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The Post-Stroke Depression Rating Scale:  
A Test Specifically Devised to Investigate Affective Disorders of Stroke Patients*

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ABSTRACT

Owing to the lack of instruments specifically constructed to study emotional and affective disorders of stroke patients, the nature of post-stroke depression (PSD) remains controversial. With this in mind, the authors constructed a new scale, the Post-Stroke Depression Rating Scale (PSDS) which takes into account a series of symptoms and problems commonly observed in depressed stroke patients. The PSDS and the Hamilton Depression Rating Scale (HDS) were administered to a group of 124 stroke patients, who had been classified, on the basis of DSM III-R diagnostic criteria, in the following categories: No depression (n = 32); Minor PSD (n = 47); Major PSD (n = 45). Scores obtained by these stroke patients on the PSDS and on the HDS were compared to those obtained on the same scales by 17 psychiatric patients also classified as major depression on the basis of DSM III-R diagnostic criteria. An analysis of the symptomatological profiles clearly showed that: (1) a continuum exists between the so-called “major” and “minor” forms of PSD; (2) in both groups of depressed stroke patients the depressive symptomatology seems due to the psychological reaction to the devastating consequences of stroke, since the motivated aspects of depression prevailed in depressed stroke patients, whereas the (biologically determined) unmotivated aspects prevailed in patients with a functional form of major depression; and (3) in stroke patients a DSM III-based diagnosis of major PSD could be in part inflated by symptoms (such as apathy and vegetative disorders) that are typical of major depression in a patient free from brain damage, but that could be due to the brain lesion per se in a stroke patient.

According to some authors (e.g., Adams & Hurwitz, 1963; Kotila, Waltimo, Niemi, Laaksonen, & Lempinen, 1984; Parikh et al., 1990) post-stroke depression must be considered as the most serious obstacle to the rehabilitation of stroke patients. However, in spite of studies designed to clarify its meaning, the nature of this behavioural disorder remains controversial.

The most important and influential series of studies on this subject has been conducted by Robinson and coworkers (Lipsey, Robinson, Pearlson, Rao, & Price, 1985; Lipsey, Spencer, Rabins, & Robinson, 1986; Robinson, Kubos, Starr, Rao, & Price, 1983, 1984; Starkstein & Robinson, 1988, 1989; Starkstein, Robinson, & Price, 1987) who have repeatedly claimed that there are two different types of post-stroke depression (PSD): a major depression and a minor depression. The former has been considered, on the basis of the diagnostic criteria of the Diagnostic and Statistical Manual (DSM III) of Mental Disorders (American Psychiatric Association, 1987) as a form of endogenous depression, whereas the latter has been considered as a form

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of dysthymic (neurotic or reactive) depression. According to Robinson and coworkers, major PSD is usually observed in patients with lesions involving the anterior parts of the left hemisphere (frontal cortex or basal ganglia) and could be due to an interruption of the monoaminergic pathways linking the brainstem to the cerebral cortex. On the contrary, the minor form of PSD shows no relationship with laterality or intrahemispheric locus of lesion, and could be caused by less specific psychological mechanisms.

A basic methodological objection that can be raised to the work of Robinson and coworkers is that the distinction proposed by these authors between major and minor PSD was substantially based on DSM III diagnostic criteria. According to these criteria, a diagnosis of major depression can be made, if in addition to a depressed mood or a loss of interest a patient presents with, at least four of the following symptoms: a significant loss of weight, a significant sleep disorder, a state of agitation or of motor retardation, a loss of energy, unmotivated feelings of guilt or of self-depreciation, a lack of concentration, recurrent thoughts of death or of suicide. But it is clear that in a stroke patient some of these symptoms (e.g., weight loss, sleep disorders, fatigue, or lack of concentration) may be due to the brain lesion per se and not to a concomitant major depression.

In the first part of a research program designed to investigate various aspects of PSD we have, therefore, tried to undertake a careful analysis of the clinical symptomatology shown by patients classified as exhibiting a major or a minor form of PSD on the basis of DSM III diagnostic criteria. We intended to check if the clinical phenomenology of patients classified as major PSD is similar to that shown by patients affected by a “functional” form of major depression, as claimed by Lipsey et al. (1986), or if there are differences between the symptomatological profiles shown by these two forms of major depression.

In particular, special attention was devoted to a number of symptoms that could aid in clarifying if major PSD must be considered (a) as an endogenous biochemically based depression; (b) as a psychological reaction to a dramatic event; (c) as an artefact resulting from the use of inappropriate criteria; or (d) as an heterogeneous condition determined by several factors.

Because only some of these symptoms are included in the DSM III diagnostic criteria or are considered in standard Depression Scales, we constructed a Post-Stroke Depression Scale (PSDS) that is based on a series of symptoms commonly observed in depressed stroke patients and which takes into account some problems specifically met by these patients.

Our analysis of the clinical phenomenology of patients showing a major PSD on the basis of DSM III diagnostic criteria was, therefore, based on two main sources of information as follows: (1) an analysis of scores obtained on the Hamilton Depression Scale (Hamilton, 1960) as principal components of the depressive symptomatology, and (2) an analysis of scores obtained on the PSDS (see below).

The clinical phenomenology of patients fulfilling the DSM III diagnostic criteria for major PSD has been compared to that of three different control groups: (a) stroke patients diagnosed as a minor form of PSD on the basis of the same criteria; (b) stroke patients showing no obvious depression; and (c) a small group of patients with a “functional” form of major depression.

Three different sets of predictions were considered as consistent, respectively, with the interpretations considering the major PSD (a) as an endogenous form of depression; (b) as a psychological reaction to a dramatic event; or (c) as an artefact resulting from the use of inappropriate criteria. According to the endogenous depression hypothesis, the symptomatological profile obtained on the Hamilton DRS and the PSDS should be very similar in patients with major PSD and in those with a functional form of major depression. In particular, both groups should obtain particularly high scores on the “unmotivated” aspects of depression, whereas the “motivated” aspects should eventually prevail in patients with minor PSD (considered by Robinson et al. as a form of reactive/neurotic depression). On the other hand, according to the psychological reactions hypothesis a different symptomatological profile should be shown by
patients with a major PSD and by those with a functional form of major depression. In particular, the "unmotivated" aspects of depression should prevail in patients with a "functional" form of depression and the "motivated" aspects in those with a post-stroke form of major depression. Furthermore, only a quantitative, but no qualitative difference should be found between stroke patients affected respectively, by a major and by a minor form of PSD. Finally, according to the methodological bias hypothesis, patients classified as major PSD should present a relatively higher incidence of symptoms related to the direct effect of brain damage, whereas those with a functional form of major depression should show a greater incidence of the more distinctive aspects of endogenous depression (that is, depressive thoughts and inability to enjoy pleasant experiences).

METHODS

Subjects
The study population consisted of a consecutive series of 124 patients, admitted for stroke either at the Neurological Department of the Catholic University of Rome or at the Rehabilitation Center "Clinica Santa Lucia" in Rome. Patients were included in the study if they met the following criteria: (1) suffered a single hemispheric stroke, as determined by CT scan or MRI data; (2) age between 35 and 75 years; (3) time since onset of the stroke between 2 weeks and 6 months; (4) no history of previous stroke, previous depressive episodes, or significant psychiatric disorders; and (5) absence of dementia, language disorders, or attentional disorders severe enough to preclude a verbal interview.

In addition to these subjects a group of patients admitted to the psychiatric ward of the Ospedale Santo Spirito (Rome) with a diagnosis of endogenous (major) depression was also studied. Seventeen patients with endogenous depression were matched to stroke patients in terms of age and educational level, but, contrary to stroke patients, were usually medicated with antidepressants. If was, in fact, impossible to find a group of patients hospitalized for a major depression who were free from antidepressive drugs.

Procedures
The psychiatric assessment was conducted by two of the authors (AA and ML) who were blind with respect to the results of the CT scan or MRI data. The examination was always performed in the late morning to minimize any possible influence of diurnal mood variations. Examination included the following: (1) the Hamilton Depression Rating Scale (Hamilton 1960); (2) a semi structured psychiatric interview; and (3) The Post-Stroke Depression Rating Scale (PSDS). The semistructured psychiatric interview was devised to categorize patients as affected by a "major depression", a "minor depression" or "no depression", according to the DSM IIIR diagnostic criteria. The interview was conducted first by engaging the patient in a general conversation about his physical and psychological conditions and then asking questions specifically concerning the symptoms used to make a diagnosis of major or minor depression. The interview was conducted in a private room, lasted about half an hour, and preceded the administration of the PSDS.

General structure of the PSDS
The PSDS is a rating scale completed by a professional examiner following a patient interview. The scale is composed of 10 sections, each of which aims to evaluate a specific aspect of the emotional, affective, and vegetative disorders of stroke patients. The 10 sections take into account the following different components of Post-Stroke Depression:

1. Depressed mood;
2. Guilt feelings;
3. Thoughts of death and/or of suicide;
4. Vegetative disorders;
5. Apathy and loss of interest;
6. Anxiety;
7. Catastrophic reactions;
8. Hyperemotionalism;
9. Anhedonia (i.e., an inability to enjoy pleasant experiences); and
10. Diurnal mood variations.

In each section (with the exception of the last) scores range between 0 (corresponding to a normal state) and 5 points (corresponding to a severe disorder). In section 10 (diurnal mood variations) scores range between a negative pole (-2) corresponding to an unmotivated, clear prevalence of depression in the early morning and a positive pole (+2) corresponding to a motivated clear prevalence of depression during situations stressing handicaps and disabilities. Furthermore, in sections 1, 2, and 3 patients are requested to qualify their responses, that is to say if their bad mood, guilt feelings, and thoughts of death are related to their actual condition or are independent from it. The PSDS does not provide a
global score, because it was not constructed to give a global assessment of the severity of PSD, but a detailed and analytical evaluation of the different symptoms that can be included under this heading. Therefore, scores obtained in each section by patients with PSD provide a symptomatological profile which can be matched to the analogous profile shown by patients with functional forms of major depression, allowing to make inferences as for the identity or the heterogeneity of the underlying mechanisms.

Validity and reliability of the PSDS
Thirty-three stroke patients were independently examined by two of the authors, a neurologist (CM) and a psychiatrist (AA), to evaluate the interrater reliability of the PSDS. The time interval between the first and the second administration of the scale was short; the first examination occurred at the end of the morning and the second at the beginning of the afternoon. Table 1 reports the values of the correlations observed between scores given by the two examiners on the 10 sections of the scale: A very high level of interrater agreement was obtained for all sections of the scale. The level of agreement was almost complete (ranging between .90 and 1.00) for Depressed mood and Suicidal thoughts. It was less complete but still very satisfactory (ranging between .80 and .90) for 6 more sections, namely: Guilt feelings, Vegetative disorders, Apathy, Anxiety, Catastrophic reactions and Anhedonia. Finally, it was less satisfactory, but still highly significant (ranging between .80 and .60) for Hyper-emotionalism and for Diurnal mood variations.

The validity of the PSDS was evaluated by computing the correlations between results obtained in homologous sections of the PSDS and of the Hamilton Depression Scale (HDS) in 124 stroke patients. Two main problems were considered in this validation study. The first was that, because the two scales have been constructed with different purposes, they overlap only in part. Thus, a comparison with items of the HDS was only possible for symptoms considered in sections 1 to 6 of the PSDS, whereas sections 7, 8, and 9 of the PSDS (dealing respectively with Catastrophic reactions, Hyper-emotionalism, and Anhedonia) do not have a counterpart in the HDS, and section 10 of the PSDS (Diurnal mood variations) was not comparable with the partly analogous item (Nr 18) of the HDS.

The second problem was that in this study, as in other validation studies (e.g., Carrol, Fielding, & Blanshki, 1973) it was not possible to make a one-to-one comparison between scores obtained in a single section of the PSDS and those obtained in a single section of the HDS. One section of the PSDS corresponded, in fact, to several items of the HDS in the evaluation of anxiety and of vegetative disorders. In our validation study, scores obtained in these sections of the PSDS were, therefore, compared to those obtained by summing scores obtained in the corresponding items of the HDS, according to criteria reported in Table 2.

Data reported in Table 2 clearly show that scores obtained on the PSDS and on the HDS were highly correlated both when the comparison concerned results obtained on single parts of the two scales and when it concerned the total scores obtained in analogous sections of the PSDS and of the HDS.

Table 1. Correlations (Spearman’s Rank Order) between Scores Given by Two Independent Raters on the Various Sections of the Post-Stroke Depression Rating Scale.

<table>
<thead>
<tr>
<th>Symptomatological Section</th>
<th>Spearman’s rho</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed mood</td>
<td>.920</td>
<td>.0001</td>
</tr>
<tr>
<td>Guilt feelings</td>
<td>.853</td>
<td>.0001</td>
</tr>
<tr>
<td>Suicidal thoughts</td>
<td>.969</td>
<td>.0001</td>
</tr>
<tr>
<td>Vegetative disorders</td>
<td>.846</td>
<td>.0001</td>
</tr>
<tr>
<td>Loss of interest</td>
<td>.858</td>
<td>.0001</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.853</td>
<td>.0001</td>
</tr>
<tr>
<td>Catastrophic reactions</td>
<td>.807</td>
<td>.0001</td>
</tr>
<tr>
<td>Hyper-emotionalism</td>
<td>.735</td>
<td>.0001</td>
</tr>
<tr>
<td>Anhedonia</td>
<td>.808</td>
<td>.0001</td>
</tr>
<tr>
<td>Diurnal mood variation</td>
<td>.629</td>
<td>.0001</td>
</tr>
</tbody>
</table>
Table 2. Correlations between Scores Obtained by Stroke Patients in Homologous Sections of the Hamilton Depression Rating Scale and Post-Stroke Depression Rating Scale.

<table>
<thead>
<tr>
<th>Symptomatological section</th>
<th>PSDS Sections</th>
<th>HDS Items</th>
<th>Spearman’s rho</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed mood</td>
<td>1 (0–5)*</td>
<td>1 (0–4)*</td>
<td>.812</td>
<td>.0001</td>
</tr>
<tr>
<td>Guilt feelings</td>
<td>2 (0–5)</td>
<td>2 (0–4)</td>
<td>.416</td>
<td>.0001</td>
</tr>
<tr>
<td>Suicidal thoughts</td>
<td>3 (0–5)</td>
<td>3 (0–4)</td>
<td>.882</td>
<td>.0001</td>
</tr>
<tr>
<td>Vegetative disorders</td>
<td>4 (0–5)</td>
<td>4/5/6/12/17</td>
<td>.701</td>
<td>.0001</td>
</tr>
<tr>
<td>Loss of interest</td>
<td>5 (0–5)</td>
<td>7 (0–4)</td>
<td>.514</td>
<td>.0001</td>
</tr>
<tr>
<td>Anxiety</td>
<td>6 (0–5)</td>
<td>9/10/11</td>
<td>.773</td>
<td>.0001</td>
</tr>
</tbody>
</table>

Total Score correlation

<table>
<thead>
<tr>
<th>PSDS Sections</th>
<th>HDS Items</th>
<th>Spearman’s rho</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2/3/4/5/6</td>
<td>1/2/3/4/5/6/7/9/10</td>
<td>.880</td>
<td>.0001</td>
</tr>
<tr>
<td>(0–30)*</td>
<td>(0–36)*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Numbers reported in parentheses correspond to the range of scores obtainable in the various PSDS sections and HDS items.

RESULTS

Symptomatological Profiles Obtained on the Post-stroke Depression Rating Scale and on the Hamilton Depression Scale by Depressed and Nondepressed Stroke Patients and by Patients with a "Functional" Form of Major Depression

To check the equivalence, proposed by Robinson and coworkers (Lipsey et al., 1986; Robinson et al., 1984) between major PSD, and "functional" forms of major depression, we categorized the 124 stroke patients who had been studied to evaluate reliability and validity of the PSDS into three groups (major depression, minor depression, and no depression) on the basis of DSM III-R diagnostic criteria. In this manner, 32 stroke patients were classified as nondepressed, 47 as presenting a minor depression, and 45 as showing a major depression.

Scores obtained by these three groups of stroke patients on the various sections of the PSDS and on the various items of the HDS were compared to those obtained on the same scales by a group of 17 psychiatric patients also classified as major depression on the basis of DSM III-R diagnostic criteria and undistinguishable from the stroke patients in terms of age and educational level. The symptomatological profiles obtained by the three groups of stroke patients and by subjects with a functional form of major depression on the 10 sections of the PSDS are reported in Figure 1.

To evaluate the statistical significance of the differences observed among the various groups (and in particular between the “functional” and the post-stroke form of major depression) an overall analysis of variance was performed on results obtained in each section of the scale. Because this analysis was highly significant in every section, post hoc comparisons were then computed by means of the Duncan’s test. Results of this analysis are reported in Table 3.

Visual analysis of the symptomatological profiles and statistical study of the intergroup differences showed that clearcut differences existed between patients affected by a “functional” and by a post-stroke form of major depression.
Fig. 1. Scores obtained by stroke patients classified as ‘major depression’, ‘minor depression’, ‘no depression’, and by subjects with a functional form of major depression, in the following section of the PSDS: D: Depressed Mood; FG: Feelings of Guilt; ST: Suicidal Thoughts; VD: Vegetative Disorders; AP: Apathy; AN: Anxiety; CR: Catastrophic Reactions; H: Hyper-emotionalism; ANH: Anhedonia; DV: Diurnal Variations.

In fact, the most specific and often unmotivated aspects of major depression, namely, depressed mood, guilt feelings, suicidal thoughts, incapacity to enjoy pleasant experiences, and early morning prevalence of depression significantly prevailed in patients with a functional form of major depression. On the other hand, the less specific and more motivated symptoms, namely, anxiety, catastrophic reactions, hyper-emotionalism, and the prevalence of depression during situations stressing handicaps or disabilities significantly prevailed in patients with major PSD.

On the other hand, when we compared the symptomatological profiles shown by patients with a major and a minor form of PSD, we found that the differences between these two groups were more quantitative than qualitative. As a matter of fact, when we discarded scores concerning depressed mood (which were high in both groups, being a defining feature of post-stroke depression) we found: (a) that the next
Table 3. Post Hoc Comparisons (Duncan Test) in the Various Sections of the PSDS among the Post-Stroke Patients with Major Depression (MD), Minor Depression (md), No Depression (nd), and the Subjects with Endogenous Depression (DEP).

<table>
<thead>
<tr>
<th>Section</th>
<th>DEP</th>
<th>MD</th>
<th>md</th>
<th>nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed Mood</td>
<td>&gt;</td>
<td>***</td>
<td>&gt;</td>
<td>***</td>
</tr>
<tr>
<td>Feelings of Guilt</td>
<td>&gt;</td>
<td>**</td>
<td>&gt;</td>
<td>md</td>
</tr>
<tr>
<td>Suicidal Thoughts</td>
<td>&gt;</td>
<td>***</td>
<td>&gt;</td>
<td>md</td>
</tr>
<tr>
<td>Vegetative Disorders</td>
<td>=</td>
<td>DEP</td>
<td>&gt;</td>
<td>md</td>
</tr>
<tr>
<td>Apathy</td>
<td>=</td>
<td>MD</td>
<td>&gt;</td>
<td>md</td>
</tr>
<tr>
<td>Anxiety</td>
<td>MD</td>
<td>&gt;</td>
<td>DEP</td>
<td>=</td>
</tr>
<tr>
<td>Catastrophic Reactions</td>
<td>MD</td>
<td>&gt;</td>
<td>DEP</td>
<td>=</td>
</tr>
<tr>
<td>Hyper-emotionalism</td>
<td>MD</td>
<td>&gt;</td>
<td>md</td>
<td>&gt;</td>
</tr>
<tr>
<td>Anhedonia</td>
<td>DEP</td>
<td>&gt;</td>
<td>MD</td>
<td>&gt;</td>
</tr>
<tr>
<td>Diurnal Variations</td>
<td>MD</td>
<td>=</td>
<td>md</td>
<td>=</td>
</tr>
</tbody>
</table>

*p < .05; ** p < .01; *** p < .001.

highest scores concerned the motivated symptoms of anxiety and of hyper-emotionalism; (b) that in both groups depression prevailed during situations stressing handicaps or disabilities; and (c) that on the contrary, low or very low scores were obtained on sections dealing with the unmotivated symptoms of guilt feelings and of suicidal thoughts. Taken together, these findings seem to indicate that: (1) a continuum exists between the "major" and "minor" forms of PSD; (2) in depressed stroke patients the psychologically motivated aspects of depression prevail over the psychologically unmotivated components; and (3) the psychologically unmotivated (and probably biochemically determined) components of depression prevail in patients with a "functional" form of major depression.

Less significant results, but certainly consistent with those obtained with the PSDS, were observed when we analyzed the symptomatological profiles obtained by the same patients on the first 14 items of the HDS (considered as the more relevant for the problem at issue). For the analysis of these profiles, which are presented in Figure 2, note that, as in the case of the validation study, some reorganization of the original data was deemed useful to obtain reasonably compact symptomatological profiles. This reorganization was achieved by grouping together items belonging to the same symptomatological areas (e.g., items 4, 5, and 6 were grouped under the general heading of "sleep disorders"). The data resulting from the grouping of homogeneous items are reported in Figure 2.

A visual inspection of the profiles reported in Figure 2 reveals that, as in the case of results obtained on the PSDS, the symptomatological profiles shown by patients with a major PSD were more similar to those presented by patients with a minor form of PSD than to those presented by patients with an endogenous depression. In fact, in both groups of depressed stroke patients, the highest scores concerned, items dealing with anxiety, rather than with depressed mood. The next highest scores concerned, respectively (a) sleep disorders, depressed mood, and hypochondria in patients with major PSD, and (b) depressed mood, sleep
disorders, and hypochondria in those with a minor form of PSD. In patients with a functional form of major depression, on the contrary, depressed mood scored highest, followed by apathy, anxiety, and suicidal thoughts. On the other hand, the distinction between "motivated" and "unmotivated" symptoms (which clearly emerged from the analysis of results obtained on the PSDS) cannot emerge from an analysis of scores obtained on the HDS, simply because "motivated" aspects of depression are not considered by this scale. The statistical study of the intergroup differences (reported in Table 4) confirmed that depressed mood, guilt feelings, and suicidal thoughts (which can be considered as the most specific and often unmotivated aspects of depression) significantly prevailed in patients with a "functional" form of major depression.

Motivated and Unmotivated Aspects of Depression in Subjects with Endogenous Depression and in Stroke Patients

By analyzing the symptomatological profiles obtained on the PSDS by stroke patients and by...
Table 4. Post Hoc Comparisons (Duncan Test) on Various Sections of the HDS among the Post-Stroke Patients with Major Depression (MD), Minor Depression (md), No Depression (nd), and the Subjects with Endogenous Depression (DEP).

<table>
<thead>
<tr>
<th>Depression</th>
<th>DEP</th>
<th>MD</th>
<th>md</th>
<th>nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guilt Feelings</td>
<td>DEP</td>
<td>MD</td>
<td>md</td>
<td>nd</td>
</tr>
<tr>
<td>Suicide</td>
<td>DEP</td>
<td>MD</td>
<td>md</td>
<td>nd</td>
</tr>
<tr>
<td>Insomnia</td>
<td>MD</td>
<td>DEP</td>
<td>md</td>
<td>nd</td>
</tr>
<tr>
<td>Work and Interest</td>
<td>DEP</td>
<td>MD</td>
<td>md</td>
<td>nd</td>
</tr>
<tr>
<td>Slowness</td>
<td>MD</td>
<td>DEP</td>
<td>md</td>
<td>nd</td>
</tr>
<tr>
<td>Agitation and Anxiety</td>
<td>MD</td>
<td>DEP</td>
<td>md</td>
<td>nd</td>
</tr>
<tr>
<td>Somatic Disorders</td>
<td>DEP</td>
<td>MD</td>
<td>md</td>
<td>nd</td>
</tr>
<tr>
<td>Hypochondria</td>
<td>MD</td>
<td>DEP</td>
<td>md</td>
<td>nd</td>
</tr>
</tbody>
</table>

*** p < .001; ** p < .01; * p < .05

Subjects with an endogenous depression we observed that the main difference between the "functional" and the "post-stroke" form of major depression seems to reside in the "motivated" or "unmotivated" quality of their depressive condition. Because this possibility had been predicted as a possible outcome of our study, patients had been explicitly requested to qualify their responses in sections 1, 2, and 3 of the PSDS, trying to say if their dark mood, guilt feelings, and thoughts of death were related to or independent from their actual condition. An analysis of answers to these questions by stroke patients with major and minor depression and by subjects with a functional form of major depression was, therefore, undertaken. Results of this analysis are reported in Table 5.

Table 5. Motivated and Unmotivated Aspects of Depression in Subjects with Endogenous Depression and in Stroke Patients.

<table>
<thead>
<tr>
<th>Symptomatological Section</th>
<th>Endogenous Depression</th>
<th>Fisher exact test</th>
<th>Major PSD</th>
<th>$\chi^2$</th>
<th>Minor PSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed Mood</td>
<td>Mot</td>
<td>2</td>
<td>&lt; .001</td>
<td>30</td>
<td>1.72</td>
</tr>
<tr>
<td></td>
<td>Unmot.</td>
<td>15</td>
<td></td>
<td>13</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>Tot.*</td>
<td>17</td>
<td></td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Guilt Feelings</td>
<td>Mot</td>
<td>5</td>
<td>&lt; .04</td>
<td>17</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td>Unmot.</td>
<td>12</td>
<td></td>
<td>11</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>Tot.**</td>
<td>17</td>
<td></td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Thoughts of Death (scores 1-2)</td>
<td>5</td>
<td>= .09</td>
<td>20</td>
<td>.16</td>
<td>16</td>
</tr>
<tr>
<td>Suicidal purposes (scores 3-5)</td>
<td>10</td>
<td></td>
<td>14</td>
<td>NS</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Tot.***</td>
<td>15</td>
<td></td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

Note. Tot. = Number of patients showing a depressed mood (*), some guilt feelings (**), or some thoughts of death or of suicide (**).
These data show that, when present, the basic symptoms of depressed mood, guilt feelings, and thoughts of death and of suicide were attributed to different reasons in depressed stroke patients and in subjects with a functional form of major depression. Patients with a (major or minor) post-stroke depression usually attributed their depression to the consequences of stroke, felt guilty because they considered previous smoking, drinking, or sexual habits as partly responsible for their actual disease and had stroke-related death worries. Patients with an endogenous depression, on the other hand, did not attribute sad mood to their actual condition, did attribute their guilt feelings to their moral worthlessness, and had active suicidal tendencies rather than death worries.

DISCUSSION

The aim of the present study was twofold: (1) to present a new scale specifically devised to investigate the depressive disorders of stroke patients (Post-Stroke Depression Rating Scale) and to provide data about its validity and reliability; and (2) to clarify, by means of this scale and the Hamilton Depression Rating Scale, the nature of the so-called major form of PSD. This was attempted by comparing the symptomatological profiles obtained on the PSDS and on the HDS by four groups of patients: three groups of stroke patients classified as major depression, minor depression, or no depression, on the basis of DSM III-R diagnostic criteria and a group of patients with a functional psychiatric disorder classified as major depression on the basis of the same criteria.

Results of the present study are more conclusive than those of a previous preliminary report (Gainotti et al., 1995), as to the nature of the major form of PSD, because the symptomatological profiles obtained on the PSDS and on the HDS by stroke patients and by subjects with a functional form of major depression are consistent with the assumption that major PSD is due more to exogenous than to endogenous factors.

This claim is based on three sources of evidence. First, both on the PSDS and on the HDS the symptomatological profiles shown by patients with a major PSD were more similar to those obtained by patients with a minor form of PSD than to those presented by patients with a functional form of major depression.

Second, the most specific (and usually unmotivated) aspects of endogenous depression, namely, depressed mood, guilt feelings, suicidal thoughts, incapacity to enjoy pleasant experiences, and early morning prevalence of negative ideas, significantly prevailed in patients with a functional form of major depression. On the contrary, the most motivated aspects were more represented in stroke patients and, in particular, in those fulfilling the DSM III-R criteria for major depression.

Finally, stroke patients and subjects with a functional form of major depression attributed a different meaning to their depressed mood and guilt feelings. The former usually attributed their sad mood to their actual condition and their guilt feelings to a previous lifestyle considered as partly responsible for the onset of stroke. The latter did not ascribe depressed mood to their actual conditions, but rather to a lack of self-esteem and attributed guilt feelings to unrealistic self-reproach or to generic feelings of moral worthlessness.

Even if the general outcome of the present study is clearly inconsistent with the model of PSD proposed by Robinson and coworkers, we cannot rule out the possibility that a subgroup of depressed stroke patients (namely, those with a left frontal lesion) may share a greater number of features with the functional forms of major depression. We did not try to check this possibility because in our study a left frontal lesion was present only in 8 out of 45 stroke patients fulfilling the diagnostic criteria for major depression. (These anatomo-clinical correlations will be reported in a companion paper by Marra, Azzoni, Gasparini, Razzano, & Gainotti).

Both theoretical and empirical reasons suggest that a much greater number of subjects should be considered before drawing meaningful inferences from such comparison. Suffice it to say that the number of 68 stroke patients and of 10 subjects with a functional form of major depression taken into account in our previous pre-
liminary study of the PSDS (Gainotti et al., 1995) proved insufficient to answer the question that had motivated our investigation.

This is not surprising if we consider the great number of lesion-related and of patient-related variables that could play a role in the determination of post-stroke depression. If we consider, for example, lesion location, which apparently should be the simplest of these variables, we see that in addition to the right/left and anterior/posterior dichotomies, originally stressed by Robinson and coworkers (Lipsey et al., 1985; Lipsey et al. 1986; Robinson et al., 1983, 1984) other dichotomies have been suggested by other authors. Starkstein, Robinson, and Price (1987) have distinguished the affective disorders provoked by cortical versus subcortical lesions. Starkstein, Robinson, Berthier, Parikh, and Price (1988) have explored the mood changes following basal ganglia versus thalamic lesions, Stern and Bachman (1991) investigated the affective disorders following ventral versus dorsal lesions, and Grasso et al. (1994) claimed that the presence of a mesial temporal lobe hypoperfusion could also be related to the presence of a post-stroke depression.

The present study, however, irrespective of the possible presence of a subgroup of depressed stroke patients showing the main features of the functional forms of major depression, clearly demonstrated that (1) a continuum exists between the so-called “major” and “minor” forms of post-stroke depression; and (2) this depressive symptomatology is mostly due to a psychological reaction to the devastating consequences of stroke.

A final point that we would like to stress concerns those symptoms, such as apathy and vegetative disorders, that are considered as typical of major depression in a patient without brain damage, but that could be due to the brain lesion per se in a stroke patient. Patients with a major form of PSD obtained very high scores on these symptoms, being indistinguishable from patients with a functional form of major depression. Much lower scores were, on the contrary, obtained on the same symptoms by patients with a minor form of PSD. It is, therefore, possible that in a stroke patient the distinction between major and minor forms of PSD based on DSM III-R diagnostic criteria may be, at least in part, due to the use of these improper diagnostic criteria.

REFERENCES

tients. Importance of location of lesion. *Brain, 107, 81-93.*


APPENDIX

The Post Stroke Depression Rating Scale
The examiner must choose for each section the statement which best corresponds to the patient’s actual state.

Section 1

DEPRESSED MOOD

Score

Well-balanced mood. At times happier, at times worried, but not more than before illness. 0

Mood a little more sad and worried than before illness. 1

Mood clearly more oriented toward sadness and pessimism than before illness. 2

Mood clearly oriented toward sadness and pessimism, with fits of crying from time to time (but by speaking it’s possible to pull him/her out of it). 3

Very sad and disheartened mood. Cries rather often and for long periods (even speaking, it’s hard to pull him/her out of it). 4

Gloomy, black mood, cries continuously, and there is no way to hearten him/her, or: so depressed and dark, can’t even cry any more. 5

**always try to determine if depressed mood:
(a) is related to handicaps and disabilities.
(b) is not related to the consequence of illness.

Section 2

GUILT FEELINGS

Score

Good level of self-esteem. Feeling of having had an essentially positive life without much self-reproach. 0

Acceptable level of self-esteem, but with some self-reproach in limited areas (for example, 1 of 3: family, friends, work). 1

Rather low level of self-esteem, with some self-reproach (not particularly serious) in various areas. 2

Little self-esteem and many guilt feelings; however does not think illness has been a just punishment. 3

Very little self-esteem and many guilt feelings; thinks illness has been a just punishment. 4
Even without being posed specific questions, spontaneously verbalizes serious expressions of self-accusation, unworthiness and guilt.

**always try to determine if guilt indicates:**
(a) moral unworthiness.
(b) responsibility for behavior (smoking, sexual abuse, food abuse, etc) held responsible for illness.

**Section 3**

**SUICIDE**

*Score*

Thinks life is always worth living. 0

Thinks life is worth living only if health, affective, and economic conditions are acceptable. 1

Thinks life in general is not worth living, but has never thought of taking it. 2

Besides often thinking life is a burden, recently has had vague ideas about killing him/herself. 3

Recently, has had recurring ideas about suicide, but without making specific plans or concrete attempts. 4

Recently, has made detailed plans (or has made serious attempts) to commit suicide. 5

**always determine whether possible suicide tendencies:**
(a) appeared only after illness.
(b) are related to consequences of illness.

**Section 4**

**VEGETATIVE DISORDERS**

Sum scores of sleep disorders (0–3) and appetite (0–2)

*Score*

Sleep disorders:

No sleep disorder. 0

Some difficulty in falling asleep or frequent nocturnal awakening. 1

Awakens very early in the morning and is unable to fall back to sleep again (poor drug effectiveness). 2

Major disorders in all sleep phases; does not allow others to sleep during the night (drugs completely ineffective). 3
Appetite disorders:

No appetite disorder. 0

Clear loss of appetite, but no weight loss. 1

Complete loss of appetite associated with weight loss. 2

Section 5

APATHY/ABULIA/INDIFFERENCE

Sum scores of following parameters:

(a) Interest in other patients and own state of health:
- adequate (is interested, asks information, tries to be useful). 0
- rather scarce both toward other patients and own morbid condition. 1
- completely absent. 2

(b) Interest in family members and friends:
- adequate (waits impatiently for their visits, asks about individuals and situations in family circle, reacts appropriately to emotionally significant events). 0
- rather scarce (clearly reduced compared to premorbid condition). 1
- completely absent. 2

(c) Interest in social situations:
- adequate, corresponding to premorbid levels regarding public and political events or work situations. 0
- clearly reduced compared to premorbid situation. 1

Section 6

ANXIETY

Sum scores for psychic anxiety (0–2), somatic anxiety (0–2) and psycho-motor agitation (0–1).

Psychic anxiety:
Calm enough; Rarely tense, nervous or apprehensive. 0

Appears rather tense, nervous, irritable; Sometimes expresses fears and worries; 1
Often appears nervous, apprehensive, irritable; Frequently expresses fears about own condition; 2
Often needs to be reassured.

Somatic anxiety:
Shows no somatic sign of anxiety, nor complains of headaches, tremors, tachycardia. 0
Rather often complains of headaches, tremors, palpitations or other gastrointestinal or urinary somatic disorders. 1

Often appears pale, sweaty; Every day complains of headaches, diffused pains, sense of precordial oppression, or other somatic symptoms. 2

*Psychomotor agitation:*  
Besides showing signs of somatic and/or psychic anxiety, also shows marked restlessness or real psychomotor agitation. 1

**Section 7**

**CATASTROPHIC REACTION**

(by/in collaboration with whoever carries out neuropsychological evaluation)

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Well-controlled reaction to possible difficulties encountered during examination.</td>
</tr>
<tr>
<td>1</td>
<td>Rather controlled reaction but some signs of impatience, irritation, restlessness.</td>
</tr>
<tr>
<td>2</td>
<td>More evident anxious or aggressive manifestations; frequent cursing or expressions of depression.</td>
</tr>
<tr>
<td>3</td>
<td>Clear manifestations of anxiety at somatic (and/or vegetative) level but without fits of crying.</td>
</tr>
<tr>
<td>4</td>
<td>Clear signs of anxiety with sporadic fits of crying or refusal to continue test.</td>
</tr>
<tr>
<td>5</td>
<td>Test practically impossible to carry out due to seriousness of behavioral disorganization and fits of anxiety and crying.</td>
</tr>
</tbody>
</table>

**Section 8**

**DIFFICULTY IN EMOTIONAL CONTROL**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The patient manages to control emotional reactions normally.</td>
</tr>
<tr>
<td>1</td>
<td>Recently becomes emotional a little more than usual.</td>
</tr>
<tr>
<td>2</td>
<td>At times laughs or cries even to light stimuli (or is not able to interrupt emotional outburst provoked by an appropriate stimulus).</td>
</tr>
<tr>
<td>3</td>
<td>Often reacts in an emotionally excessive way with fits of laughter or crying. However, is able to control him/herself in the presence of strangers.</td>
</tr>
<tr>
<td>4</td>
<td>Bursts out laughing or crying even in the presence of strangers and it is difficult for him/her to break off these attacks.</td>
</tr>
<tr>
<td>5</td>
<td>Patient is completely incapable of controlling emotional reactions.</td>
</tr>
</tbody>
</table>
Section 9

ANHEDONIA

Sum scores of parameters (A) and (B) and one other choice (in relation to sex and patient’s premorbid interests) between parameters (C), (D), and (E).

Score

A) Visits of friends or relatives (or receiving good news about them) gives me pleasure
- the same as before the illness. 0
- less than before the illness. 1
- gives me no pleasure. 2

B) A better-than-usual meal (for example, something brought from home) gives me pleasure
- the same as before the illness. 0
- less than before the illness. 1
- gives me no pleasure. 2

C) If my team wins
- it pleases me the same as before. 0
- it no longer interests me. 1

D) Seeing an erotic scene on TV
- pleases me like before. 0
- has no effect on me. 1

E) The visit of a beautiful child
- cheers me up the same as before. 0
- no longer gives me pleasure. 1

Section 10

DIURNAL VARIATIONS

The time when I feel most depressed is:

Always in the early morning, when I wake up and have a whole useless day before me to fill. -2

It varies from one day to the other, but usually it is worse in the early morning, when I wake up. -1

I always feel more or less depressed in the same way. 0

There’s no rule, but usually I feel more depressed when something happens that makes me feel handicapped. +1

Always when the situation makes me feel disabled and unable to do basic things, such as...
(insert an example consistent with the patient’s deficit). +2
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