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Memory Complaint After Electroconvulsive Therapy: Assessment with a New Self-Rating Instrument

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Memory complaints before bilateral electroconvulsive therapy (ECT), 1 week after ECT, and 6 months after ECT were assessed in 35 patients using a newly developed self-rating scale. Memory complaints that occurred 1 week after ECT differed quantitatively and qualitatively from memory complaints that occurred before ECT. Six months later, memory complaints qualitatively resembled the complaints reported 1 week after ECT and differed sharply from those reported before ECT. It was suggested that a patient's impression of his memory is altered by bilateral ECT and that this altered impression persists in gradually diminishing form for at least 6 months after a typical course of treatment. Since the self-rating instrument used here appeared to differentiate between memory complaints associated with depression (before ECT) and memory complaints associated with amnesia (1 week after ECT), this instrument may be useful in a variety of settings where there is interest in human memory function.

INTRODUCTION

Complaints of poor memory are common in psychiatric and neurological patients, but their significance is often difficult to determine. Self-reports of

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memory function can be discrepant with the results of memory tests (Kahn *et al.*, 1975; Cronholm and Ottosson, 1963). For example, in depressed elderly patients memory complaints appeared to be related more to degree of depression than to performance on memory tests (Kahn *et al.*, 1975). Conversely, patients receiving electroconvulsive therapy (ECT) who were clinically improved often denied memory impairment despite the fact that memory impairment could be documented by formal testing (Cronholm and Ottosson, 1963).

We recently reported that memory complaints were common 6 to 9 months after a course of bilateral ECT, being reported by 60% to 70% of patients interviewed (Squire and Chace, 1975; Squire, 1977). Yet, formal tests have failed to demonstrate persisting memory impairment after bilateral treatment (Squire and Chace, 1975; Harper and Wiens, 1975). Since memory complaints are common in depressed patients (Ianzito *et al.*, 1974; Marsella *et al.*, 1973), it has been difficult to know whether memory complaints after ECT are related to recurring depressive symptoms, to a sense of impaired memory that was present even before treatment; or indeed, whether complaints are in any way related to or caused by ECT.

A method for distinguishing memory complaints that are related to depression from memory complaints related to the effects of ECT could help understand the ECT process and could provide a tool for the assessment and interpretation of memory functions in a variety of conditions. It has been shown previously that depression and the acute amnesia associated with ECT exert qualitatively distinct effects on memory (Sternberg and Jarvik, 1976; Cronholm and Ottosson, 1961). This finding suggested that depression and amnesia might also affect memory complaints differently. Here we describe a new self-rating instrument which can differentiate memory complaints that occur before ECT, when patients are presumably depressed, from memory complaints that occur shortly after a course of ECT, when patients are amnesic. We have applied this self-rating instrument to the problem of understanding the memory complaints that occur many months after ECT.

METHOD

Subjects

The subjects of the prospective follow-up study were 46 depressed psychiatric inpatients at six hospitals who had been prescribed a course of bilateral ECT. Of the 46 patients originally included in the study, 11 were lost to long-term follow-up. Seven could not be located, two died, one declined to be interviewed, and one was subsequently prescribed a course of maintenance ECT. For the remaining 35 patients (27 female) the specific diagnoses as recorded on admission were primary affective disorder or severe depression (12), manic-depressive, depressed (11), involutional melancholia (7), depressive neurosis (4), schizo-affective disorder (1). Patients with neurological disorders, schizophrenia, or depression secondary to alcoholism or drug-abuse were excluded. Twenty-one of the 35 patients had not received ECT before, and none had received ECT during the past year. Of the 14 patients who had received ECT previously, 12 had received one course of ECT from 1 to 16 years previously (mean = 8 years). The remaining two had received two and three courses of ECT, respectively, during the same period. Patients were between the ages of 25 and 64 (mean = 41), with an average of 12.7 years of education.

An additional group of 19 subjects (15 female) was studied retrospectively. These subjects had been psychiatric patients at the same six hospitals from 6 to 10 months previously (median = 7 months), and had received a prescribed course of bilateral ECT. Their diagnoses had been primary affective disorder or severe depression (8), manic-depressive, depressed (4), neurotic depression (4), involutional melancholia (2), schizo-affective disorder (1). Four of these subjects had received ECT prior to that time; 15 had never received ECT before. These 19 subjects were between the ages of 26 and 64 (mean = 42), with an average of 13.1 years of education.

Electroconvulsive Therapy

Bilateral treatment was administered three times a week on alternate days following medication with atropine, methohexital sodium, and succinylcholine (130-150 V for 0.6-1.0 sec). Electrode placement was temporal-parietal. In all cases the patient was described by his physician as having a modified grand mal seizure. Decisions concerning the number of treatments were made by the individual psychiatrists. Persons in the first group (n = 35) received from 5 to 21 treatments (mean = 11.1). Persons in the second group (n = 19) had received 6 to 20 treatments (mean = 10.0).

Tests and Procedure

An 18-item self-rating scale of memory functions was constructed that asked subjects to compare their memory now to their memory during the period before hospitalization (Table I). For each item, subjects rated themselves on a 9-point scale from -4 (worse than ever before), though 0 (same as before), to +4 (better than ever before). Each item inquired about memory functions in a somewhat different way. The wording of items was derived from remarks we had heard patients make about their memory before and after ECT, and from information about how depression and amnesia can differentially affect memory.

Table I. Self-Rating Scale of Memory Function[a]

1. My ability to search through my mind and recall names or memories I know are there is
2. I think my relatives and acquaintances now judge my memory to be
3. My ability to recall things when I really try is
4. My ability to hold in my memory things that I have learned is
5. If I were asked about it a month from now, my ability to remember facts about this form I am filling out would be
6. The tendency for a past memory to be "on the tip of my tongue," but not available to me is
7. My ability to recall things that happened a long time ago is
8. My ability to remember the names and faces of people I meet is
9. My ability to remember what I was doing after I have taken my mind off it for a new minutes is
10. My ability to remember things that have happened more than a year ago is
11. My ability now to remember what I read and what I watch on television is
12. My ability to recall things that happened during my childhood is
13. My ability to know when the things I am paying attention to are going to stick in my memory is
14. My ability to make sense out of what people explain to me is
15. My ability to reach back in my memory and recall what happened a few minutes ago is
16. My ability to pay attention to what goes on around me is
17. My general alertness to things happening around me is
18. My ability to follow what people are saying is

[a] Each item began with the statement "compared to before I began to feel bad and went to the hospital. . ." Thus, both therefore ECT and after ECT patients were asked to rate their memory now compared to before they began to feel bad. In this way, the before-ECT test attempted to assess memory problems of recent onset, presumably related to depression. After-ECT tests attempted to assess residual effects of depression and the effects of ECT on memory. For each item, patients rated themselves on a 9-point scale ranging from −4 (worse than ever before), through 0 (same as before) to +4 (better than ever before. Here the items have been ordered according to the magnitude of the difference in score obtained before ECT and 1 week after ECT (Fig. 1). Item 1 produced the largest difference, and Item 18 produced the smallest difference.

The first group (n = 35) was given the self-rating scale 1 to 2 days before the first treatment of the series, 1 week after the completion of the series, and again about 6 months after the completion of treatment (range 5-9 months, median = 6). For the 1-week test, 8 patients were visited in the hospital; 27 had been discharged and were visited in their homes. The location of testing did not affect the results. The difference between the self-rating scores of patients tested at home and patients tested at the hospital did not approach significance ($F < 1.0$). For the 6-month test, 34 of the 35 original patients were visited in their homes. The second group (n = 19) was given the self-rating scale on one occasion 6 to 10 months (median = 7) after their course of bilateral ECT. Seventeen of the 19 subjects were visited in their homes. Two had been readmitted and were tested in the hospital.

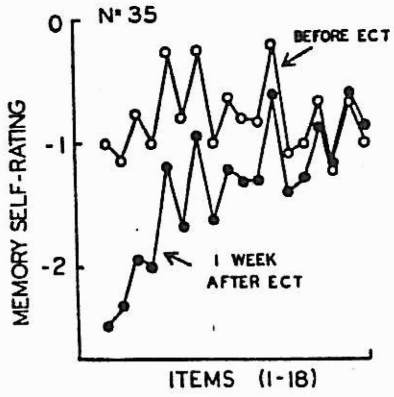

Fig. 1. Self-ratings of memory function (on a −4 to +4 scale) before and 1 week after a course of bilateral ECT. The order of test items (1–18) is the same as shown in Table I.

RESULTS

Figure 1 shows the results with the self-rating scale before ECT and one week after ECT (n = 35). The items (1-18) have been ordered along the abscissa just as they appear in Table I, according to the magnitude of the difference in scores obtained before and after ECT. Thus, Item 1 to the extreme left produced the smallest before–after difference. These results make three general points about the experience of memory dysfunction before and after ECT: (i) Patients clearly had memory complaints before ECT. At this time, the average score on the self-rating scale was −0.80 and the average SEM ± 0.29 for the 18 test items. This score was significantly below the zero level (t = 11.4, $p < 0.01$). For purposes of comparison, 20 hospital employees (16 female; mean age = 42; mean = 13 years of education) also took the self-rating scale and were asked to rate their memory now compared to 1 year ago. This group's average score on the self-rating scale was −0.05 ± 0.06, a score not measurably different from zero (t = 0.1) and significantly different from the score of the patient group before ECT (F = 6.1, $p < 0.02$). Thus, before-ECT patients considered their memory to be poorer than normal subjects. (ii) One week after ECT memory complaints were present, but patients rated their memory worse than before ECT. At this time the average score on the self-rating scale was −1.4 and the average SEM ± 0.33 for 18 items. A two-way analysis of variance (items × test occasion) revealed a significant effect of test time on memory self-ratings (F = 4.3, $p < 0.05$). (iii) The pattern of scores obtained before and after ECT indicated that some items were apparently more sensitive than other items to the effects of ECT. This conclusion followed from the findings of a significant interaction between item scores and testing occasion (F = 2.2, $p <$ 0.01). Thus, before-ECT patients had an approximately equivalent score across

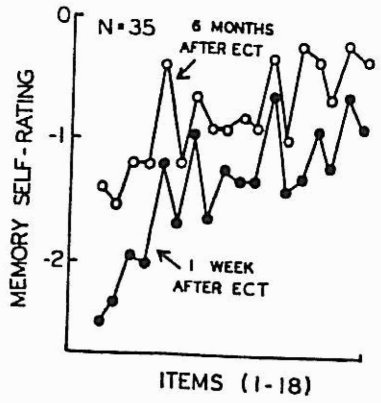

Fig. 2. Self-ratings of memory function (on a −4 to +4 scale) 1 week and 6 months after a course of bilateral ECT. The order of test items (1–18) is the same as shown in Table I.

all items. By contrast, 1 week after-ECT patients rated themselves as worse on some items than on others.

Having established that patients had one pattern of memory complaint before ECT and a different pattern of complaint after ECT, it was possible to ask whether memory self-ratings obtained 6 months after ECT resembled the before-ECT pattern or the after-ECT pattern. Figure 2 shows the self-rating scores 6 months after ECT for the same 35 patients. Here the 6-month scores have been presented together with the 1-week scores so that they might be more easily compared. At 6 months after ECT, the average self-rating score was −0.8, *vs.* −1.4 at 1 week after ECT, and a two-way analysis of variance (items X test occasion) revealed that scores at 6 months were significantly improved compared to scores at 1 week ($F = 8.1, p < 0.1$). These data indicate that patients consider their memories to have improved between 1 week and 6 months after ECT. The pattern of complaint 6 months after ECT appeared similar to the pattern observed 1 week after ECT.

Figure 3 depicts more clearly the relationship between the self-rating scores obtained 6 months after ECT and the self-rating scores obtained earlier. Here three best-fitting lines have been constructed through the scores from before ECT, 1 week after ECT, and 6 months after ECT (method of least squares). These data illustrate that the pattern of complaint 6 months after ECT resembled the pattern of complaint observed 1 week after ECT and differed sharply from the pattern of complaint observed before ECT. This conclusion followed from the finding that the interaction (items X test occasion) between before-ECT and 6-month scores was highly significant ($F = 2.2, p < 0.01$), whereas the comparable interaction between 1-week and 6-month scores did not approach significance ($F = 0.7, p < 0.3$).

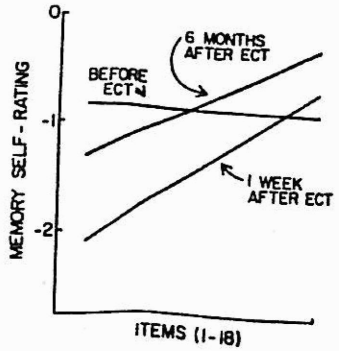

Fig. 3. Self-ratings of memory function before, 1-week after, and 6 months after a course of bilateral ECT. Scores for test Items 1–18 are here represented as best-fitting lines across the scores for all test items.

Patients who had had prior experience with ECT ($n = 14$, mean age = 41) and patients who had never received ECT prior to the present course ($n = 21$, mean age = 41) had similar self-rating scores before ECT and 1 week after ECT ($F < 1.8, p < 0.1$). Six months after ECT, these two subgroups also had a similar pattern of self-rating scores (items X subgroup, $F = 1.2, p < 0.2$), but patients who had received ECT in the past rated their memory as somewhat better than patients without prior ECT experience ($F = 4.1, p < 0.06$).

In the absence of additional information, this finding cannot be clearly interpreted. It is possible that persons who have had ECT before and who have previously experienced a complete sequence of amnesia and recovery from amnesia are more willing to rate their memory as good than persons who have not experienced this sequence. It is also possible that any group that has never had ECT before will always contain some individuals who respond poorly to ECT and who will have long-lasting memory complaint. Additional follow-up of these two subgroups, now in progress, may clarify these issues.

Age and number of treatments, two factors that can influence memory test scores (Kahn *et al.*, 1975; Harper and Wiens, 1975) did not correlate with memory complaints on any occasion before or after ECT (all r's < 0.22, $p > 0.1$). However, the distribution of ages and number of treatments in this study may not have been sufficiently broad to provide a good test of these correlations; 46% of the 35 patients were 35–45 years of age, and 63% of them had received 8–12 treatments.

To determine whether self-rating scores obtained 6 months after ECT had been influenced in any way by repeated testing, we compared the 6-month scores of these 35 patients with the scores of the 19 patients who were tested on only one occasion 7 months after ECT. The scores of these two groups were nearly identical in every respect. The average self-rating scores were −0.8 (for $n = 35$) and −0.76 (for $n = 19$). The best-fitting lines constructed from the scores for all 18 items were nearly superimposable. Thus, for the first group ($n = 35$) this line could be described by the relationship $y = 0.061X - 1.3$ for the second group ($n = 19$), $y = 0.065X - 1.38$.

Further examination of Fig. 3 indicates that at 6 months after ECT scores on some items had not yet recovered to the before-ECT level. Yet, score on other items had apparently recovered to or exceeded the before-ECT leve

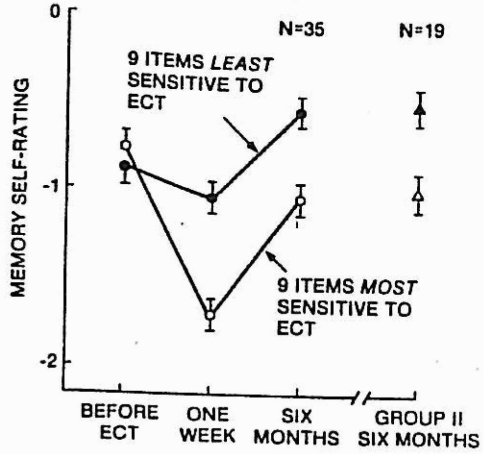

Fig. 4. Self-ratings of memory function before, 1 week after, and 6 months after a course of bilateral ECT. The nine test items labeled as most sensitive to ECT are the first nine items in Table I. These items were the nine items producing the largest difference in self-rating scores before ECT *vs.* 1 week after ECT. Group II (n = 19) was tested on one occasion 7 months after a course of bilateral ECT.

This point is illustrated in a different way in Fig. 4, where the 18 items have been separated into two equal groups. One group consists of the nine items most sensitive to the acute effects of ECT on memory. These items are the first nine items in Table I and the left-most items in Figs. 1, 2, and 3. The second group consists of the nine items least sensitive to the acute effects of ECT. These are Items 10–18 in Table I and the right-most items in Figs. 1, 2, and 3. Figure 4 shows that at 6 months after ECT the average scores for the nine items most sensitive to ECT remained significantly below the before-ECT level (t = 2.8, $p < 0.01$). Moreover, at 6 months after ECT the average score for the nine items least sensitive to ECT was significantly above the before-ECT level (t = 2.7, $p < 0.01$). To determine whether the results obtained from this somewhat arbitrary grouping of test items had any generality, we followed this same procedure with the independent group of 19 subjects. Figure 4 indicates that nearly identical results were obtained with this group. Taken together, these results suggest that some memory complaints, as measured by Items 1–9, were more severe at 6 months after ECT than before ECT. As measured by Items 10–18, other complaints were less severe after ECT than before ECT.

Finally, an attempt was made to assess the importance to the subjects of their persisting complaints by asking them to select one of five statements that best described their circumstance.

Severity of Memory Problem	Before ECT	1 Week after ECT	6 Months after ECT
1. No problem	9	8	6
2. Only an occasional minor problem	7	2	8
3. Minor problems but they occur frequently	9	4	10
4. Many problems that are disturbing and that occur frequently	10	14	9
5. Severe problems that interfere with almost everything I do	0	7	2

This tabulation indicated that 1 week after ECT the average report was "many disturbing memory problems." Before ECT and at 6 months after ECT the average report was "minor but frequent problems."

DISCUSSION

A new self-rating instrument has been described for the assessment and interpretation of memory complaints. The test appears to discriminate between memory complaints that occur before ECT and memory complaints that occur 1 week after treatment is completed. Memory complaints reported before ECT were presumably related to depressive illness (Ianzito *et al.*, 1974; Marsella *et al.*, 1973). Since memory dysfunction can easily be demonstrated 1 week after a course of bilateral treatment (Harper and Wiens, 1975; Squire *et al.*, 1976; Cronholm and Blomquist, 1959), it seems reasonable to suppose that the altered pattern of memory complaints observed 1 week after ECT was largely related to amnesia. We have used this method to assess memory complaints that persist several months after a course of bilateral ECT.

Memory complaints were present 6 months after ECT, but diminished compared to 1 week after ECT. The memory complaints reported 6 months after ECT qualitatively resembled the pattern of memory complaints observed 1 week after ECT and differed sharply from the pattern of memory complaints observed before ECT. It must be emphasized that these findings apply only to bilateral ECT. Unilateral ECT, which affects memory test scores less than bilateral ECT (Squire, 1977; Harper and Wiens, 1975), would be expected to be associated with less memory complaint. A long-term follow-up study of unilateral ECT and memory complaint is now in progress. It should also be of interest to assess the course of memory complaint in psychiatric patients receiving treatments other than ECT.

The specific items that demonstrated persisting memory complaint (Items 1-9) seemed to differ from items that did not (10-18). Several of the first nine items asked about the ability to learn and retain new material or to recall previously learned material. Several of the second nine items asked about the ability to attend, to hold information in memory across short time intervals, or to recall material from the remote past. It is interesting to note that the amnesic syndrome typically spares immediate memory function (e.g., Items 13, 14, 16, 17, 18) and memory of the distant past (e.g., Items 10, 12), but can affect learning (e.g., Items 4, 8), delayed recall (e.g., Items 5, 9), and memory for the more recent past. Thus, Items 1–9 may ask about experiences likely to be associated with amnesia. Items 10–18 may ask about experiences more likely to be associated with depression. Whereas it is not clear that each of the 18 items was affected differently by depression and amnesia, or that the two sets of items (1-9 and 10-18) are each measuring just one factor, the results before and after ECT nevertheless suggest that these two sets of items can differentiate between memory complaints due to depression and memory complaints due to amnesia.

The results from the self-rating scale described here do not constitute strong evidence for persisting memory dysfunction, because formal memory tests have indicated that memory functions substantially recover by 6 months after ECT. New learning capacity and memory for events that occurred many years previously appear to be fully recovered by 6 months after ECT (Squire and Chace, 1975; Squire *et al.*, 1980; Squire, 1980). Memory for events that occurred 1 to 2 years before ECT recovers substantially (Squire *et al.*, 1975; Squire and Cohen, 1978; Squire, 1980), although the possibility has remained that lasting impairment may occur for some information acquired during this time period (Squire *et al.*, 1980; Janis, 1950).

This discrepancy between memory complaint and the results of formal testing cannot yet be completely resolved. Nevertheless, the results with the self-rating instrument appear to answer certain questions about the experience of memory dysfunction and its causes. In the present case, it seems clear that (i) memory complaints long after ECT are qualitatively different from memory complaints that occur before ECT. Therefore, these complaints cannot be explained as recurrence of psychiatric illness, low self-esteem, or as a long-standing tendency to complain about memory; (ii) in a variety of respects, memory complaints long after ECT resemble complaints reported shortly after ECT, at a time when amnesia can be demonstrated with formal tests. Memory complaints might therefore be based on this earlier experience and reflect a persisting tendency to question whether memory functions have fully recovered. This information should be useful in counseling patients about memory problems. In addition, the methods described here may prove useful in evaluating other examples of memory complaint such as those associated with head injury, psychotropic drugs, or normal aging.

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