

SHORT REPORT

The London handicap scale: a re-evaluation of its validity using standard scoring and simple summation

Crispin Jenkinson, Jonathan Mant, Judy Carter, Derick Wade, Simon Winner

Abstract

Objective—To assess the validity of the London handicap scale (LHS) using a simple unweighted scoring system compared with traditional weighted scoring

Methods—323 patients admitted to hospital with acute stroke were followed up by interview 6 months after their stroke as part of a trial looking at the impact of a family support organiser. Outcome measures included the six item LHS, the Dartmouth COOP charts, the Frenchay activities index, the Barthel index, and the hospital anxiety and depression scale. Patients' handicap score was calculated both using the standard procedure (with weighting) for the LHS, and using a simple summation procedure without weighting (U-LHS). Construct validity of both LHS and U-LHS was assessed by testing their correlations with the other outcome measures.

Results—Cronbach's *a* for the LHS was 0.83. The U-LHS was highly correlated with the LHS ($r=0.98$). Correlation of U-LHS with the other outcome measures gave very similar results to correlation of LHS with these measures.

Conclusion—Simple summation scoring of the LHS does not lead to any change in the measurement properties of the instrument compared with standard weighted scoring. Unweighted scores are easier to calculate and interpret, so it is recommended that these are used.

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The London handicap scale (LHS) is a measure of the disadvantage experienced as a result of ill health.¹ The reduction of handicap is a central aim of rehabilitation programmes and other interventions for patients with neurological disease.² Measures such as the LHS therefore have great potential in the measurement of outcomes both in research settings and in the evaluation of clinical services for the purposes of audit and clinical governance. Scales for widespread clinical use should be simple to apply and

to interpret, and should be validated in appropriate clinical settings.

Whereas many measures lack a clear conceptual base,^{3,4} the LHS is based on the descriptive framework of handicap developed by the World Health Organisation (WHO) in the international classification of impairments, disabilities, and handicaps (ICIDH).⁵ The ICIDH defines six dimensions of handicap: mobility, orientation, occupation, physical independence, social integration, and economic self sufficiency. In the LHS each of these six areas is classified on a six point scale. Respondents complete the questionnaire by selecting one category per dimension indicating their perceived level of disadvantage (on a six point scale from "none" to "extreme"). Although the concept of handicap has been superseded by the concept of participation in a more recent framework of the WHO,⁶ the dimensions of the LHS remain relevant and are represented in the newer classification. The LHS seems to be a valid, reliable, and acceptable measure,^{1,7} and was found to be sensitive to differences between groups in a randomised controlled trial of occupational therapy.⁸ However, a potential limitation is the use of weights to derive a single handicap measure between 0 (extreme disadvantage) and 100 (no disadvantage) from the responses to the six questions. The originally published weights were derived from interviews with 79 community dwelling subjects who were asked to rate the severity of some health states described by the questionnaire on a visual analogue rating scale.⁹ These weights were subsequently modified on the basis of further interviews.⁷ It has been argued that such weights can add little to the validity of the summary measure,¹⁰ but make the scoring of questionnaires more difficult and limit uptake by researchers.¹¹ Therefore, it is important to assess whether weighting does enhance the validity of the questionnaire. The aim of this study was to compare scores from the LHS based on the original weighting scheme with those gained from an unweighted LHS (U-LHS). The U-LHS was calculated simply by summing the raw scores of the six dimensions of the LHS and representing the total on a scale of 0 to 100 as for the original instrument. The validity of the U-LHS in relation to the LHS was

Health Services
Research Unit,
Department of Public
Health, University of
Oxford, Institute of
Health Sciences,
Headington, Oxford,
UK
C Jenkinson

Department of
Primary Care and
General Practice,
University of
Birmingham,
Birmingham, UK
J Mant

Rivermead
Rehabilitation Centre,
Abingdon Road,
Oxford, UK
J Carter
D Wade

Department of Clinical
Geratology, Radcliffe
Infirmary, Oxford, UK
S Winner

Correspondence to:
Dr Jonathan Mant,
Department of Primary Care
and General Practice,
Medical School, University
of Birmingham, Edgbaston,
Birmingham, B15 2TT, UK
email j.w.mant@bham.ac.uk

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assessed by comparing performance with other outcome measures used in rehabilitation research.

Methods

From 1996 to 1998, 323 patients who had been admitted to hospital in Oxford with acute stroke were followed up 6 months later. These patients were all part of the Oxfordshire randomised controlled trial of the impact of a family support organiser on patients with stroke and their carers.¹² The exclusion criteria for this study were: admitted from a nursing home; no local family carer; poor prognosis (not expected to survive to 6 months) and presence of major medical problems unrelated to stroke. Patients were interviewed at their place of residence by a researcher using a battery of outcome measures, including the LHS (described above), the Dartmouth COOP charts,¹³ the Frenchay activities index,¹⁴ the Barthel activities of daily living index,¹⁵ and the hospital anxiety and depression scale.¹⁶ Ethical approval was obtained from the Central Oxford Research Ethics Committee.

THE DARTMOUTH COOP CHARTS

The COOP chart system is a general health status measure which consists of nine questions. There are five response categories for each question, with each response category being linked to a drawing intended to represent the health state. The charts were initially developed to provide primary care clinicians with an efficient measurement tool for assessing and monitoring patient function in routine practice.^{17, 18} The nine questions cover physical functioning/fitness, feelings/emotional condition, daily activities, social activities, pain, overall health, social support, and quality of life. A further question asks patients to report on change in health, but data on this item are not reported here. The COOP charts have been compared with longer measures of health status and provide a similar picture of health state.^{13, 19} The COOP charts measure several dimensions of health, of which those tapping physical aspects of health would be anticipated to be more closely associated with the LHS than those tapping emotional aspects of health.

THE FRENCHAY ACTIVITIES INDEX (FAI)

The FAI consists of 15 activities (including housework, walking, shopping, gardening, reading, and work). The activities included were not selected by patients with stroke, but a reasonably high level of concordance between this measure and the LHS would be expected nevertheless.

THE BARTHEL INDEX

The Barthel index measures functional independence in personal care and mobility. It was developed to monitor performance before and after treatment to help establish how much nursing care may be needed by specific patients. It assesses independence in several activities of daily living, such as feeding, bathing, walking, dressing, and controlling

bowels and bladder. A reasonably high level of association would be expected between the LHS and Barthel score.

THE HOSPITAL ANXIETY AND DEPRESSION SCALE

The hospital anxiety and depression scale (HAD) scale was designed to detect the presence and severity of mood disorder likely to be found in non-psychiatric hospital outpatients. The measure consists of 14 items, seven of which relate to depression and seven of which relate to anxiety. Consequently the instrument yields two scores: an anxiety score and a depression score. None of the components of the LHS relate directly to anxiety or depression, so no strong correlation would be anticipated between the LHS and the HAD.

ANALYSIS

Weighted handicap scores (LHS) were calculated using standard scoring.⁷ To determine whether a simple summation of the items of the LHS would be both feasible and sensible the internal reliability of the items was calculated using the Cronbach's α statistic.²⁰ Unweighted (U-LHS) scores were then calculated by assigning a score of 0–5 (0=extreme disability and 5=no disability) for each of the six dimensions of the LHS, adding them together, and multiplying by (100/30). Construct validity of the U-LHS and the LHS was assessed by comparing their results with the other outcome measures described above using the Spearman's rank correlation coefficient. Linear regression was used to determine to what extent dependent variables of the LHS and U-LHS could be explained by scores on the HAD, Barthel, and Frenchay indices and COOP charts, and whether weighting scores produced substantial differences.

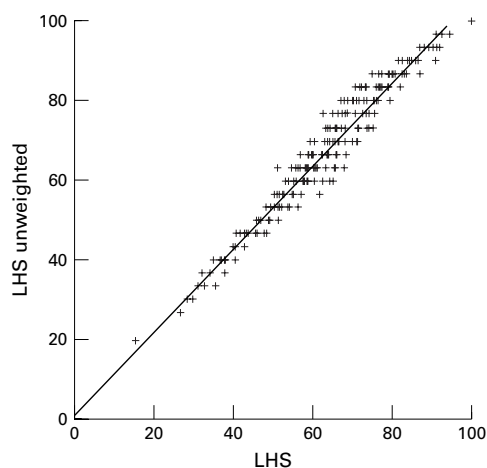
Results

Data on the LHS were available for 303 out of 323 (94%) patients. The mean age of these patients was 74 (SD 11, range 31–94) years. One hundred and sixty five (55%) of the patients were men. Sixty eight (22%) received help to complete the questionnaire.

A Cronbach's α value of 0.83 was achieved which strongly suggests that items of the questionnaire are measuring a single underlying dimension (handicap), and may then reasonably be summed together to provide a single index figure.

The mean score using the LHS was 63.9 (SD 16.4, range 15.3–100), and using U-LHS it was 67.7 (SD 17.5, range 20–100). LHS and U-LHS were highly correlated (Spearman's $r=0.98$, $p<0.0001$ (figure)).

The construct validity of LHS and U-LHS was explored by correlating results of each with the Barthel and Frenchay indices, COOP charts, and HAD. Results are reported in the table. All correlations were in the expected direction with very high correlations between the LHS and the Frenchay and Barthel indices, as well as with COOP charts physical fitness and activities of daily living. There was a striking similarity in correlations between LHS and unweighted LHS scores.



Scatterplots of LHS against unweighted LHS.

Correlation of weighted and unweighted LHS with the Frenchay and Barthel indices and the dimensions of the HAD and COOP charts

	LHS	U - LHS	Number of patients
Frenchay activities index	0.76***	0.81***	291
Barthel ADL index	0.73***	0.78***	299
HAD-anxiety	-0.33***	-0.32***	243
HAD-depression	-0.56***	-0.58***	238
COOP charts:			
Physical fitness	0.64***	0.67***	297
Feelings	0.30***	0.30***	294
Daily activities	0.75***	0.77***	295
Social activities	0.53***	0.54***	293
Pain	0.18**	0.15**	295
Overall health	0.39***	0.40***	293
Social support	0.12*	0.12*	293
Quality of life	0.45***	0.47***	291

*p<0.05; **p<0.01; ***p<0.0001.

A linear regression analysis was undertaken to determine to what extent the dependent variables of LHS and unweighted LHS could be explained by scores on the HAD, Barthel, and Frenchay indices, and COOP charts. Results were similar whether the LHS was weighted (adjusted $R^2=0.66$) or unweighted (adjusted $R^2=0.74$).

Discussion

The LHS was developed as an outcome measure for assessing need and for evaluating new and existing services for people with chronic ill health and disability.¹ It has been shown to be acceptable to patients as it is both brief and easily understood. The uptake of health status measures can be improved if both administration and interpretation of measures is kept relatively straightforward.²¹ Consequently, a simple summation method of scoring the measure, as tested here, would seem desirable.

Measures at the level of handicap (participation) may be useful clinically: they can be used with patients having a wide variety of diseases; they assess the effect of the whole service (including Social Services); and they are likely to measure outcomes of relevance to patients. The LHS might therefore be useful in many areas of clinical audit.

The results of this study suggest that a simplified scoring scheme can provide almost the same information as the original weighted scheme for

the LHS. Although differences between the actual numbers gained using the two methods were found the pattern of results gained was almost identical. The originally published weights were derived from only 79 people,⁹ and although 224 subjects were used to derive the final weights,⁷ this would seem an insufficient number to be certain of their accuracy. Furthermore, a simplified format enhances the interpretability of scores, with, for example, scores above 50 indicating overall no, slight, or moderate problems, and those below 50 indicating considerable, severe, or extreme problems. In this study, the unweighted scores were multiplied by 100/30 to facilitate comparison with the weighted ones. There would of course be no necessity to introduce this complication into the scoring, which could simply be from 0–30. An unweighted score is the most parsimonious solution providing greater ease in calculation and interpretation of scores.

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- 1 Harwood R, Gompertz P, Ebrahim S. Handicap one year after stroke: validity of a new scale. *J Neurol Neurosurg Psychiatry* 1994;57:825–9.
- 2 Ebrahim S. Measurement of impairment, disability and handicap. In: Hopkins A, Costain D, eds. *Measuring the outcomes of medical care*. London: Royal College of Physicians, 1990:27–41.
- 3 McDowell I, Newell C. *Measuring health: a guide to rating scales and questionnaires*. 2nd ed. Oxford: Oxford University Press, 1996.
- 4 McDowell I, Jenkinson C. Development standards for health measures. *Journal of Health Services Research and Policy* 1996;1:238–46.
- 5 World Health Organisation. *International classification of impairments, disabilities and handicaps*. Geneva: WHO, 1980.
- 6 World Health Organisation. *ICIDH-2: International classification of impairments, activities, and participation. A manual of dimensions of disablement and functioning. Beta-1 draft for field trials*. Geneva: WHO, 1997.
- 7 Harwood RH, Ebrahim S. *Manual of the London handicap scale*. Nottingham: University of Nottingham, 1995.
- 8 Walker MF, Gladman JRF, Lincoln NB, et al. Occupational therapy for stroke patients not admitted to hospital: a randomised controlled trial. *Lancet* 1999;354:278–80.
- 9 Harwood R, Rogers A, Dickinson E, et al. Measuring handicap: the London handicap scale, a new outcome measure for chronic disease. *Quality in Health Care* 1994;3:11–16.
- 10 Jenkinson C. Why are we weighting? *Soc Sci Med* 1991;32:1413–16.
- 11 Feinstein AR. Benefits and obstacles for development of health status assessment in clinical settings. *Medical Care* 1992;20(suppl):MS50–6.
- 12 Mant J, Carter J, Wade DT, et al. Randomised controlled trial of a stroke family support organiser. *Cerebrovasc Dis* 1999;9(suppl 1):123.
- 13 McHorney CA, Ware JE, Rogers W, et al. The validity and relative precision of MOS short- and long- form health status measures and Dartmouth COOP charts: Results from the medical outcomes study. *Medical Care* 1992;30:MS253–65.
- 14 Wade DT, Legh-Smith J, Langton-Hewer R. Social activities after stroke: measurement and natural history using the Frenchay activities index. *International Rehabilitation Medicine* 1985;7:176–81.
- 15 Mahoney F, Wood D, Barthel D. Rehabilitation of chronically ill patients: the influence of complications on the final goal. *South Med J* 1958;51:606–9.
- 16 Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67:361–70.
- 17 Nelson EC, Landgraf JM, Hays RD, et al. The functional status of patients: how can it be measured in physicians' offices? *Medical Care* 1990;28:1111–26.
- 18 Wasson J, Keller A, Rubenstein L, et al. Benefits and obstacles of health status assessment in ambulatory settings: the clinician's point of view. *Medical Care* 1992;30:MS42–9.
- 19 Jenkinson C, Lawrence K, McWhinnie D, et al. Sensitivity to change of health status measures in a randomized controlled trial: comparison of the COOP charts and the SF-36. *Qual Life Res* 1995;4:47–52.
- 20 Cronbach, LJ. Coefficient α and the internal structure of tests. *Psychometrika* 1951;16:297–334.
- 21 Kane RL. Commentary: functional assessment questionnaire for geriatric patients, or the clinical Swiss army knife. *Medical Care* 1987;25:S178–89.