-787.

Mark VW, Taub E, Uswatte G, Bashir K, Cutter GR, Bryson CC, Bishop-McKay S, Bowman MH *Constraint-induced movement therapy for the lower extremities in multiple sclerosis: case series with four year follow-up* pp753-760.

Rose MH, Løkkegaard A, Sonne-Holm S, Jensen BR *Improved clinical status, quality of life, and walking capacity in Parkinson's Disease after body weight-supported high-intensity locomotor training* pp687-692.

Rosenberg DE, Bombardier CH, Artherholt S, Jensen MP, Motl RW *Self-reported depression and physical activity in adults with mobility impairments* pp731-736.

White JH, Towers SE, Turner A, Hambridge J *Electronic screening and decision support for poststroke depression: an exploration of doctors' and patients' perceptions of acceptability* pp788-790.

Winter JM, Crome P, Sim J, Hunter SM *Effects of mobilization and tactile stimulation on chronic upper-limb sensorimotor dysfunction after stroke* pp693-702.

Volume 94:5

Bowden MG, Behrman AL, Neptune RR, Gregory CM, Kautz SA *Locomotor rehabilitation of individuals with chronic stroke: difference between responders and non-responders* pp856-860.

Carvalho C, Sunnerhagen KS, Willén C *Walking performance and muscle strength in the later stage poststroke: a nonlinear relationship* pp845-850.

Chang YJ, Liang JN, Hsu MJ, Lien HY, Fang CY, Lin CH *Effects of continuous passive motion on reversing the adapted spinal circuit in humans with chronic spinal cord injury* pp822-828.

Foley N, Pereira S, Salter K, Fernandez MM, Speechley M, Sequeira K, Miller T, Teasell R *Treatment with Botulinum Toxin improves upper-extremity function post stroke: a systematic review and meta-analysis* pp977-989.

Fornusek C, Davis GM, Russold MF *Pilot study of the effect of low-cadence Functional Electrical Stimulation cycling after spinal cord injury on thigh girth and strength* pp990-993.

González-Fernández M, Christian AB, Davis C, Hillis AE *Role of aphasia in discharge location after stroke* pp851-855.

van der Horn HJ, Spikman JM, Jacobs B, van der Naalt J *Postconcussive complaints, anxiety, and depression related to vocational outcome in minor to severe traumatic brain injury* pp867-874.

Houwink A, Nijland RH, Geurts AC, Kwakkel G *Functional recovery of the paretic upper limb after stroke: who regains hand capacity?* pp839-844.

Kim BR, Chun MH, Kim DY, Lee SJ *Effect of high- and low-frequency repetitive transcranial magnetic stimulation on visuospatial neglect in patients with acute stroke: a double-blind, sham-controlled trial* pp803-807.

Meulenkamp TM, Cardol M, van der Hoek LS, Francke AL, Rijken M *Participation of people with physical disabilities: three-year trend and potential for improvement* pp944-950.

Mueller MJ, Tuttle LJ, LeMaster JW, Strube MJ, McGill JB, Hastings MK, Sinacore DR *Weight-bearing versus nonweight-bearing exercise for persons with diabetes and peripheral neuropathy: a randomized controlled trial* pp829-838.

Nakase-Richardson R, Sherer M, Barnett SD, Yablon SA, Evans CC, Kretzmer T, Schwartz DJ, Modarres M *Prospective evaluation of the nature, course, and impact of acute sleep abnormality after traumatic brain injury* pp875-882.

Page SJ, Gauthier LV, White S *Size doesn't matter: cortical stroke lesion volume is not associated with upper extremity motor impairment and function in mild, chronic hemiparesis* pp817-821.

Peterson EW, Ari EB, Asano M, Finlayson ML *Fall attributions among middle-aged and older adults with multiple sclerosis* pp890-895.

Slaman J, Bussmann J, van der Slot WM, Stam HJ, Roebroeck ME, van den Berg-Emons RJ, Transition and Lifespan Research Group South West Netherlands *Physical strain of walking relates to activity level in adults with cerebral palsy* pp896-901.

Tang WK, Liang H, Mok V, Ungvari GS, Wong KS *Is pain associated with suicidality in stroke?* pp863-866.

Thanakiatpinyo T, Srisawasdi G *Effect of hand size on the stimulation intensities required for median and ulnar sensory nerve conduction studies* pp925-929.

van Vliet R, Hoang P, Lord S, Gandevia S, Delbaere K *Falls efficacy scale-international: a cross-sectional validation in people with multiple sclerosis* pp883-889.

Volume 94:6

Bland MD, Sturmoski A, Whitson M, Harris H, Connor LT, Fucetola R, Edmiaston J, Huskey T, Carter A, Kramper M, Corbetta M, Lang CE *Clinician adherence to a standardized assessment battery across settings and disciplines in a poststroke rehabilitation population* pp1048-1053.

Cao Y, Selassie AW, Krause JS *Risk of death after hospital discharge with traumatic spinal cord injury: a population-based analysis, 1998–2009* pp1054-1061.

Cook RJ, Berg K, Lee KA, Poss JW, Hirdes JP, Stolee P *Rehabilitation in home care is associated with functional improvement and preferred discharge* pp1038-1047.

Corrigan JD, Hammond FM *Traumatic brain injury as a chronic health condition* pp1199-1201.

Hauptfleisch J, Meagher TM, Hughes RJ, Singh JP, Graham A, Lopez de Heredia L *Interobserver agreement of magnetic resonance imaging signs of osteomyelitis in pelvic pressure ulcers in patients with spinal cord injury* pp1107-1111.

Jan YK, Crane BA *Wheelchair tilt-in-space and recline does not reduce sacral skin perfusion as changing from the upright to the tilted and reclined position in people with spinal cord injury* pp1207-1210.

Kenyon A, McEvoy M, Sprod J, Maher C *Validity of pedometers in people with physical disabilities: a systematic review* pp1161-1170.

Krishnan C, Kotsapouikis D, Dhaher YY, Rymer WZ *Reducing robotic guidance during robot-assisted gait training improves gait function: a case report on a stroke survivor* pp1202-1206.

Kubota S, Nakata Y, Eguchi K, Kawamoto H, Kamibayashi K, Sakane M, Sankai Y, Ochiai N *Feasibility of rehabilitation training with a newly developed wearable robot for patients with limited mobility* pp1080-1087.

Lawler K, Taylor NF, Shields N *Outcomes after caregiver-provided speech and language or other allied health therapy: a systematic review* pp1139-1160.

Medina-Mirapeix F, Del Baño-Aledo ME, Oliveira-Sousa SL, Escolar-Reina P, Collins SM *How the rehabilitation environment influences patient perception of service quality: a qualitative study* pp1112-1117.

de Mettelinge TR, Delbaere K, Calders P, Gysel T, van den Noortgate N, Cambier D *The impact of peripheral neuropathy and cognitive decrements on gait in older adults with Type 2 diabetes mellitus* pp1074-1079.

Pawlowski J, Dixon-Ibarra A, Driver S *Review of the status of physical activity research for individuals with traumatic brain injury* pp1184-1189.

Pyatak EA, Blanche EI, Garber SL, Diaz J, Blanchard J, Florindez L, Clark FA *Conducting intervention research among underserved populations: lessons learned and recommendations for researchers* pp1190-1198.

Satink T, Cup EH, Ilott I, Prins J, de Swart BJ, Nijhuis-van der Sanden MW *Patients' views on the impact of stroke on their roles and self: a thematic synthesis of qualitative studies* pp1171-1183.

Sheffler LR, Taylor PN, Gunzler DD, Buurke JH, IJzerman MJ, Chae J *Randomized controlled trial of surface peroneal nerve stimulation for motor relearning in lower limb hemiparesis* pp1007-1014.

Theurer JA, Johnston JL, Fisher J, Darling S, Stevens RC, Taves D, Teasell R, Hachinski V, Martin RE *Proof-of-principle pilot study of oropharyngeal air-pulse application in individuals with dysphagia after hemispheric stroke* pp1088-1094.

Wu CY, Huang PC, Chen YT, Lin KC, Yang HW *Effects of mirror therapy on motor and sensory recovery in chronic stroke: a randomized controlled trial* pp1023-1030.

Volume 94:7

Blikman LJ, Huisstede BM, Kooijmans H, Stam HJ, Bussmann JB, van Meeteren J *Effectiveness of energy conservation treatment in reducing fatigue in multiple sclerosis: a systematic review and meta-analysis* pp1360-1376.

Brasure M, Lamberty GJ, Sayer NA, Nelson NW, MacDonald R, Ouellette J, Wilt TJ *Participation after multidisciplinary rehabilitation for moderate to severe traumatic brain injury in adults: a systematic review* pp1398-1420.

Chen C, Koh GCH, Naidoo N, Cheong A, Fong NP, Tan YV, Chan KM, Tan BY, Menon E, Ee CH, Lee KK, Ng YS, Koh D, Chia KS, Teo YY *Trends in length of stay, functional outcomes, and discharge destination stratified by disease type for inpatient rehabilitation in Singapore community hospitals from 1996 to 2005* pp1342-1351.

Cicerone KD *Participation after multidisciplinary rehabilitation for moderate to severe traumatic brain injury in adults* pp1421-1423.

Goh EY, Chua SY, Hong SJ, Ng SS *Reliability and concurrent validity of Four Square Step test scores in subjects with chronic stroke: a pilot study* pp1306-1311.

van Koppenhagen CF, de Groot S, Post MW, Hoekstra T, van Asbeck FW, Bongers H, Lindeman E, van der Woude LH *Patterns of changes in wheelchair exercise capacity after spinal cord injury* pp1260-1267.

Langley J, Davie G, Wilson S, Lilley R, Ameratunga S, Wyeth E, Derrett S *Difficulties in functioning one year after injury: the role of pre-injury sociodemographic and health characteristics, health care and injury-related factors* pp1277-1286.

Nocera JR, Stegemöller EL, Malaty IA, Okun MS, Marsiske M, Hass CJ *National Parkinson Foundation Quality Improvement Initiative Investigators: Using the Timed Up and Go test in a clinical setting to predict falling in Parkinson's Disease* pp1300-1305.

Rice LA, Smith I, Kelleher AR, Greenwald K, Hoelmer C, Boninger ML *Impact of the Clinical Practice Guideline for preservation of upper limb function on transfer skills of persons with acute spinal cord injury* pp1230-1246.

Rose DK, Behrman AL, Nadeau SE, Martin AD, Schofield RS, Tilson JK, Cen SY, Lu X, Wu SS, Azen S, Duncan PW, LEAPS Investigative Team *Does exercise tolerance testing at 60 days poststroke predict rehabilitation performance?* pp1223-1229.

Schüssler-Fiorenza CM, Xie D, Pan Q, Stineman MG *Comparison of complex versus simple activity of daily living staging: validation of simple stages* pp1320-1327.

Stalder-Lüthy F, Messerli-Bürgy N, Hofer H, Frischknecht E, Znoj H, Barth J *Effect of psychological interventions on depressive symptoms in long-term rehabilitation after an acquired brain injury: a systematic review and meta-analysis* pp1386-1397.

Tyson SF, Kent RM *Effects of an ankle-foot orthosis on balance and walking after stroke: a systematic review and pooled meta-analysis* pp1377-1385.

Volume 94:8

Barbic SP, Bartlett SJ, Mayo NE *Emotional vitality: concept of importance for rehabilitation* pp1547-1554.

Cameron MH, Asano M, Bourdette D, Finlayson ML *People with multiple sclerosis use many fall prevention strategies but still fall frequently* pp1562-1566.

Dlugonski D, Pilutti LA, Sandroff BM, Suh Y, Balantrapu S, Motl RW *Steps per day among persons with multiple sclerosis: variation by demographic, clinical, and device characteristics* pp1534-1539.

Kressler J, Nash MS, Burns PA, Field-Fote EC *Metabolic responses to four different body weight-supported locomotor training approaches in persons with incomplete spinal cord injury* pp1436-1442.

Lee SC, Kang SW, Kim MT, Kim YK, Chang WH, Im SH *Correlation between voluntary cough and laryngeal cough reflex flows in patients with traumatic brain injury* pp1580-1583.

Mehta S, Hill D, McIntyre A, Foley N, Hsieh J, Ethans K, Teasell RW, Loh E, Welk B, Wolfe D *Meta-analysis of Botulinum Toxin A detrusor injections in the treatment of neurogenic detrusor overactivity after spinal cord injury* pp1473-1481.

Piernik-Yoder B, Ketchum N *Rehabilitation outcomes of stroke patients with and without diabetes* pp1508-1512.

Pistoia F, Sacco S, Carolei A, Sarà M *Corticomotor facilitation in vegetative state: results of a pilot study* pp1599-1606.

Postma K, Haisma JA, de Groot S, Hopman MT, Bergen MP, Stam HJ, Bussmann JB *Changes in pulmonary function during the early years after inpatient rehabilitation in persons with spinal cord injury: a prospective cohort study* pp1540-1546.

Shin S, Sosnoff JJ *Spinal cord injury and time to instability in seated posture* pp1615-1620.

Sosnoff JJ, Balantrapu S, Pilutti LA, Sandroff BM, Morrison S, Motl RW *Cognitive processing speed is related to fall frequency in older adults with multiple sclerosis* pp1567-1572.

Stein A, Panjwani A, Sison C, Rosen L, Chugh R, Metz C, Bank M, Bloom O *Pilot study: elevated circulating levels of the proinflammatory cytokine macrophage migration inhibitory factor in patients with chronic spinal cord injury* pp1498-1507.

Vuillerot C, Payan C, Iwaz J, Ecochard R, Bérard C, MFM Spinal Muscular Atrophy Study Group *Responsiveness of the motor function measure in patients with spinal muscular atrophy* pp1555-1561.

Woodbury ML, Velozo CA, Richards LG, Duncan PW *Rasch analysis staging methodology to classify upper extremity movement impairment after stroke* pp1527-1533.

Volume 94:9

Allen DD, Potter K *Measurement characteristics and clinical utility of the 12-item multiple sclerosis walking scale* pp1849-1850.

Altman IM, Swick S, Malec JF *Effectiveness of home- and community-based rehabilitation in a large cohort of patients disabled by cerebrovascular accident: evidence of a dose-response relationship* pp1837-1841.

Askari S, Kirby RL, Parker K, Thompson K, O'Neill J *Wheelchair Propulsion test: development and measurement properties of a new test for manual wheelchair users* pp1690-1698.

Carlozzi NE, Fyffe D, Morin KG, Byrne R, Tulsky DS, Victorson D, Lai JS, Wecht JM *Impact of blood pressure dysregulation on health-related quality of life in persons with spinal cord injury: development of a conceptual model* pp1721-1730.

Charbonneau R, Kirby RL, Thompson K *Manual wheelchair propulsion by people with hemiplegia: within-participant comparisons of forward versus backward techniques* pp1707-1713.

Denno MS, Gillard PJ, Graham GD, DiBonaventura MD, Goren A, Varon SF, Zorowitz R *Anxiety and depression associated with caregiver burden in caregivers of stroke survivors with spasticity* pp1731-1736.

Goldman HH *Commentary on measuring disability* pp1687-1689.

Lamb F, Anderson J, Saling M, Dewey H *Predictors of subjective cognitive complaint in postacute older adult stroke patients* pp1747-1752.

Latimer-Cheung AE, Martin Ginis KA, Hicks AL, Motl RW, Pilutti LA, Duggan M, Wheeler G, Persad R, Smith KM *Development of evidence-informed physical activity guidelines for adults with multiple sclerosis* pp1829-1836.

Latimer-Cheung AE, Pilutti LA, Hicks AL, Martin Ginis KA, Fenuta AM, MacKibbon KA, Motl RW *Effects of exercise training on fitness, mobility, fatigue, and health-related quality of life among adults with multiple sclerosis: a systematic review to inform guideline development* pp1800-1828.

Marfeo EE, Haley SM, Jette AM, Eisen SV, Ni P, Bogusz K, Meterko M, McDonough CM, Chan L, Brandt DE, Rasch EK *Conceptual foundation for measures of physical function and behavioral health function for social security work disability evaluation* pp1645-1652.

Marfeo EE, Ni P, Haley SM, Jette AM, Bogusz K, Meterko M, McDonough CM, Chan L, Brandt DE, Rasch EK *Development of an instrument to measure behavioural health function for work disability: item pool construction and factor analysis* pp1670-1678.

McDonough CM, Jette AM, Ni P, Bogusz K, Marfeo EE, Brandt DE, Chan L, Meterko M, Haley SM, Rasch EK *Development of a self-report physical function instrument for disability assessment: item pool construction and factor analysis* pp1653-1660.

Ni P, McDonough CM, Jette AM, Bogusz K, Marfeo EE, Rasch EK, Brandt DE, Meterko M, Haley SM, Chan L *Development of a computer-adaptive physical function instrument for social security administration disability determination* pp1661-1669.

Noreau L, Cobb J, Bélanger LM, Dvorak MF, Leblond J, Noonan VK *Development and assessment of a community follow-up questionnaire for the Rick Hansen Spinal Cord Injury Registry* pp1753-1765.

Triolo RJ, Bailey SN, Miller ME, Lombardo LM, Audu ML *Effects of stimulating hip and trunk muscles on seated stability, posture, and reach after spinal cord injury* pp1766-1775.

Zimmerli L, Jacky M, Lünenburger L, Riener R, Bolliger M *Increasing patient engagement during virtual reality-based motor rehabilitation* pp1737-1746.

Clinical Rehabilitation

Volume 27:3

Boyce M, Canning C, Mahant N, Morris J, Latimer J, Fung V *Active exercise for individuals with cervical dystonia: a pilot randomized controlled trial* pp226-235.

de Bruin E, van het Reve E, Murer K, *A randomized controlled pilot study assessing the feasibility of combined motor–cognitive training and its effect on gait characteristics in the elderly* pp215-225.

Jones L, Morris R *Experiences of adult stroke survivors and their parent carers: a qualitative study* pp272-280.

Rothwell K, Boaden R, Bamford D, Tyrrell P *Feasibility of assessing the needs of stroke patients after six months using the GM-SAT* pp264-271.

Volume 27:4

Holmes JD, Jenkins ME, Johnson AM, Hunt MA, Clark RA *Validity of the Nintendo Wii balance board for the assessment of standing balance in Parkinson's Disease* pp361-366.

Kloosterman MGM, Snoek GJ, van der Woude LHV, Buurke JH, Rietman JS *A systematic review on the pros and cons of using a pushrim-activated power-assisted wheelchair* pp299-313.

Simpson G, Jones K *How important is resilience among family members supporting relatives with traumatic brain injury or spinal cord injury?* pp367-377.

Thieme H, Bayn M, Wurg M, Zange C, Pohl M, Behrens J *Mirror therapy for patients with severe arm paresis after stroke: a randomized controlled trial* pp314-324.

Voume 27:5

Drummond AER, Whitehead P, Fellows K, Sprigg N, Sampson CJ, Edwards C, Lincoln, NB *Occupational therapy pre-discharge home visits for patients with a stroke (HOVIS): results of a feasibility randomized controlled trial* pp387-397.

Nyström A, Hellström K *Fall risk six weeks from onset of stroke and the ability of the Prediction of Falls in Rehabilitation Settings Tool and motor function to predict falls* pp473-479.

Takebayashi T, Koyama T, Amano S, Hanada K, Tabusadani M *et al* *A six month follow-up after constraint-induced movement therapy with and without transfer package for patients with hemiparesis after stroke: a pilot quasi-randomized controlled trial* pp418-426.

Thomas S, Walker M, Macniven J, Haworth H, Lincoln N *Communication and Low Mood (CALM): a randomized controlled trial of behavioural therapy for stroke patients with aphasia* pp398-408.

Volume 27:6

Chang LH, Wang J *Institutional contexts contribute to the low priority given to developing self-care independence in a rehabilitation ward: a qualitative study* pp538-545.

Huijben-Schoenmakers M, Rademaker A, Scherder E *Can practice undertaken by patients be increased simply through implementing agreed national guidelines? An observational study* pp513-520.

Page SJ, Hill V, White S *Portable upper extremity robotics is as efficacious as upper extremity rehabilitative therapy: a randomized controlled pilot trial* pp494-503.

Rodakowski J, Skidmore ER, Rogers JC, Schulz R *Does social support impact depression in caregivers of adults ageing with spinal cord injuries?* pp565-575.

Volume 27:7

Fong KNK, Yang NYH, Chan MKL, Chan DYL, Lau AFC, Chan CC *Combined effects of sensory cueing and limb activation on unilateral neglect in subacute left hemiplegic stroke patients: a randomized controlled pilot study* pp628-637.

Khalil H, Quinn L, van Deursen R, Dawes H, Playle R, Rosser A, Busse M *What effect does a structured home-based exercise programme have on people with Huntington's disease? A randomized, controlled pilot study* pp646-658.

Malhotra S, Rosewilliam S, Hermens H, Roffe C, Jones P *et al* *A randomized controlled trial of surface neuromuscular electrical stimulation applied early after acute stroke: effects on wrist pain, spasticity and contractures* pp579-590.

Mayo NE, MacKay-Lyons MJ, Scott SC, Moriello C, Brophy J *A randomized trial of two home-based exercise programmes to improve functional walking post-stroke* pp659-671.

Miller L, McIntee E, Mattison P *Evaluation of the effects of reflexology on quality of life and symptomatic relief in multiple sclerosis patients with moderate to severe disability; a pilot study* pp591-598.

Volume 27:8

Ashford S, Turner-Stokes L, Siegert R, Slade M *Initial psychometric evaluation of the Arm Activity Measure (ArmA): a measure of activity in the hemiparetic arm* pp728-740.

Cho HY, Kim JS, Lee GC *Effects of motor imagery training on balance and gait abilities in post-stroke patients: a randomized controlled trial* pp675-680.

Cobley CS, Fisher RJ, Chouliara N, Kerr M, Walker MF *A qualitative study exploring patients and carers experiences of Early Supported Discharge services after stroke* pp750-757.

Fisher RJ, Walker MF, Golton I, Jenkinson D *The implementation of evidence-based rehabilitation services for stroke survivors living in the community: the results of a Delphi consensus process* pp741-749.

Larson RD, Larson DJ, Baumgartner TB, White LJ *Repeatability of the timed 25-foot walk test for individuals with multiple sclerosis* pp719-723.

Volume 27:9

Hillsdon KM, Kersten P, Kirk HJ *A qualitative study exploring patients experiences of standard care or cardiac rehabilitation post minor stroke and transient ischaemic attack* pp845-853.

Northcott S, Hilari K *Stroke Social Network Scale: development and psychometric evaluation of a new patient-reported measure* pp823-833.

Paoloni M, Giovannelli M, Mangone M, Leonardi L, Tavernese E, Di Pangrazio E, Bernetti A, Santilli V, Pozzilli C *Does giving segmental muscle vibration alter the response to botulinum toxin injections in the treatment of spasticity in people with multiple sclerosis? A single-blind randomized controlled trial* pp803-812.

Tarakci E, Yeldan I, Huseyinsinoglu BE, Zenginler Y, Eraksoy M *Group exercise training for balance, functional status, spasticity, fatigue and quality of life in multiple sclerosis: a randomized controlled trial* pp813-822.

Tyson SF, Sadeghi-Demneh E, Nester CJ *The effects of transcutaneous electrical nerve stimulation on strength, proprioception, balance and mobility in people with stroke: a randomized controlled cross-over trial* pp785-791.

Volume 27:10

Carda S, Invernizzi M, Baricich A, Cognolato G, Cisari C *Does altering inclination alter effectiveness of treadmill training for gait impairment after stroke? A randomized controlled trial* pp932-938.

Lee SW, Cho KH, Lee WH *Effect of a local vibration stimulus training programme on postural sway and gait in chronic stroke patients: a randomized controlled trial* pp921-931.

Lennon S, McKenna S, Jones F *Self-management programmes for people post stroke: a systematic review* pp867-878.

Miklitsch C, Krewer C, Freivogel S, Steube D *Effects of a predefined mini-trampoline training programme on balance, mobility and activities of daily living after stroke: a randomized controlled pilot study* pp939-947.

Tyson SF, Sadeghi-Demneh E, Nester CJ *A systematic review and meta-analysis of the effect of an ankle-foot orthosis on gait biomechanics after stroke* pp879-891.

Disability and Rehabilitation

Volume 35:5

Asano M, Duquette P, Andersen R, Lapierre Y, Mayo NE *Exercise barriers and preferences among women and men with multiple sclerosis* pp353-361.

Drulovic J, Bursac LO, Milojkovic D, Tepavcevic DK, Gazibara T, Pekmezovic T *MSQoL-54 predicts change in fatigue after inpatient rehabilitation for people with multiple sclerosis* pp362-366.

Lauhoff P, Murphy N, Doherty C, Horgan NF *A controlled clinical trial investigating the effects of cycle ergometry training on exercise tolerance, balance and quality of life in patients with Parkinson's Disease* pp382-387.

Nierse CJ, Abma TA, Horemans AM, van Engelen BG *Research priorities of patients with neuromuscular disease* pp405-412.

Riberto M, Lopes KA, Chiappetta LM, Lourenção MI, Battistella LR *The use of the comprehensive International Classification of Functioning, Disability and Health core set for stroke for chronic outpatients in three Brazilian rehabilitation facilities* pp367-374.

Volume 35:6

Donnellan C, Martins A, Conlon A, Coughlan T, O'Neill D, Collins DR *Mapping patients' experiences after stroke onto a patient-focused intervention framework* pp483-491.

Karhula ME, Kanelisto KJ, Ruutiainen J, Hämäläinen PI, Salminen AL *The activities and participation categories of the ICF Core Sets for multiple sclerosis from the patient perspective* pp492-497.

Peters GO, Buni SG, Oyeyemi AY, Hamzat TK *Determinants of return to work among Nigerian stroke survivors* pp455-459.

de Rooij A, Roorda LD, Otten RH, van der Leeden M, Dekker J, Steultjens MP *Predictors of multidisciplinary treatment outcome in fibromyalgia:a systematic review* pp437-449.

Zaben M, El Ghoul W, Belli A *Post-traumatic head injury pituitary dysfunction* pp522-525.

Volume 35:7

Bryant MS, Rintala DH, Hou JG, Protas EJ *Reliability of the non-instrumented walk test in persons with Parkinson's Disease* pp538-542.

Graven C, Sansonetti D, Moloczij N, Cadilhac D, Joubert L *Stroke survivor and carer perspectives of the concept of recovery: a qualitative study* pp578-585.

Lawrence M, Kinn S *Needs, priorities, and desired rehabilitation outcomes of family members of young adults who have had a stroke: findings from a phenomenological study* pp586-595.

Simkhada PP, Shyangdan D, van Teijlingen ER, Kadel S, Stephen J, Gurung T *Women's knowledge of and attitude towards disability in rural Nepal* pp606-613.

Strauser D, Wagner S, Wong AW, O'Sullivan D *Career readiness, developmental work personality and age of onset in young adult central nervous system survivors* pp543-550.

Volume 35:8

Phillips J, Kneebone II, Taverner B *Breaking bad news in stroke rehabilitation: a consultation with a community stroke team* pp694-701.

Volume 35:9

Bamm EL, Rosenbaum P, Wilkins S *Is Health Related Quality Of Life of people living with chronic conditions related to patient satisfaction with care?* pp766-774.

Burke SM, Utley A *Climbing towards recovery: investigating physically injured combat veterans' psychosocial response to scaling Mt Kilimanjaro* pp732-739.

Patel S, Alavi Y, Lindfield R, Kuper H *The impact of rehabilitative services in the lives of adults and children with disabilities, in low-income and middle-income countries: an assessment of the quality of the evidence* pp703-712.

Sandroff BM, Motl RW *Comparison of ActiGraph activity monitors in persons with multiple sclerosis and controls* pp725-731.

Snoeys L, Vanhoof G, Manders E *Living with locked-in syndrome: an explorative study on health care situation, communication and quality of life* pp713-718.

Sveen U, Ostensjo S, Laxe S, Soberg HL *Problems in functioning after a mild traumatic brain injury within the ICF framework: the patient perspective using focus groups* pp749-757.

Volume 35:10

Burton LJ, Tyson S, McGovern A *Staff perceptions of using outcome measures in stroke rehabilitation* pp828-834.

Combs SA, Van Puymbroeck M, Altenburger PA, Miller KK, Dierks TA, Schmid AA *Is walking faster or walking farther more important to persons with chronic stroke?* pp860-867.

Fliess-Douer O, Vanlandewijck YC, van der Woude LH *Reliability and validity of perceived self-efficacy in wheeled mobility scale among elite wheelchair-dependent athletes with a spinal cord injury* pp851-859.

van Hal L, Meershoek A, Nijhuis F, Horstman K *A sociological perspective on 'the unmotivated client': public accountability and professional work methods in vocational rehabilitation* pp809-818.

Latimer SF, Wilson FC, McCusker CG, Caldwell SB, Rennie I *Subarachnoid haemorrhage (SAH): long-term cognitive outcome in patients treated with surgical clipping or endovascular coiling* pp845-850.

Volume 35:11

Chan J, Winter A, Palit M, Sturt R, Graaff Sd, Holland AE *Are gait and mobility measures responsive to change following botulinum toxin injections in adults with lower limb spasticity?* pp959-967.

Chen P, McKenna C, Kutlik AM, Frisina PG *Interdisciplinary communication in inpatient rehabilitation facility: evidence of under-documentation of spatial neglect after stroke* pp1033-1038.

Kosmala-Anderson J, Wallace LM *A qualitative study of the childbearing experience of women living with multiple sclerosis* pp976-981.

McKenna A, Wilson FC, Caldwell S, Curran D, Nagaria J, Convery F, Storey L *Decompressive hemicraniectomy following malignant middle cerebral artery infarctions: a mixed methods exploration of carer experience and level of burden* pp995-1005.

Wheatley-Smith L, McGuinness S, Colin Wilson F, Scott G, McCann J, Caldwell S *Intensive physiotherapy for vegetative and minimally conscious state patients: a retrospective audit and analysis of therapy intervention* pp1006-1014.

Volume 35:12

Ng A, Kennedy P, Hutchinson B, Ingram A, Vondrell S, Goodman T, Miller D *Self-efficacy and health status improve after a wellness program in persons with multiple sclerosis* pp1039-1044.

Volume 35:13

Adriaansen JJ, van Asbeck FW, Lindeman E, van der Woude LH, de Groot S, Post MW *Secondary health conditions in persons with a spinal cord injury for at least 10 years: design of a comprehensive long-term cross-sectional study* pp1104-1110.

Bakkum AJ, de Groot S, van der Woude LH, Janssen TW *The effects of hybrid cycle training in inactive people with long-term spinal cord injury: design of a multi-center randomized controlled trial* pp1127-1132.

Kellett D, Mpofu E, Madden R *Reflective action assessment with a prospective clinical problem-solving tool in the context of rehabilitation medicine: an illustrative case study* pp1048-1054.

Kooijmans H, Post MW, van der Woude LH, de Groot S, Stam HJ, Bussmann JB *Randomized controlled trial of a self-management intervention in persons with spinal cord injury: design of the HABITS (Healthy Active Behavioural Intervention in SCI) study* pp1111-1118.

Madden R, Fortune N, Cheeseman D, Mpofu E, Bundy A *Fundamental questions before recording or measuring functioning and disability* pp1092-1096.

Madden RH, Llewellyn G, Stucki G *Think before you measure* pp1045-1047.

Mpofu E *Qualities of life design measures with chronic illness or disability* pp1055-1058.

van der Scheer JW, de Groot S, Postema K, Veeger DH, van der Woude LH *Design of a randomized-controlled trial on low-intensity aerobic wheelchair exercise for inactive persons with chronic spinal cord injury* pp1119-1126.

van der Woude LH, de Groot S, Postema K, Bussmann JB, Janssen TW; ALLRISC, Post MW *Active LifestyLe Rehabilitation interventions in aging spinal cord injury (ALLRISC): a multicentre research program* pp1097-1103.

Volume 35:14

Browne AL, Appleton S, Fong K, Wood F, Coll F, de Munck S, Newnham E, Schug SA *A pilot randomized controlled trial of an early multidisciplinary model to prevent disability following traumatic injury* pp1149-1163.

Hale LA, Mulligan HF, Treharne GJ, Smith CM *The feasibility and short-term benefits of Blue Prescription: a novel intervention to enable physical activity for people with multiple sclerosis* pp1213-1220.

Nunnerley JL, Hay-Smith EJ, Dean SG *Leaving a spinal unit and returning to the wider community: an interpretative phenomenological analysis* pp1164-1173.

Smith CM, Hale LA, Mulligan HF, Treharne GJ *Participant perceptions of a novel physiotherapy approach ('Blue Prescription') for increasing levels of physical activity in people with multiple sclerosis: a qualitative study following intervention* pp1174-1181.

Tate DG, Forchheimer MB, Karana-Zebari D, Chiodo AE, Kendall Thomas JY *Depression and pain among inpatients with spinal cord injury and spinal cord disease: differences in symptoms and neurological function* pp1204-1212.

Wolf T, Koster J *Perceived recovery as a predictor of physical activity participation after mild stroke* pp1143-1148.

Volume 35:15

Dunn JA, Hay-Smith EJ, Whitehead LC, Keeling S *Liminality and decision making for upper limb surgery in tetraplegia: a grounded theory* pp1293-1301.

Moll LR, Cott CA *The paradox of normalization through rehabilitation: growing up and growing older with cerebral palsy* pp1276-1283.

Morley A, Tod A, Cramp M, Mawson S *The meaning of spasticity to people with multiple sclerosis: what can health professionals learn?* pp1284-1292.

Phan PL, Blennerhassett JM, Lythgo N, Dite W, Morris ME *Over-ground walking on level and sloped surfaces in people with stroke compared to healthy matched adults* pp1302-1307.

Stevelink SA, van Brakel WH *The cross-cultural equivalence of participation instruments: a systematic review* pp1256-1268.

Volume 35:16

Devos H, Brijs T, Alders G, Wets G, Feys P *Driving performance in persons with mild to moderate symptoms of multiple sclerosis* pp1387-1393.

Grawburg M, Howe T, Worrall L, Scarinci N *Third-party disability in family members of people with aphasia: a systematic review* pp1324-1341.

Gustafsson L, Bootle K *Client and carer experience of transition home from inpatient stroke rehabilitation* pp1380-1386.

Hitzig SL, Noreau L, Balioussis C, Routhier F, Kairy D, Craven BC *The development of the spinal cord injury participation and quality of life (PAR-QoL) toolkit* pp1408-1414.

Sorita E, N'kaoua B, Larrue F, Criquillon J, Simion A, Sauzéon H, Joseph PA, Mazaux JM *Do patients with traumatic brain injury learn a route in the same way in real and virtual environments?* pp1371-1379.

Volume 35:17

Boger EJ, Demain S, Latter S *Self-management: a systematic review of outcome measures adopted in self-management interventions for stroke* pp1415-1428.

Hay-Smith EJ, Dickson B, Nunnerley J, Anne Sinnott K *'The final piece of the puzzle to fit in': an interpretative phenomenological analysis of the return to employment in New Zealand after spinal cord injury* pp1436-1446.

Klinke ME, Wilson ME, Hafsteinsdóttir TB, Jónsdóttir H *Recognizing new perspectives in eating difficulties following stroke: a concept analysis* pp1491-1500.

Nogueira LA, Teixeira L, Sabino P, Filho HA, Alvarenga RM, Thuler LC *Gait characteristics of multiple sclerosis patients in the absence of clinical disability* pp1472-1478.

Volume 35:18

Ashford S, Slade M, Turner-Stokes L *Conceptualisation and development of the arm activity measure (ArmA) for assessment of activity in the hemiparetic arm* pp1513-1518.

Leong BK, Mazlan M, Abd Rahim RB, Ganesan D *Concomitant injuries and its influence on functional outcome after traumatic brain injury* pp1546-1551.

Zidarov D, Thomas A, Poissant L *Knowledge translation in physical therapy: from theory to practice* pp1571-1577.

Volume 35:19

Eyssen IC, Steultjens MP, de Groot V, Steultjens EM, Knol DL, Polman CH, Dekker J *A cluster randomised controlled trial on the efficacy of client-centred occupational therapy in multiple sclerosis: good process, poor outcome* pp1636-1646.

Hart T, Brockway JA, Whyte J, Bell KR, Neuberger S, Chervoneva I *Analyzing the ingredients of a telephone counselling intervention for traumatic brain injury* pp1668-1675.

Kapoor S *Nordic walking and its clinical benefits in different disorders* p1676.

Volume 35:20

Neven A, Janssens D, Alders G, Wets G, Van Wijmeersch B, Feys P *Documenting outdoor activity and travel behaviour in persons with neurological conditions using travel diaries and GPS tracking technology: a pilot study in multiple sclerosis* pp1718-1725.

Physical Therapy

Volume 93:3

Hayward LM, Black LL, Mostrom E, Jensen GM, Ritzline PD, Perkins J *The first two years of practice: a longitudinal perspective on the learning and professional development of promising novice physical therapists* pp369-383.

Said CM, Galea MP, Lythgo N *People with stroke who fail an obstacle crossing task have a higher incidence of falls and utilize different gait patterns compared with people who pass the task* pp334-344.

Volume 93:4

Bhatt T, Yang F, Mak MKY, Hui-Chan CWY, Pai YC *Effect of externally cued training on dynamic stability control during the sit-to-stand task in people with Parkinson's Disease* pp492-503.

Duncan RP, Leddy AL, Cavanaugh JT, Dibble LE, Ellis TD, Ford MP, Foreman KB, Earhart GM *Comparative utility of the BESTest, Mini-BESTest, and Brief-BESTest for predicting falls in individuals with Parkinson's Disease: a cohort study* pp542-550.

Gunn HJ, Newell P, Haas B, Marsden JF, Freeman JA *Identification of risk factors for falls in multiple sclerosis: a systematic review and meta-analysis* pp504-513.

Nijland RHM, van Wegen EEH, Harmeling-van der Wel BC, Kwakkel G for the Early Prediction of Functional Outcome After Stroke (EPOS) Investigators *Accuracy of physical therapists' early predictions of upper-limb function in hospital stroke units: The EPOS study* pp460-469.

Roberts LC, Whittle CT, Cleland J, Wald M *Measuring verbal communication in initial physical therapy encounters* pp479-491.

Volume 93:5

Deng H, Kimberley TJ, Durfee WK, Dressler BL, Steil C, Carey JR *Combined statistical analysis method assessing fast versus slow movement training in a patient with cerebellar stroke: a single-case study* pp649-660.

Ellis T, Boudreau JK, DeAngelis TR, Brown LE, Cavanaugh JT, Earhart GM, Ford MP, Foreman KB, Dibble LE *Barriers to exercise in people with Parkinson's Disease* pp628-636.

Elston B, Goldstein M, Makambi KH *Item response theory analysis of the Outpatient Physical Therapy Improvement in Movement Assessment Log (OPTIMAL)* pp661-671.

Hsueh IP, Chen JH, Wang CH, Hou WH, Hsieh CL *Development of a computerized adaptive test for assessing activities of daily living in outpatients with stroke* pp681-693.

Robinson CA, Matsuda PN, Ciol MA, Shumway-Cook A *Participation in community walking following stroke: the influence of self-perceived environmental barriers* pp620-627.

Volume 93:6

Bernhardsson S, Larsson MEH *Measuring evidence-based practice in physical therapy: translation, adaptation, further development, validation, and reliability test of a questionnaire* pp819-832.

Dye DC, Eakman AM, Bolton KM *Assessing the validity of the Dynamic Gait Index in a balance disorders clinic: an application of Rasch Analysis* pp809-818.

Padgett PK, Kasser SL *Exercise for managing the symptoms of multiple sclerosis* pp723-728.

Pang MYC, Yang FZH, Jones AYM *Vascular elasticity and grip strength are associated with bone health of the hemiparetic radius in people with chronic stroke: implications for rehabilitation* pp774-785.

Yu WH, Chen KL, Chou YT, Hsueh IP, Hsieh CL *Responsiveness and predictive validity of the hierarchical balance short forms in people with stroke* pp798-808.

Volume 93:7

Engel HJ, Tatebe S, Alonzo PB, Mustille RL, Rivera MJ *Physical therapist–established intensive care unit early mobilization program: quality improvement project for critical care at the University of California San Francisco Medical Center* pp975-985.

Janssen J, Hale L, Mirfin-Veitch B, Harland T *Building the research capacity of clinical physical therapists using a participatory action research approach* pp923-934.

Johnson L, Burridge JH, Demain SH *Internal and external focus of attention during gait re-education: an observational study of physical therapist practice in stroke rehabilitation* pp957-966.

Kleffelgaard I, Roe C, Sandvik L, Hellstrom T, Soberg HL *Measurement properties of the high-level mobility assessment tool for mild traumatic brain injury* pp900-910.

Quinn L, Khalil H, Dawes D, Fritz NE, Kegelmeyer D, Kloos AD, Gillard JW, Busse M for the Outcome Measures Subgroup of the European Huntington's Disease Network *Reliability and minimal detectable change of physical performance measures in individuals with pre-manifest and manifest Huntington disease* pp942-956.

Volume 93:8

Gui MS, Pedroni CR, Martins Aquino LM, Pimentel MJ, Alves MC, Rossini S, Reimão R, Berzin F, Marques AP, Rizzatti-Barbosa CM *Facial pain associated with fibromyalgia can be marked by abnormal neuromuscular control: a cross-sectional study* pp1092-1101.

Motl RW, McAuley E, Sandroff BM *Longitudinal change in physical activity and its correlates in relapsing-remitting multiple sclerosis* pp1037-1048.

Phonthee S, Saengsuwan J, Siritaratiwat W, Amatachaya S *Incidence and factors associated with falls in independent ambulatory individuals with spinal cord injury: a six month prospective study* pp1061-1072.

Tsang CSL, Liao LR, Chung RCK, Pang MYC *Psychometric properties of the Mini-Balance Evaluation Systems Test (Mini-BESTest) in community-dwelling individuals with chronic stroke* pp1102-1115.

Volume 93:9

Aiken A *The unique health and rehabilitation needs of those who serve or have served* p1157.

Goffar SL, Reber RJ, Christiansen BC, Miller RB, Naylor JA, Rodriguez BM, Walker MJ, Teyhen DS *Changes in dynamic plantar pressure during loaded gait* pp1175-1184.

Scherer MR, Weightman MM, Radomski MV, Davidson LF, McCulloch KL *Returning service members to duty following mild traumatic brain injury: exploring the use of dual-task and multitask assessment methods* pp1254-1267.

Physiotherapy Research International

Volume 18:1

Aguilar A, Stupans I, Scutter S, King S *Exploring the professional values of Australian physiotherapists* pp27–36.

Kwakkel G on behalf of the EXPLICIT-stroke consortium *Characterizing the protocol for early modified constraint-induced movement therapy in the EXPLICIT-Stroke trial* pp1–15.

MacPherson MM, MacArthur L, Jadan P, Glassman L, Bouzubar FF, Hamdan E, Landry MD *A SWOT analysis of the physiotherapy profession in Kuwait* pp37–46.

Nijland R, van Wegen E, van der Krogt H, Bakker C, Buma F, Klomp A, van Kordelaar J, Pearson J, Richardson J, Calnan M, Salisbury C, Foster N *Acceptability to patients of PhysioDirect telephone advice and treatment services: a qualitative investigation* p63.

Volume 18:2

Alsalaheen BA, Whitney SL, Mucha A, Morris LO, Furman JM, Sparto PJ *Exercise prescription patterns in patients treated with vestibular rehabilitation after concussion* pp100–108.

Jones F, Livingstone E, Hawkes L *Getting the balance between encouragement and taking over – reflections on using a new stroke self-management programme* pp91–99.

Langhammer B, Verheyden G *Stroke rehabilitation: issues for physiotherapy and physiotherapy research to improve life after stroke* pp65–69.

Volume 18:3

Almalty AMR, Hamed SH, Al-Dabbak FM, Shallan AE *Short-term and long-term effects of electrical stimulation on skin properties* pp157–166.

Ashford S, Turner-Stokes L *Systematic review of upper-limb function measurement methods in Botulinum Toxin intervention for focal spasticity* pp178–189.

Physiotherapy Theory and Practise

Volume 29:3

Danzl MM, Hunter EG *Perceived value of stroke outcome measures across the post-acute care continuum: A qualitative case study* pp202–210.

Finley M, Combs S *User perceptions of gaming interventions for improving upper extremity motor function in persons with chronic stroke* pp195–201.

Plani N, Becker P, van Aswegen H *The use of a weaning and extubation protocol to facilitate effective weaning and extubation from mechanical ventilation in patients suffering from traumatic injuries: A non-randomized experimental trial comparing a prospective to retrospective cohort* pp211–221.

Volume 29:4

Aaslund MK, Helbostad JL, Rolf Moe-Nilssen R *Walking during body-weight-supported treadmill training and acute responses to varying walking speed and body-weight support in ambulatory patients post-stroke* pp278–289.

Abbott A, Halvorsen M, Dedering Å *Is there a need for cervical collar usage post anterior cervical decompression and fusion using interbody cages? A randomized controlled pilot trial* pp290–300.

Dennis D, Mullins R *Guillain–Barre syndrome patient's satisfaction with physiotherapy: a two-part observational study* pp301–308.

Kelley CP, Childress J, Noser EA *Management of skin-related adverse events during locomotor training with robotic-assisted body weight supported treadmill: a case report* pp309–318.

Volume 29:5

Askim T, Indredavik B, Engen A, Roos K, Aas T, Mørkved S *Physiotherapy after stroke: To what extent is task-oriented practice a part of conventional treatment after hospital discharge?* pp343–350.

Harvey LA, Chu J, Adams R, Batty J, Barratt D, Kwok S *Accuracy of physiotherapists' predictions for mobility outcomes at one-year post spinal cord injury* pp393–400.

Volume 29:6

Omu O, Reynolds F *Life satisfaction and self-efficacy in patients affected by a first stroke living in Kuwait: a two-phase study* pp443–456.

Volume 29:7

Levac DE, Miller PA *Integrating virtual reality video games into practice: clinicians' experiences* pp504–512.

Patton N, Higgs J, Smith M *Using theories of learning in workplaces to enhance physiotherapy clinical education* pp493–503.

Stroke

Volume 44:3

van Dalen JW, Moll van Charante EP, Nederkoorn PJ, van Gool WA, Richard E *Poststroke apathy* pp851-860.

Lapchak PA *Recommendations and practices to optimize stroke therapy: developing effective translational research programs* pp841-843.

Mead GE, Hsieh CF, Lee R, Kutlubaev M, Claxton A, Hankey GJ, Hackett M *Selective serotonin reuptake inhibitors for stroke recovery: a systematic review and meta-analysis* pp844-850.

Trupe LA, Varma DD, Gomez Y, Race D, Leigh R, Hillis AE, Gottesman RF *Chronic apraxia of speech and Broca's area* pp740-744.

Volume 44:4

Albright KC, Boehme AK, Mullen MT, Seals S, Grotta JC, Savitz SI *Changing demographics at a comprehensive stroke center amidst the rise in primary stroke centers* pp1117-1123.

Ayerbe L, Ayis S, Crichton S, Wolfe CD, Rudd AG *The natural history of depression up to 15 years after stroke: the South London Stroke Register* pp1105-1110.

Fazekas F, Wardlaw JM *The origin of white matter lesions: a further piece to the puzzle* pp951-952.

Gordon CD, Wilks R, McCaw-Binns A *Effect of aerobic exercise (walking) training on functional status and health-related quality of life in chronic stroke survivors: a randomized controlled trial* pp1179-1181.

Hess DC, Hoda MN, Bhatia K *Remote limb preconditioning and postconditioning: will it translate into a promising treatment for acute stroke?* pp1191-1197.

Jang SH, Chang CH, Lee J, Kim CS, Seo JP, Yeo SS *Functional role of the corticoreticular pathway in chronic stroke patients* pp1099-1104.

Kleindorfer DO, Khatri P *Understanding the remarkable decline in stroke mortality in recent decades* pp949-950.

Stewart JC, Cramer SC *Patient-reported measures provide unique insights into motor function after stroke* pp1111-1116.

Volume 44:5

Broderick JP, Schroth G *What the SWIFT and TREVO II trials tell us about the role of endovascular therapy for acute stroke* pp1761-1764.

Van Hooff RJ, De Smedt A, De Raedt S, Moens M, Mariën P, Paquier P, De Keyser J, Brouns R *Unassisted assessment of stroke severity using telemedicine* pp1249-1255.

Howells DW, Macleod MR *Evidence-based translational medicine* pp1466-1471.

Kliper E, Bashat DB, Bornstein NM, Shenhar-Tsarfaty S, Hallevi H, Auriel E, Shopin L, Bloch S, Berliner S, Giladi N, Goldbourt U, Shapira I, Korczyn AD, Assayag EB *Cognitive decline after stroke: relation to inflammatory biomarkers and hippocampal volume* pp1433-1435.

Kluding PM, Dunning K, O'Dell MW, Wu SS, Ginosian J, Feld J, McBride K *Foot drop stimulation versus ankle foot orthosis after stroke: 30 week outcomes* pp1660-1669.

Kokubo Y, Iso H, Saito I, Yamagishi K, Yatsuya H, Ishihara J, Inoue M, Tsugane S *The impact of green tea and coffee consumption on the reduced risk of stroke incidence in Japanese population: the Japan public health center-based study cohort* pp1369-1374.

Liu J, Wang LN *Gamma aminobutyric acid (GABA) receptor agonists for acute stroke* ppe65-e66.

Mortimer AM, Simpson E, Bradley MD, Renowden SA *Computed tomography angiography in hyperacute ischemic stroke: prognostic implications and role in decision-making* pp1480-1488.

O'Donnell MJ, Diener HC, Sacco RL, Panju AA, Vinisko R, Yusuf S; PRoFESS Investigators *Chronic pain syndromes after ischemic stroke: PRoFESS trial* pp1238-1243.

Papavasileiou V, Milionis H, Michel P, Makaritsis K, Vemmou A, Koroboki E, Manios E, Vemmos K, Ntaios G *ASTRAL score predicts five year dependence and mortality in acute ischemic stroke* pp1616-1620.

Schaapsmeerders P, Maaijwee NA, van Dijk EJ, Rutten-Jacobs LC, Arntz RM, Schoonderwaldt HC, Dorresteijn LD, Kessels RP, de Leeuw FE *Long-term cognitive impairment after first-ever ischemic stroke in young adults* pp1621-1628.

Sung WH, Wang CP, Chou CL, Chen YC, Chang YC, Tsai PY *Efficacy of coupling inhibitory and facilitatory repetitive transcranial magnetic stimulation to enhance motor recovery in hemiplegic stroke patients* pp1375-1382.

Taub E, Uswatte G, Mark VW, Morris DM, Barman J, Bowman MH, Bryson C, Delgado A, Bishop-McKay S *Method for enhancing real-world use of a more affected arm in chronic stroke: transfer package of constraint-induced movement therapy* pp1383-1388.

Zhao S, Zhao M, Xiao T, Jolkkonen J, Zhao C *Constraint-induced movement therapy overcomes the intrinsic axonal growth-inhibitory signals in stroke rats* pp1698-1705.

Volume 44:6 supplement 1

Boden-Albala B, Quarles LW *Education strategies for stroke prevention* ppS48-S51.

Broderick JP *Devices and clinical trials: overview and equipoise* ppS3-S6.

Grotta JC *Stroke Progress Review Group: summary of successes and lack of progress* ppS111-S113.

Howard VJ *Reasons underlying racial differences in stroke incidence and mortality* ppS126-S128.

Jones TA, Allred RP, Jefferson SC, Kerr AL, Woodie DA, Cheng SY, Adkins DL *Motor system plasticity in stroke models: intrinsically use-dependent, unreliably useful* ppS104-S106.

Kim AS, Johnston SC *Temporal and geographic trends in the global stroke epidemic* ppS123-S125.

Rowley HA *The alphabet of imaging in acute stroke: does it spell improved selection and outcome?* ppS53-S54.

Saver JL *The evolution of technology* ppS13-S15.

Volume 44:7

Chung C, Pollock A, Campbell T, Durward B, Hagen S *Cognitive rehabilitation for executive dysfunction in adults with stroke or other adult non-progressive acquired brain damage* ppe77-e78.

Iaci JF, Parry TJ, Huang Z, Finklestein SP, Ren J, Barrile DK, Davenport MD, Wu R, Blight AR, Caggiano AO *Dalfampridine improves sensorimotor function in rats with chronic deficits after middle cerebral artery occlusion* pp1942-1950.

Kulshreshtha A, Vaccarino V, Judd SE, Howard VJ, McClellan WM, Muntner P, Hong Y, Safford MM, Goyal A, Cushman M *Life's Simple 7 and risk of incident stroke: the reasons for geographic and racial differences in stroke study* pp1909-1914.

Liu Z, Chopp M, Ding X, Cui Y, Li Y *Axonal remodeling of the corticospinal tract in the spinal cord contributes to voluntary motor recovery after stroke in adult mice* pp1951-1956.

Reijmer YD, Freeze WM, Leemans A, Biessels GJ; Utrecht *Vascular Cognitive Impairment Study Group The effect of lacunar infarcts on white matter tract integrity* pp2019-2021.

Rist PM, Chalmers J, Arima H, Anderson C, Macmahon S, Woodward M, Kurth T, Tzourio C *Baseline cognitive function, recurrent stroke, and risk of dementia in patients with stroke* pp1790-1795.

Stinear C, Ackerley S, Byblow W *Rehabilitation is initiated early after stroke, but most motor rehabilitation trials are not: a systematic review* pp2039-2045.

Volume 44:8

Bhalla A, Wang Y, Rudd A, Wolfe CD *Differences in outcome and predictors between ischemic and intracerebral hemorrhage: the South London Stroke Register* pp2174-2181.

Garrison KA, Aziz-Zadeh L, Wong SW, Liew SL, Winstein CJ *Modulating the motor system by action observation after stroke* pp2247-2253.

Harrison TC, Silasi G, Boyd JD, Murphy TH *Displacement of sensory maps and disorganization of motor cortex after targeted stroke in mice* pp2300-2306.

Sucharew H, Khoury J, Moomaw CJ, Alwell K, Kissela BM, Belagaje S, Adeoye O, Khatri P, Woo D, Flaherty ML, Ferioli S, Heitsch L, Broderick JP, Kleindorfer D *Profiles of the National Institutes of Health Stroke Scale items as a predictor of patient outcome* pp2182-2187.

Stroke literature synopses: basic science ppe89.

Sucharew H, Khoury J, Moomaw CJ, Alwell K, Kissela BM, Belagaje S, Adeoye O, Khatri P, Woo D, Flaherty ML, Ferioli S, Heitsch L, Broderick JP, Kleindorfer D Profiles of the Thiel A, Hartmann A, Rubi-Fessen I, Anglade C, Kracht L, Weiduschat N, Kessler J, Rommel T, Heiss WD *Effects of non-invasive brain stimulation on language networks and recovery in early poststroke aphasia* pp2240-2246.

Vickrey BG, Brott TG, Koroshetz WJ; Stroke Research Priorities Meeting Steering Committee and the National Advisory Neurological Disorders and Stroke Council; National Institute of Neurological Disorders and Stroke *Research priority setting: a summary of the 2012 NINDS Stroke Planning Meeting Report* pp2338-2342.

Volume 44:9

Barreto AD, Pedroza C, Grotta JC *Adjunctive medical therapies for acute stroke thrombolysis: is there a CLEAR-ER choice?* pp2377-2379.

van Delden AL, Peper CL, Nienhuys KN, Zijp NI, Beek PJ, Kwakkel G *Unilateral versus bilateral upper limb training after stroke: the Upper Limb Training After Stroke Clinical trial* pp2613-2616.

Jenkinson C, Fitzpatrick R, Crocker H, Peters M *The Stroke Impact Scale: validation in a UK setting and development of a SIS short form and SIS index* pp2532-2535.

McDonnell MN, Hillier SL, Hooker SP, Le A, Judd SE, Howard VJ *Physical activity frequency and risk of incident stroke in a national US study of blacks and whites* pp2519-2524.

Resources of interest

Useful websites

How does experience change the brain?
www.thersa.org/events/video/archive/elizabeth-gould

UK Acquired Brain Injury Forum
http://ukabif.org.uk

The International Network of SCI physiotherapists (SCIPT)
http://www.scipt.org

EBRSR: Evidence-Based Review of Stroke Rehabilitation
http://ebrsr.com/index.php

The Internet Stroke Centre
www.strokecenter.org

Stroke Improvement Programme
www.improvement.nhs.uk/stroke

WHO community based rehabilitation guidelines
www.who.int/disabilities/cbr/guidelines/en/index.html

Patient opinion
www.patientopinion.org.uk

NHS Outcomes Framework
www.gov.uk/government/publications/nhs-outcomes-framework-2012-to-2013

Parkinson's Disease
www.parkinsons-voices.eu

Exercises
www.physiotherapyexercises.com

Regional reports

East Anglia

Tabitha Mathers

The East Anglia membership continues to be strong, and members have opportunity to access a wide range of subjects at courses and talks.

The AGM in May saw Professor John Saxton delivering an excellent talk on 'A pragmatic intervention designed to promote sustained exercise behaviour change in people with MS'. There is soon to be a repeat of the highly successful 'Connective Tissue and Fascia' course, held at Addenbrookes at the end of August, followed by 'Cognitive Impairment (assessment and treatment)' at Icanho – the Suffolk brain injury rehab centre, in September. We are fortunate to have Helen Lindfield returning later in the autumn, to lead a course on ataxia management. The programme for 2014 is currently being developed, and we hope to include, among other things, a course on clinical reasoning in orthotics.

Our committee numbers ten: Louise Dunthorne (Chair), Wendy Hendrie (Treasurer), Paul Chapman (Secretary), Tabitha Mathers (Regional Representative) and Sesa Ishaya, Nic Alexander, Kate Goddard, Lucy Baines, Will Winterbotham, Anna Colbear, and Anne Glynn as committee members. Nic Alexander has stepped down as Regional Representative and we would like to thank her for her work over many years.

We would also like to urge members to update their details on the ACPIN website to ensure they are able to stay in touch with local news. Please contact the committee at eastanglia@acpin.net with any suggestions for future talks/courses.

Kent

Anna Hargrave

The last few months have brought about some changes within the Kent ACPIN committee. Our long-serving Regional Representative, Nikki Guck, has now joined the ACPIN executive committee, and I would like to take this opportunity to thank her for her hard work over the last few years and for her ongoing commitment to Kent ACPIN.

Having lost three of our committee members for different reasons, we have now managed to recruit some new volunteers, and we now have a very healthy Kent ACPIN core team of ten people from across the region.

In May this year we had the pleasure of hosting a John Rothwell study day titled 'The Basal Ganglia and its role in Movement Disorders'. The course was oversubscribed and the feedback we received from delegates was that the course was excellent. We are grateful to John Rothwell for his continued support to educate and develop neurotherapists in Kent. We had an evening lecture on strapping by Anthony West in September and have several study opportunities coming up over the next few months

Information about venues, times and costs will be emailed out to all Kent ACPIN members. If you would like further information please contact me.

2014 promises to be an exciting year for us in Kent! We are hoping to organise a two-day clinical reasoning course in June 2014, aimed at advanced neurophysiotherapists, who will need to have completed a three-week Bobath course. We are also in the early stages of planning a stroke study day in May or June of 2014, information for both courses to follow.

As always we are very aware of the struggle to book study leave and the prices of courses, so we always aim to provide courses that Kent members have expressed an interest in, and keep the cost as low as possible. If you have any ideas for courses or venues, or would like to get involved with the Kent ACPIN committee please contact me on Kent@acpin.net

London

Andrea Shipley

London ACPIN membership continues to expand with all events well attended. We also have two new committee members to welcome; Liz Livingstone and Claire McCarroll who are already offering fresh ideas and useful information at meetings.

This year's programme has progressed well so far. In February, Liz Dewar's evening presentation on 'The principals of exercise prescription in neurology' went very well and was extremely informative, receiving lots of positive feedback.

In March, Mindy Levin gave us an excellent day presentation on 'Motor control and motor learning in neurology rehabilitation'. This was well received, but quite an intense day. Generally members found it very interesting and enjoyable; elements of the theory were somewhat challenging, but the visual practical elements aided understanding. The final session about the application of theory into clinical practise was, as ever, very popular with attendees wanting more of this.

In June we had our annual half-day research update. As we have come to expect, this was an enlightening morning of feedback on a wide variety of topics. Sally Davenport commenced proceedings with a fantastic presentation on dance for those with Parkinson's Disease and its impact on their physical function, cognition and well-being. Disappointingly she was unable to show us the specific dance moves herself! Karen Baker presented a very interesting update on the use of robotic devices in upper limb rehabilitation. Elizabeth Cassidy gave us a moving insight into the lived experience of progressive cerebellar ataxia, presenting with expertise and enthusiasm. This was followed by Neil O'Connell helping us make sense of meta-analysis, as only he can, with humour and making it look simple.

We hosted a cheese and wine evening on September 12th with a presentation by Catriona Neville (extended scope practitioner in Facial Palsy) and SLT colleague Venessa Venables from Queen Victoria Hospital. They talked about their experiences with, and MDT management of, facial palsy resulting from lower motor neurone deficits.

The last of this year's study days was shared with our occupational therapy colleagues from SSNP on October 26th. Dr William Levack, the expert on goal-setting in rehabilitation, came over from New Zealand to take us through the challenges goal-setting presents to the MDT: its theoretical background, motivation, ethics, life goals and much more.

The London Committee would like to remind members that for those carrying out research there is a travel bursary available that you can apply for.

We look forward to seeing you in 2014 and hope to have the completed 2014 programme out to you soon, with our first event towards the end of February. ACPIN members as always will be able to attend some events for free and others for very reasonable rates for day and half-day courses. With keeping costs low in mind, we apologise if some people find the area available for refreshments not as comfortable as we might wish it to be.

Manchester

Stuart McDarby

Following on from 2012, 2013 has seen Manchester continue to strive to provide thought-provoking and relevant topics as part of our programme.

So far this year we have enjoyed an evening lecture and patient demonstration in March (as part of the AGM). This was led by senior Bobath tutor Lynne Fletcher and, as always, was very well received.

In July we welcomed Glyn Nielson and Dr Antonia Kirkby who delivered an excellent half-day course on functional disorders: aetiology and treatment. The feedback was positive and attendees left with new ideas and concepts.

Our committee has remained stable this year and we continue to welcome any local physiotherapists interested in coming on board! We have recently met to begin discussing next year's programme and will be aiming to provide more day/half-day courses across the year.

As always, we welcome any ideas around topics, speakers and venue. Feel free to contact us with your thoughts at manchester@acpin.net

Best wishes for the rest of 2013 and we hope to see you at our events!

Merseyside

Anita Wade-Moulton

The Merseyside membership now stands at 68. We have had a few changes to the committee with the resignation of chairperson Jo Haworth who has given much of her time and a number of years to Mersey ACPIN – thank you, Jo. We now have one new committee member, Chandri Shar.

We have had a successful lecture from one of the Walton Neuro Centre's specialist OTs in 'Fatigue Management' and there has been good attendance to lectures so far this year. A new and exciting programme of lectures and courses is in the planning stages for 2014.

A reminder that anyone wanting to be a part of Merseyside ACPIN committee should contact one of the committee members by email or come and speak to one of us at the next ACPIN meeting.

We are in the process of changing the email from the Yahoo account to the national ACPIN one: Merseyside@acpin.net

Oxford

Claire Guy

Welcome to all members for the autumn edition and thank you so much for your continued support. I hope we are providing a programme you are interested in (it seems like it) but please let us know any ideas you have: email into oxford@acpin.net

We all enjoyed the warm summer, I am sure. Shame there was no team punt on the river! We have had a successful run of lectures; Jo Pierce and Kim Radford provided us with a comprehensive and researched look at the painful shoulder, a topic that will always be useful. A patient who suffered a significant brain injury shared his experiences and his hopes; joined by his wife they provided a thought-provoking and insider's view of TBI. At a time when patient involvement is stressed at every level, it was a privilege to have this gentleman share his story. We returned to Stoke Mandeville Hospital in September for an overview of what physical outcomes therapists can expect at different levels of Spinal Cord Injury with Tom Barnes and Michelle Clarke providing both the Physiotherapy and Occupational Therapy perspective. An interesting talk on brain imaging was hosted at the West Wing, John Radcliffe Hospital, Oxford. A well-subscribed course on vestibular aspects of treatment was held at a new venue, the MS treatment centre, Halton. Thank you for the venue – it scored top marks in the evaluation! A course on ataxia will be taking place around the time of publication and judging by the interest should be well subscribed.

Next year, once again, is a varied programme. No courses planned, so please support the evening sessions. Practical sessions include: Orthotics management, FES demos with providers at the AGM, an informal early evening with snacks, and a session looking at one of the Exoskeleton assisted-walking devices in action. We are hoping to hear about neuro-oncology and will be welcoming Georgie Friend back from Canada to talk about her experiences of completing a therapeutic rehabilitation qualification and how it can be integrated into practice in the UK.

So, varied and interesting; check your flyers, *Frontline* or contact any of the committee for information. With thanks again to you all.

South Trent

Kate Caldwell

The latter half of 2013 has seen South Trent ACPIN host a series of evening lectures and holding their first journal club. The evening lectures were well received including a lecture held in Leicester focusing on the physiotherapist's role in end of life care and our most recent evening lecture by Dr Pandyan held at the Royal Derby Hospital presenting on spasticity management.

The journal club was well attended and explored articles studying the phenomenon of Pusher Syndrome and its management. All attendees found this useful and future journal clubs are being planned.

Towards the end of 2013 and into 2014 we have a number of events planned including a day course on the assessment and management of low tone and an evening lecture on stem cell research.

South Trent ACPIN are a very friendly and dedicated committee and are always looking to recruit more members. If you would like to join, or have some ideas of lectures or courses you would like to see us host, please contact us on email: southtrent@acpin.net

South West

Nic Turner

South West ACPIN continues to be active within the region and our membership continues to grow with approximately 230 members. Our committee in Bristol has also recently grown with five new committee members, and we continue to have committee subgroups in Devon and Cornwall. If anyone is interested in joining our Devon and Cornwall subgroups, then please get in touch, as they would always welcome more committee support.

Courses organised over the last six months have been held across the region: our AGM in Bristol, which included lectures on various neurological disorders; a spinal cord injury evening lecture in

Devon; our summer social in Bristol on the Paralympics in London 2012, and a splinting evening lecture in Devon. Thank you to our membership for their continued support at our events as they all remain popular. Further information on courses planned for Winter 2013 to Spring 2014 will be sent to our membership via email as well as displayed on the South West ACPIN webpage.

As of September 2013 our Regional Representative changed to Nic Turner so please get in touch with him with any queries or any ideas/suggestions for future courses or venues at southwest@acpin.net

Surrey and Borders

Emma Jones

2013 has been a good year for Surrey and Borders ACPIN. We have three new committee members to replace the loss of a number of long-standing members, earlier in the year. We now have a committee of twelve.

We have a continued strong membership of over 110 members and we have been well supported with attendance at our evening lectures.

This year we have had a number of evening lectures which has included EMG triggered FES, Advanced Planning for Neurological Conditions, and one from a patient's perspective on life after stroke and the experience of goal-setting. We also had a study morning in November 2013 with Fiona Jones on Self-management after Stroke.

Ongoing events will be forwarded to members by email. They also may be advertised in *Frontline*, on the iCSP website and on Facebook and Twitter, so keep your eyes peeled!

Please do not hesitate to contact me with any queries or suggestions for future programmes on surrey@acpin.net

We look forward to seeing you all at future events!

Wales

Adele Griffiths

Wales ACPIN would like to welcome all new members and thank all existing members for their continued support. 2013 has seen our Chair, Jakko Brouwers take up the position of Vice Chair on the National ACPIN committee, a role which sometimes has him travelling from South Wales to CSP Headquarters in London twice in one week. We are delighted to report that another of our committee members Michelle Price has taken up a role in the planning of the UK Stroke Forum. Several members of ACPIN Wales have been working with the Welsh Government to produce a report on delivery of Neurological Physiotherapy services which encompasses twelve key areas for development within local Health Boards and across the nation as a whole.

After a busy start to 2013, activity has been quiet over the summer in part due to the logistical challenges of co-ordinating a Web-ex presentation on several sites; having reflected upon this the committee has decided to change our approach to course and Web-ex planning for 2014 and will be planning dates and content for the whole year by the end of 2013.

At the time of going to press we had a good level of interest in attending our Neuro-hydro course on September 21st in Camarthen with guest lecturer Jackie Pattman, and have planned a Web-ex debate entitled 'To stretch or not to stretch'.

With the Camarthen hydrotherapy course, we are starting to establish host sites in Wales with local ACPIN members assisting in course organisation – if any Wales ACPIN members would like to host a course in their local facilities please let the committee know.

As with all the ACPIN regions, Wales ACPIN has started to use the new generic email address wales@acpin.net – please use this for future correspondence.

Wessex

Lindsay O'Connor

Since the last update there have been a few important changes in the region to be aware of. Our thanks to Emma Lewis who has stepped down as Secretary following her recent move to London, thank you for all your hard work. We would like to welcome Sarah Al-Daftary as our new secretary. Sarah has been an active committee member and we are very happy she is taking on this new role. You may also have noticed the new address used to send out course information (wessex@acpin.net). This is our new regional email provided by ACPIN – please save it to your contacts.

Please also make sure you visit the ACPIN website (www.acpin.net/member.html) to update your contact details so we have the right email and postal address, and encourage any colleagues who you know are ACPIN members to do the same. Unfortunately there are always several undelivered emails each time we send out information which means you may be missing out.

Following a break for the summer we had several exciting events planned in the autumn. This included a two-day course on 'Dynamic movement screening and functional exercise' in September and a study morning 'Exploring the management of the minimally conscious patient' in November. We have plans for several upcoming evening lectures and will forward information when these details are confirmed.

As mentioned in our last update we are still having difficulty organising and arranging courses across the whole of the region, particularly in the west of the region (Bournemouth, Poole and the surrounding areas of Dorset). As a committee we are really keen to provide events across the region and are therefore interested in making links with members who would be happy to act as a liaison in order to identify potential locations. If you would be interested please contact the committee.

As always we welcome ideas from our members on events and courses you would like us to organise, or any other comments and suggestions.

West Midlands

Cameron Lindsay

West Midlands have been relatively quiet since April when we hosted a single day course from Paulette Van Vliet. Unfortunately, due to problems with an appropriate site to host the event at, we had to limit this to the non-practical element of the previously advertised course.

The committee had a meeting at Jamie's Italian on the 12th June to discuss our future courses – which was a nice change from our usual meeting room. The courses included an 'Observational gait analysis' morning on the 5th October. This was a half-day interactive course based on movement science principles looking at the kinematics of normal gait and deviations observed in a neurological patient. It was held at the Walsall Manor Hospital, which is a new site for us to hold a course at.

We also had an exciting 'Functional disorders' Study afternoon on 20th November at University Hospitals, Birmingham with Dr Mark Edwards and Glenn Nielsen from UCLH and Dr Hugh Rickards, a local neuropsychiatrist.

Writing for Syn'apse

***Syn'apse* is the official peer-reviewed journal of the Association of Chartered Physiotherapists in Neurology (ACPIN). *Syn'apse* aims to provide a forum for publications that are interesting, informative and encourage debate in neurological physiotherapy and associated areas.**

***Syn'apse* is pleased to accept submitted manuscripts from all grades and experience of staff including students. We particularly wish to encourage 'novice' writers considering publication for the first time and ACPIN provides support and guidance as required. All submissions will be acknowledged within two working weeks of receipt.**

Examples of articles for submission:

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 patients' 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 time scales 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* below).

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.

Sharing good practice

This *Syn'apse* feature aims to spread the word amongst ACPIN members about innovative practice or service developments. The original format for this piece started as a question and answer session, covering the salient points of the topic, along with a contact name of the author for readers to pursue if they wish. Questions were loosely framed around the following aspects (this would be for an audit)

- What was the initiating force?
- How did you go about it?
- What measurements did you use?
- What resources did you need?
- What did you learn about the process?
- How has it changed your service?

However recent editions have moved away from this format, and provide a fuller picture of their topic eg *Introducing a management pack for stroke patients in nursing homes* (Dearlove H Autumn 2007), *An in-service development education programme working across three different hospitals* (Fisher J Spring 2006), *A therapy led bed service at a community hospital* (Ramaswamy B Autumn 2008) and *Establishing an early supported discharge team for stroke* (Dunkerley A Spring 2008).

Product news

A short appraisal of up to 500 words, used to bring new or redesigned equipment to the notice of readers. This may include a description of a mechanical or technical device used in assessment, treatment management or education to include specifications and summary evaluation. Please note, ACPIN and *Syn'apse* take no responsibility for these products, it is not an endorsement of the product.

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.

OTHER REGULAR FEATURES

Focus on…

This is a flexible space in *Syn'apse* that features a range of topics and serves to offer different perspectives on subjects. Examples have been a stroke survivor's own account, an insight into physiotherapy behind the Paralympics and the topics of research, evidence and clinical measurement.

Five minutes with…

This is the newest feature for *Syn'apse*, where an ACPIN member takes 'five minutes' to interview well-known professionals about their views and influences on topics of interest to neurophysiotherapists. We are always keen to receive suggestions of individuals who would be suitable to feature.

PREPARATION OF EDITORIAL MATERIAL

Copies should be produced in Microsoft Word. Wherever possible diagrams and tables should be produced in electronic form, eg 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, 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 1,400 x 2,000 pixels at 72dpi.

All **abbreviations** must be explained.

References should be listed alphabetically, in the Harvard style. (see www.shef.ac.uk/ library/libdocs/hsl-dvc1.pdf) 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 *Syn'apse* editor **Lisa Knight** at:
synapse@acpin.net

Regional representatives

November 2013

East Anglia
Tabitha Mathers
eastanglia@acpin.net

Kent
Anna Hargrave
kent@acpin.net

London
Andrea Shipley
london@acpin.net

Manchester
Stuart McDarby
manchester@acpin.net

Merseyside
Anita Wade-Moulton
merseyside@acpin.net

Northern
Anne Wood
northern@acpin.net

Northern Ireland
Jacqui Crosbie
nireland@acpin.net

North Trent
Anna Wilkinson
northtrent@acpin.net

Oxford
Claire Guy
oxford@acpin.net

Scotland
Gillian Crighton
scotland@acpin.net

South Trent
Kate Caldwell
southtrent@acpin.net

South West
Nic Turner
southwest@acpin.net

Surrey & Borders
Emma Jones
surrey@acpin.net

Sussex
Gemma Alder
sussex@acpin.net

Wales
Adele Griffiths
wales@acpin.net

Wessex
Lindsay O'Connor
wessex@acpin.net

West Midlands
Cameron Lindsay
wmidlands@acpin.net

Yorkshire
Kirstie Elliot
yorkshire@acpin.net

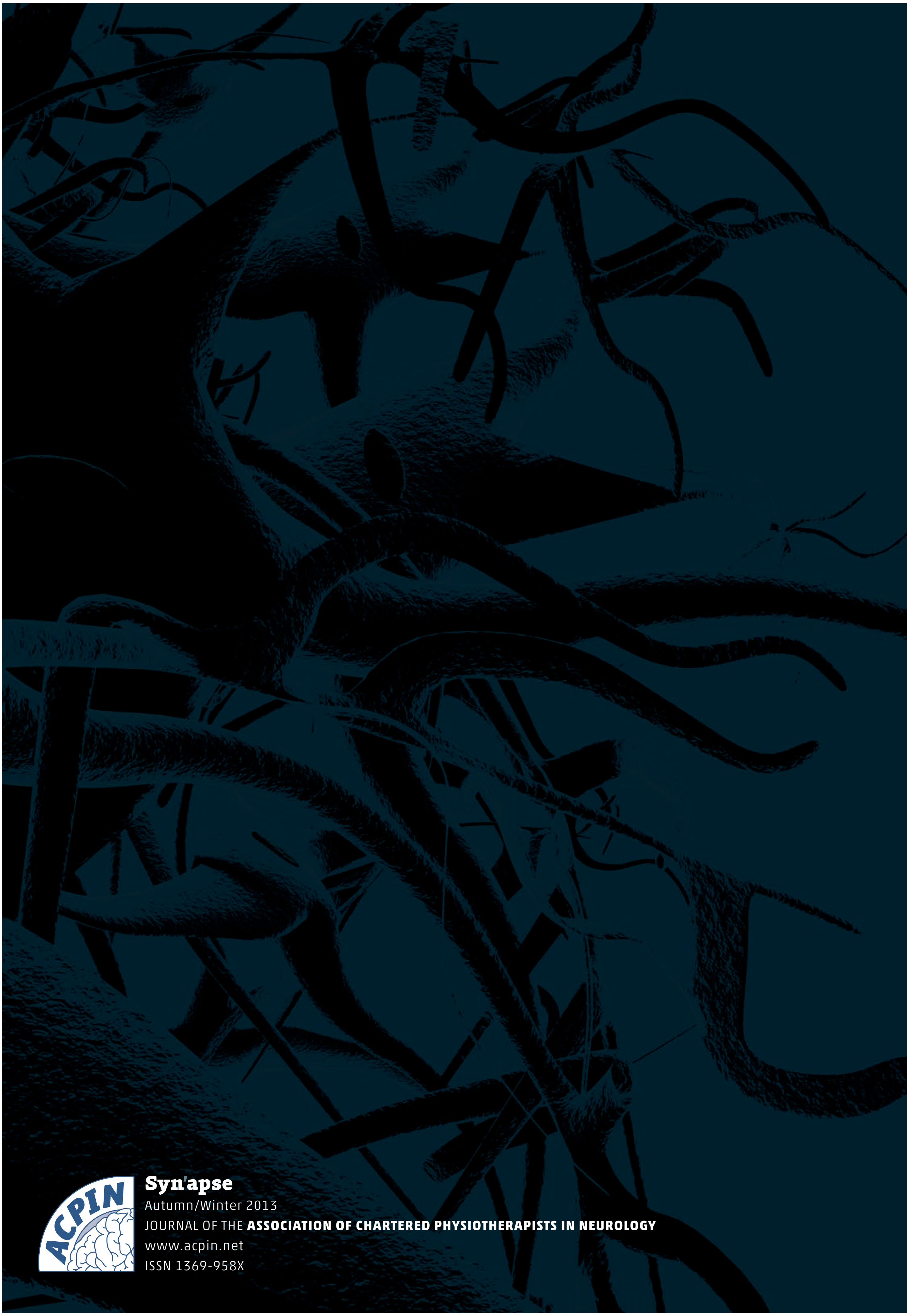
Syn'apse

Editor
Lisa Knight
synapse@acpin.net

Editorial Advisory Committee
Members of ACPIN executive and national committees as required.

Design
kwgraphicdesign
44 (0) 1395 264801
kw@kwgraphicdesign.co.uk

Printers
Henry Ling Limited
The Dorset Press
Dorchester



Syn'apse
Autumn/Winter 2013
JOURNAL OF THE **ASSOCIATION OF CHARTERED PHYSIOTHERAPISTS IN NEUROLOGY**
www.acpin.net
ISSN 1369-958X