

SOCIAL, FUNCTIONAL, AND NEUROPSYCHOLOGICAL DETERMINANTS OF THE PSYCHIATRIC SYMPTOMS OF STROKE PATIENTS RECEIVING REHABILITATION AND LIVING AT HOME

Rodger A. Weddell

From the Department of Surgical Neurology, Morrision Hospital, Swansea, Great Britain

ABSTRACT. In view of the strong evidence supporting the hypothesis that high Expressed Emotion of a key relative contributes to relapse in psychiatric patients, methods used in Expressed Emotion research were applied in an investigation of psychiatric disorder in stroke patients receiving hospital based rehabilitation and support. Patient mood in 37 stroke patients was related to the critical attitude of a key relative. Patient depression may also have been associated with severity of dysphasia, but no link was found between patient mood and the other measures of cognitive or physical deficit used in this study. Psychiatric distress in the key relative had a rather different causal basis. Relatives' psychiatric disorders were associated with physical burden, cognitive deficit, and severity of dysphasia. This study suggests that, when the patient is dependent for self-care, rehabilitation-assisted recovery may alleviate relative distress more than patient distress.

Key words: cerebrovascular disorders, family relationship, psychiatric status, rehabilitation, disability, aphasia.

The increased incidence of psychiatric distress after stroke (10, 20, 26) can be linked with a variety of causal factors (27), including psychosocial determinants. Thus, Espmark (10) and Lishman (20) relate emotional adjustment to intrapsychic factors and premorbid personality. Furthermore, a correlation was found between number of social contacts and severity of depression in the stroke patient (28), and the importance of social influences is also generally recognised (15, 16). Greater appreciation of the influence of psychosocial variables on emotional adjustment would assist in counselling the patient and/or their relatives, and effective counselling may lead to functional gains (as well as improving emotional state), since outcome after rehabilitation has been linked with the psychological adjustment of the stroke patient (14, 19).

The crucial psychosocial determinants of psychiatric distress are often hard to quantify. However, there is a growing body of literature on the Expressed Emotion index, which is a composite meas-

ure of the degree of criticism, hostility, and emotional over-involvement directed by a relative towards a patient with a functional psychiatric illness. Symptomatic relapse is most common in psychiatric patients, when they live with a relative who directs high Expressed Emotion (EE) towards them during a standard interview (6, 33, 35). The Expressed Emotion studies also show that relapse is more frequent when patients spend over 35 hours of each week in close face-to-face contact with a high EE relative. Moreover, social intervention, specifically designed to lower relatives' level of Expressed Emotion and/or lessen face-to-face contact between patient and high EE relatives, resulted in a reduced relapse rate in schizophrenics (17, 18). Taken together, these results strongly suggest that emotion expressed by the key relative causes relapse.

While most work on EE has involved schizophrenic patients, Vaughn & Leff (33) found number of critical comments, one component of the EE index, was also associated with relapse in depressed neurotic patients. However, Expressed Emotion research has not yet been applied in the study of the psychiatric disorders of the brain damaged patient.

The relatives of brain damaged patients also show signs of emotional distress (9, 24), which may sometimes increase the patient's emotional disturbance (23). However, the contribution of psychiatric disorder in the relative to the emotional distress of the brain damaged patient is not often studied.

In addition to psychosocial factors, psychiatric disorders may occur in reaction to neuropsychological and functional deficit. Benson (3) concluded that the social isolation, frustration and a sense of helplessness associated with dysphasia sometimes induces a reactive depression. Robinson & Benson (25) found depression was common in dysphasics, while Gaiotti (12) showed a close link between the catastrophic reaction and dysphasia. There are, however, indications that euphoria occurs in some forms of

dysphasia (3). Furthermore, the relationships between the patient's psychiatric distress and neuropsychological or physical deficits remain to be defined. An association between psychiatric distress and severity of physical or cognitive deficits after brain damage has been found in some studies (22, 28), but patient mood was unrelated to cognitive or functional deficit in other investigations (7, 21, 26, 36).

The present study examines the contribution of family factors to psychiatric distress in stroke outpatients, receiving hospital-based rehabilitation. The hypothesis that relative criticism determines patient mood disorder is examined. The potential contributions of physical deficit, cognitive deficit and dysphasia to psychiatric disorder are also considered. In addition, some determinants of psychiatric distress in the relative are investigated.

METHODS

Subjects. 22 male and 15 female stroke patients were recruited from rehabilitation therapists. 12 were attending a day hospital, and all were receiving physiotherapy and/or speech therapy and/or occupational therapy, at least once weekly. Patients were only selected if they had been living with their key relative (spouse in all but 6 cases) for at least one month. The sample includes all 8 patients in the second pilot study, and a further 29 subjects were subsequently recruited over a 6-month period when therapists referred all suitable current patients. The therapist's view of the patient's or relative's personality and psychiatric status was irrelevant to selection. Patients over 80 years were excluded, and mean age was 65.1 years (SD=7.8 years). Their first stroke had occurred a mean of 18.7 months previously, but 11 patients had at least one further stroke, and the time between the most recent stroke and interviews was an average of 9.8 months (SD=8.1 months; range 1–32 months). The diagnosis of stroke was based on clinical history and current neurological signs, supplemented by EEG records, CT scanning, isotope brain scanning, and angiography (the latter 3 investigations being performed in a minority of cases). There was neurological evidence of bilateral damage in 3 cases. Fourteen patients had had a unilateral right hemisphere stroke. While all social classes were represented most patients were from social classes 3 to 5.

Interview of key relative. This was based on the Camberwell Family Interview (34). Relatives were first asked to describe the main practical problems and behavioural changes due to the stroke, and were specifically questioned about sleep and appetite disturbance, irritability, depression, anxiety, social withdrawal, possessiveness, childishness, emotional lability, changes in affection, sexual changes, personality change, memory impairment and underactivity. When the relative reported a symptom they were asked to describe an incident when the symptom was present, indicate symptom frequency, and also describe their own reactions to the symptom. Questions were not asked in the

same order, and the interview was informal to give the relative freedom to express their feelings about the patient. All interviews were tape-recorded so that subsequently the relative's critical comments could be counted.

Critical comments were rated by carefully following the written guidelines used in the research on Expressed Emotion. An utterance could be rated as a critical comment if it followed a non-leading question from the interviewer, or if the relative spontaneously changed the topic of conversation. Remarks had a critical content when there was a clear statement that the respondent disliked a patient's behaviour, or the patient as a whole person. Criticism was, however, principally detected from the vocal tone and pitch in the relative's utterance. Number of critical comments in 15 interviews was separately assessed by the author and another rater who was blind to all other information about the patient or relative. An acceptable level of interjudge agreement was achieved ($r=0.83$).

Assessment of psychiatric status. Patients and their key relatives each completed a 30-item version of the General Health Questionnaire (GHQ), which has been validated with the Present State Examination (11), and has been used to detect psychiatric disturbance in neurological patients (5, 7, 26).

Benjamin et al. (2) found the GHQ was insensitive to chronic psychiatric disorder, and suggested that a separate brief questionnaire sensitive to chronic illness should be used to supplement the GHQ. For this reason, patients completed the 12-item Lees Scale (31) comprised of two six item subscales measuring general anxiety and general depression. This scale is similar to the Zung Self Rating Depression Scale which has been shown to be a valid measure of mood in stroke patients (26).

Quantitative measures of physical, functional, and neuropsychological deficit. Sensory function in each limb was scored separately. 0 points was scored when there was no evidence of extinction to bilateral touch and ability to detect a single light touch appeared intact. When the patient did not detect unilateral light touch, that limb scored 2 points. In all other cases a score of 1 point was given. A similarly constructed 3 point scale was used to assess loss of power in each limb. Sensory and motor scores were added and thus severity of unilateral sensorimotor impairment ranged from 0–8 points.

A valid Activities of Daily Living scale (ADL) was used to evaluate independence in self-care (30). Though 17 activities are rated in this scale, the authors state, "... the number of individual activities that actually has to be measured can be reduced to five, i.e. walking, making tea, bathing, dressing and transfer from floor to chair ..." These 5 activities were each rated on a three point scale. When the patient performed the activity without the help of another person, 1 point was scored. If the patient was unable to give any assistance, 3 points were scored. Total ADL scores ranged from 5–15 points.

Performance on Ravens Coloured Progressive Matrices and the Benton Visual Retention Test are impaired following damage to either hemisphere (4, 39), and so these tests were administered to provide a general index of degree of cognitive deficit.

The short form of the Token Test (8) measured severity of dysphasia. An array of 20 differently coloured square and

Table I. GHQ, Leeds scores and criticism: males and females compared

	Male patients		Female patients	
	Mean	(SD)	Mean	(SD)
<i>Patient (N=33)</i>				
GHQ	8.9	(7.8)	6.1	(6.5)
Leeds				
(i) Total score	13.2	(6.2)	12.1	(8.1)
(ii) Leeds anxiety	6.6	(4.0)	6.0	(5.3)
(iii) Leeds depression	6.6	(4.0)	6.1	(4.5)
<i>Relative (N=37)</i>				
Critical Comments	7.4	(8.3)	8.3	(6.1)
GHQ	8.4	(9.6)	6.3	(3.7)

round tokens of two sizes are placed before the patient, who is given up to 36 increasingly complex instructions requiring him to touch or move the tokens.

Procedure and statistical analysis. The patient and relative were interviewed twice at home. When they were first seen together Sensorimotor function and independence in ADL were assessed, and the Benton and Short Token Test were also administered. In the second interview, the patient was left on his own to complete Ravens Coloured Matrices, the GHQ and the Leeds scales. In another room the relative was interviewed. The investigator subsequently checked that the patient had completed the tests correctly. A few dysphasic patients required assistance in completing the GHQ and Leeds scales. The investigator read the questions aloud at least twice to ensure that the patient's answers were consistent. Replies were inconsistent for 4 patients, who were not scored on the GHQ or Leeds scales.

Pearson correlation coefficients, partial correlation coefficients, and Student's *t*-values were computed using SPSSX (32), and two-tailed probability values are quoted throughout. Subgroups considered in the statistical analyses all comprised at least 14 subjects, scores on all measures employed had a range of at least 10 points, and score distributions were judged sufficiently close to normality to warrant use of parametric statistics. However, a supplementary non-parametric analysis was performed to check the validity of the parametric analyses. Both analyses produced the same results, except that the non-parametric Kendall partial correlation procedure permits control of only one variable, and the significance of the partial correlation coefficient cannot be estimated precisely (29).

RESULTS

Relative criticism, relative mood and psychiatric disorder in the patient. Table I compares male and female patients and their relatives in amount of criticism, GHQ or Leeds scale scores. No sex differences were found when male and female group scores were compared using the Student's *t*-test.

19 relatives (51%) and 16 patients (48%) were clas-

sified as psychiatric cases using a GHQ cutting score of 4/5. A further 7 patients scored above the recommended cut-off point of 6/7 on the Leeds Anxiety and/or Depression scales (31). The GHQ contains questions about the physical and cognitive symptoms of psychiatric disorder. As physical and cognitive symptoms are frequent after brain damage, a higher GHQ cutting score of 11/12 has been recommended to identify the neurological patients with psychiatric disorder (5). Eleven (33%) patients' scores were above this more conservative cut-off. Even this conservative cutting score suggests a high rate of psychiatric distress in the patient group, since only 16.3% of an Australian and 21.6% of a British random community sample scored above the normal GHQ cut-off score of 4/5 (13).

Criticism in the key relative correlated significantly with patient GHQ, Leeds Depression and Total Leeds scores, but not with Leeds Anxiety score (Table II). However, Table II shows that relative GHQ was similarly correlated with these indices of patient mood. On one hand, the patient's psychiatric disturbance may be separately related with (a) the relative's criticism and (b) mood disorder in the relative. On the other hand, these two effects may not be dissociable. Indeed, relatives' GHQ scores correlated with the number of critical comments ($r=0.56$; $p<0.002$).

Partial correlation was used to separate the contribution of (a) relative criticism on patient mood, from (b) the influence of relative mood on patient mood. After holding relative GHQ constant, the partial correlation coefficients for relative criticism with patient GHQ (Partial $r=0.39$; $p<0.06$) and patient Total Leeds (Partial $r=0.38$; $p<0.07$) approached significance. In contrast, control of relative criticism resulted in non-significant partial correlation coefficients between relative GHQ and patient GHQ

Table II. The association between relative criticism, relative mood, and patient mood, in 33 patient-relative pairs

	Relative criticism	Relative GHQ
Patient GHQ	0.50**	0.34 ^a
Patient Leeds		
(i) Total score	0.51**	0.46*
(ii) Leeds anxiety	0.31 ^a	0.19
(iii) Leeds depression	0.51**	0.53**

** $p<0.01$; * $p<0.05$; ^a $p<0.1$.

Table III. The contribution of severity of disability to degree of criticism and psychiatric stress

	Sen- sori- motor	ADL	Benton	Ma- trices
<i>Patient (N=33)</i>				
Leeds total	0.25	0.08	-0.13	-0.11
GHQ	-0.01	0.16	-0.20	-0.23
<i>Relative (N=37)</i>				
Criticism	-0.03	0.16	-0.10	-0.29 ^a
GHQ	0.14	0.48**	-0.54**	-0.37*

** $p < 0.01$; * $p < 0.05$; ^a $p < 0.1$.

(Partial $r = 0.09$; NS), and patient Total Leeds (Partial $r = 0.23$; NS). Thus, trends in the present data favour the hypothesis that psychiatric distress in the patient was primarily determined by criticism in the relative.

Patient mood and functional deficit. 10 patients had a visual field defect. Motor function was unimpaired in 10 cases, 6 patients had weakness predominantly in one limb, and 21 patients were hemiplegic. Though 30 could walk on their own or with the help of a stick or tripod, only 9 were fully independent in self-care. Activity level had been markedly reduced subsequent to the stroke in all cases. Most patients sat at home doing very little. At least once weekly, 12 (32%) attended a day centre, while other patients attended outpatient physiotherapy and/or speech therapy and/or occupational therapy. In addition to this, 26 (72%) went out of doors on their own or with a relative 2 or more times per week. Fifteen patients (41%) did have regular household duties which included cooking, tidying up, washing and gardening. However, for 6 of these patients the chores were non-essential, simple tasks which were completed within a few minutes.

Table III shows that patient GHQ and Total Leeds scores were not significantly associated with Sensorimotor, ADL, Benton, or Matrices scores. There were, however, indications of an association between severity of dysphasia and patient mood. Performance on the Token Test was significantly related to Total Leeds score ($r = -0.63$; $p < 0.008$), but not GHQ ($r = -0.34$; NS), in the left hemisphere group.

Partial correlation was used to evaluate the degree to which the association between relative criticism and patient mood is mediated by the severity of disability factor. The association between relative criticism and patient mood was independent of severity

of functional or cognitive deficit. After adjustments were made for Sensorimotor, ADL, Benton and Matrices scores the partial correlations of relative criticism with Total Leeds (Partial $r = 0.54$; $p < 0.01$), and GHQ (Partial $r = 0.46$; $p < 0.04$) were significant. However, 5 dysphasic patients had clinical psychiatric distress (scoring 12 or more on the GHQ), and the data suggested that patient mood is linked with severity of dysphasia, within the left hemisphere group. Furthermore, when the left hemisphere group was considered on its own, control of relative criticism left a significant association between severity of dysphasia and Total Leeds score (Partial $r = -0.55$; $p < 0.05$), but not GHQ (Partial $r = -0.17$; NS). In contrast, when severity of dysphasia was controlled, the correlation between relative criticism and Total Leeds was no longer significant (Partial $r = 0.36$; NS). This suggests that the link between relative criticism and patient mood may not be independent of severity of dysphasia in the left hemisphere group.

Relative mood with functional and neuropsychological deficit. Relative GHQ scores correlated with ADL, Benton, and Matrices scores (Table III), indicating that degree of psychiatric distress in the relative was sensitive to severity of functional and cognitive deficit. Also, within the left hemisphere group, there was a significant correlation between relative GHQ and Token Test score ($r = -0.57$; $p < 0.007$).

DISCUSSION

The main finding of the present study is that the methods used in Expressed Emotion research can be usefully applied to the investigation of family influences on psychiatric distress after stroke. The present data further suggests that criticism in the relative contributes to psychiatric distress in stroke patients receiving hospital-based rehabilitation.

The association between relative criticism and patient mood was independent of severity of functional or cognitive deficit. In fact, patient mood was unrelated to Sensorimotor, ADL, Matrices and Benton scores in the present investigation, and several studies have similarly found no correlation between functional or cognitive deficit and patient mood (26). These non-significant correlations do not imply that patients were indifferent to their physical and cognitive deficits. On the contrary, stroke patients often feel stigmatised by their disability (10, 14), and the present patients often expressed negative feelings about their dependence on others. However, the fact of dependence may have been more crucial in the

production of patient psychiatric distress than the precise degree of dependence. In other words, patients' psychiatric symptoms are related to a sense of incompetence and helplessness (10). Patients feel helpless because they are unable to perform simple/basic tasks, the actual number of basic tasks beyond their competence being less important.

While dependent stroke patients may be especially sensitive to criticism, there is an alternative explanation for the association between relative criticism and patient mood. Observations of marital interpersonal interactions indicate that negative behaviours including criticism are more common in distressed couples (37). This suggests that long standing poor quality family relationships, predating stroke onset, may be responsible for the significant cluster of inter-correlations between relative mood, relative criticism and patient mood. Further application of the methods used in the original Expressed Emotion research is required to show that relatives' criticism is a specific determinant of mood disorder after stroke. First, patient mood and relative criticism could be assessed before hospital discharge. If criticism causes patient distress, then relative criticism would be associated with larger increases of patients' mood disorder measured at a later stage (e.g. after 9 months). Second, if relative criticism contributes to patient distress, then the discharged stroke patient's distress would correlate with the amount of weekly close face-to-face contact they have had with relatives that are highly critical (6, 33, 35). Third, a social intervention programme designed to reduce criticism in the relative should lower psychiatric distress in the patient (17, 18). In fact, such an intervention package would not only have theoretical implications. The need for family counselling after stroke is frequently advocated (10, 14, 16, 38), and Expressed Emotion research would provide a scientific basis for the psychological treatment of the psychiatric symptoms of stroke patients seen in rehabilitation settings.

Social factors were not the only cause of mood disorder in the patient, however. Previous work suggests that dysphasia leads to depression (3), and in the present study severity of dysphasia correlated with Total Leeds, and near significantly with GHQ scores. The association between severity of dysphasia and Total Leeds (but not GHQ) score remained significant after controlling level of relative criticism, suggesting that the effect of dysphasia on patient mood may be independent of relative criticism. However, it was not possible to show that the

effect of criticism on patient mood was independent of dysphasia in left hemisphere patients. Furthermore, the data do not support previous reports of an association between level of functional independence and patient mood (22), or the patient's assessment of the quality of their life (1). However, 76% of the present patients were not fully independent in self-care, and the significant relationship between patient distress and severity of disability found in some studies (1, 22) may be due to the recruitment of a higher proportion of independent and less disabled patients.

Finally, the factors influencing psychiatric distress in the relative appeared to be rather different from those determining patient mood disorder. First, relative GHQ correlated with degree of independence in ADL, indicating that relative distress was proportional to the degree of physical burden imposed on them by the patient's disability. Second, Matrices and Benton scores correlated with relatives' GHQ. This may be due to the patient becoming less able to understand or emotionally support the relative, as the severity of cognitive deficit increases. Third, dysphasia further impairs that patient's ability to understand or support the relative (38), and this is probably one reason for the correlation between severity of dysphasia and relatives' GHQ. In addition, the difficulties dysphasic patients can have in finding words is often intensely frustrating for the relative (23), and the special social problems caused by dysphasia probably also underlie the correlation between relative GHQ and severity of dysphasia. In conclusion, these links between patient's deficits and relative mood raise the possibility that relatives of dependent stroke patients may benefit more than the patients themselves from physical rehabilitation.

ACKNOWLEDGEMENTS

I am grateful to Mrs T. Griffiths for her support. Dr W. Conacher, Sister E. Welsh, Mrs A. Miller and the rehabilitation therapists for their help in recruiting subjects. I also thank Miss H. Hughes for her help in establishing inter-judge reliability for the ratings of relative criticism.

REFERENCES

1. Ahlsio, B., Britton, M., Murray, V. & Theorell, T.: Disability and quality of life after stroke. *Stroke* 15: 886-890, 1986.
2. Benjamin, S., Decalmer, P. & Haran, D.: Community screening for mental illness: A validity study of the General Health Questionnaire. *Br J Psychiat* 140: 174-180, 1982.

3. Benson, D. F.: Psychiatric aspects of aphasia. *Br J Psychiat* 123: 555-566, 1973.
4. Benton, A. L.: The visual retention test as a constructional praxis test. *Confin Neurol* 22: 41-49, 1962.
5. Bridges, K. W. & Goldberg, D. P.: The validation of the GHQ-28 and the use of the MMSE in neurological patients. *Br J Psychiat* 148: 548-553, 1986.
6. Brown, G. W., Birley, J. L. T. & Wing, J. K.: Influence of family life on the course of schizophrenic illness: A replication. *Br J Psychiat* 121: 241-258, 1972.
7. De Paulo, J. R., Folstein, M. E. & Gordon, B.: Psychiatric screening on a neurological ward. *Psychol Med* 10: 125-132, 1980.
8. De Renzi, E. & Faglioni, P.: Normative data and screening power of a shortened version of the token test. *Cortex* 14: 41-49, 1978.
9. Dzau, B. S. & Boehme, B. S.: Stroke rehabilitation: A family-team education programme. *Arch Phys Med Rehab* 59: 236-239, 1978.
10. Espmark, S.: Stroke before 50: a follow-up study of vocational and psychological adjustment. *Scand J Rehab Med*, Suppl. 2, 1973.
11. Finley-Jones, R. A. & Murphy, E.: Severity of psychiatric disorder and the 30-item General Health Questionnaire. *Br J Psychiat* 134: 609-616, 1979.
12. Gainotti, G.: Emotional behavior and hemispheric side of lesion. *Cortex* 8: 41-55, 1972.
13. Goldberg, D.: Manual of the General Health Questionnaire. NFER-NELSON, Windsor, 1978.
14. Hyman, M. D.: Social psychological determinants of patients' performance in stroke rehabilitation. *Arch Phys Med Rehabil* 53: 217-226, 1972.
15. Isaacs, B., Neville, Y. & Rushford, I.: The stricken: The social consequences of stroke. *Age Ageing* 5: 188-192, 1976.
16. Kinsella, G. J. & Duffy, F. D.: Attitudes towards disability expressed by spouses of stroke patients. *Scand J Rehab Med* 12: 73-76, 1980.
17. Leff, J., Kuipers, L., Berkowitz, R., Eberlein-Vries, R. & Sturgeon, D.: A controlled trial of social intervention in the families of schizophrenic patients. *Br J Psychiat* 14: 121-134, 1982.
18. Leff, J., Kuipers, L., Berkowitz, R. & Sturgeon, D.: A controlled trial of social intervention in the families of schizophrenic patients: Two year follow-up. *Br J Psychiat* 146: 594-600, 1985.
19. Lehman, J. F., DeLateur, B., Fowler, R., Warren, C., Arnold, R., Schertzer, G., Hurka, R., Whitmore, J., Masock, A. & Chambers, K.: Stroke rehabilitation: Outcome and prediction. *Arch Phys Med Rehabil* 56: 383-389, 1975.
20. Lishman, W. A.: *Organic Psychiatry: The Psychological Consequences of Cerebral Disorder*. Blackwell, London, 1978.
21. Maybury, C. P. & Brewin, C. R.: Social relationships, knowledge and adjustment to multiple sclerosis. *J Neurol Neurosurg Psychiat* 47: 372-376, 1984.
22. Mindham, R. H. S.: Psychiatric aspects of Parkinson's disease. *Br J Hosp Med*: 11, 411-414, 1974.
23. Mulhall, D. J.: Dysphasic stroke patients and the influence of their relatives. *Br J Dis Com* 13: 127-134, 1978.
24. Oddy, M., Humphrey, M. & Uttley, D.: Stresses upon the relatives of head injured patients. *Br J Psychiat* 133: 507-513, 1978.
25. Robinson, R. G. & Benson, D. F.: Depression in aphasic patients: Frequency, severity, and clinical-pathological correlations. *Brain and Lang* 14: 282-291, 1981.
26. Robinson, R. G. & Price, T. R.: Post-stroke depressive disorders: A follow-up study of 103 patients. *Stroke* 13: 635-641, 1982.
27. Robinson, R. G., Starr, L. B., Kubos, K. L. & Price, T. R.: A two-year longitudinal study of post-stroke mood disorders: Findings during the initial evaluation. *Stroke* 14: 736-741, 1983.
28. Robinson, R. G., Starr, L. B., Lipsey, J. R., Rao, K. & Price, T. R.: A two-year longitudinal study of post-stroke mood disorders: Dynamic changes in associated variables over the first six months of follow-up. *Stroke* 15: 510-517, 1984.
29. Siegel, S.: *Nonparametric Statistics: For the Behavioral Sciences*. McGraw-Hill, Tokyo, 1956.
30. Sheikh, K., Smith, D. S., Meade, T. W., Goldenberg, E., Brennan, P. J. & Kinsella, G.: Repeatability and validity of a modified Activities of Daily Living (ADL) index in studies of chronic disability. *Int Rehab Med* 1: 51-58, 1979.
31. Snaith, R. P., Bridge, G. W. K. & Hamilton, M.: The Leeds scales for the self-assessment of anxiety and depression. *Br J Psychiat* 128: 156-165, 1976.
32. SPSSX: *Users' Guide: A Complete Guide to SPSSX Language and Operations*. McGraw-Hill, Chicago, 1983.
33. Vaughn, C. E. & Leff, J. P.: The influence of family and social factors on the course of psychiatric illness. *Br J Psychiat* 129: 125-137, 1976.
34. Vaughn, C. E. & Leff, J. A.: The measurement of expressed emotion in the families of psychiatric patients. *Br J Soc Clin Psychol* 15: 157-169, 1976.
35. Vaughn, C. E., Snyder, K. S., Jones, S., Freeman, W. B. & Falloon, I. R. H.: Family factors in schizophrenic relapse: Replication in California of British research on Expressed Emotion. *Arch Gen Psychiat* 41: 1169-1177, 1984.
36. Warburton, J. W.: Depressive symptoms in Parkinson patients referred for thalamotomy. *J Neurol Neurosurg Psychiat* 30: 368-370, 1967.
37. Weiss, R. L.: The conceptualization of marriage from a behavioral perspective. *In Marriage and Marital Therapy* (ed. T. J. Paolino & B. S. McCrady). Brunner/Mazel, New York, 1979.
38. Williams, S. E. & Freer, C. A.: Aphasia: its effect on marital relationships. *Arch Phys Med Rehabil* 67: 250-252, 1986.
39. Zaidel, E., Zaidel, D. W. & Sperry, R. W.: Case studies of Ravens Progressive Matrices following brain bisection and hemidecortication. *Cortex* 17: 167-185, 1981.

Address for offprints:

Rodger A. Weddell
 Department of Surgical Neurology
 Morriston Hospital
 Swansea
 Great Britain