

# Proceedings of SRR

These are abstracts from the proceeding of the Society for Research in Rehabilitation meeting held in Cambridge on 12 January 2005.

## A randomized crossover trial: the effect of aerobic treadmill training on gait characteristics, speed, endurance and fatigue in individuals with multiple sclerosis

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**Background:** Eighty-five per cent of individuals with multiple sclerosis (MS) report gait disturbance as main complaint and show limitations as reduced speed, limited endurance, and poor safety. Evidence after stroke suggests treadmill training may benefit individuals' gait speed, endurance, and well-being. This study investigates the effect of treadmill training on gait characteristics in people with MS.

**Method:** A randomized crossover trial was carried out in the Oxford Centre for Enablement. Participants were recruited from the community. After pre-assessment familiarization and baseline-assessment individuals were randomly allocated to immediate (week 0–4) or delayed (week 6–10) training with independent re-assessments. Training involved 12 sessions, maximum 30 min, treadmill training at 55–85% of age-predicted maximum heart rate. Primary measures were temporal and spatial parameters recorded using GAITRite. Secondary measurements included 10-m timed walk, 2-minute walk and Fatigue Severity Scale.

**Results:** The immediate training group ( $n = 8$ ,  $54.4 \pm 11.4$  years) showed significant greater change in score in week 5 than the delayed training group ( $n = 8$ ,  $52.8 \pm 5.5$  years) in 'step-time strong leg' ( $p = 0.046$ ), percentage of 'swing weak leg' ( $p = 0.027$ ), 'stance weak leg' ( $p = 0.028$ ) and 'double support

weak leg' ( $p = 0.046$ ) and on the 10-m timed walk ( $p = 0.05$ ).

**Discussion:** Despite a small sample this study suggests that treadmill training in MS patients is feasible, tolerated, increases gait speed and endurance, and induces changes in important gait parameters.

**Conclusion:** Treadmill training may be beneficial for people with MS and does not increase fatigue.

## Bilateral movements and motor extinction: a case study

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**Background:** Recent claims suggest the use of bilateral practice following stroke facilitates movement on the affected or contralesional side. However, such practice may not be appropriate for all patients. Here, we present data from a patient who demonstrates 'motor extinction' (a deficit in the contralesional limb that either only becomes apparent or disproportionately worsens on bilateral movements relative to unilateral movement).

**Method:** A randomization designed single case experiment in a 52-year-old right-handed male patient (LR) following a right fronto-temporal infarction. This involved measuring the kinematics of self-paced unimanual and bimanual circle-drawing movements including the effects of visual guidance. Circle diameter (primary measure), cycle duration, circularity, drift, velocity and interlimb coupling (secondary measures) were derived from the two-dimensional coordinates.

**Results:** While the contralesional limb showed comparable movements to the ipsilesional limb for unimanual movements (diameter:  $p=0.1$ ), it showed markedly reduced performance when involved in bimanual movements ( $p<0.001$ ). Directing vision towards or away from the affected limb had little effect on the resulting asymmetry ( $p=0.3$ ).

**Discussion:** The marked deterioration in motor performance of the contralesional limb during bilateral movements demonstrates the inhibitory effects that bilateral movements may have. We discuss the results with reference to both attentional and intentional factors which may underlie motor extinction.

**Conclusion:** While bimanual co-ordination is clearly an important skill that patients aim to learn following stroke, bilateral practice may have an inhibitory effect on the contralesional limb in some patients. Bimanual coordination is a complex behaviour, influenced by multiple factors.

## Does the untrained eye 'see' more? Stroke rehabilitation service users' perceptions of collaborative goal-setting

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**Background:** Collaborative goal-setting, focused on the service user, is key to successful rehabilitation. Most rehabilitation goal-setting studies are from health care professionals' perspectives. This study aims to investigate stroke service users' views of this process as endorsed by one World Health Organization target for 2005.

**Design:** Qualitative individual semi-structured interviews.

**Setting:** Mixed neurological rehabilitation ward: north-west UK hospital.

**Participants:** Consecutive sample of seven stroke service users (1 female, median age 64(IQR = 54–72), fulfilling inclusion criteria, attending rehabilitation and goal-setting meetings.

**Procedure:** Nine interviews that captured views and accounts of respondent's experience were transcribed verbatim and thematically analysed using constant comparison. A second assessor confirmed the themes and categories. Validation included: re-interviewing a sample of respondents, service users'

review of summaries and clinician/researchers' peer review.

**Results:** All service users considered themselves actively involved in goal-setting. A mismatch was reported between users/professionals' views in terms of goal difficulty, timing and practice. In the formal goal-setting meetings, short-term physical goals were the focus. Whilst valuing setting such goals for encouraging motivation, and structured rehabilitation, participants equally valued social and life goals. Goal-setting triggered informal peer-peer discussion about goal behaviour and efficacy, plus encouraged peer support.

**Discussion:** Though a small sample, service users' consistently saw themselves as holding more informed views about other users' goal selection and activity than professionals.

**Conclusion:** More research is required to determine if inter-peer awareness of goal issues is a common phenomenon.

## Epilepsy Impact Scale: Is it a unidimensional scale?

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**Background:** The Epilepsy Impact Scale was developed to measure the impact of epilepsy on daily life. It measures one construct 'impact' and has 10 items. It is a simple scale that can be completed within 5 min. The aim of the study was to check for unidimensionality using the test of fit based on the Rasch model.

**Method:** A postal survey was conducted as part of an ongoing thesis work. The impact scale was used in the survey and all valid responses were analysed. Misfitting items were identified on the basis of a high residual and significant chi-squared and differential item functioning (DIF) was performed using five factors with significance set at 1%.

**Results:** A 24-page questionnaire was mailed to 2000 participants with epilepsy and 750 valid responses were analysed. There were 411 (54.8%) female and 338 (45.1%) male respondents. Initial analysis of the items showed poor fit to the model overall (total

item–trait Interaction chi-squared = 226.260,  $df = 90$ ,  $p < 0.001$ ). The explanation for the poor fit was that individual items either displaying disordered thresholds, poor individual item fit or DIF on at least one of the five factors.

**Discussion:** Although the items in the scale appear to tap on different domains which one would commonly associate with everyday life they do not measure the same construct. The summated score will not be useful as an outcome measurement, particularly if an antiepileptic medication is being evaluated.

**Conclusion:** The scale has limited use to measure impact of epilepsy.

### **Everyone uses it, so it must be OK: a (classical) psychometric analysis of the self-report Barthel Index**

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**Background:** Since it was first published in 1994, the self-report Barthel Index (srBI) has been used in many surveys of patients' ability. However, the measurement properties of the srBI have been incompletely examined. This study aims to present an evaluation of the classical psychometrics of the srBI in patients admitted for multidisciplinary rehabilitation.

**Method:** Patients' ability was measured on admission and discharge using the team-scored Barthel Index (tsBI). Patients rated their own ability at the same times using the srBI. The srBI was examined for floor and ceiling effects, internal consistency, convergent validity with the tsBI, and responsiveness.

**Results:** Sixty-four patients had a median (interquartile range, IQR) age of 45.5 (39–61) years, and their diagnoses included: spinal cord injury 17; stroke 16; multiple sclerosis 12; Guillain–Barre 7; other 12. The median (IQR) srBI scores on admission and discharge were 13 (10–17) and 17 (14–19). Floor and ceiling effects were 1.6% and 10.9% on admission, and 0% and 34.9% on discharge. Cronbach's alpha was 0.903. Pearson's correlation between the tsBI and srBI was  $r = 0.77$ . The effect size was 0.68.

**Discussion:** The srBI demonstrates good internal consistency, construct validity and responsiveness. There are marked floor and ceiling effects, as seen with the tsBI.

**Conclusion:** Whilst the srBI demonstrates some good classical measurement properties, it is an ordinal measure, and the next stage of this project is to use Rasch analysis to examine the measurement properties of the srBI more comprehensively.

### **Patients' awareness of memory functioning following stroke**

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**Background:** Some stroke patients are poorly aware of their physical limitations. However, it is unclear whether poor awareness extends to cognitive impairments, which are also common following stroke. We investigated whether right hemisphere stroke (RHS) patients were less aware of their memory functioning than closely matched nonstroke controls.

**Method:** A consecutive sample of RHS patients ( $n = 62$ ) completed nonverbal and verbal recall assessments 4 and 16 weeks post stroke. Patients estimated their likely performance prior to undertaking them (the difference between estimated and actual performance used as an index of awareness). Each patient was individually matched to a nonstroke control on the basis of age and verbal intelligence.

**Results:** Patients tended to overestimate (i.e., be less aware of) their nonverbal recall performance relative to nonstroke controls at 4 weeks ( $F = 3.65$ ,  $p = 0.06$ ) and at 16-weeks ( $F = 5.05$ ,  $p = 0.03$ ) post stroke. They were, however, as accurate as nonstroke controls at estimating their verbal recall performance on both occasions.

**Discussion:** This study provided empirical support for a proposition that previously had only anecdotal backing: some RHS patients are poorly aware of their memory functioning, and tend to overestimate their ability to remember new information. Poor awareness was restricted to memory for nonverbal information (e.g., routes, faces), which is often affected by RHS.

**Conclusion:** Clinicians should not only take account of the severity of memory problems, but also whether patients themselves recognize changes to their memory. Intervention may need to target poor memory awareness after RHS, particularly regarding nonverbal materials.

## Reliably diagnosing apraxia of speech (AOS) following stroke

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**Background:** The distinction between apraxia of speech (AOS) and aphasia following stroke is controversial. There is no universally agreed definition of AOS or 'gold standard' for assessment, so it is difficult to interpret the studies in the field. Many studies rely on clinical judgements to diagnose AOS, without adequately quantifying their reliability. We investigated whether specialist speech and language therapists (SLTs) could consistently diagnose AOS (intra-rater reliability), and whether their diagnoses agreed (inter-rater reliability).

**Method:** Forty-two people with communication difficulties following stroke were recruited, 55% of whom showed AOS during detailed assessment. Videos of patients' conversations and repetitions of polysyllabic words were rated, for the presence or absence of AOS and the severity of AOS, on two separate occasions by four specialist SLTs. They were given no definition of AOS and no training. Intra-rater reliability and inter-rater reliability were calculated using Cohen's kappa and 95% confidence intervals.

**Results:** Intra-rater reliability for diagnosing the presence and the severity of AOS was high (kappas across all therapists of 0.93 and 0.90 respectively), as was the inter-rater reliability (kappas of 0.86 and 0.74 respectively).

**Discussion:** Despite controversy over its existence, specialist SLTs can reliably diagnose AOS. Additional data will be used to investigate whether these high levels of reliability extend to the SLTs' ability to locate specific apraxic errors within connected speech.

**Conclusion:** The results support the value of further research into AOS to develop an accepted assessment procedure and to evaluate the effectiveness of rehabilitation.

## The development and validation of a work instability scale for traumatic head injury

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**Background:** Traumatic brain injury (TBI) is common in people of working age. Many returning to work are unaware that psychological sequelae may compromise work. Work instability is experienced if there is a mismatch between an individual's functional and cognitive abilities and their job demands, potentially threatening employment. It is during this period of work instability that the individual is vulnerable and arguably appropriate interventions can help facilitate job retention.

**Method:** The concept of work instability following TBI was explored through qualitative interviews ( $n=33$ ) which generated potential items for a Work Instability Scale (WIS). Rasch analysis was used to examine the scaling properties of the scale. Criterion validity was established using gold standard vocational assessments by occupational psychologists ( $n=20$ ).

**Results:** The scale was reduced to 36 items following analysis; fit to the Rasch model was good with the summary fit statistics chi-squared interaction of 72.5 (df 72) giving a significance of 0.459. A PCA of the residuals showed that the first residual factor accounted for just 11.3% of the variation, supporting the unidimensionality of the 36-item scale. The clinical cut point of a score of 2 showed 88% sensitivity and 100% specificity to any risk of job loss.

**Discussion:** Currently there is no reliable way of screening for, or monitoring the risk of job loss following TBI, despite evidence showing high levels of job loss in this population.

**Conclusion:** The TBI-WIS offers the prospect of positive proactive management of the risk of job loss following a head injury.

## The validity and reliability of the Impact on Participation and Autonomy Questionnaire

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**Background:** This study evaluated the validity and reliability of a new measure: Impact on Participation and Autonomy Questionnaire, English Version (IPA-E). The IPA has shown to load onto five factors.

**Method:** Two hundred and thirteen people with multiple sclerosis, rheumatoid arthritis spinal cord injury and GP attendees were recruited and stratified by level of disability (median age 54). Inclusion criteria: English as first language, aged 18–75, score > 6 on Mental Status Questionnaire. A sample size calculation was conducted. Sixty-six Participants completed the IPA-E on a second occasion. Other measures: SF-36, London Handicap Scale, three domains of the Functional Limitations Profile (household management, social integration, emotion).

**Results:** Confirmatory Factor Analysis confirmed the construct validity of the IPA-E normal fit index (NFI) = 0.98, (comparative fit index (CFI) = 0.99), indicating a good fit to the model. Convergent and discriminant validity was confirmed by the predicted associations, or lack of, with the exception of a poor association between the 'social life/relationships' IPA-E subscale and 'FLP-emotion'. Internal reliability of the IPA was confirmed (Cronbach alphas > 0.8 and item-total correlations for all subscales > 0.5). Test–retest reliability was confirmed for all but one item (weighted kappas > 0.6) and subscales (ICCs > 0.90).

**Discussion:** Further research is required to examine the responsiveness of the IPA to change over time, its clinical utility and suitability for use with people from ethnic minorities and with older people.

**Conclusion:** The IPA is a valid, reliable and acceptable measure of participation and autonomy in people with a range of conditions and can make a unique and fundamental contribution to outcome assessment.

### **A pilot study of rehabilitation support: improving outcome after discharge following an acute stroke**

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**Background:** Stroke patients and their carers often lose skills and confidence post discharge. Carers may benefit from input that equips them in supporting the patient in maintaining these skills. This study was designed to evaluate whether enhancing the support given to stroke survivors and their carers, on discharge from hospital, improved functional and emotional outcomes for the patient, and increased carer well-being.

**Method:** Sixteen patients and their carers were randomly allocated to a control or intervention group. The control group (mean age 70.9) received usual care. The intervention (mean age 63.7) in addition to usual care were allocated a trained rehabilitation support worker (RSW). The RSW visited the patient and carer at home for six weeks post discharge to support them in practising rehabilitation skills. Patient function (Barthel Index) and patient/carer confidence were independently assessed at discharge (week 0). The above assessments and patient/carer mood (GHQ-12) and Carer Giver Strain were also assessed at weeks 1, 6 and 12.

**Results:** The RSW group had higher Barthel scores at week 0, 1 and 12 but not week 6 ( $p < 0.05$ ). Patient confidence and well-being revealed no significant effect ( $p > 0.05$ ). Carer confidence in transfers overall was significantly lower in the RSW group ( $p < 0.05$ ) but no difference was seen for mobility ( $p > 0.05$ ). There was no significant overall difference between groups in terms of carer well-being ( $p > 0.05$ ).

**Discussion:** Patients benefited in terms of function but carer confidence seemed to decrease.

**Conclusion:** Further evaluation is underway.

### **An investigation into the validity of the stroke aphasic depression questionnaire in care-home settings.**

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**Background:** The the Stroke Aphasia Depression Questionnaire (SAD-Q) was developed to assess

mood in those who are unable to self-report using standard questionnaires. It has demonstrated reliability with patients living in their own homes. However, the reliability of the scale when completed by professional carers in a care home setting is unknown and is the purpose of this study.

**Method:** The Hospital Anxiety and Depression Scale (HADS) was completed by 82 care-home residents (mean age 88.6 years, SD 6.5), whilst the SAD-Q was completed by a carer. Scatter plots, Spearman's rank correlation and a sensitivity–specificity test were carried out on the SAD-Q and HADS (depression subscale) data.

**Results:** Spearman's rank correlation between the two measures was statistically significant ( $r=0.45$ ,  $p<0.01$ ), and the SAD-Q was shown to be 77% sensitive in that 10 out of 13 true positives were identified.

**Discussion:** The analyses indicate that the SAD-Q correlates modestly with the HADS depression subscale. However, caution is advised when using the SAD-Q as a screening measure as 22% of residents were wrongly categorized as depressed. In addition, there is an assumption that nonaphasic individuals' outcomes equate to those of aphasic individuals, which may not be the case.

**Conclusion:** In conclusion, whilst the SAD-Q appears to provide a reasonable assessment of emotional distress in aphasic patients, it is recommended that further research be carried out before the questionnaire is employed as a screening tool.

## Patients' perceptions of the impact of treatment with botulinum toxin for spasticity following stroke

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**Objectives:** To identify the impact of treatment on the quality of lives of patients.

**Data collection:** The depth of information generated in the development of the spasticity in stroke impact scale allowed secondary analysis. Patients' experiences were obtained by taped semi-structured interviews. A sample of  $n=24$  were stratified by gender, duration of stroke and previous employment.

**Data analysis:** Strategies of grounded theory were used. Explanations were abstracted using constant comparison in which interpretations are constantly verified by the subjects' responses. Single unambiguous phenomena were identified – open codes. Phenomena addressing single concepts were categorized – selective codes. Dominant categories and their relationships produced themes. Themes were logically organised into explanations. Explanations were refined and tested by considering negative cases and re-reading transcripts in conjunction with demographic and observational data.

**Quality of data and analysis:** Validity was ensured using respondent validation, appropriate sampling and the use of negative cases. Reflective practice by the researcher, keeping research diaries and inter-rater correlation with independent researchers at each stage of practice ensured reliability.

**Results:** Patients valued treatment if it moderated the most significant impact of spasticity – loss of autonomy – caused by pain and immobility which led to limitations in activities and increased dependency. Seven were expecting increased movement but it made no difference. Four said it made activity worse by reducing muscle tone and ten benefited from pain relief.

**Discussion:** Body image was not considered important.

**Conclusion:** Pain relief appears to be the singular value of treatment.

## The reliability and validity of the Physiological Cost Index on two different tracks

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**Background:** The Physiological Cost Index (PCI) is proposed as a low-cost measure of the energy cost of walking. Subjects walk at their 'preferred pace' along a track, until a steady state working heart rate is achieved. PCI is calculated as:

$PCI \text{ (beats/min)} = (\text{walking heart rate} - \text{resting heart rate})/\text{speed}$ .

Since track design may influence preferred walking pace, this study investigated the reliability and validity of PCI scores from two different tracks (20 m and 12 m figures of eight).

**Method:** Oxygen consumption ( $V_{O_2}$ ) and cost ( $E_{O_2}$ ) were recorded in 40 healthy subjects walking on each track. Validity, intra- and inter-rater reliability of PCI scores were evaluated.

**Results:** Intra- and inter-rater reliability of PCI scores were good (intraclass correlation coefficient (ICC) = 0.73 and 0.79; 0.61 and 0.72 for 20-m and 12-m tracks). Correlations between  $V_{O_2}$  and  $E_{O_2}$  with PCI were poor. PCI scores from the 20-m track were lower than those on the 12-m track ( $p = 0.002$ ); subjects walked faster on the 20-m track ( $p < 0.001$ ).

**Discussion:** The PCI may not be valid as a measure of energy expenditure in healthy subjects as the energy demands of comfortable walking for a short time are minimal. The 12-m track limited walking pace, therefore the 20-m track is suggested for clinical assessment as it allowed subjects to walk more quickly.

**Conclusion:** The PCI is reliable but not valid as a measure of the energy cost of walking in healthy subjects on either track, therefore its use in healthy subjects is not recommended.