Personality change after stroke: some preliminary observations

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Objective: To describe changes in personality after stroke and effects on carers.

Methods: A consecutive series of patients was recruited from hospital admissions with stroke. A novel questionnaire was administered to the patients’ main carer at nine months after the stroke to determine their perception of the patient’s pre-stroke and post-stroke personality. Personality change was identified by changes in these ratings, and associations between personality change and the following variables explored: emotional disorder in patients and carers (measured using the hospital anxiety and depression scale and a structured psychiatric interview), stroke classification (Oxford community stroke classification), residual disability (Barthel index and Nottingham extended activities of daily living scale), and lesion characteristics on computed tomography (CT).

Results: Carers of 35 patients with stroke took part. Reported changes in personality after stroke included: reduced patience and increased frustration (both p < 0.0001, t test of difference), reduced confidence, more dissatisfaction, and a less easy going nature (all p < 0.005). Occasionally, aspects of personality change were seen as positive by carers. There were relations between greater personality change and interviewer rated patient depression or anxiety (p < 0.001) but not when this was self rated; and between personality change and both emotional disorder in carers (p < 0.005) and greater disability (p < 0.01) but not CT lesion characteristics.

Conclusions: Carers commonly perceive personality change in stroke patients. This is associated with self rated emotional distress in the carer. More research is needed to understand what carers mean by “personality change” and what factors contribute to the perceived change.

“Personality change” is one of the most frequently voiced complaints of carers after their friend or relative has had a stroke. The overall clinical problem of personality change after stroke has received virtually no attention, although many of its likely constituents such as emotional disorder, cognitive impairment, and “brain injury” related changes in behaviour have been studied individually.

In this preliminary study we had the following aims: to characterise change in personality as described by the carer across a wide range of descriptors; to test the hypotheses that perceived personality change is associated with depression and anxiety in patient and carer; and to seek associations between personality change, initial stroke severity, residual disability, stroke classification, and stroke lesion appearance on computed tomography (CT).

METHODS
Patient recruitment
Patients with stroke were recruited from a larger study of acute stroke care within a teaching hospital. Consecutive patients with a definite stroke were considered for inclusion by a stroke research fellow (JK) within the first few days after their stroke.

One month after the stroke, all patients except those with very severe stroke (that is, with a high chance of death), previously known dementia, or severe communication disorder were referred for further screening by a research psychologist (ET). After this screening, those patients who scored less than 8/10 on an abbreviated mental test score, those who lived on their own, and those whose carer was unable to communicate with the researcher were excluded.

Nine months after the stroke, the patient and the carer who lived with the patient were approached to ask if they were willing to take part in the study. Patients with a previous stroke were included in the study, but for those patients it was made clear that we had interest in changes of personality specifically related to the most recent stroke. Patients were interviewed in their own home by the researcher (ET).

The study was approved by the local research ethics committee and all participants gave consent.

Measures completed by carers
We wished to explore personality change after stroke as observed by carers. In the absence of standardised measures to assess personality change in patients with neurological problems, we used a questionnaire incorporating items employed in studies of observer ratings of personality change after head injury—20 items were taken from those used by Tyrer and Humphrey, augmented with additional items used by Brooks and McKinlay.

Carers completed a standard questionnaire which required them to describe their relative’s personality in terms of 30 descriptive adjectives (for example, bored, aggressive, caring). They did this on their own, while the patient was being interviewed, but could ask the researcher (ET) for help. For each adjective, they were asked to indicate how they saw their relative’s stroke and how they saw their

Abbreviations: DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, 4th edition; EADL, extended activities of daily living scale; HAD, hospital anxiety and depression scale; LACS, lacunar stroke; OCSP, Oxford community stroke project classification; PACS, partial anterior circulation stroke; POCI, posterior circulation stroke; SCID, structured clinical interview for DSM-IV; TACS, total anterior circulation stroke.
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Using unpaired psychiatric data from the SCID interview were examined using simple linear regression for each variable (categorical distress (HAD) with the overall personality change score patient emotional disorder (HAD, SCID), and carer emotional score), residual disability (Barthel, Nottingham EADL), we explored the relation of patient age, stroke severity (NIH stroke project classification (OCSP)). Computed tomography (CT) of the head was undertaken where possible as part of routine practice, usually within two days of stroke onset, and interpreted blind to reported personality change. Nine months after the stroke, at the same time as the carer ratings of personality change, residual disability was assessed with the Barthel index and the Nottingham extended activities of daily living scale (EADL). Emotional disorder in the patient was assessed with a structured clinical interview for the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) (SCID), which makes diagnoses according to the DSM-IV classification and with a continuous measure of distress, the self rated HAD scale. Antidepressant drug use at nine months was also recorded.

Measures completed by patients

On initial admission, the patient’s stroke severity was recorded using the National Institute of Health stroke score (NIH score) and classified according to the Oxford community stroke project classification (OCSP). Computed tomography (CT) of the head was undertaken where possible as part of routine practice, usually within two days of stroke onset, and interpreted blind to reported personality change. Nine months after the stroke, at the same time as the carer ratings of personality change, residual disability was assessed with the Barthel index and the Nottingham extended activities of daily living scale (EADL). Emotional disorder in the patient was assessed with a structured clinical interview for the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) (SCID), which makes diagnoses according to the DSM-IV classification and with a continuous measure of distress, the self rated HAD scale. Antidepressant drug use at nine months was also recorded.

Analysis

We calculated a change score for each item by subtracting the pre-stroke rating from the post-stroke rating (where strongly agree = 0, agree = 1, neither agree nor disagree = 2, disagree = 3, and strongly disagree = 4). We reverse scored 12 items (bored, unhappy, worried, frustrated, dissatisfied, irritable, unreasonable, quick tempered, aggressive, withdrawn, useless, worthless) which we judged to be negative personality characteristics. We then derived an overall personality change score by averaging all 30 change scores. For the purpose of seeking associations with CT lesion location data, we defined those patients with an overall mean change score by averaging all 30 change scores. 0.5 as having “personality change”.

The analysis was done in three stages. First, we described the carer ratings for each personality item pre- and post-stroke, presenting mean scores and 95% confidence intervals (CI). The statistical significance of differences in pre- and post-stroke ratings were assessed using paired t tests. Second, we explored the relation of patient age, stroke severity (NIH score), residual disability (Barthel, Nottingham EADL), patient emotional disorder (HAD, SCID), and carer emotional distress (HAD) with the overall personality change score using simple linear regression for each variable (categorical psychiatric data from the SCID interview were examined using unpaired t tests). Finally, we examined the association of CT lesion location with the overall personality change score using the χ² test for categorical data.

RESULTS

Patient and carer characteristics

We assessed 121 patients over a 13 month period. Figure 1 shows recruitment of cases and reasons for exclusion. The sample studied was predominantly male (68%) and the carers predominantly female (68%). Stroke severity overall was relatively mild, with a median baseline NIH stroke score of 3 and a median Barthel score at 9 months of 19.

Personality change

Figures 2 and 3 show the carers’ perceptions of their relative’s personality before and nine months after their stroke, ordered according to the size of the perceived personality change. For clarity of presentation we have given positive and negative personality characteristics separately. There were significant differences between “before” and “after” ratings for over half the categories. These are indicated with asterisks on the figures.

We analysed each of the personality items according to whether the carer rated it as the same, more, or less after the stroke (table 2). This table emphasises that, while change in personality was usually perceived negatively, some carers reported a positive impact after stroke—for example, three carers reported that their relative had become less “unreasonable”.

Figure 1 Recruitment of cases and reasons for exclusion.

121 Consecutive inpatients with definite stroke, able to communicate and without obvious severe cognitive deficits

1 patient died
18 patients failed abbreviated mental test score (< 8/10)
4 patients too unwell
1 patient moved
6 patients refused to take part

91 Patients approached for study at one month

At 9 months:
2 patients died
4 patients too unwell
2 patients refused to take part
2 patients did not reply to invitation

81 Patients enrolled in study at 9 months

31 patients
Lived alone
1 carer
Unable to communicate because of dementia
12 carers
Did not reply
2 carers
Incomplete responses

35 Patients and carer pairs completed study

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Emotional disorder in patients and carers

The structured clinical interview for DSM-IV indicated that four patients (11%) had a diagnosis of major depression, six (17%) had minor depression, and six (17%) had generalised anxiety disorder. Only one patient was taking an antidepressant drug (for sciatic nerve pain) and one other was taking minor tranquillisers for agoraphobia. On the HAD self rating scale, only 14% of the patients had scores for depression or anxiety of more than 7. In contrast, 57% of the carers had HAD scores for depression or anxiety of more than 7 (51% anxiety, 23% depression).

Associations between personality change and other variables

Emotional disorder in the patient

The overall mean personality change score was used for these analyses. There was no association between personality change and total patient HAD score (simple linear regression, \( r^2 = 0 \)). However, personality change was more likely to be reported in patients with an interviewer rated SCID diagnosis of major or minor depression (9/10 depressed patients vs 6/25 non-depressed patients; \( p < 0.01 \), unpaired \( t \) test) or generalised anxiety (4/5 anxious patients vs 11/25 non-anxious patients; \( p < 0.01 \), unpaired \( t \) test).

Emotional disorder in the carer

The carer’s rating of personality change in the patient was associated with total carer HAD score (\( p < 0.005 \), \( r^2 = 0.26 \), simple linear regression).

Residual disability, stroke severity, and stroke classification

There was an association between personality change and residual disability as measured by the Nottingham EADL scale (\( p < 0.01 \), \( r^2 = 0.20 \)) but not with the Barthel disability index. Greater personality change was also associated with the OCSP stroke classification (\( \chi^2, p < 0.05 \)) (with the order of greatest to least change being: total anterior circulation stroke (TACS), posterior circulation stroke (POCS), partial anterior circulation stroke (PACS), and lacunar stroke (LACS) (table 3)). Greater personality change was not associated with baseline NIH stroke score or age.

Table 1

<table>
<thead>
<tr>
<th>Clinical characteristics of patients and carers</th>
<th>Participating patients (n = 35)</th>
<th>Non-participating patients (n = 54)*</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex of patients (% male)</td>
<td>69% male</td>
<td>54% male*</td>
<td>NS (Fisher’s exact)</td>
</tr>
<tr>
<td>Median age of patients (range)</td>
<td>72 (55 to 91)</td>
<td>72 (range 33 to 90)*</td>
<td>NS (Mann–Whitney)</td>
</tr>
<tr>
<td>CT characteristics of lesion</td>
<td>12.5% primary haemorrhage, 28% old infarct</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Side of lesion</td>
<td>58% symptoms on left side of body</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>NIH stroke score at admission (median [range])</td>
<td>3.0 (0 to 21)</td>
<td>4.0 (range 0 to 21)*</td>
<td>NS (unpaired ( t ) test)</td>
</tr>
<tr>
<td>Oxford community stroke classification (n)</td>
<td>TACS (4), PACS (10), LACS (14), POCS (7)</td>
<td>TACS (3), PACS (13), LACS (21), POCS (16)*</td>
<td>NS (( \chi^2 ))</td>
</tr>
<tr>
<td>Average length of time between stroke and assessment (range)</td>
<td>272 days (223 to 367)</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Barthel index at 9 months (median [range])</td>
<td>19 (12 to 20)</td>
<td>20 (7 to 20)</td>
<td>NS (Mann–Whitney)</td>
</tr>
<tr>
<td>Nottingham EADL score at 9 months (median [range])</td>
<td>17 (2 to 21)</td>
<td>17.5 (2 to 21)</td>
<td>NS (Mann–Whitney)</td>
</tr>
<tr>
<td>Patient HAD score (mean scores)</td>
<td>Anxiety 4.8; depression 4.8</td>
<td>Anxiety 4.7; depression 4.5</td>
<td>NS (Mann–Whitney)†</td>
</tr>
<tr>
<td>Patient HAD score (% with significant score (&gt;7))</td>
<td>Anxiety 14%; depression 14%</td>
<td>Anxiety 24%; depression 20%</td>
<td>NS (Fisher’s exact)†</td>
</tr>
<tr>
<td>Carers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex of carer (% male)</td>
<td>31% male</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Carer HAD score (mean scores)</td>
<td>Anxiety 7.9; depression 5.4</td>
<td>Anxiety 7.9; depression 5.4</td>
<td>NA</td>
</tr>
<tr>
<td>Carer HAD score (% with significant score (&gt;7))</td>
<td>Anxiety 51%; depression 23%</td>
<td>Anxiety 51%; depression 23%</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Includes all patients approached for the study at one month except two patients who died.
†Comparisons were for total HAD score.
CT, computed tomography; EADL, extended activities of daily living scale; HAD, hospital anxiety and depression scale; LACS, lacunar stroke; NA, not applicable; NIH, National Institutes of Health; PACS, partial anterior circulation stroke; POCS, posterior circulation stroke; TACS, total anterior circulation stroke.

Figure 2

Carer’s rating of patient personality pre- and post-stroke: negative personality characteristics. Lines represent 95% confidence intervals. \( p < 0.05 \), \( **p < 0.005 \), \( t \) test.

Bored**
Frustrated**
Dissatisfied**
Unhappy**
Irritable**
 Worried**
Unreasonable*
Quick tempered
Withdrawn
 Worthless
 Aggressive
Useless

Before
After
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree

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Personality change after stroke

The Barthel score, both of which measure aspects of disability. We found an association between emotional distress in the carer and greater personality change in the patient. Greater personality change was also associated with the Nottingham EADL but not with the Barthel score, both of which measure aspects of disability.

Personal change is a frequent and lasting complaint voiced by carers of stroke patients. Some aspects of this personal change—particularly those with more established biological substrates such as emotionalism and an inability to control anger—are well described. In its totality, personal change appears to be a much broader phenomenon. It encompasses straightforward emotional disorder—changes in cognitive function, emotional expression, and behaviour probably as a result of brain damage—and also carer factors such as their own distress, personality, and change in life circumstances. It remains uncertain to what degree the observed major personality and behavioural change seen acutely after a stroke, such as emotionalism, correlates with later carer perceived personality change.

Attempting to measure “personality change” as described by the carer is difficult, partly because it may mean different things to different people, but also because it is an inherently heterogeneous problem. Although studies have been carried out in patients with conditions such as dementia, subarachnoid haemorrhage, and head injury, there has been a marked neglect of this area in ischaemic stroke research.

We are aware of no other similar study based on carer ratings of personality change before and after predominantly ischaemic stroke. Personality change (42%) and distressing behaviour (35%) were reported in one study following stroke,7 and another reported an increase in six unspecified things to different people, but also because it is an inherently heterogeneous problem.


![Table 2](https://www.jnnp.com)

<table>
<thead>
<tr>
<th>Feature</th>
<th>More</th>
<th>The same</th>
<th>Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive personality characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient</td>
<td>1</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td>Capable</td>
<td>0</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>Active</td>
<td>0</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>In control</td>
<td>1</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Independent</td>
<td>0</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Energetic</td>
<td>0</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Confident</td>
<td>0</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Easy going</td>
<td>1</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Stable</td>
<td>0</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Enthusiastic</td>
<td>0</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Cooperative</td>
<td>1</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>Caring</td>
<td>0</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Down to earth</td>
<td>0</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>Friendly</td>
<td>0</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>Hopeful</td>
<td>1</td>
<td>29</td>
<td>5</td>
</tr>
<tr>
<td>Tidy appearance</td>
<td>0</td>
<td>29</td>
<td>6</td>
</tr>
<tr>
<td>Helpful</td>
<td>0</td>
<td>29</td>
<td>6</td>
</tr>
<tr>
<td>Attractive</td>
<td>1</td>
<td>32</td>
<td>3</td>
</tr>
<tr>
<td>“Negative” personality characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bored</td>
<td>18</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Unhappy</td>
<td>17</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>Worried</td>
<td>16</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Frustrated</td>
<td>16</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Dissatisfied</td>
<td>15</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Irritable</td>
<td>14</td>
<td>19</td>
<td>2</td>
</tr>
<tr>
<td>Unreasonable</td>
<td>12</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Quick tempered</td>
<td>9</td>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>Aggressive</td>
<td>7</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Withdrawn</td>
<td>7</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>Useless</td>
<td>5</td>
<td>29</td>
<td>1</td>
</tr>
<tr>
<td>Worthless</td>
<td>5</td>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>

Values are numbers of patients.

DISCUSSION

This preliminary study shows the variety of ways in which stroke can influence a carer’s perception of a patient’s personality. In our study there were significant negatively associated between reported personality change, the presence of a visible infarct and laterality of the lesion, the proportion of patients with haemorrhage, cortical or subcortical location, or grey matter or white matter.
negative personality characteristics and a decrease in two positive personality characteristics after stroke. Several other studies have reported on personality change from cross sectional reports lacking any assessment of pre-stroke personality. Anderson et al reported a range of abnormal behaviours at one year post-stroke, such as withdrawal (49%), irritability (49%), odd ideas (35%), unpredictability (35%), rudeness (23%), and odd behaviour (17%). Similarly, Bogousslavsky reported various behaviours in a cohort of over 300 stroke patients, including sadness (72%), disinhibition (56%), lack of adaptation (44%), environmental withdrawal (40%), crying (27%), passivity (24%), and aggressiveness (11%). Most recently, Martin et al applied the European brain injury questionnaire to 214 patients after stroke and to 195 of their carers and reported that there were significant differences between carer and patient ratings in several items, including: “being unsure what to do in dangerous situations”, “thinking only of yourself”, “everything is an effort”, and “failing to notice other people’s moods”. In the only study involving patient ratings of personality change that we are aware of, 26 patients with stroke reported being less interested, independent, in control, and satisfied after their stroke. They still saw themselves as friendly, calm, caring, hopeful, and talkative.

Our finding that carer emotional distress was more strongly associated with carer rated personality change than patient self rated emotional distress is open to several different interpretations. Perhaps the carer is more distressed by a personality change of which the patient is less aware; this could be viewed as a form of “emotional anosognosia” and would be supported by the discrepancy between interview rated and self rated measures of emotional distress. Alternatively, carers who are prone to emotional distress themselves may tend to perceive greater personality change. For example, the carer of one patient with stroke wrote: “My husband is not very interested in things going on around him and although I get tired doing things around the house he just sits and watches me struggle along. I have to ask for his help at times, although he will do things if I ask him”. This quote illustrates some of the difficulties in this area. Is the primary problem in this case apathetic personality change in the patient, tiredness and emotional disorder in a carer having to look after a disabled person, or a combination of both?

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REFERENCES