A Retrospective Controlled Study into Memory Complaints Reported by Depressed Patients After Treatment with Electroconvulsive Therapy and Pharmacotherapy or Pharmacotherapy Only

King Han Kho, MD, PhD, Michiel Floris VanVreeswijk, MA,† and Jaap M.J. Murre, PhD‡*

Abstract: Few studies have been conducted comparing complaints of memory problems using objective and subjective memory scales in depressed patients who received electroconvulsive therapy (ECT) + pharmacotherapy or treatment with pharmacotherapy only. Patients who suffer from depression according to the *Diagnostic and Statistical Manual of Mental Disorder (Fourth Edition)* criteria and who were admitted within the past 5 years before this study in a general psychiatric hospital were screened for inclusion. Objective retrograde amnesia was assessed using the Autobiographical Memory Interview and the Amsterdam Media Questionnaire (AMQ). Subjective retrograde amnesia was assessed using the Squire Subjective Memory Questionnaire and the ECT Retrograde Amnesia and Perception Scale (ERAPS), a newly developed scale. Twenty of the 84 patients who received ECT + pharmacotherapy and 30 of the 196 patients who received pharmacotherapy only participated in the study. Patients' ERAPS memory scores were compared with proxies' ERAPS memory scores of the patients to assess the reliability of memory complaints. The ECT + pharmacotherapy group was found to suffer more from memory problems using the AMQ 1990 test. There was also a difference for the proxy's ERAPS memory score, reflecting the conviction of proxies from the ECT + pharmacotherapy patients that these patients suffer more memory problems due to the illness, treatment with pharmacotherapy, or ECT. The differences could not be explained by the influence of determinants for retrograde amnesia. ECT + pharmacotherapy patients did not attribute their memory problems mainly to ECT but put equal "blame" on the depressive illness, treatment with pharmacotherapy, and ECT. The analyses suggest that the AMQ 1990s test is (more) sensitive in registering retrograde amnesia than the other scales used in the study.

Key Words: ECT, pharmacotherapy, retrograde amnesia, proxy

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Although electroconvulsive therapy (ECT) is accepted as an important treatment for severe depressions, it remains controversial. Adverse effects, of which memory problems are the most important, are emphasized by critics of ECT. Weiner and colleagues[1] identified selective autobiographical memory deficits at 6 months follow-up. Other studies however showed that memory deficits caused by ECT are temporary and cannot be observed after 3 to 6 months.[2] Devanand and colleagues[3] showed that 8 patients who received at least 100 ECT treatments were equivalent in cognitive function scores and subjective memory complaints to matched controls who had not been treated with ECT.

Research into memory problems after treatment of depression covers several aspects of memory functions. The focus of the current study is on amnesia, which is the loss of memories. This can be differentiated into retrograde and anterograde amnesia. Retrograde amnesia is the loss of memories acquired before treatment of depression, and anterograde amnesia is the inability to acquire new memories after treatment. Several standardized and well-validated tests for anterograde amnesia are available.[4] This is not the case for retrograde amnesia. A reliable assessment of retrograde amnesia would require that all memories preceding treatment are recorded. Memory loss is then assessed after treatment. This of course is not feasible. Retrograde amnesia can therefore only be assessed partially and in retrospect by testing the patient's knowledge of public and personal events. Such tests measure signs of memory problems and are called *objective tests*. Because of the inherent uncertainty about reliability of memory recall, subjective tests of amnesia have also been developed. These tests assess complaints of memory problems and are called subjective because they measure how the patients feel about their memory. Studies showed that anterograde amnesia assessed with objective tests resolves within a few weeks after an ECT course,[5] whereas in contrast, severe and lasting subjective complaints of memory problems have been reported (American Psychiatric Association Task Force on Electroconvulsive Therapy,[5] p 201; Donahue).[6] In regard to the public acceptance of ECT, these complaints may be more important than favorable test results using objective tests of amnesia.

We hypothesized that depressed patients who received ECT + pharmacotherapy suffered significantly more from retrograde amnesia than depressed patients who were treated with pharmacotherapy only and that subjective tests were more sensitive than objective tests in detecting this difference. These hypotheses were tested by between-group comparisons using objective and subjective tests of retrograde amnesia. This study also explores the presence of confounding variables,

From the *GGZ Delfland St Jorisweg 2, 2612 GA Delft, the Netherlands; †GGZ Delfland, locatie Reinier de Graafweg 7A, 2625 AD Delft, the Netherlands; and ‡Department of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB Amsterdam, the Netherlands.

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Reprints: King Han Kho, MD, PhD, GGZ Delfland St Jorisweg 2, 2612 GA Delft, the Netherlands (e-mail: k.kho@ggz-delfland.nl).

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which may influence the assessment of retrograde amnesia. These are called *determinants of retrograde amnesia*.

METHODOLOGY

Electroconvulsive Therapy Procedure

Before the ECT course, patients were informed about the adverse cognitive effects; ECT can cause loss of memories mainly from the most recent past. Psychotropic medication prescribed before ECT was continued throughout the course. All patients were admitted to hospital during the ECT course. Anesthesia was induced with intravenous thiopentone sodium (4–5 mg/kg) and succinylcholine (0.5–1 mg/kg). The blood oxygen level was kept above 95%. Seizures were induced with a customized brief-pulse, constant-current device (Thymatron DGx) with a maximum stimulus level of 1008 mC twice weekly. Treatment was started with unilateral d'Elia electrode placement, which was changed to bitemporal placement if there was an insufficient response after 6 sessions. In life-threatening conditions (suicidal ideation or refusal to eat and drink), patients were given bitemporal treatment from the onset. The stimulus settings were initially based on the age[7] and adjusted for the concurrent medication used; the stimulus setting was adjusted 5% to 10% upward with the use of benzodiazepines and antiepileptics. The length of the seizures measured by the electroencephalogram was kept above 20 seconds. If seizure duration fell below 20 seconds, the stimulus setting was raised at the next session. During once weekly consultations, the clinician and the patient evaluated the treatment. The decision to stop ECT was made after discussion with the patient if remission was achieved—defined as a 17-item Hamilton Rating Scale of Depression (17-item HRSD)[8] score less than eight—if there was a lack of further improvement, or in case of intolerable adverse effects.

Patients who relapsed after a successful ECT course were offered another course. If this proved successful, maintenance ECT was offered in a frequency of once weekly initially. The frequency was tapered to once monthly or less after every 3 sessions if the mood remained stable.

Patient Selection

After an ECT course, patients receive pharmacotherapy, continuation ECT, or both as maintenance treatment. This group is called the *ECT + pharmacotherapy group*. These patients are compared with patients who have received pharmacotherapy only for their depression. This group is called the *pharmacotherapy group*. Patients who suffered from depression according to the *Diagnostic and Statistical Manual of Mental Disorder (Fourth Edition)*[9] criteria and had been admitted within the past 5 years before this study in GGZ Delfland, a general psychiatric hospital in the Netherlands, were screened for inclusion. Patients who were older than 18 years and able to give informed consent were asked to participate in this study. A written invitation was sent to the patients. They were asked to return the signed consent form in an enclosed prestamped envelope. If the patient did not reply, undergraduate research students approached the patient by telephone. Patients were excluded if the medical records showed or the patients reported that they suffered from a neurological disorder that can cause memory problems or from dementia. They were also excluded if they abused alcohol or drugs, or if they were not fluent in Dutch.

For ECT + pharmacotherapy patients, the total duration of illness was defined as the period between the first sign of psychiatric disorder reported in the medical records and the first ECT session. The duration of index episode was defined as the period between the emergence of psychiatric symptoms before the admission during which ECT was started and the first ECT session. For pharmacotherapy patients, the same starting time point was used, but the end point was defined by the date of admission because this was taken as the start of a successful treatment with pharmacotherapy resulting in a discharge from hospital. The study was approved by the local institutional review board.

Rating Scales

The diagnosis on axis I of the DSM IV was made using the Dutch version of the Mini International Neuropsychiatric Interview (MINI),[10] a structured interview that has been validated in relation to the Structured Clinical Interview for DSM III R, the Composite International Diagnostic Interview, and expert professional opinion.[11]

The current research focuses on retrograde amnesia assessed with objective and subjective tests. Few tests for subjective memory complaints are available. Squire and colleagues have developed the Squire Subjective Memory Questionnaire (SSMQ) that contains 18 items to measure the severity of memory complaints after ECT. The total score ranges from 0 to 144. A low total score signifies more memory problems. They showed that memory complaints can persist after ECT.[12–15] Using this test, Squire and Slater[15] conducted one of the few studies that compared depressed patients who received ECT with those who had not been so treated. Memory complaints were found to encompass the period from 6 months before until 2 months after the ECT course. They also found that memory complaints were worse shortly after the ECT course and persisted to a lesser degree for another 3 years in approximately half of the patients. Most of the studies using the SSMQ were conducted with patients treated with sine-wave ECT devices, which may cause significantly more memory problems than brief-pulse devices.[1,16] For this reason, these sine-wave devices are now regarded as obsolete. Memory complaints can be influenced by factors other than treatment modality (ECT or antidepressants). Coleman and colleagues[17] showed that changes in SSMQ scores after ECT are independent of changes in objective anterograde and retrograde amnesia tests but are highly correlated with the degree of improvement in depressive symptoms. Prudic and colleagues[18] reported that depressive symptoms can influence test results. For this study, the SSMQ was translated into Dutch by a native English–speaking psychiatrist who is fluent in Dutch.

The ECT Retrograde Amnesia and Perception Scale (ERAPS) has been developed by one of us (K.H.K., an experienced psychiatrist) based on complaints from patients who have received ECT. The ERAPS assesses complaints of memory loss, the duration of this loss, and the perception and acceptance of medication and ECT. Complaints of memory loss in 4 areas are assessed: precious memories, other memories,

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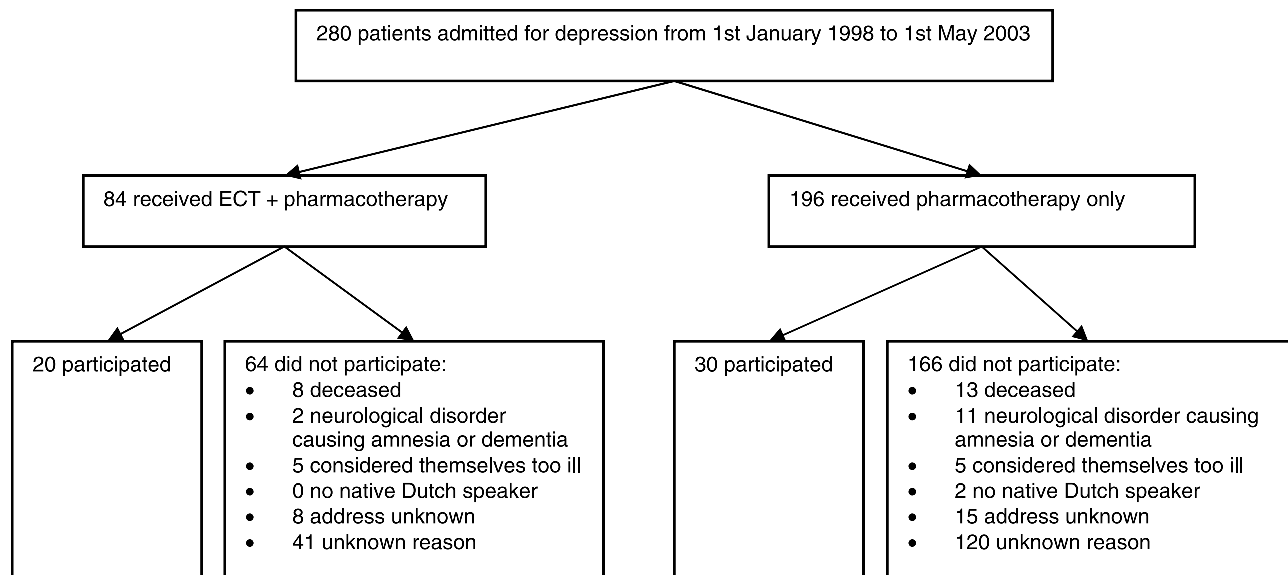

FIGURE 1. Flowchart of patient selection.

knowledge, and skills. The patients are asked how certain they are that this loss is a result of their illness and/or treatment. Each item is scored on a 7-point scale: 1 (= certainly not) to 7 (= certainly yes). The total score ranges from 4 to 28. A low total score signifies that the patient is convinced that the depression or antidepressive treatment does not cause memory problems. The ERAPS memory score is calculated by adding the scores of the 4 items. The perception of the treatment is explored further in the perception section of the questionnaire. The patients are asked if they think that the loss of memories is caused by their illness, treatment with medicines, or treatment with ECT, and if they would have accepted treatment with medicines or ECT if they had known that it causes memory problems. Each of the 5 perception items is scored on a 7-point scale. The ERAPS perception score is calculated by adding the scores of the 5 items. Finally, the level of annoyance with memory problems is assessed on a 4-point scale: 0 (= no problem) to 4 (= very annoying). The psychometric properties of the ERAPS have been discussed elsewhere (Kho et al, unpublished data). The SSMQ and the ERAPS are subjective memory tests.

The Autobiographical Memory Interview (AMI)[19,20] tests the recall of personal events during several stages in the patients' lives. This scale has recently been translated into Dutch by Meeter and Murre.[21] The total score ranges from 0 to 90, with a low score signifying more severe amnesia. With the Amsterdam Media Questionnaire (AMQ),[22] the knowledge of public events from the 1970s, 1980s, and 1990s was scored. The total scores range from 0 to 42, with a lower score signifying more severe amnesia. The AMI and the AMQ are objective rating scales for retrograde amnesia.

The Beck Depression Inventory (BDI)[23] and 17-item HRSD were used to score the severity of depression. Information on personal data and illness variables were gathered using information from the medical records.

The BDI, 17-item HRSD, and personal and illness variables were used in the analyses as potential confounding variables for memory complaints. The ERAPS, SSMQ, AMI, AMQ, and BDI are self-rating scales.

Rating Procedure

The MINI and 17-item HRSD were administered by 3 trained undergraduate research students who were blind to the patient's treatment condition. The tests took about 2 hours to complete. Patients were invited to have the assessments in the hospital. To assess the reliability of the patient's complaints of memory loss, the proxy simultaneously assesses the patient's complaints of memory loss by also completing the ERAPS independently from the patient. The patient's spouse, close relative, or friend was taken as the proxy. The proxy was instructed to score how convinced they are that the patient suffered from memory problems as a result of the depression or its treatment. The proxy was also asked to complete the 17-item HRSD, as depressive symptoms may influence the proxy's assessment. The tests were applied in counterbalanced order; that is, in both groups, tests were applied in a particular order to half of the patient sample. This order was reversed for the other half of the sample.

Because the period between the last ECT session and the test date can influence test results,[15] this "time to test" was recorded. For the pharmacotherapy patients, the time to test was defined as the period between the date of discharge and test date.

The hypotheses stated earlier were tested by:

1. Between-group comparisons using the SSMQ and the ERAPS.
2. Between-group comparisons using the AMI and AMQ.
3. Exploring the determinants of retrograde amnesia using the BDI, the 17-item HRSD, and personal and illness variables.

STATISTICAL ANALYSIS

Between-group comparisons were performed using Student *t* tests, χ^2 tests, and Mann Whitney *U* tests, where

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TABLE 1. Abbreviations Used in This Article

AMI	Autobiographical Memory Interview
AMQ	Amsterdam Media Questionnaire
BDI	Beck Depression Inventory
ECT	Electroconvulsive therapy
ERAPS	ECT Retrograde Amnesia and Perception Scale
17-Item HRSD	17-Item Hamilton Rating Scale of Depression
MINI	Mini International Neuropsychiatric Interview
SSMQ	Squire subjective memory questionnaire
SSRI	Selective serotonin reuptake inhibitor
TCA	Tricyclic antidepressant

appropriate. Differences in correlation coefficients between both groups were analyzed by performing a Fisher r to Z transformation on the correlation coefficients to produce z values. The Z test was then performed on the z values (Hays[24], p 591). A P value of 0.05 or less was considered significant. Univariate analysis of covariance was used to explore the confounding influence of covariates on differences in memory scores. The alpha level was adjusted for multiple testing by Bonferroni correction.

RESULTS

General Results

From 1 January 1998 to 1 May 2003, 280 patients were admitted to our psychiatric hospital for treatment of their depressive disorder. Figure 1 shows the flowchart of patient selection for the study.

Twenty (24%) of the 84 patients who received ECT + pharmacotherapy and 30 (15%) of the 196 pharmacotherapy patients participated. The reasons for nonparticipation are shown in Figure 1. Of the 230 patients who did not participate, 161 did so for unknown reason.

The average age of the 50 participants was significantly lower than of the 161 patients who did not participate for unknown reason, with mean ages of 53 years (SD = 13) and 62 years (SD = 17), respectively ($t = -3.55$; $P < 0.001$). The sex distribution was 18 male to 32 female patients for the participants and 50 male to 111 female patients for the nonparticipants. This difference was not statistically significant ($\chi^2 = 0.43$; Fisher exact test, $P = 0.60$).

Group Comparisons

For clarity, the abbreviations are summarized in Table 1.

Table 2 shows the differences in patients' and illness' variables. Table 3 shows the differences in medication use and rating scale scores between both groups.

Because of Bonferroni correction, the level of significance was set at $P = 0.003$. No statistically significant difference was found in the patient ERAPS memory score of the ECT + pharmacotherapy group compared with the pharmacotherapy group (19 vs 12; $z = -2.29$; $P = 0.022$). The proxy ERAPS memory score however showed a significantly higher score in the ECT + pharmacotherapy group compared with the pharmacotherapy group (19 vs 8; $z = -2.94$; $P = 0.003$). A significantly lower AMQ 90s score was found in the ECT + pharmacotherapy group compared with the pharmacotherapy group (7 vs 10; $z = -3.04$; $P = 0.002$).

Of all the variables which may confound test results, only the duration of index episode showed a significant difference between both groups, with a longer index episode for the ECT + pharmacotherapy group compared with the pharmacotherapy group (4.9 vs 0.6 years; $z = -3.75$; $P < 0.001$). To correct for the confounding effect of duration of index episode, we performed an analysis of covariance, which showed that the main effect of treatment group for the AMQ 90s [$F(1, 44) = 12.64$; $P = 0.001$] was significant. Duration of index episode however was not significantly associated with AMQ 90s [$F(1, 44) = 0.09$; $P = 0.76$].

The patients' opinions on the causes of memory complaints were explored by calculating Spearman rho correlation between the ERAPS memory score and the

TABLE 2. Patient and Illness Variables

	Total	ECT + Pharmacotherapy	Pharmacotherapy	P*
N	50	20	30	
Age at test date, mean (SD)	53 years (13)	55 years (11)	52 years (14)	0.43
Gender (male:female)	18:32	5:15	13:17	0.24
Education level (3–7), mean (SD)	5 (1)	5 (1)	5 (1)	0.52
Duration of illness, mean (SD)	16.1 years (12.4)	18.0 years (9.7)	14.8 years (13.9)	0.38
Range	0.08–51.9 years	2.1–30.4 years	0.08–51.9 years	
Duration of index episode, mean (SD)	2.3 years (5.5)	4.9 years (8.1)	0.6 years (0.7)	<0.001
Range	0.0–27.6 years	0.08–27.6 years	0.0–2.6 years	
Major depression	33	15	18	0.37
Bipolar I disorder depression	11	3	8	0.49
Bipolar II disorder depression	6	2	4	1.00
Obsessive compulsive disorder	5	1	4	0.64
Alcohol abuse	3	1	2	1.00
Drug abuse	1	1	0	0.40

*Two-tailed t test, χ^2 test, or Mann-Whitney U test, where appropriate.

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TABLE 3. Group Differences Between ECT + Pharmacotherapy and Pharmacotherapy Patients

	Total	ECT + Pharmacotherapy	Pharmacotherapy Only	P*
N	50	20	30	
TCA†	14 (28%)	4 (20%)	10 (33%)	0.353
SSRI†	17 (34%)	5 (25%)	12 (40%)	0.365
Benzodiazepine†	21 (42%)	8 (40%)	13 (43%)	1.000
Antipsychotic†	10 (20%)	3 (15%)	7 (23%)	0.720
Lithium†	15 (30%)	7 (35%)	8 (27%)	0.547
Time to test, mean (SD)	2.2 years (1.6)	1.8 years (1.7)	2.5 years (1.5)	0.155
Range	0.01–5.45 years	0.01–5.45 years	0.07–5.19 years	
17-Item HRSD patient, mean (SD)	10 (11)	11 (12)	9 (9)	0.865
Range	0–35	0–35	0–30	
BDI, mean (SD)	17 (16)	20 (19)	15 (15)	0.430
Range	0–53	0–53	0–48	
17-Item HRSD proxy, mean (SD)	3 (3)	2 (2)	4 (4)	0.213
Range	0–14	0–5	0–14	
AMI total, mean (SD)	73 (11)	71 (13)	76 (9)	0.216
AMI incidents, mean (SD)	20 (5)	18 (5)	21 (5)	0.053
AMI early childhood, mean (SD)	18 (4)	17 (5)	18 (4)	0.624
AMI adulthood, mean (SD)	17 (2)	17 (3)	18 (2)	0.720
AMI recent memory, mean (SD)	19 (2)	18 (3)	19 (2)	0.060
AMQ total, mean (SD)	25 (10)	22 (10)	27 (9)	0.060
AMQ 70s , mean (SD)	9 (4)	9 (4)	9 (4)	0.588
AMQ 80s, mean (SD)	7 (4)	6 (4)	7 (3)	0.090
AMQ 90s, mean (SD)	9 (3)	7 (3)	10 (2)	0.002
SSMQ, mean (SD)	62 (27)	59 (34)	64 (21)	0.298
ERAPS memory score patient, mean (SD)	15 (9)	19 (9)	12 (8)	0.022
ERAPS memory score proxy, mean (SD)	13 (10)	19 (10)	8 (7)	0.003
No. unilateral ECT, mean (SD)		23 (25)		
Range		0–87		
No. bitemporal ECT, mean (SD)		5 (9)		
Range		0–36		
No. total ECT, mean (SD)		27 (23)		
Range		4–87		

*Two-tailed *t* test, χ^2 test, or Mann-Whitney *U* test, where appropriate.
†Patients were rated whether they received medication during the tests or not.

ERAPS ECT perception score (Table 4). The 7-point ECT perception scale was dichotomized to "No" and "Yes."

For the total study population, the ERAPS memory score was significantly and positively correlated with the perception that memory complaints were caused by the depressive disorder and by the treatment with medication. Electroconvulsive therapy + pharmacotherapy patients also significantly attributed memory complaints to the depressive disorder and treatment with medication, and the pharmacotherapy group significantly attributed memory complaints to the depressive disorder. No significant group differences in correlations were found, as shown by the nonsignificant *Z* test.

TABLE 4. Spearman Rho Correlation Between ERAPS Memory Score and Dichotomized ERAPS Perception Score of the ERAPS

	Total Population (N)	ECT + Pharmacotherapy Group (N)	Pharmacotherapy Group (N)	Z Test	P‡
Attribute to depression	0.68† (40)	0.55* (15)	0.66† (25)	−0.49	0.63
Attribute to medication	0.50* (35)	0.57* (13)	0.41 (22)	0.54	0.59
Accept medication	0.11 (34)	0.22 (12)	−0.02 (22)	0.60	0.55
Attribute to ECT		0.40 (16)			
Accept ECT		0.22 (15)			

*$P < 0.05$.
†$P < 0.001$.
‡Two-tailed significance.

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The level of annoyance about memory problems was significantly higher in the ECT + pharmacotherapy group than in the pharmacotherapy group ($z = -2.16$; $P = 0.04$).

DISCUSSION

Few differences in memory scores were found between the ECT + pharmacotherapy and pharmacotherapy groups. Only the differences in the proxy's ERAPS memory and in the AMQ 90s scores were found to be significant, with the ECT + pharmacotherapy group showing higher levels of memory problems. No difference was found in subjective memory complaints assessed using the SSMQ, and the between-group patient's ERAPS memory score difference did not reach statistical significance after Bonferroni correction. The relative lack of group differences could be explained by the small number of participants reducing the power of analysis, but may also point to the clinical relevance of these differences; if the differences are clinically relevant, it should be detected even using such a small study population. The results suggest that patients who have been treated with ECT + pharmacotherapy are equally convinced that memory problems are caused by their depression and/or treatment of depression as patients who have been treated with pharmacotherapy only. Proxies however report that patients treated with ECT + pharmacotherapy are more convinced that they suffer from memory problems. The discrepancy between the reports of patients and the reports by proxies points to the problem of establishing the reliability of subjective memory tests. Can the patient reliably report on memory problems in the presence of amnesia or can a proxy reliably assess the patient's feeling about his or her memory? Subjective tests however aim to assess the perception that patients have on memory problems irrespective of the presence or absence of memory problems. In this study, no correlation was found between subjective and objective memory scores. This is consistent with the finding by Coleman and colleagues[17] who found no difference in SSMQ scores 2 months after brief-pulse ECT compared with a normal control group. For the acceptance of ECT, however, it is important to know that patients do not perceive this treatment to cause more memory problems than treatment with pharmacotherapy or suffering from depression.

The conviction by proxies that ECT + pharmacotherapy patients suffer more memory problems found an objective support by a lower score on the AMQ 90s in this group of patients. No difference was found in AMQ 80s and AMQ 70s scores, which suggests that patients who received ECT + pharmacotherapy suffered from retrograde amnesia for the most recent past. An alternative explanation for our finding that ECT + pharmacotherapy patients suffer more from retrograde amnesia for the most recent past as shown by the AMQ 90s scores is that the more severe retrograde amnesia reflects the more severe depression suffered by ECT + pharmacotherapy patients compared with pharmacotherapy patients. As the level of depression is known to affect memory functions,[18] a more severe depression could result in more severe impairment in the formation of new memories. The duration of index episode before treatment can arbitrarily be seen as an indication of the severity of depression. The ECT + pharmacotherapy group showed a longer index episode.

Further analysis was necessary to explore the association between ECT + pharmacotherapy, duration of index episode, and retrograde amnesia. The other potential determinants for retrograde amnesia—age, sex, education level, total duration of illness, duration of index episode, diagnosis, comorbid psychiatric disorder, 17-item HRSD and BDI scores—did not differ significantly in the between-group comparisons and were therefore not used for further analysis. Univariate analysis of covariance showed that the duration of index episode did not influence the significant association between the AMQ 90s scores with having received ECT + pharmacotherapy or pharmacotherapy.

With the ERAPS ECT perception scale, the attribution of memory complaints to depression or treatment was further explored by correlating these questions with the ERAPS memory scores. The analysis using patients from both groups showed that patients attributed the complaints mainly to the depressive disorder and, to a lesser degree, to treatment with medication. Electroconvulsive therapy + pharmacotherapy and pharmacotherapy patients attributed memory complaints roughly equally to depression and treatment with medication. Surprisingly, the ECT + pharmacotherapy patients tended not to attribute memory complaints to treatment with ECT but rather to depression or treatment with medication. These findings suggest that ECT + pharmacotherapy patients put equal "blame" on the depression and treatment with medication as on ECT. Electroconvulsive therapy was not perceived as the most important cause of amnesia.

Electroconvulsive therapy + pharmacotherapy patients found their memory problems significantly more annoying than the pharmacotherapy patients. In both groups, the severity of memory complaints did not affect the acceptance of treatment with medication or ECT, as shown by the small and nonsignificant correlations between acceptance of treatment and ERAPS memory score.

Our study found few differences in memory complaints reported by ECT + pharmacotherapy patients as compared with patients receiving pharmacotherapy only. Subjective tests were not found to be more sensitive than objective tests in detecting these complaints. The number of patients in this study however was small, limiting the generalizability of the findings. Further research is therefore necessary with a larger population to resolve the association between memory complaints and attribution. A large proportion of patients did not participate in the study for unknown reasons in the ECT + pharmacotherapy and pharmacotherapy groups (49% and 61%, respectively). This low participation rate limits the generalizability of results. In addition, the nonparticipants were significantly older than the patients who agreed to participate. This confines the generalizability of results to the younger group.

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