
Proceedings of SRR

These are abstracts from the proceedings of the Society for Research in Rehabilitation meeting held at Chilworth Manor, Southampton on 7 and 8 July 2005. The Society for Research in Rehabilitation is a multiprofessional organization and anyone interested in joining should visit the website: www.srr.org.uk

Predicting people with stroke at risk of falls

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Background: Although many risk factors have been linked to falls among people with stroke, it is not possible to predict which patients will fall repeatedly after discharge from hospital. The purpose of this prospective study was to identify at discharge the patients at risk of becoming repeat-fallers within 12 months.

Method: Consecutively hospitalized patients with stroke were identified. Strokes were classified using the Oxford Classification and mobility milestones 1 recorded. Balance, mobility, mood and attention were measured at discharge and six and 12 months later. Falls were recorded using diaries.

Results: Eighty-two men and 40 women, mean age 70.2 years (SD 12.5), were recruited. Near-falls in hospital and poor balance, upper and lower limb function and ADL ability predicted falls: type and site of stroke did not. Logistic regression revealed that repeated falling could be predicted with 69% specificity and 64% sensitivity. Near-falls in hospital (odds ratio 3.3, 95% CI 1.4, 7.9) was the best predictor of repeated falls in the 12 months after discharge, followed by the Rivermead upper limb score (odds ratio 0.9, 95% 0.8, 1.00 per unit increase in score). Near-falls alone achieved higher specificity (84%) but at the cost of lower sensitivity (40%).

Discussion: People with stroke who experienced near-falls in hospital and had poor upper limb function at discharge were most at risk of falls in the following 12 months.

Conclusion: It was not possible to predict repeat falling in the next 12 months from information available at discharge with simultaneously high sensitivity and specificity.

Evaluation of a single axis accelerometry system for monitoring sit to stand activity in stroke patients

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Background: Task-specific practice is important for recovery of function after stroke. However measuring the intensity of practice is often difficult. The purpose of this study was to establish whether the Activpal accelerometer could accurately quantify frequency of sit to stand (STS) movements and to assess its use in counting extra STS practice sessions during inpatient rehabilitation.

Method: Six stroke patients needing supervision to stand wore a monitor attached to the thigh during 30-min training sessions ($n = 36$ sessions). STS were also counted by direct observation. Stored data were downloaded to computer and automatically processed using a minimum movement time of 2 s. Data were analysed by comparing the difference between the automatic STS and manual counts. Four patients wore the Activpal during the day for five days and received extra daily practice from a therapy assistant. The number of STS recorded during the extra practice session was compared with the count from the rest of the day.

Results: Activpal and manual counts were closely matched, the mean difference in count was 2.3 (SD 5.1), 95% CI -7.7 to 12.2 . The mean number of STS increased significantly from 24 in the normal routine to 46 (range 31–70) with extra practice.

Discussion: The date provided by the monitor was found to be valid for counting STS practice provide in this group of patients. Thirty minutes extra practice approximately doubled the number of stands achieved per day.

Conclusion: The Activpal is a useful clinical tool for measuring amount of practice stands in rehabilitation.

Whole word therapy for acquired apraxia of speech

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Background: Therapy for speech production deficits in acquired apraxia of speech (AOS) is strongly influenced by segmental models of speech encoding. The aim of this study was to investigate the efficacy of a new, word-level approach to treatment. The treatment was delivered by computer software. This enabled participants to self-administer high-dose and controlled-content rehabilitation.

Method: The study used a patient-series design with multiple baseline measures of control and treated behaviours. Participants completed two phases of computer therapy: one involving the speech programme and the second, a placebo treatment, aimed at visual-spatial cognition. The participants were three women with AOS at least six months post onset of stroke. Participants administered their own therapy using a laptop computer.

Results: Utterance duration measures were used to assess the degree of fluency and cohesiveness of word forms. The data revealed that there were significant changes in duration across treated and non-treated word sets, with durations becoming shorter (paired *t*-tests, $P < 0.003$, with Bonferroni adjustment). Accuracy of word production in repetition and picture naming for treated and structurally related untreated words also improved.

Discussion: Word-level treatment resulted in improvements in the speed of word production, and in the accuracy of words in both repetition and picture naming. The effects of the treatment were not limited

to treated words. Improvement generalized to both structurally related and unrelated word forms.

Conclusion: Intensive therapy directed at the level of the word is an effective intervention for AOS.

Physical performance in patients on renal dialysis

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Background: Clinical studies indicate that patients on long-term maintenance renal dialysis report symptoms of neurological and musculoskeletal dysfunction function, but even those without overt comorbidity may suffer from deficits in physical performance. The aim of this study was to objectively assess physical function in a select sample of asymptomatic dialysis patients.

Method: Twelve patients were recruited from the dialysis population attending at a large regional centre. Only those aged ≤ 55 years, free from neurological or musculoskeletal signs and symptoms and reporting a SF-36 physical function score of 75 points or more were eligible for inclusion. Subjects were compared to age- and sex-matched sedentary controls in a matched pairs design. Physical performance indicators included: sensory function measured by vibration perception threshold; muscle strength measured by peak quadriceps muscle torque; static balance measured by centre of pressure excursion; walking speed and the sit to stand test. Between group comparisons were made using paired *t*-tests.

Results: Comparison with controls revealed that the dialysis patients suffered from significant deficits in sensory function ($P < 0.01$), muscle strength ($P < 0.05$), standing balance ($P < 0.01$), walking speed ($P < 0.005$) and sit to stand test ($P < 0.001$) performance.

Discussion: These findings suggest that even a select group of dialysis patients, free from overt comorbidity, experience significant objective physical performance deficits.

Conclusion: The inclusion of early physical rehabilitation strategies in the management of dialysis patients is supported.

The self-report Barthel Index: is it a unidimensional scale?

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Background: In use since the 1950s, the team-scored Barthel Index (tsBI) has been extensively analysed and modified. A self-report version of the Barthel Index (srBI), first published in 1994, is increasingly being used to measure patients' ability. However, the srBI has not been subject to item response analysis. This study aims to evaluate the scaling properties of the srBI using Rasch analysis.

Method: Patients' perception of their ability was measured on admission to a rehabilitation unit using the srBI, whilst the team scored the tsBI. The srBI was examined for unidimensionality using RUMM 2020 software. Age, sex and method of scoring the BI were used to examine for differential item functioning (DIF).

Results: Sixty-four patients had a median (IQR) age of 45.5 (39–61) years. Initial analysis revealed poor fit (chi-squared 0.001). By reordering the thresholds of the mobility item, and removing the bowel and bladder and toilet use items, which demonstrated DIF, it was possible to develop a unidimensional model (chi-square = 0.03).

Discussion: The srBI could be further developed to produce a unidimensional scale of patients' ability. As described before with the tsBI, sphincter disturbance appears to be a separate dimension to physical function.

Conclusion: It is possible to construct an interval level measure of ability from some items of the srBI. Future work will focus on collecting data from larger groups and examining patient and proxy measures.

The role of carer and patient factors in predicting distress in carers of patients with chronic stroke

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Background: The stroke caregiving literature is inconsistent: the prevalence of carer distress varies from 0 to 62%. Some of the published research reports associations between carer distress and patient dis-

ability, whereas other papers have not found any such relationship. Our research explores the possible role of psychosocial factors in explaining the wide variation in the levels of distress found in these carers.

Method: A cross-sectional study (power = 70%) of 86 carers of chronic stroke (part of a larger stroke study) was designed to identify factors associated with distress in the carers of stroke patients. Standardized measures were used to assess stroke factors in the patient and psychosocial factors in the carer.

Results: Carer distress was common (59%). There was no significant difference in the severity of carer distress between the carers of aphasic and non-aphasic patients ($t = 0.09$; $P = 0.93$). Multiple regression demonstrated that seven predictors explained 45% of the variance. Four of these, all carer factors, were significant, with generalised self-efficacy being a key variable ($\beta = -0.32$; $P = 0.0015$). It was not confounded by the patients' disability.

Discussion: There is a need to confirm that the relationship between generalised self-efficacy and carer distress is a causal one. If this can be done, then there would be scope for developing interventions to increase carers' perceptions of generalised self-efficacy as a basis for reducing the considerable levels of distress that occur in carers of stroke patients.

Conclusion: Carer factors rather than stroke disability factors predict carer distress.

An investigation into knee muscle strength through joint range and functional moments produced during chair rise in older adults

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Background: The ability to perform a chair rise is an important physical function and is a precursor for many mobility functions. Biomechanically, rising from a chair is observed to be a highly demanding task for older adults. Hence, the relationship between knee extensor strength and functional moments produced during chair rise was investigated in a large sample of older adults.

Method: This study utilized a custom-built torque dynamometer to measure strength of knee extensors in 82 older adults aged 60 years and above (mean age 73.2 ± 7.3 ; age range 60–88 years). Isometric strength of knee muscles was measured at three different positions within the joint range of motion (90° , 60° and 0°). Peak functional moments produced at knee during chair rise were obtained through biomechanical analysis using Vicon motion analysis system and Kistler force platform.

Results: Peak isometric muscle strength declined with increasing age and the 80 year olds had approximately 20% lower strength compared to those in the sixties age cohort. The peak knee functional moment was not significantly different among the three age cohorts ($P = 0.375$). Knee strength was significantly correlated with the functional moments produced during chair rise ($r = 0.67$; $P < 0.05$).

Discussion: This investigation showed that knee extensor strength was associated with the functional moments produced at the knee during chair rise in older adults.

Conclusion: Loss of strength with advancing age is likely to increase the demands of performing this activity in older adults thus producing functional limitation and perhaps affecting their quality of life.

StrokeQoL: a measure of quality of life in chronic stroke patients

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Background: The quality of life in chronic stroke patients is important to be assessed given the prevalence (2–2.5/1000 inhabitants) and the incidence (5/1000 inhabitants) of this pathology. The objective of this study is to develop a measurement of quality of life in chronic stroke adults using the Rasch measurement model. This scale, called StrokeQoL, is based on the concept of ‘Participation’ described by the International Classification of Functioning, Handicap and Health, published by WHO in 2001.

Method: The preliminary questionnaire included 84 life situations (or items) developed from a literature review of existing scales and from the opinion of 21 health professionals on chronic stroke patients. The

questionnaire was submitted to 102 chronic stroke patients (72% men; mean age 63 years) who were asked to provide their perceived satisfaction in various life situations on a four level scale (0: very unsatisfied; 1: unsatisfied; 2: satisfied; 3: very satisfied). The patients’ responses were analysed with RUMM 2020 (Rasch software).

Results: The final StrokeQoL questionnaire including 31 items represents a reliable measurement ($R = 0.94$). The difficulty hierarchy of StrokeQoL appears to be uniformly perceived by chronic stroke patients whatever the sex, the housing, the region, the education level, the social status and the investigators.

Discussion: The StrokeQoL questionnaire defines a reliable, valid, unidimensional and linear scale which seems appropriate to evaluate the life satisfaction of a broad sample of stroke patients.

Conclusion: The current metric properties of StrokeQoL make an encouraging starting-point for its clinical application in chronic stroke patients.

Relationship between manual ability and upper limb impairments in children with cerebral palsy

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Background: To clarify the relationship between manual ability and upper limb impairments in children with cerebral palsy (CP).

Method: One hundred and one CP children were assessed. Manual ability was measured with the ABILHAND-Kids questionnaire. The children were also administered the Jamar dynamometer test, the Box and Block manual dexterity test, the Purdue Pegboard digital dexterity test, the Semmes–Weinstein tactile sensitivity test, the Manual Form Perception Test, and a proprioception test. The relationship between manual ability and upper limb impairments was investigated through a correlation matrix and a multiple linear regression analysis.

Results: Manual ability is significantly correlated with grip strength, manual dexterity, digital dexterity and stereognosis, both for dominant and non-dominant hand. Tactile sensitivity and proprioception were not related to manual ability. The multiple linear regression

indicates that manual dexterity of the dominant hand and grip strength of the non-dominant hand are the best independent predictors of the children's manual ability.

Discussion: The achievement of manual activities requires the combination of a dexterous dominant hand to manipulate the objects and a strong non-dominant hand to stabilize the objects. However, this combination of impairments explains only 57% of the variance in manual ability measures indicating that manual ability cannot simply be inferred from the upper limb impairments.

Conclusion: Manual ability depends on complex interactions between upper limb impairments and personal (e.g. motivation, cognitive status, compensatory behaviours) or environmental (e.g. assisting devices, school education) contextual factors. Consequently, manual ability should be measured per se.

An analysis of the content of physiotherapy for postural control in people after stroke: an observational study

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Background: The lack of information about the content of therapy is a frequent criticism in stroke rehabilitation research. This study aimed to describe in detail the content of one aspect of physiotherapy; the rehabilitation of postural control. Secondary aims were to assess the effects of the physiotherapists' experience and adherence to the Bobath concept on choice of interventions.

Method: Design: Cross-sectional survey. Setting: Twelve NHS Trusts. Participants: 35 stroke physiotherapists working in acute and rehabilitation settings recorded the treatment of 121 patients in 644 treatment sessions using the Stroke Physiotherapy Intervention Recording Tool.¹ Analysis: Descriptive statistics, independent *t*-tests and chi-squares to describe the content of interventions, effects of experience and adherence to the Bobath concept.

Results: Physiotherapists' clinical practice reflects the traditional Bobath concept, although they perceived their practice to be eclectic. The emphasis was on therapist-led interventions in which the patient was

relatively passive. The most frequent interventions were 'preparation for treatment' ($n = 1969$, 43%), 'practising balance and walking activities' ($n = 1583$, 34%) and 'practising functional tasks' ($n = 703$, 15%). Interventions to encourage independence or activity outside the treatment session were rarely used. This pattern was seen regardless of the physiotherapists' experience or adherence to the Bobath concept, although experienced physiotherapists were more likely to consider themselves Bobath 'purists' than novice therapists.

Conclusion: Physiotherapists' practice reflected a traditional Bobath approach, although they perceived their practice to be eclectic.

Reference

- 1 Tyson S, Selley A. Development of the Stroke Physiotherapy Intervention Record Tool. *Disabil Rehabil* 2004; **26**: 1184–1188.

What helps adjustment to chronic illness?

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Background: After the onset of a chronic illness, adjustment may play an important role in the patient's rehabilitation. However, little is known about the processes of adjustment. This study aimed to assess adjustment over time, measured by change in quality of life (QoL), and to determine the factors predicting this change.

Method: At baseline and 10-month follow-up, 301 people with Menière's disease, all members of a self-help group (SHG), completed questionnaires assessing functional QoL (SF-36) and goal-oriented QoL (GOQoL). Baseline predictors comprised social comparison (the identification/contrast scale and social comparison through the SHG), self-esteem (Rosenberg scale), perceived control (IPQ-R scale), optimism (LOT), disease severity scales and demographic information.

Results: Regression analysis showed positive predictors of functional QoL to include self-esteem, membership of the SHG and the perception of movement towards goals, whilst comparing with other SHG members had a negative effect. Positive predictors of

goal-oriented QoL emerged as self-esteem and social support.

Discussion: These results show how persistent social comparison with others with chronic illness may lead to a reduction in QoL. This shows that SHGs may assist adjustment by facilitating positive interpretations of comparisons. These results also have implications for the delivery of the rehabilitative treatment in terms of realistic goal-setting which may have a direct impact on adjustment.

Conclusion: As membership of a SHG may have both negative and positive effects on adjustment, the delivery of advice from these groups needs to be tailored to encourage the positive interpretation.

Correlation between hand deficits and corticospinal tract dysgenesis in patients with congenital hemiplegia: a combined MRI and DTI study

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Background: The contribution of the corticospinal (CS) system is crucial to control fine prehension. In congenital hemiplegic (CH) patients, the CS tract dysgenesis is classically quantified by measuring the area of the cerebral peduncles on T1 MRI. However, such a measure is unavoidably biased because other pathways travel through the peduncles. The present study aimed to estimate this dysgenesis more specifically and to correlate it with hand deficits in CH patients.

Method: Twelve CH patients and 12 controls were assessed for stereognosis, proprioception, tactile pressure detection, spatial resolution, grip strength, manual and digital dexterity and manual ability. The CS tract dysgenesis was quantified by a symmetry index between the ipsi- and contralesional sides using both a conventional MRI approach and a diffusion tensor imaging (DTI) approach.

Results: The CS tract symmetry indexes were highly correlated between both methods, although the asymmetry was systematically larger with DTI. In both methods, symmetry indexes were highly correlated with hand deficits but correlations were always better for DTI.

Discussion: Although both measures of dysgenesis were highly correlated with hand deficits, the DTI was found more sensitive. Therefore this measure should provide us with a better prognostic tool to anticipate motor deficits.

Conclusion: We suggest that the conventional MRI approach has systematically underestimated the CS dysgenesis in previous studies.

Trunk muscle activity in postnatal women

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Background: The effects of pregnancy and childbirth on trunk muscle function are unknown. This study investigated whether motoneurone recruitment of the abdominal (rectus abdominis, RA; internal oblique, IO; external oblique, EO) and paraspinal (lumbar multifidus, LM) muscles was altered in postnatal women.

Methods: Subjects: Women at four stages in the first postnatal year: Day 1 ($n=19$); eight weeks ($n=22$); six months ($n=21$); 12 months ($n=23$); 20 normal controls. Experimental procedure: Surface electromyography (EMG) was recorded over the anterior deltoid (AD), RA, EO, IO and LM muscles. In standing, subjects lifted their left arm straight, as fast as possible to 90 degrees shoulder flexion, repeated 10 times at varying intervals, in response to a visual cue. EMG signals were full-wave rectified and onset determined visually. Latency between onset of deltoid activity and that of the four trunk muscles was measured. Comparisons between controls and postnatal groups were examined using unpaired *t*-tests.

Results: At day 1, EO latency (78 ± 50 ms; mean \pm 1 SD) was significantly greater ($P=0.0128$) than in controls (46 ± 24 ms). At eight weeks, RA latency (97 ± 77 ms) was less ($P=0.0029$) than in controls (172 ± 77 ms). All values were normal by six months and no abnormalities were found for IO or LM.

Discussion and conclusion: The slower EO onset at day 1 suggests fatigue. The faster RA onset at eight weeks suggests a more postural function (type I fibre activity). These findings need to be related to other

aspects of trunk muscle physiology and function, to help inform development of postnatal exercise programmes.

Factors influencing adherence to vestibular rehabilitation

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Background: Although vestibular rehabilitation (VR) has been shown to be a successful and cost-effective way of treating dizziness, there has been no previous research determining factors related to adherence.

Method: Two studies were carried out employing a structured interview format to assess participants' beliefs regarding the advantages and disadvantages of the therapy, their perceptions of whether others think they should take part, and their perception of the control they have over taking part in the therapy. Study 1: Forty-three participants were asked to describe their key beliefs before and after taking part in VR. Study 2: One hundred and twenty participants were asked to rate agreement with key beliefs using a 7-point bipolar (– to +3) scale at baseline and three-month follow-up.

Results: Study 1: Content analysis revealed over half of the participants were concerned that VR may make their symptoms worse. Factors that they believed would increase adherence were 'encouragement', 'routine' and 'self motivation', and the barriers were 'physical illnesses' and 'daily schedule'. Study 2: GLM and test–retest reliability calculations indicated much greater change in the beliefs of the treatment group, with beliefs being less positive post therapy.

Discussion: These results indicate that attitudes to a new treatment may change considerably post treatment, and therefore pretreatment attitudes may not be powerful predictors of adherence.

Conclusion: Patients need to be reassured that the treatment will not make their symptoms intolerable, need support during the early stages of rehabilitation when symptoms may initially worsen, and assistance with making rehabilitation a routine part of their daily schedule.

Community-based exercise for residual symptoms of inflammatory peripheral neuropathy

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Background: Persistent symptoms are common after Guillain–Barré syndrome (GBS) and chronic inflammatory demyelinating polyradiculoneuropathy (CIDP). Residual problems include muscle weakness and fatigue, which contribute to persistent disablement. This study assessed the feasibility and effectiveness of a community-based exercise programme for people with CIDP or after GBS.

Methods: Sixteen patients at least one year after nadir of GBS or with stable CIDP were recruited. Participants were prescribed a 12-week unsupervised, community-based programme consisting of strengthening, aerobic and functional exercises by a physiotherapist. Regular contact by telephone monitored symptoms and adherence. The primary outcome was alteration in disability; secondary outcomes included impairment measures and quality of life. Data were analysed using paired *t* or Wilcoxon tests.

Results: Fourteen participants (4 females; 10 GBS, 4 CIDP) completed the programme, undertaking a mean (SD) of 37 (3) sessions over three months and 20 days (29 days). All exercised safely with no adverse events. Significant improvements were seen in disability (ODSS, $P=0.02$), health-related quality of life (SF-36, PCS $P=0.004$), anxiety ($P=0.02$) and fatigue ($P=0.01$). Improvements in isometric strength were statistically significant ($P=0.032$) as were changes in the total workload produced on exercise testing ($P=0.02$). Peak workload remained unchanged from baseline.

Discussion: These findings support the use of prescribed exercise to reduce persistent disability after GBS or CIDP. Limitations of this study were lack of rater blinding to subject participation and lack of a non-exercising control group.

Conclusion: This study demonstrates that community-based exercise is feasible and appears to improve chronic disability in people with GBS and CIDP.