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Memory Impairment after Convulsive Therapy

Influence of Age and Number of Treatments

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Summary. The influence of age and number of treatments on memory impairment was studied in depressed patients after a series of convulsive treatments: bilateral ECT, unilateral ECT on the nondominant hemisphere, and flurothyl convulsive therapy. Before and after the completed convulsive therapy course the patients were tested with a memory test battery and the symptoms rated with a depression scale.

Before treatment older age-groups had decreased ability to learn, but their post-treatment forgetting score was not significantly higher than in other age-groups.

An increase in the number of ECTs did not seem to correlate with the degree of memory impairment. The conclusion of the present study is that age (up to 65) and the number of ECTs (up to 10) have no apparent influence on memory impairment after electroconvulsive therapy.

Key words: Memory impairment – Age – Number of treatments.

Introduction

The correlation between memory functions and age has previously been studied in psychiatric patients by Cronholm et al. [6]. The results suggest that age displays a weak but significant negative correlation with 'learning', but no significant correlation with 'retention'.

An analysis of the influence of age on memory impairment after a single electroconvulsive treatment [11] revealed a tendency for the level of memory functions after ECT to be lower with increasing age. This was mainly because age gave a lower level even before ECT. When the influence of the pre-treatment level was discounted, age showed no significant relation to memory changes after ECT.

However, in another study of memory functions, measured after the sixth treatment [9], the oldest group had significantly lowered memory ability compared with the youngest group. This result was mainly attributable to a marked

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decline in memory scores in patients treated with BI-ECT, whereas unilateral ECT did not change memory scores to any noticeable degree [9]. After a complete series of ECT, the relation between the age variable and method of treatment showed the same tendencies, but none of the comparisons was statistically significant.

Earlier investigations have thus given different results and do not permit a definite hypothesis. The purpose of this paper is to help to clarify whether age has any effect on memory impairment after a series of different types of convulsive treatment: bilateral electroconvulsive therapy (BI-ECT), unilateral ECT on the nondominant hemisphere (ND-ECT), and flurothyl (or Indoklon) convulsive therapy (ICT). Besides this, the influence of the number of treatments and its interaction with the age variable are considered.

Table 1. The patients series. Age, number of treatments, and memory scores (mean values, standard deviation in parentheses)

Variable	Type of treatment		
	BI-ECT $n = 25$	ND-ECT $n = 28$	ICT $n = 23$
Age	51.0	49.1	46.7
	(12.2)	(12.7)	(12.0)
Number of treatments	6.3	6.6	5.7
	(1.7)	(2.2)	(1.7)
Range	3–10	3–10	3–10
Before treatment			
IMS	47.4	45.0	49.4
	(15.0)	(12.4)	(14.5)
DMS	36.8	35.4	40.1
	(15.1)	(11.9)	(13.5)
FS	10.6	9.6	9.3
	(5.4)	(4.7)	(4.7)
After treatment			
IMS	44.4	46.6	45.3
	(12.8)	(11.4)	(14.3)
DMS	29.0	35.1	28.6
	(12.4)	(10.3)	(12.5)
FS	14.5	11.6	16.7
	(7.5)	(6.4)	(8.1)
Diff. before – after			
IMS	3.0	–1.6	4.2
	(–13.8)	(12.6)	(13.1)
DMS	7.8*	0.3	11.5**
	(14.4)	(12.4)	(13.8)
FS	–3.9**	–2.0	–7.4**
	(7.4)	(5.9)	(7.9)

IMS = immediate memory scores, DMS = delayed memory scores, FS = forgetting scores
* = $P<0.05$, ** = $P<0.01$

Patients and Methods

The subjects were 76 inpatients with endogenous depressive states, included in studies of the anterograde effect on memory of convulsive therapy [7, 10]. The ages of the subjects ranged from 18 to 65 years and the number of treatments from 3 to 10. Age, number of treatments, and memory scores are presented in Table 1.

The patients were tested under double-blind conditions on the day before and 3—5 days after the completed convulsive therapy course, at the same time in the day, and with parallel forms of the memory test battery [1—5, 7, 10]. The battery consists of three tests: the 30 Figure Test, the 30 Word-Pair Test, and the 30 Personal Data Test. For each test three scores are obtained, the immediate memory score (IMS, immediately after presentation of the items), delayed memory score (DMS, 3 h after the presentation of the items) and their difference, forgetting score (FS). IMS may be considered to be a function of the hypothetical variable 'learning', and FS a function of the variable 'retention'. DMS is obviously related to both learning and retention. The psychologic method and the theoretical memory model are discussed in more detail elsewhere [8].

The symptoms of depression were rated under double-blind conditions by means of the Cronholm-Ottosson depression scale [2, 4] initially and 4 days after termination of the treatment. The treatment procedure has been described previously [7, 10].

Statistical Methods. In testing the significance of the effect of ECT and ICT on memory variables, the *t*-test for intraindividual differences was used. Correlation and partial correlation coefficients were computed according to current formulas.

Results

With increasing age, IMS and DMS show on the whole a weak falling tendency (Figs. 1 and 2), before as well as after treatment. FS appears not to be higher in older age groups (Fig. 3).

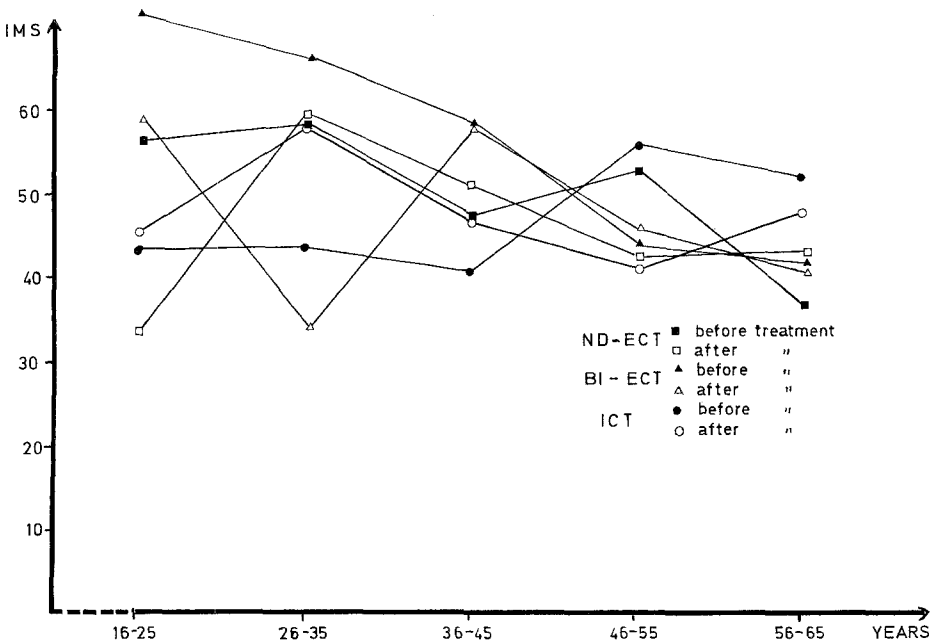

Fig. 1. IMS before and after treatment

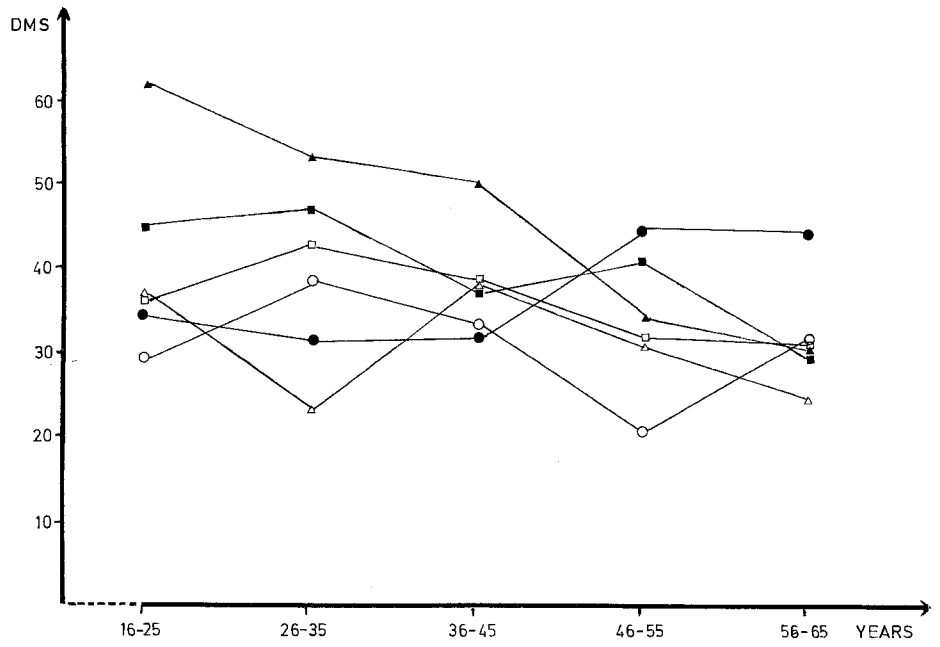

Fig. 2. DMS before and after treatment

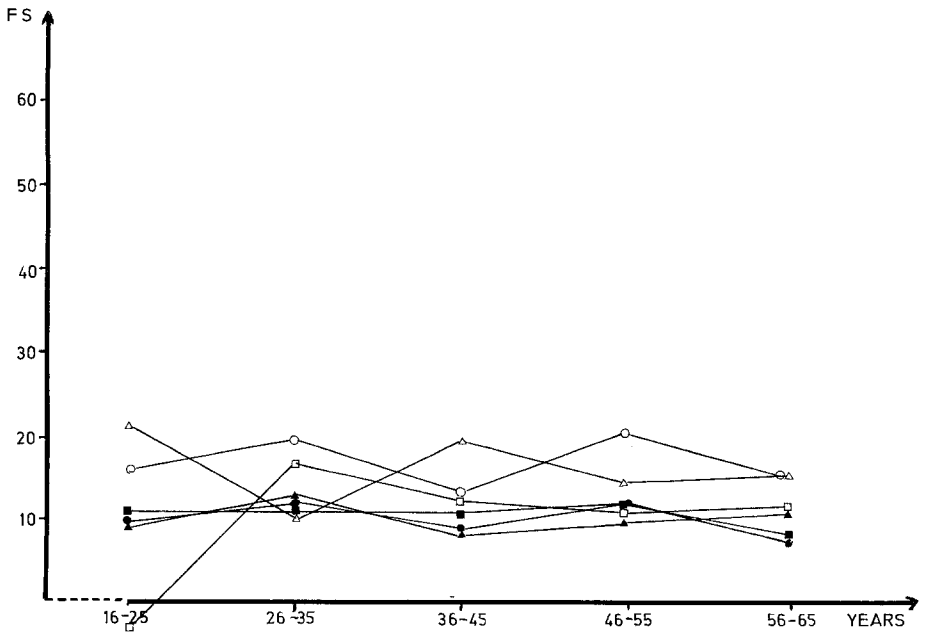

Fig. 3. FS before and after treatment

Table 2. Correlation coefficients in the treatment groups

	0	1	2	3	4	5	6	7	8
BI-ECT group									
0 Age		−0.282	−0.031	−0.565**	−0.566**	0.050	−0.361	−0.408*	0.134
1 Number of treatments			−0.171	0.221	0.159	0.166	0.321	0.232	0.132
2 Diff. depression score				0.061	0.169	−0.331	−0.258	−0.322	0.136
ND-ECT group									
0 Age		0.154	0.057	−0.548**	−0.493**	−0.201	−0.274	−0.169	−0.202
1 Number of treatments			−0.231	−0.017	−0.043	0.125	−0.036	−0.143	0.289
2 Diff. depression score				−0.437*	−0.439*	−0.113	−0.516**	−0.459*	−0.234
ICT group									
0 Age		0.493*	−0.064	0.212	0.265	−0.109	0.438*	0.461*	−0.082
1 Number of treatments			0.025	−0.269	−0.185	−0.148	0.248	0.123	0.194
2 Diff. depression score				−0.160	−0.227	0.161	0.239	0.499*	−0.448*
The whole series									
0 Age		0.114	−0.012	−0.300*	−0.285*	−0.067	−0.101	−0.082	−0.017
1 Number of treatments			−0.142	−0.028	−0.043	−0.046	0.115	−0.005	0.215
2 Diff. depression score				−0.203	−0.173	−0.120	−0.225	−0.086	−0.194
3 IMS before treatment									
4 DMS before treatment									
5 FS before treatment									
6 Diff. IMS before–after									
7 Diff. DMS before–after									
8 Diff. FS before–after									

* = $P<0.05$; ** = $P<0.01$

Before treatment there are, for the whole patient series, low but significant correlations between age and IMS and DMS, but no correlation between age and FS (Table 2).

After a series of treatments, age appears to be correlated, in the BI-ECT and ICT groups, to memory impairment expressed as differences between IMS and DMS before and after treatment. Since changes in memory scores are dependent on the combined effect of a number of factors, partial correlation coefficients were computed (Table 3). There appears to be a weak relationship between memory impairment and age which is statistically significant only in a few partial correlations. Inspection of the data may give the impression that the relations are opposite in BI-ECT and ICT, with ND-ECT taking an intermediate place. However, since the initial values are not similar in the treatment groups, no special trend can be distinguished. On the basis of the present data, therefore, no relationship between age and degree of memory impairment can be postulated.

Increasing number of treatments seems not to be correlated with the degree of memory impairment in any of the treatment groups (Tables 2 and 3). It is possible that in the ICT group there is a positive relationship between age and number of treatments.

Table 3. Partial correlation coefficients between differences (before—after treatment) in memory variables and number of treatments, age, and improvement (as difference between depression rating scores before and after treatment)

Memory variables	BI-ECT				ND-ECT				ICT			
	Memory variables correlated to age		Memory variables correlated to No. ECT		Memory variables correlated to age		Memory variables correlated to No. ECT		Memory variables correlated to age		Memory variables correlated to No. ICT	
	(No. ECT constant)	(Diff. depress. constant)	(Age constant)	(Diff. depress. constant)	(No. ECT constant)	(Diff. depress. constant)	(Age constant)	(Diff. depress. constant)	(No. ICT constant)	(Diff. depress. constant)	(Age constant)	(Diff. depress. constant)
Diff. IMS	—0.298	—0.382	0.245	0.291	—0.272	—0.286	0.007	—0.186	0.375	0.249	0.041	0.468*
Diff. DMS	—0.367	—0.442*	0.134	0.190	—0.150	—0.161	—0.120	—0.288	0.464*	0.128	0.135	0.569**
Diff. FS	0.180	0.140	0.179	0.166	—0.261	—0.194	0.331	0.248	—0.208	0.236	0.270	0.124

* = < 0.05; ** = < 0.01

Comments

The results of the present study are quite consistent with earlier investigations of depressed patients before treatment [6], which showed a negative relation between age and immediate memory but not between age and forgetting. In our study, however, this trend is less clear-cut in the ICT group, where the mean age is lower than in the other groups.

No significant relation between age and memory impairment due to a single electroconvulsive treatment was found by Ottosson [11]. A similar result was obtained in the present study after a series of treatments of various modifications of convulsive therapy.

Fromholt et al. [9] suggest that ECT causes a significantly more pronounced reduction in memory performance in the older patients which is not confirmed in this study. Differences in treatment technique, in the composition of patients groups, and in memory tests may explain these divergent results, which can hardly be compared. The same memory tests were used in both Ottosson's [11] study and our own, while Fromholt et al. [9] used Wechsler's Memory Scale and Kimura's Recurring Figures Test, which measure mainly immediate memory or learning. The results obtained by the Danish authors indicate that the patients in the older age groups may be more sensitive to 'short-term' effects of BI-ECT (24 h after the last of a number of treatments) in learning ability. Our results indicate that age does not play any important role for the 'long-term' effects of BI-ECT and ND-ECT (3—5 days), either on learning or on retention. Learning impairment is possibly correlated to age in ICT.

The number of treatments seems to be of little importance for post-treatment changes, independently of the type of convulsive treatment (Table 2). These conclusions cannot be extended to patients who received more than 10 treatments, not covered by our study. There is, however, a positive correlation between the number of treatments and higher age in the ICT-group, which may possibly suggest that this type of treatment is less efficient in the older age-groups.

To sum up, age and the number of treatments seem to have little influence on memory impairment in ECT. The older age-groups show a lower pre-treatment level of learning, which may give their forgetting a relatively greater importance. The results of the present study do not permit generalization for patients older than 65 years and for more treatments than 10.

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