Clinical Rehabilitation 2005; **19:** 45–53

Lateral weight transference exercises following acute stroke: a preliminary study of clinical effectiveness

TE Howe Postgraduate Institute, School of Health and Social Care and Teesside Centre for Rehabilitation Sciences, University of Teesside, The James Cook University Hospital, Middlesbrough, **I Taylor** School of Health and Social Care, University of Teesside, Middlesbrough and WestMARC, Southern General Hospital, Glasgow, **P Finn** School of Health and Social Care, University of Teesside, Middlesbrough and **H Jones** Stroke Rehabilitation, Physiotherapy Department and Neurosciences, The James Cook University Hospital, Middlesbrough, UK

Received 10th May 2003; returned for revisions 21st August 2003; revised manuscript accepted 20th June 2004.

Objectives: To evaluate a training programme aimed at improving lateral weight transference in patients following acute stroke to determine main treatment effects, if any, to inform the design of future studies.
Design: A single-blind randomized controlled trial.
Setting: The Stroke Unit at The James Cook University Hospital, Middlesbrough, UK.
Subjects: Thirty-five patients with an acute stroke.
Interventions: All subjects received their usual care, including physiotherapy. The treatment group ($n = 17$) received 12 additional therapy sessions (over four weeks) comprising exercises aimed at improving lateral weight transference in sitting delivered by trained physiotherapy assistants.
Main outcome measures: Measures of dynamic reaching, sitting and standing, and static standing balance were undertaken by a blind independent observer.
Results: Specific measures of weight displacement in standing and reaching, and timed standing up and sitting down did not detect any differences over time regardless of group. Neither were there any significant changes over time, except for sway during static standing ($p < 0.01$) and time to return to their original position during dynamic reaching ($p = 0.01$).
Conclusions: A training programme aimed at improving lateral weight transference did not appear to enhance the rehabilitation of acute stroke patients. Improvements observed in postural control in standing and sitting may be attributable to usual care or natural recovery.

Address for correspondence: Professor Tracey Howe, Director, Teesside Centre for Rehabilitation Sciences, University of Teesside, The James Cook University Hospital, Middlesbrough, TS3 4BW, UK. e-mail: tracey.howe@tees.ac.uk

 10.1191/0269215505cr786oa

Introduction

Following acute stroke, the ability to move outside the base of support in sitting, balance in standing and move from sitting to standing and back again is critical to independence. The evaluation of physiotherapy intervention in stroke rehabilitation is a priority area for physiotherapy research.[1,2] According to physiotherapy treatment approaches based on'neurophysiological' principles[3,4] the ability to selectively transfer weight is deemed essential to enable achievement of these basic functional tasks. A recent Cochrane review[5] recommended that future research should concentrate on investigating clearly defined and described techniques regardless of their theoretical origin.

Patients, at least one year following stroke, in the experimental group of a two-week forward reaching task-related programme were able to reach further and faster, increase the load through the affected lower limb and improve activation of leg muscles to improve balance compared to a control group.[6] The experimental group also improved in a sit-to-stand activity, however, the sample size was small. Therefore, the purpose of this study was to evaluate a training programme aimed at improving lateral weight transference in patients following acute stroke to determine main treatment effects, if any, on specific measures of weight displacement in standing and reaching. We also used measures of standing up and sitting down. In addition, we recorded length of stay in hospital and the duration and number of treatment sessions. Data from this preliminary study will inform sample size calculations for, and assist in the design of, future randomized controlled trials.

Methods

Approval was granted by the local research ethics committee and consecutive patients admitted to the stroke unit at The James Cook University Hospital, Middlesbrough, UK were approached. They were included in this study if they met the following criteria: aged over 18 years with an acute vascular stroke (haemorrhage or infarct) presenting with hemiplegia; medically stable; able to co-operate with treatment and give informed consent; previously independently mobile indoors with or without a stick around their home; and previously independent in personal activities of daily living. They were excluded if they had a history of any other neurological pathology, conditions affecting balance, vertigo, medication affecting balance, dementia, impaired conscious levels or concomitant medical illness or musculoskeletal conditions affecting upper limbs, hips, spine impairing their ability to undergo therapy. Patients with serious perceptual problems (assessed using the Rivermead Perceptual Assessment Battery and the Rey-Osterreith Complex figure copying test with scores below 30), severe receptive dysphasia, or those classified as having the 'pusher syndrome'[3] determined clinically were also excluded.

All patients received their usual care, including physiotherapy, but were randomly allocated to a usual care only group, or to the treatment group receiving 12 additional therapy sessions (a total of 6 h over four weeks) (Figure 1). Group allocation was via randomized permutated blocks.[7] The project manager held details of assignment and revealed these to the recruiting physiotherapist via telephone only when the patient was due to be allocated to a group. The code was not broken until all patients had completed the study and all analysis was complete.

The treatment comprised exercises aimed at improving lateral weight transference in sitting and standing based on the work of Davies[4] and was delivered by trained physiotherapy assistants. This included repetition (practice) of self-initiated goal-orientated activities in various postures with, where appropriate, manual guidance and verbal encouragement of these movement strategies (feedback) (Appendix 1). Reaching in sitting or standing postures is preceded and accompanied by postural adjustments resulting in segmental alignment.[8] Outcome measures included lateral reaching in sitting, standing up, sitting down, and static standing and were undertaken by a blind independent observer at baseline, four weeks (retest) and eight weeks (follow-up). Three repetitions of each activity were undertaken on each test occasion with rest periods between each, the mean value was used for analysis. These measures of performance, selected to be relevant to a clinical setting, were repeatable.[9,10]

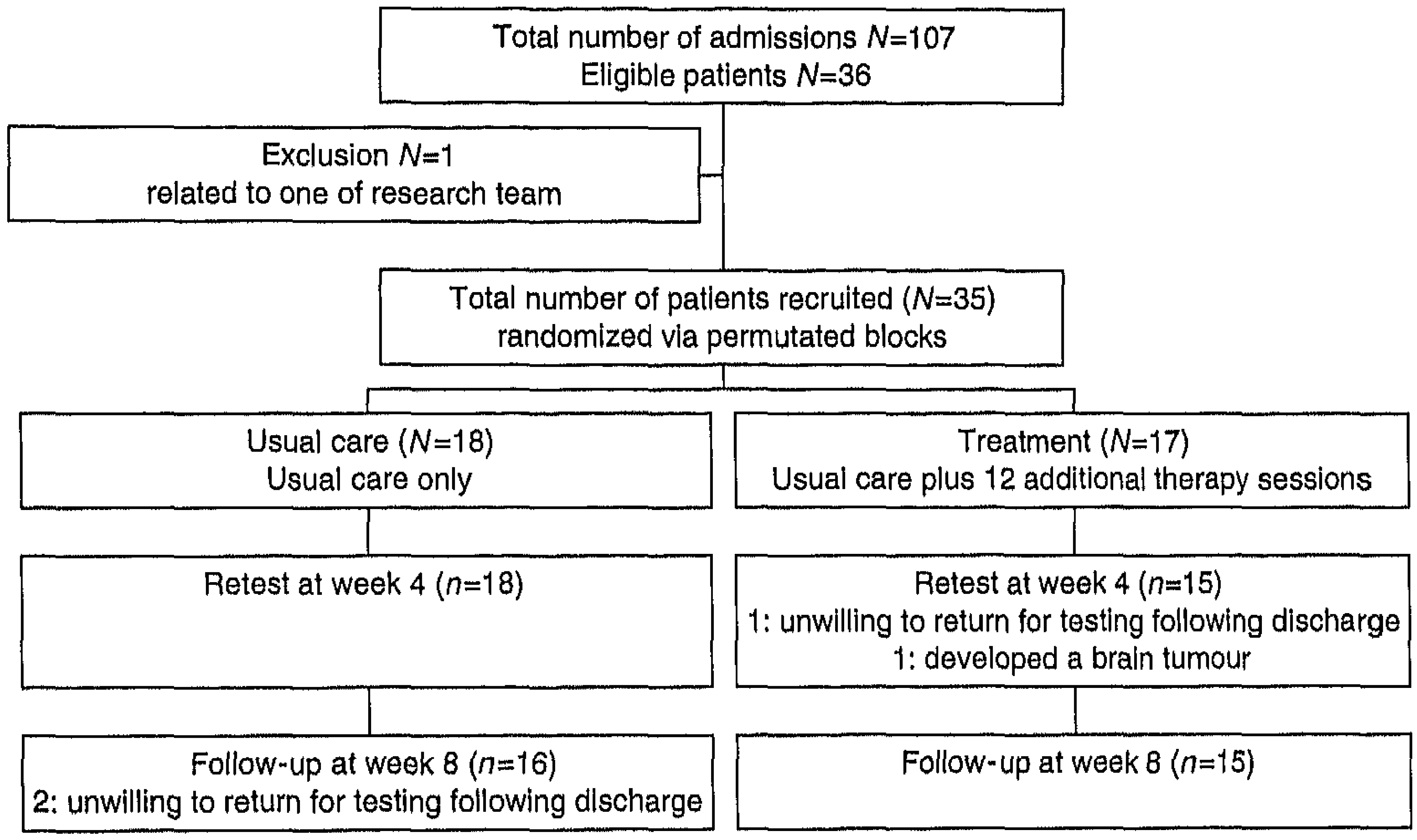

Figure 1 Flow diagram of participants' progression through the trial

Lateral reach test

Patients were seated with their thighs fully supported on the seat device of a Balance Performance Monitor (SMS Technologies Ltd., Harlow, UK) positioned on a table, the height of which was adjusted to ensure that their feet were off the ground throughout the test. Patients were asked to reach sideways with their unaffected arm and touch a target positioned at the height of C7 during sitting and at a distance of 125% of their arm length (measured from the acromioclavicular joint to the tip of the extended middle finger). Patients were asked to sit up straight prior to commencement of the test and, if successful in reaching the target, a buzzer sounded that signalled them to return to their start position. The hearing impaired were given a visual signal. No instructions were given about movement speed. Data was collected for 30 s at 10 Hz and commenced 10 s prior to the instruction to start the test providing data relating to the start and recovery position. Maximum weight displacement was calculated as the difference between the mean weight displacement during quiet sitting prior to the reach movement and the maximum displacement recorded. Time to return to quiet sitting was calculated as the time taken from maximum weight displacement recorded until the last movement as judged from synchronized video recordings.

Static standing balance

Patients stood barefoot unsupported on the footplates of the Balance Performance Monitor for a maximum of 30 s. No visual feedback or verbal communication was given during the test. Individual stance (width and angle) was recorded at baseline and repeated for subsequent tests. Lateral weight displacement was calculated as the mean of the 300 lateral (left/right) data points; the mid-line value was set at 0%. Sway is the standard deviation of the lateral weight displacement.

Sit-to-stand-to-sit

Patients were seated on an adjustable height armless chair with a backrest. The height of the chair was set at 120% of the distance from the floor to the joint line of the knee during standing for each subject. Patients used their preferred foot position and were allowed to use their arms to assist rising. No instructions were given about speed of movement. A timing device (University of Teesside, UK)[11] was used to collect data, initiation of standing was loss of contact with a pressure switch on the backrest of the chair and the end-point was the head breaking an infrared beam on attainment of full height.

Repeated measures analysis of variance was used to test for between-group differences and changes in measurement values from baseline to retest and follow-up. A per protocol analysis was used, with only data from patients with measurements at all three visits able to be analysed. The statistician (PF) was blind to the nature of group allocation until completion of analysis. A significance level of 5% was used.

Results

The recruitment period was from 10 September 2001 to 14 February 2002. Baseline characteristics are outlined in Table 1. The groups did not differ (statistically significantly) in any of these characteristics.

Eleven physiotherapists, and one student physiotherapist and two physiotherapy assistants working under the supervision of a physiotherapist, were involved in the delivery of physiotherapy deemed usual care for this sample. Patients in the usual care group ($n = 18$) received 255 sessions of therapy, total duration 8643 min, and those in the treatment group ($n = 17$) received, as their usual care, 217 sessions, total duration 7135 min. The average duration of a session was 5.5 min longer in the treatment group, mean 38.4 compared to 32.9 min, however as the sessions are not independent of each other it is not appropriate to test for differences in session duration. The average individual session duration per patient was not statistically significantly different between the groups (Mann–Whitney U-test; $U = 145.0$, $p = 0.79$).

Patients in the treatment group between them received 181 additional treatment sessions, mean 10.6 sessions, each of 30 min duration (total 5430 min).

The length of stay in hospital was mean (standard deviation) 23.1 (17.5) days and 26.5 (15.7) days for usual care and treatment groups respectively and was not statistically significantly different.

Table 2 shows group means (SD) for individuals who performed the test at baseline, retest (four weeks) and follow-up (eight weeks) respectively. Measures of weight displacement in standing and reaching, and timed standing up and sitting down did not detect any statistically significant differences over time regardless of group. Neither were there any significant changes over time within groups, except for sway during static standing ($F[1,24] = 12.02$, $p < 0.01$) and time to return to their original position during dynamic reaching ($F[1,29] = 8.94$, $p = 0.01$). However, the time taken to stand up from sitting and to sit from standing appeared to decrease at retest then increase at follow-up. No differences were detected in lateral weight displacement in standing or sitting even

Table 1 Mean (SD) baseline characteristics of registered patients ($N = 35$)

	Treatment ($n = 17$)	Usual care ($n = 18$)
Sex (male/female)	9/8	9/9
Age (years)	71.5 (10.9)	70.7 (7.6)
Side of hemiplegia (left/right)	9/8	11/7
Weight (kg)	76.1 (18.4) ($n = 14$)	71.8 (11.9) ($n = 14$)
Height (m)	1.66 (0.10)	1.66 (0.07) ($n = 17$)
Body mass index (kg/m^2)	27.2 (3.9) ($n = 14$)	26.1 (3.7) ($n = 14$)
Mean time from stroke to recruitment	26.5 (15.7)	23.1(17.5)
Modified Rivermead Mobility Index on admission	24.7 (8.1) ($n = 6$)	24.4 (8.9) ($n = 8$)
First stroke	13	15
Stroke classification		
Total anterior circulation infarction (TACI)	2	3
Partial anterior circulation infarction (PACI)	7	6
Lacunar circulation infarction (LACI)	4	4
Posterior circulation infarction (POCI)	1	3
Other/no report	3	2

Table 2 Test characteristics by group

	Treatment ($n = 17$)	Usual care ($n = 18$)
Lateral reach test		
Maximum weight displacement (%)		
Baseline	69.3 (12.0) ($n = 17$)	71.4 (13.2) ($n = 18$)
Retest	66.3 (12.2) ($n = 15$)	71.4 (12.0) ($n = 18$)
Follow-up	68.2 (12.5) ($n = 15$)	71.7 (7.6) ($n = 16$)
Time to return to quiet sitting (s)		
Baseline	2.9 (1.5) ($n = 17$)	2.5 (0.8) ($n = 18$)
Retest	1.9 (0.8) ($n = 15$)	2.1 (0.7) ($n = 18$)
Follow-up	2.5 (1.3) ($n = 15$)	1.9 (0.5) ($n = 16$)
Static standing balance		
Lateral weight displacement (% bodyweight: to expected side)		
Baseline	3.6 (33.5) ($n = 16$)	5.3 (30.1) ($n = 13$)
Retest	6.1 (33.8) ($n = 15$)	3.4 (27.0) ($n = 17$)
Follow-up	2.5 (32.7) ($n = 15$)	−0.9 (28.3) ($n = 15$)
Lateral weight displacement (% bodyweight: absolute)		
Baseline	22.6 (24.2) ($n = 16$)	10.3 (28.7) ($n = 13$)
Retest	24.4 (23.4) ($n = 15$)	19.2 (18.6) ($n = 17$)
Follow-up	19.6 (25.8) ($n = 15$)	18.0 (21.3) ($n = 15$)
Sway (% lateral weight displacement)		
Baseline	7.4 (6.2) ($n = 16$)	6.4 (2.7) ($n = 13$)
Retest	4.8 (3.6) ($n = 15$)	4.5 (2.9) ($n = 17$)
Follow-up	4.2 (2.4) ($n = 15$)	3.7 (2.4) ($n = 15$)
Sit-to-stand-to-sit		
Sit-to-Stand (s)		
Baseline	5.5 (7.5) ($n = 14$)	8.9 (17.0) ($n = 12$)
Retest	3.3 (3.7) ($n = 15$)	2.6 (1.2) ($n = 15$)
Follow-up	4.2 (7.3) ($n = 14$)	2.9 (2.5) ($n = 15$)
Stand-to-Sit (s)		
Baseline	5.1 (7.7) ($n = 14$)	3.9 (3.3) ($n = 12$)
Retest	2.7 (1.1) ($n = 15$)	2.9 (1.9) ($n = 15$)
Follow-up	3.1 (3.1) ($n = 14$)	2.5 (1.3) ($n = 15$)

Table shows group means (SD) for individuals who performed the test at baseline, retest (four weeks) and follow-up (eight weeks) respectively.

when values were analysed taking into consideration the expected side of weight displacement by side of hemiplegia.

Discussion

We used specific measures of weight displacement in standing and reaching, in addition to timed standing up and sitting down to evaluate a training programme aimed at improving lateral weight transference in patients following acute stroke. We found that there were no significant differences between the groups for any of these outcome measures. However, there were significant differences within groups; sway values during static standing decreased significantly over time, and the time taken to return from maximum weight displacement back to the original resting position during reaching in sitting also decreased significantly over time. These results indicate an improvement in postural control in standing and sitting.

Previous studies have investigated the effect of modifications of posture and direction on variables relating to reaching forward in healthy subjects.[12,13] A further study of stroke patients revealed that after a two-week task-related programme subjects were able to reach further and faster, increase the load through the affected lower limb and improve activation of leg muscles to improve balance compared to a control group.[6] The experimental group also improved in a sit-to-stand activity. However, the sample size was small and the population comprised subjects at least one year following stroke. Other authors have reported the use of the BPM for training lateral weight distribution in standing following stroke.[14] The use of visual feedback was promising,[15] reducing asymmetry and regaining a normal pattern of weight distribution after four weeks training. However, this comprised a single case series and further work in this area has not been undertaken.

The overall lack of general treatment effects of either usual care only or in combination with a specific component of treatment, lateral weight transference, observed in our study may be attributable to several causes. Explanations could include the small sample size, heterogeneous nature of our sample, the treatment dose, clinician bias, the timing of interventions, choice of outcome measures, the type of intervention, and the individualized mixture of interventions that make up usual care.

There is a lack of randomized controlled trials in this area and thus this study was designed to determine the main treatment effects, if any, to inform sample size calculations for, and the design of, future studies. We recruited a relatively small sample of 35 patients during a five-month period, but not surprisingly, despite our inclusion criteria, they were heterogeneous for cerebral damage characteristics, other associated problems and time of commencement of therapy. However, their average age was 71 years and initial scores on the Modified Rivermead Mobility Index were similar to those reported in the literature.[16] Although these participants represented only one-third of admissions during this period they were deemed a representative sample of patients who would receive therapeutic input in other rehabilitation units and thus our results have implications for current practice.

For the significant results (sway during static standing and time to return to original position during sitting) over time, the study had power over 90%. However, the small effect sizes observed for all other comparisons indicate that a much larger total sample would be required, possibly necessitating the need for a multicentre approach.

The treatment dose, an additional 12 sessions (6 h), on first impression may be deemed small. However, patients in the usual care group received a total of 7135 min physiotherapy while those in the treatment group received 8643 min. The additional therapy received by the treatment group represented a 63% increase in total therapy time. This would have corresponded to a 76% increase for those in the usual care group. These values are similar to the amount of total treatment, from 5 to 36 h, stated in studies identified in a recent Cochrane review,[5] and compare to the 67% additional therapy received by the experimental group in a study investigating the effect of intensity of therapy in a neurological rehabilitation setting.[17] Furthermore, the average amount of daily treatment received by intensive rehabilitation groups, based on a research synthesis of nine studies, was 48.4 min compared with 23.4 min for control groups. Meta-analysis revealed small but statistically significant intensity-effect relationships in activities of daily living and neuromuscular and functional outcomes.[18]

It is difficult to blind patients and therapists in trials examining the efficacy of a physical intervention. The introduction of bias by therapists with knowledge of group allocation was monitored using standardized coded treatment sheets for all patients. This revealed that there was no statistically significant difference between the groups in the average individual session duration per patient. We assume therefore, that our attempts at minimizing bias were successful.

It has been reported that the time course of functional recovery is during the first 3–6 months following stroke. Indeed 80% of patients in the Copenhagen Stroke Study achieved their best walking function in the first five weeks.[19] The length of stay in hospital in our study was within this time frame and thus the timing of our interventions could potentially have had the optimum level of impact.

Patients needed a high level of ability to independently stand up from sitting and maintain standing for 30 s. Four patients were unable to achieve standing and five were unable to maintain standing at baseline but were able to on subsequent occasions (floor effect). However, these data were not taken into account as a per protocol analysis was used, with only data from patients with measurements at all three visits able to be analysed.

The intervention, based on the work of Davies,[4] may lack a strong theoretical basis but incorporated elements of motor learning[8,20] including repetition (practice) of self-initiated goal-orientated activities with, where appropriate, manual guidance and verbal encouragement (feedback).

Physiotherapists reported that usual care was loosely based on 'neurophysiological' principles, however, their choice of specific physical interventions during each session was determined on an individual basis based on the symptomatic presentation of the patient at the time. Therapy staff based on the stroke unit during the recruitment and treatment periods included physiotherapists,

Clinical messages

- A training programme aimed at improving lateral weight transference did not appear to enhance the acute rehabilitation of stroke patients.
- Sway values during static standing and time to return from reaching in sitting indicated a significant improvement in postural control over time.
- Improvements observed may be attributable to usual care or natural recovery.

students and therapy assistants working under the supervision of these physiotherapists. This is representative of clinical practice in the UK where staffing levels are in a constant state of flux and junior staff rotate through areas. Therefore, the physical interventions given to patients in the same group or between groups may have demonstrated considerable variability.

Physiotherapy treatment approaches based on 'neurophysiological' principles[3,4] believe that the interaction between the trunk, the upper limb and the pelvis are central in the ability to perform tasks involving reaching outside of the base of support. It is postulated that loss of selective trunk activity impairs the ability to utilize the limbs effectively and to maintain balance without falling over and much therapy time appears to be devoted to improving this ability, namely lateral weight transference. The results of the present study indicate that a training programme aimed at improving lateral weight transference did not appear to enhance the acute rehabilitation of stroke patients. Improvements observed for sway values during static standing and the time taken to return from maximum weight displacement back to the original resting position during reaching in sitting indicate an improvement in postural control in standing and sitting but may be attributable to usual care or natural recovery.

Acknowledgements

The authors wish to thank all the participants who freely gave up their time. Judy Purton, Hannah Lowndes-Northcott and Dave Williams for their valuable contributions in the execution of this study, the staff of the stroke unit at The James Cook University Hospital for their patience and accommodating us. Andrea Cook and Naomi Roopchand for managing the project and the Physiotherapy Research Foundation for providing funds to enable the completion of this study.

References

1 Chartered Society of Physiotherapy. Priorities for physiotherapy research 1997. Results of a consultation exercise, 1998.

2 Chartered Society of Physiotherapy. Priorities for physiotherapy research 2001. Results of a consultation exercise, 2002.

3 Davies PM. *Steps to follow*. Berlin: Springer-Verlag, 1985.

4 Davies PM. *Right in the middle*. Berlin: Springer-Verlag, 1990.

5 Pollock A, Baer G, Pomeroy V, Langhorne P. Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke (Cochrane Review). In: *The Cochrane Library*, Issue 2. Chichester, UK: John Wiley & Sons, 2004.

6 Dean CM, Shepherd RB. Task-related training improves performance of seated reaching tasks after stroke: a randomised controlled trial. *Stroke* 1997; **28**: 722–28.

7 Bland M. *An introduction to medical statistics*. Oxford: Oxford University Press, 1995; **9**: 96.

8 Carr JH, Shepherd RB. *Neurological rehabilitation: optimizing motor performance*. Oxford: Butterworth Heinemann, 1998.

9 Howe TE, Taylor I, Ashton VJ. Repeatability and precision of lateral weight distribution measurements of healthy volunteers and stroke patients during quiet standing. Conference Proceedings, 14th International Congress of the World Confederation of Physical Therapy, Barcelona, Spain 2003.

10 Howe TE, Taylor I, Whittaker VJ. Repeatability and precision of lateral weight displacement measurements of healthy volunteers and stroke patients during lateral reaching in sitting, and timed sitting and standing. Unpublished data.

11 Howe TE, Fitzgerald JE. A timing device for measuring temporal parameters of sitting and standing. The Institute of Physics and Engineering in Medicine, Conference proceedings. Measurements and Simulations in Musculoskeletal Biomechanics, London, 1999.

12 Dean CM, Shepherd RB, Adams R. Sitting balance I: trunk-arm co-ordination and the contribution of the lower limbs during self-paced reaching in sitting. *Gait Posture* 1999; **10**: 135–46.

13 Dean CM, Shepherd RB, Adams R. Sitting balance II: reach direction and thigh support affect the contribution of the lower limbs when reaching beyond arms length. *Gait Posture* 1999; **10**: 147–53.

14 Sackley CM, Baguley BI, Gent S, Hodgson P. The use of a balance performance monitor and weight-transference in the treatment of weight-bearing problems after stroke. *Physiotherapy* 1992; **78**: 907–14.

15 Sackley CM, Baguley BI. Visual feedback after stroke with the balance performance monitor: two single-case studies. *Clini Rehabil* 1993; **7**: 189–95.
16 Lennon S, Johnson L. The modified Rivermead Mobility Index: validity and reliability. *Disabil Rehabil* 2000; **22**: 833–39.
17 Slade A, Tennant A, Chamberlain MA. A randomised controlled trial to determine the effect of intensity of therapy upon length of stay in a neurological rehabilitation setting. *J Rehabil Medi* 2002; **34**: 260–66.
18 Kwakkel G, Wagenaar RC, Koelman TW, Lankhorst GJ, Koetsier JC. Effects of intensity of rehabilitation after stroke: a research synthesis. *Stroke* 1997; **28**: 1550–56.
19 Jorgensen HS, Nakayama H, Raaschou HO, Olsen TS. Recovery of walking function in stroke patients: The Copenhagen Stroke Study. *Arch Phys Med Rehabil* 1995; **76**: 27–32.
20 Carr JH, Shepherd RB. *Movement science: foundations for physical therapy in rehabilitation*, first edition. Rockville, MD: Aspen Publishers, 1987.

Appendix 1 – Treatment intervention

Patient sitting on a plinth, with maximum base of support, feet on floor, table in front at elbow height:

1) Patient's elbows on table, assistant on affected side, supporting affected arm on table, and prompting lumbar flexion and extension, maintaining neutral head position and correcting any associated cervical extension (10 reps)
2) Patient and assistant position as in ex 1, patient using unaffected hand to move cones from unaffected side to affected side within patient's own base of support (10 reps)
3) As ex 2, but moving cones forwards and backwards on table with unaffected arm, within patient's base of support (10 reps)
4) As ex 2, but moving hoops over cones on table with unaffected arm, from unaffected to affected side, reaching out of patient's base of support (10 reps)
5) As ex 2, but moving hoops over cones on table forwards and back, reaching out of patient's base of support (10 reps)

Remove table, same starting position as at beginning:

6) With unaffected hand, moving hoops from outside base of support on unaffected side of plinth, and placing on stand in front of patient at height of full reach of patient (10 reps)
7) Repeat with stand slightly towards unaffected side, and with stand placed slightly towards affected side (10 reps)
8) Position as ex 6, with unaffected hand moving hoops from plinth on affected side and placing on the floor between feet (10 reps)
9) Position as ex 6, with unaffected hand moving hoops from plinth on affected side and placing on the floor between feet (10 reps)

Reposition table in front of patient but allow room for standing:

10) Patient's hands on table, assistant on affected side, patient moves from sitting to standing (10 reps)
11) Patient and assistant position as in ex 1, patient using affected hand to move cones from unaffected side to affected
12) As ex 2, but moving cones forwards and backwards on table with affected arm, within patient's base of side within patient's own base of support (10 reps)
13) As ex 2, but moving hoops over cones on table with affected arm, from unaffected to affected side, reaching out of patient's base of support. (10 reps)

Appendix 1 (*Continued*)

14) As ex 2, but moving hoops over cones on table forwards and back, reaching out of patient's base of support (10 reps)

Remove table, same starting position as at beginning:

15) With affected hand, moving hoops from outside base of support on unaffected side of plinth, and placing on stand in front of patient at height of full reach of patient (10 reps)
16) Repeat with stand slightly towards affected side, and with stand placed slightly towards affected side (10 reps)