Featured Articles

Is Electroconvulsive Therapy for Depression More Effective Than Placebo? A Systematic Review of Studies Since 2009

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Background: A 2010 review of studies, previous reviews and meta-analyses found minimal evidence that electroconvulsive therapy (ECT) for depression was more effective than placebo during the treatment period and no evidence at all of efficacy beyond the end of treatment. The current review explored whether any contradictory evidence has since been generated. **Method:** MEDLINE and PsycINFO were searched to identify all post-2009 studies that had compared ECT and simulated ECT for depression, or had in any other way generated valid depression data for ECT recipients at two or more points in time. **Results:** Ninety-one studies met inclusion criteria. There were no new placebo-controlled trials. There have now been no such studies since 1985. Only 4 placebo-controlled studies have ever produced data beyond the end of treatment, none of which have found any advantage for ECT over placebo. Of the 91 studies, only 2 aimed to evaluate the efficacy of ECT. Both were severely flawed. None of the other 89 produced robust evidence that ECT is effective for depression, primarily because at least 60% maintained ECT participants on medication and 89% produced no meaningful follow-up data beyond the end of treatment. No studies investigated whether ECT prevents suicide. **Conclusions:** There is still no evidence that ECT is more effective than placebo for depression reduction or suicide prevention. Given the well-documented high risk of persistent memory dysfunction, the cost-benefit analysis for ECT remains so poor that its use cannot be scientifically, or ethically, justified.

Keywords: electroconvulsive therapy; depression; suicide; efficacy; placebo; literature review

The administration of electricity to the human brain to cause a seizure, in the hope of ameliorating depression and other problems, remains the most controversial of psychiatric treatments. Although much of this controversy focuses on whether or not it causes brain dysfunction and increases risk of mortality (Breggin, 2008; Read & Bentall,

http://dx.doi.org/10.1891/1559-4343.19.1.5

2010; Read, Bentall, Johnstone, Fosse, & Bracken, 2013; Ross, 2006; Sackeim et al., 2007), there is also debate about what benefits there are which might outweigh the risks.

In 2010, the first author of this article, and the renowned British clinical psychologist Professor Richard Bentall, published a peer-reviewed systematic review of 70 years of research on the effectiveness of electroconvulsive therapy (ECT) on depression (its primary target today) and "schizophrenia." The review found only 10 depression studies comparing ECT to the appropriate placebo (simulated electroconvulsive therapy [SECT]—in which the general anesthetic is applied but the electricity is withheld). Six of the 10 studies reported some short-term benefit during the course of treatment for a minority of the ECT recipients, sometimes perceived only by psychiatrists but not by other raters. The other 4 studies reported no differences at all. None of the 10 studies reported any difference between ECT and SECT beyond the end of treatment. In fact, only 4 studies had followed participants beyond the end of treatment. None of these 4 found any difference between ECT and SECT (Read & Bentall, 2010).

As revealing as the findings themselves are, it is equally concerning that in 70 years since the introduction of ECT, there had only ever been four placebo-controlled studies examining whether ECT has any benefits for depressed people after the treatment has finished. The last of these was in 1985 (Gregory, Shawcross, & Gill, 1985; finding no difference between the ECT and SECT groups at either 1 month or 3 months after the last electroshock). So, despite the absence of any evidence up until 1985 that ECT has any lasting effect on depression, there had, in 2010, been no further attempts to produce any evidence for 25 years.

Similarly, the 2010 review identified no evidence that ECT has any benefit beyond the end of treatment for people diagnosed with schizophrenia. The two most recent studies comparing ECT and SECT for people diagnosed with schizophrenia had found no differences at all, either during or after treatment (Sarita, Janakiramiaiah, Gangadhar, Subbakrishna, & Rao, 1998; Ukpong, Makanjuola, & Morakinyo, 2002).

The 2010 review noted, moreover, that there had been eight meta-analyses on ECT for depression (Gábor & László, 2005; Greenhalgh, Knight, Hind, Beverley, & Walters, 2005; Janicak et al., 1985; Kho, van Vreeswijk, Simpson, & Zwinderman, 2003; Pagnin, de Queiroz, Pini, & Cassano, 2004; Tharyan & Adams, 2005; UK ECT Review Group, 2003; Van der Wurff, Stek, Hoogendijk, & Beekman, 2003), and three on ECT for schizophrenia (Greenhalgh, et al., 2005; Painuly & Chakrabarti, 2006; Tharyan & Adams, 2005). None of these meta-analyses had identified any studies showing that ECT had any benefit beyond the day of the final treatment. There has been one subsequent depression meta-analysis (Dierckx, Heijnen, van den Broek, & Birkenhäger, 2012). It cited no studies providing any data beyond the end of treatment (or even any studies comparing ECT to placebo *during* treatment).

The 2010 review also reported that there was no evidence, of any kind, in support of the hypothesis that ECT prevents suicide (Read & Bentall, 2010, pp. 339–340).

In the 4 years preceding 2010, two peer-reviewed reviews (Rasmussen, 2009; Ross, 2006), and two books—based on scientific studies (Breggin, 2008) and personal evidence (Andre, 2009)—had reached similar conclusions to the 2010 review; for example, "Rigorously defined endogenously depressed patients did exceptionally well with sham ECT, as well as with real ECT" (Rasmussen, 2009, p. 59).

The current review sought, first, to update the 2010 review, by determining if there was any new evidence that ECT recipients experience more reduction of their depression

than recipients of SECT at any point in time after the final shock has been administered. Second, a systematic review was conducted to identify any new evidence (since 2010), of any kind, that ECT is an effective treatment for depression.

METHOD

An electronic search was conducted to identify all studies published since December 2009 comparing ECT and SECT, or in any other way generating meaningful depression data for ECT recipients. MEDLINE and PsycINFO were searched using the following terms: (*ECT* OR *electroconvulsive therapy* OR *electroshock therapy* OR *electroconvulsive treatment* OR *electroshock treatment*) in combination with (*depression* OR *depressive* OR *mood disorder*) OR (*placebo* OR *sham* OR *simulated*). Inclusion criteria were original research studies that reported depression scores at two or more points in time, of adult (older than 18 years old) ECT recipients, regardless of the research question; and use of any empirically validated measure of depression. Case reports, review articles, letters to the editor (with no empirical research), animal studies, and papers written in languages other than English were excluded. Data from study samples identified as overlapping were excluded.

The abstracts of all retrieved articles were assessed for relevance using the inclusion and exclusion criteria. The full text was accessed if relevance could not be determined from the abstract. The reference lists of relevant reviews were also manually screened to identify any additional studies. Because our search yielded only two studies explicitly aiming to investigate the efficacy of ECT, data were extracted from studies with other aims. Studies were included for data extraction if depression scores were available for all participants receiving ECT (without adjunct treatments).

Studies meeting the inclusion criteria are summarized in Table 1, listed according to study design, inclusion of a follow-up period, reporting of suicide rates or suicidality, whether concomitant use of drug therapy was allowed, and the diagnoses of the samples. Most of the data were extracted from studies not directly investigating the efficacy of ECT, so not all studies reported on the statistical significance of change in depression over time. As such, we also ranked the format of reported results in the following hierarchical manner (from strongest to lowest level of evidentiary support): reporting statistical significance of change in depression; reporting pre–post ECT scores without indicating statistical significance; graphical representation of change only; and reporting only the proportion of responders or remitters.

RESULTS

Focus and Design of the 91 Studies

Details of the search process are presented in Figure 1. Of the 2,513 studies yielded by the search process, 91 met the inclusion criteria. Table 1 outlines the methodological components of the studies that produced data that directly (2) or indirectly (89) addressed the efficacy of ECT for depression. Randomized controlled trials (RCTs) were defined as studies with active control arms (including other treatments) and were not limited to studies

TABLE 1. Methodological Qualities of the 91 Electroconvulsive Therapy (ECT) Studies

	Placebo-Controlled Studies	Efficacy RCTs	Data Extracted From RCTs	Data Extracted From Nonrandomized Trials	Data Extracted From Observational Studies	Data Extracted From Retrospective Reviews	Total *N*
Total *N*	0	1	24	5	47	14	91
Efficacy							
Reports statistical significance	0	1	11	2	33	3	50
Reports pre–post ECT change	0	0	10	1	9	8	28
Graphical representation only	0	0	2	2	2	0	6
Reports percentage of responders/remitters	0	0	1	0	3	3	7
Follow-up	0	0	7	0	10	0	17
Suicide	0	0	1	0	0	0	1
Medication							
Continued	0	0	17	3	29	6	55
Discontinued	0	1	4	1	13	3	22
Not reported	0	0	3	1	5	5	14
Sample							
Unipolar Depression	0	0	10	5	27	5	47
Bipolar Depression	0	1	0	0	0	0	1
Schizophrenia	0	0	0	0	1	0	1
Other substance-induced psychosis	0	0	0	0	0	1	1
Mixed diagnoses	0	0	14	0	18	6	38
Not reported	0	0	0	0	1	2	3

Note. RCTs = randomized controlled trials.

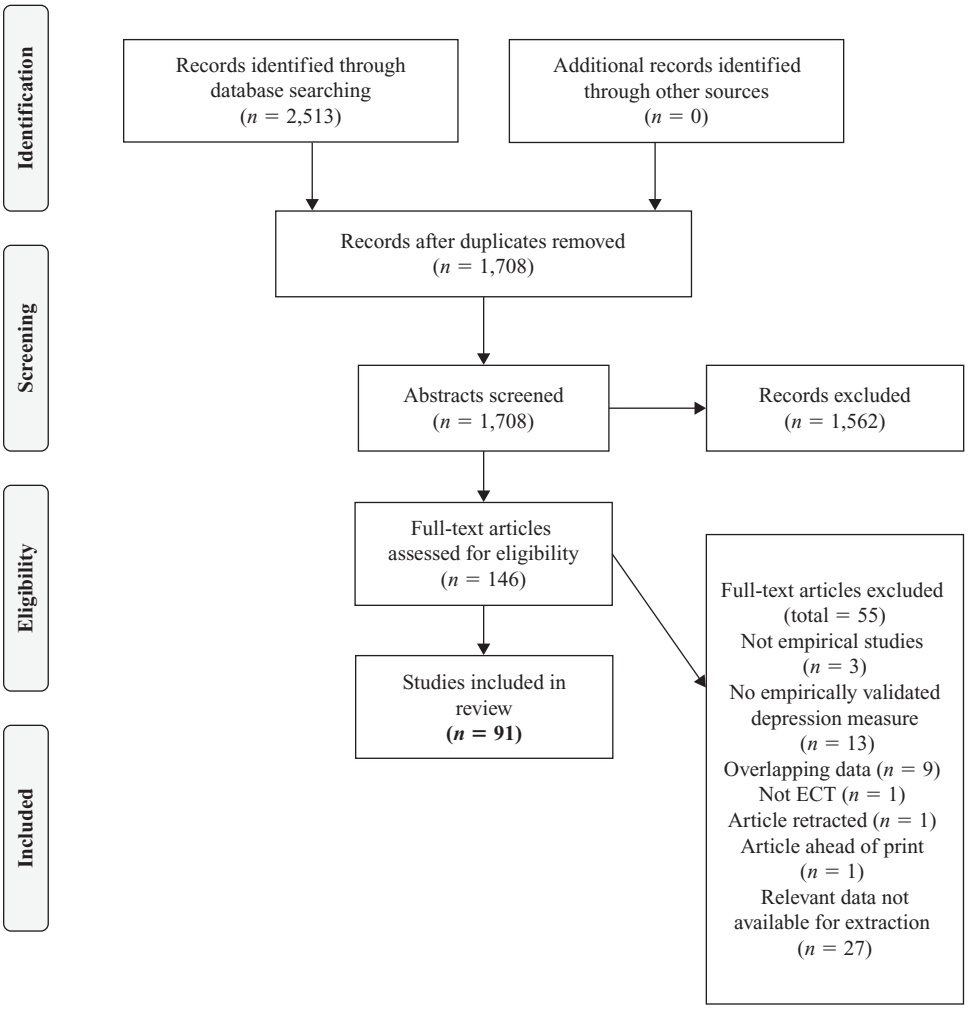

FIGURE 1. Flow chart of search process. ECT = electroconvulsive therapy.

with a placebo/nonactive control component. All prospective cohort or noncomparative studies were defined as "Observational Studies" (prospective cohort studies follow a group of individuals over time to see whether factors on which people in the group differ affect certain outcomes).

Between 2010 and the end of 2016, there were zero placebo-controlled studies comparing ECT and SECT for depression.

Since 2010, only two studies have explicitly attempted to investigate the efficacy of ECT. One attempted to examine the efficacy of ECT through comparison with another treatment. Schoeyen et al. (2015) conducted an RCT comparing the effectiveness of ECT to pharmacological treatment for individuals with a diagnosis of bipolar disorder. Magid, Truong, Trevino, and Husain (2013) conducted a retrospective review as a "preliminary

evaluation of the efficacy and efficiency" (p. 258) of ultrabrief right unilateral ECT, a newer form of ECT.

All other data in this review were extracted from 89 studies that did not aim to examine the efficacy of ECT but nevertheless included either pre–post ECT depression measures, or the proportion of responders/remitters after a course of ECT.

Of these 89 studies, 24 were RCTs (Abdallah, Fasula, Kelmendi, Sanacora, & Ostroff, 2012; Abdollahi et al., 2012; Bailine et al., 2010; Bjølseth et al., 2015; Brakemeier et al., 2014; Ghasemi et al., 2014; Hansen et al., 2011; Kayser et al., 2011; Kellner et al., 2010; Keshtkar, Ghanizadeh, & Firoozabadi, 2011; Kumar, Sharma, & Mani, 2012; Loo et al., 2012; Loo et al., 2014; Masoudzadeh, Yahyavi, Rashidi, Mohammadpour, & Kiani, 2013; Matthews et al., 2013; Mayur, Bray, Fernandes, Bythe, & Gilbett, 2010; Mayur, Byth, & Harris, 2013; Purtuloğlu et al., 2013; Quante et al., 2011; Roepke et al., 2011; Spaans et al., 2013; Wang et al., 2012; Yildiz et al., 2010; Yoosefi et al., 2014); and 5 were nonrandomized trials (Allen et al., 2015; Aten, Oudega, van Exel, Stek, & van Waarde, 2015; Gedge et al., 2012; Lin et al., 2015; Okamoto et al., 2010).

Forty-seven of the 89 were observational studies (Azuma et al., 2011; Bär et al., 2010; Bayless et al., 2010; Beall et al., 2012; Bersani et al., 2014; Bilgen et al., 2014; Burgese & Bassitt, 2015; Casarotto et al., 2013; Dannlowski et al., 2013; Delle Chiaie et al., 2013; Dukart et al., 2014; Ebert et al., 2010; Galletly, Paterson, & Burton, 2012; Goto et al., 2012; Guloksuz et al., 2015; Hu et al., 2010; Johansson, Ehnvall, Friberg, & Myredal, 2010; Joshi et al., 2016; Kalogerakou et al., 2015; Kautto et al., 2015; Lin et al., 2013; Loo, Mahon, Katalinic, Lyndon, & Hadzi-Pavlovic, 2011; Lucca et al., 2010; Lyden et al., 2014; McCall et al., 2013; Medda et al., 2014; Meeter, Murre, Janssen, Birkenhäger, & van den Broek, 2011; Minelli et al., 2014; Nickl-Jockschat et al., 2016; Nordanskog, Larsson, Larsson, & Johanson, 2014; Ota et al., 2015; Oudega et al., 2011; Perrin et al., 2012; Piccinni et al., 2013; Rapinesi et al., 2015; Rapinesi et al., 2013; Royster et al., 2012; Saijo et al., 2010; Samuelsson, Gerdin, Öllinger, & Vrethem, 2012; Tendolkar et al., 2013; Valevski, Pickholtz, Roz, Weizman, & Rehavi, 2010; van Waarde et al., 2013; Vırıt et al., 2010; Vukadin, Birkenhäger, Wierdsma, Groenland, & van den Broek, 2011; Warnell, Swartz, & Thomson, 2011; Weeks et al., 2013; Wei et al., 2014).

Thirteen of the 89 were other retrospective reviews (Birkenhäger, Pluijms, Ju, Mulder, & van den Broek, 2010; Fernandez, Philpot, Marsh, Hartney, & Kozel, 2014; Gálvez et al., 2013; Graveland, Wierdsma, van den Broek, & Birkenhäger, 2013; Järventausta et al., 2013; Lapidus et al., 2013; Loo, Garfield, Katalinic, Schweitzer, & Hadzi-Pavlovic, 2013; Martínez-Amorós et al., 2014; Niemantsverdriet, Birkenhäger, & van den Broek, 2011; Pulia, Vaidya, Jayaram, Hayat, & Reti, 2013; Ueda, Koyama, & Okubo, 2010; Vaidya et al., 2012; Watts & Groft, 2010).

The aims of these 89 studies varied. About half ($n = 45$) investigated potential mechanisms of action in ECT and/or predictors of response to ECT. Five compared ECT with other treatments; 12 examined the effects of differing parameters of ECT delivery; 12 compared the effects of different anesthetic agents; 7 examined the effects of various adjuncts to ECT; 3 examined cognitive deficits after ECT and 3 naturalistic studies described the use of ECT over a period. In addition, there was one study examining the effects of ECT on Parkinson disease–induced psychosis, and one examining response to treatment after one session of ECT.

Most studies involved individuals with unipolar depression (52%) or included samples with mixed diagnoses (42%). Of the 91 studies meeting inclusion criteria, 50 (55%)

reported on the statistical significance of the differences in depression scores over time. The remainder of the studies indicated some changes but did not report the statistical significance. Seventeen studies (19%) had some form of follow-up period (>1 week) after the end of the treatment period, 7 of which were RCTs.

Concomitant psychopharmacological medication was continued in 55 of the 91 studies (60%), with a further 14 (15%) not stating whether this was the case. So in only 22 (24%) were the ECT recipients definitely not receiving medication. Only one study reported on suicidality, but none reported on whether ECT prevented suicide.

Changes in Depression During the Treatment Period

There have been no placebo-controlled ECT studies on depression in the last 6 years, during (or beyond) the treatment period.

There has been only one study that aimed to directly investigate the efficacy of ECT in depression through comparison with another treatment modality. It had no placebo control group and no data beyond the end of the treatment period. Schoeyen et al. (2015) performed a prospective randomized study with 73 individuals with treatment resistant bipolar disorder. Participants were randomly assigned to receive a 6-week course of ECT, or algorithm-based pharmacological treatment. The primary outcome measure was the longitudinal profile on the Montgomery-Åsberg Depression Rating Scale (MADRS). Secondary outcome measures included longitudinal profiles on the Inventory of Depressive Symptomatology-Clinician Rated, times to response and remission, and proportion of responders/remitters at the end of the 6-week treatment period. Response was defined as a decrease in MADRS score of at least 50% from baseline. Remission was defined as a MADRS score of 12 or lower. Linear mixed-effects modeling analysis indicated that the mean MADRS and Inventory of Depressive Symptomatology-Clinician Rated scores were significantly lower in the ECT group than the pharmacology group at the end of the 6-week treatment period. However, because of differences in the handling of missing values, *t* test comparison indicated that the mean MADRS score (the primary outcome measure) did not differ between the pharmacological treatment group and the ECT group at the end of the 6-week treatment period. Among treatment completers ($n = 43$), the response rate was higher in the ECT group than in the pharmacological treatment group, but there was no difference in the remission rates.

Schoeyen et al. (2015) conclude that their "results show that ECT is more effective than pharmacological treatment in the acute phase of treatment-resistant bipolar depression, which supports ECT as a treatment option" (p. 49). However, several major limitations need to be considered. First, to be included in this study, participants were required to be "treatment resistant"—defined as having no response to two or more trials with antidepressants and/or mood stabilizers with documented efficacy in bipolar disorder. A history of nonresponse to ECT was conversely an exclusion criterion. Thus, the study sample comprised only individuals for whom pharmacological treatment had already demonstrated inefficacy, and excluded all individuals for whom ECT had demonstrated inefficacy. Given that pharmacological treatment was already ineffective for these individuals, the superiority of ECT over pharmacological treatment is neither unexpected nor generalizable. Second, although blind raters co-rated some assessments, neither the patients nor the treating psychiatrists (who rated the outcome assessments) were blinded to treatment modality. Lack of blinding can bias both treatment outcomes and assessment thereof. Third, if

individuals in the ECT group reached remission before the end of the 6-week treatment period, they were switched to an algorithm-based pharmacological maintenance treatment (in accordance with the same treatment protocol as the pharmacological treatment group). However, the authors did not report on the number of participants in the ECT group that switched treatment groups and what maintenance treatment these individuals received. Thus, it is unclear how many individuals in the "ECT" group received ECT only, and how many received the same pharmacological treatment as the comparison group, or for how long. In other words, an early responder to ECT may have not relapsed because they were now on medication rather than because they had received ECT.

Beside Schoeyen et al. (2015), there was only one other study that directly aimed to investigate the efficacy of ECT. It has no data beyond the end of the treatment period and no control group, placebo or otherwise. Magid et al. (2013) retrospectively reviewed the preliminary efficacy and efficiency of ultrabrief right unilateral ECT after the adoption of a new ECT protocol at the University of Texas Southwestern Department of ECT. Response to ECT was defined as greater than 5-point decrease on the Patient Health Questionnaire 9 (PHQ-9; Spitzer, Kroenke, & Williams, 1999) and a final PHQ-9 score of less than 10. Remission was defined as a final PHQ-9 score of 5 or less. The review demonstrated that 68% of the 62 participants (including diagnoses of unipolar and bipolar depression) responded to ECT and 44% reached remission criteria. Although this study directly aimed to investigate efficacy, PHQ-9 scores before and after ECT were not reported. Furthermore, the study is limited by its retrospective design and, most important, again, by the lack of any sort of control group.

Of the other 89 studies included in this review, 46 reported on whether or not their findings were statistically significant during the treatment period (3 additional studies reported on statistical significance but only at follow-up). Only 1 of these 46 did not find a statistically significant reduction in depression during the ECT treatment course. Ueda et al. (2010) examined whether ECT could alleviate psychosis related to Parkinson's disease and antiparkinsonian medication. The mean of the 17-item Hamilton Depression Rating Scale (HDRS-17) decreased but did not reach statistical significance in this sample of five individuals. All other studies that reported level of significance found a statistically significant reduction on a depression measure during the course of ECT treatment. This included 31 observational studies, 10 RCTs including an ECT-only group, 2 nonrandomized trials, and 2 retrospective reviews. In none of these studies was ECT compared to a control group that did not receive ECT and, therefore, reductions in depression cannot be attributed to ECT. Reductions could, for instance, have been spontaneous remission and/or the result of placebo effects such as the hope and expectation created by any treatment and particularly by a major procedure such as ECT (Rasmussen, 2009; Read & Bentall, 2010).

Changes in Depression Beyond the Treatment Period

Even if there was strong evidence that ECT reduces depression in the period during which it is being administered, without evidence that reduction lasts beyond the end of the treatment period it cannot be claimed that the treatment is effective for the condition in question. It is well established that ECT recipients have very high relapse rates after the end of the treatment period (Kellner et al., 2006; Read & Bentall, 2010; Sackeim et al., 2001).

Only 17 of the 91 studies (19%) included a follow-up period (defined as >1 week after the final treatment). Four of these were uninformative about the long-term effects on ECT

recipients in general, because data beyond the treatment period were selectively reported only for those individuals who responded, or remitted, during treatment (Brakemeier et al., 2014; Lucca et al., 2010; McCall et al., 2013; Yildiz et al., 2010). Two other studies did not report whether the level of difference at follow-up was statistically significant, and one study did not analyze the follow-up data because of small numbers (Loo et al., 2012; Loo et al., 2014; Rapinesi et al., 2013).

The remaining ten studies that included a follow-up period all reported reduced depression. Five of these studies reported a significant decrease in depression at the 1-month follow-up time point, in comparison to baseline severity (Hansen et al., 2011; Kayser et al., 2011; Minelli et al., 2014; Weeks et al., 2013; Yoosefi et al., 2014). Two observational studies (Johansson et al., 2010; Kalogerakou et al., 2015) both reported a significant decrease in depression compared to baseline, at 8–9 weeks follow-up and 6 months since the beginning of treatment, respectively. Three studies compared levels of depression at follow-up with depression at the end of the treatment period (Dukart et al., 2014; Meeter et al., 2011; Nordanskog et al., 2014). All three of these studies reported a significant improvement in depression during the treatment period. There were no further improvements in any of these studies during the follow-up period, but the level of depression appeared to remain stable during the follow-up periods of 3 and 6 months.

Overall, although only 10 studies (11%) provided useable follow-up data, reduction in depression scores appeared to be maintained during the follow-up period. However, as with the studies demonstrating change during the treatment period, none of these studies included a placebo control group. Many were observational studies and/or had no group comparisons at all.

Suicide

Of the 91 included studies, none aimed to investigate whether ECT prevented suicide. Only one study examined suicidality in relation to ECT. Yildiz et al. (2010) conducted a pilot controlled study investigating early continuation pharmacotherapy as an adjunct to ECT. In addition to receiving ECT, participants were randomized to additionally receive early continuation pharmacotherapy, late continuation pharmacotherapy or placebo after the fourth session of ECT. The study considered the change in expressed suicidal thoughts, as recorded on Item 10 on the MADRS at baseline and after completion of ECT treatment course. However, data were only reported for all participants combined. As a result of this reporting, the change in suicidal thoughts in the placebo group, who only received ECT, was not determined.

DISCUSSION

In the decades since the introduction of ECT, most medical practitioners have come to subscribe to the principles of evidence-based medicine, which have been defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). Subscribers to these principles tend to accept that although clinical decision-making can be informed by a range of types of knowledge, the most robust of these is data from placebo-controlled randomized trials (Cipriani, Girlanda, & Barbui, 2009). By 2010, there

had only been 10 such studies for ECT and depression, and none since 1985. Those 10 had produced minimal evidence of some temporary benefits, for a minority, during the treatment period, and no evidence at all of benefits beyond the end of the treatment period.

In other medical disciplines, this state of affairs might have led either to a phasing out of the procedure or at least to a plethora of studies seeking to determine whether the treatment in question does actually work. This is not the case for psychiatry and ECT. There has now not been a single placebo-controlled trial (randomized or otherwise) of whether ECT reduces depression for more than 30 years.

It is not the case, however, that there is no ECT research being conducted. Our review reported a multitude of studies, many seeking to establish whether one type of ECT is more effective, or produces less cognitive dysfunction, than another, but all simply assuming that it does work. Only two studies in the last 6 years have made an explicit attempt to determine whether ECT works (Magid et al., 2013; Schoeyen et al., 2015). Both were so methodologically flawed as to be unable to answer the question in a scientifically meaningful way. Of all the studies that inadvertently generated data that might have provided some support for the hypothesis that ECT is an effective treatment for depression 45% did not report statistical significance, 60% continued the ECT recipients on psychiatric drugs (with this being undetermined for a further 15%), 89% had no meaningful follow-up data beyond the end of treatment (and 81% no follow-up data at all), and 100% had no placebo control group. Despite the best, most inclusive, efforts of the reviewers, no new robust evidence has emerged in the past 6 years to support the hypothesis that ECT is any more effective in reducing depression than placebo. There has also been no new evidence to support the hypothesis that ECT prevents suicide.

Such continued failure to produce any evidence would be of less concern if there were not robust evidence that ECT causes long-lasting memory loss for a significant proportion of recipients (Breggin, 2008; Read et al., 2013; Rose, Fleischmann, Wykes, Leese, & Bindmann, 2003; Ross, 2006; Sackeim et al., 2007).

Memory Loss

A 2003 review of studies of memory loss at least 6 months post-ECT found a range of 51%–79% and a range for "persistent or permanent memory loss" of 29%–55% (Rose et al., 2003). In 2007, ECT proponent Professor Harold Sackeim and his colleagues conducted the largest prospective study and found that autobiographical memory was significantly worse than pre-ECT levels ($p < .0001$) both shortly after ECT *and* 6 months later (Sackeim et al., 2007). Furthermore, the degree of impairment was related to the number of administrations of ECT. Even using the very conservative cut off of 2 standard deviations worse than pre-ECT scores, 12% met the criterion for "marked and persistent retrograde amnesia," with higher rates for the two demographic groups who receive ECT disproportionately—women and older people. The impairment was also greater among those who received bilateral ECT rather than unilateral ECT. (Bilateral remains the most common form of ECT.) Significant memory loss is also consistently reported by many participants in qualitative studies of the subjective experience of ECT recipients (Fisher, 2012; Johnstone, 1999; Rose, Fleischmann, & Wykes, 2004; Rose et al., 2003). Although ECT proponents often seek to dismiss these findings as "subjective memory loss" (Read & Bentall, 2010, p. 343), that is, either imagined or caused by depression rather than ECT, a 2006 review concluded that "there is no evidence of a correlation between

impaired memory/cognition after ECT and impaired mood, much less a causal relationship" (Robertson & Pryor, 2006, p. 230).

The most recent statement by the UK's Royal College of Psychiatry (RCP) is

> Memory problems can be a longer-term side effect. Surveys conducted by doctors and clinical staff usually find a low level of severe side-effects, maybe around 1 in 10. Patient-led surveys have found much more, maybe in half of those having ECT. . . . Some people do complain that their memory has been permanently affected, that their memories never come back. (Royal College of Psychiatrists, 2016)

A New Zealand Government report concurs, stating that "ECT may permanently affect memory and sometimes this can be of major personal significance" and bemoaning the "slowness in acceptance by some professional groups that such outcomes are real and significant in people's lives" (Ministry of Health, 2004, p. 16). A review of studies of the effects of ECT suggests that "ECT affects the brain in a similar manner as severe stress or brain trauma which activates the HPA axis and the dopamine system and may compromise frontotemporal functions" (Fosse & Read, 2013, p. 1).

Conclusion

We conclude that the continued use of ECT is not consistent with an evidence-based approach to the practice of medicine. There is no new evidence in the last 6 years to challenge the conclusion, in the 2010 review, that "the cost-benefit analysis for ECT is so poor that its use cannot be scientifically justified" (Read & Bentall, 2010, p. 333).

The use of ECT has been steadily declining in many countries. In England for example, individual administrations have fallen from 159,600 in 1980 to 27,128 in 2006 (Singhal, 2011), and to less than 15,000 in 2013 (Cresswell & Hodge, 2013). Nevertheless, it was estimated that at the turn of the century, about 1 million people worldwide were still receiving this procedure annually (Prudic, Olfson, & Sackeim, 2001). A more recent review of 70 studies, found "large variation between continent, countries and regions in utilization, rates and clinical practice" (Leiknes, Jarosh-von Schweder, & Høie, 2012, p. 296). High users include Australia, Belgium, Norway, Sweden, and the United States. In Australia (Oakley-Brown, 2015) and Texas (Swanson, 2014), the use of ECT has actually been increasing in recent years. An evidence-based approach to clinical care would, however, see a rapid *decline* in the use of this procedure. It seems reasonable to suggest, again, that

> The continued use of ECT therefore represents a failure to introduce the ideals of evidence-based medicine into psychiatry. This failure has occurred not only in the design and execution of research, but also in the translation of research findings into clinical practice. It seems there is resistance to the research data in the ECT community, and perhaps in psychiatry in general. (Read & Bentall, 2010, p. 344)

We should, meanwhile, remain cognizant of the fact that the archetypal ECT recipient remains, as it has for decades, a distressed woman more than 50 years old (Leiknes et al., 2012; Read et al., 2013).

At the beginning of 2016, the U.S. Food and Drug Administration (FDA) was taking submissions on their proposal to reclassify ECT devices from Class III (high risk) to Class II

(low risk). On January 29, 2016, the president of the American Psychiatric Association, Dr. Renée Binder, urged members to support the proposal and drafted a letter for members to submit to the FDA, which included: "The APA considers ECT a safe and effective evidence-based medical treatment" (Binder, 2016). She did not recommend any research, old or recent, that they might submit in support of this claim. It seems there is none.

In July 2017, an updated search for new placebo-controlled studies comparing ECT and SECT for depression was conducted. There still were none.

Limitations

The primary limitation of this review is that there were insufficient properly designed studies (none) to permit any conclusions about whether ECT is effective for depression. The review could have been improved by searching more than two databases, having a second person check the selection of relevant articles, and attempting to retrieve unpublished and ongoing studies. It should also be acknowledged that a review protocol was not preregistered.

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