They Affect the Person, but for Better or Worse? Perceptions of Electroceutical Interventions for Depression Among Psychiatrists, Patients, and the Public

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Abstract

Responding to reports of cases of personality change following deep brain stimulation, neuroethicists have debated the nature and ethical implications of these changes. Recently, this literature has been challenged as being overblown and therefore potentially an impediment to patients accessing needed treatment. We interviewed 16 psychiatrists, 16 patients with depression, and 16 members of the public without depression, all from the Midwestern United States, about their views on how three electroceutical interventions (deep brain stimulation, electroconvulsive therapy, and transcranial magnetic stimulation) used to treat depression might affect the self. Participants were also asked to compare the electroceuticals' effects on the self with the effects of commonly used depression treatments (psychotherapy and pharmaceuticals). Using qualitative content analysis, we found that participants' views on electroceuticals' potential effects on the self mainly focused on treatment effectiveness and side effects. Our results have implications for both theoretical discussions in neuroethics and clinical practice in psychiatry.

Keywords

psychiatry; depression; personality; therapy; qualitative interviews; United States

Introduction

Psychiatric electroceutical interventions are therapies that use magnetic or electrical stimulation of the brain with the aim of treating psychiatric disorders such as major depressive disorder. These interventions include electroconvulsive therapy (ECT), repetitive transcranial magnetic stimulation (rTMS), and deep brain stimulation (DBS). All of these interventions are intended for use when frontline therapies (psychotherapies and pharmaceutical treatments) are not effective. ECT and TMS are currently in therapeutic use, while DBS is being tested in clinical trials and its efficacy has not yet been established.

One major focus of the neuroethics literature in recent years has been whether electrical stimulation of the brain might affect some aspect of patients' selves, although what "self" means in this context has been greatly disputed. To date, this discussion has mainly addressed DBS, as a result of documented cases of striking post-surgery personality changes, including mania or gambling addiction, or alterations to an individual's sense of self (Ford, 2006; Schectman, 2010; Witt et al., 2013). Yet neuroethicists

have not engaged in a similarly robust discussion when it comes to considering the potential effects of other electroceuticals. Only a few authors have discussed the potential effects of rTMS on the self (e.g., Cabrera et al., 2014; Cheshire, 2018; Jotterand & Giordano, 2011). These discussions have generally focused on the possibility for rTMS to cause the same effects on the self that have been reported in DBS patients. In the case of ECT, there has been no recent discussion in the neuroethics literature in light of the purported effects of DBS on the self. This is a missed opportunity as, for example, ECT can lead to memory loss in some patients, with reports of patients who feel that this memory loss has changed who they are (Johnstone, 1999; Rose et al., 2003).

A number of studies have examined patient experiences with DBS and changes to self. The majority of

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these have focused on the experiences of patients, and occasionally caregivers of patients, who have undergone DBS for Parkinson's disease; this is unsurprising, given that most DBS surgeries are performed for this and other motor disorders. For example, Gilbert et al. (2017, 2018) explored postoperative feelings of self-estrangement in patients who had received DBS for Parkinson's disease. Hariz et al. (2011) interviewed DBS patients with primary dystonia (a movement disorder involving involuntary muscle contractions) and found that these patients mostly felt that the therapy-induced changes in their life influenced their identity, but that ultimately they were the same person. Haahr et al. (2010) and Hariz et al. (2016) found that patients' views of how DBS affected them changed over time, although neither study explicitly asked patients about changes to self-related characteristics. Thomson et al. (2020) interviewed patients with Parkinson's disease and their caregivers both prior to and following DBS surgery. Prior to DBS, there was variation in how much participants knew about the possibility of changes to the self. Participants also emphasized how much the illness had already influenced their, or their partner's, personality and self. At the post-surgery interview, participants reported both positive and negative personality changes and identified a number of potential causes for these experiences, including the direct effects of stimulation and indirect effects resulting from improved symptoms. Several patients believed that the surgery had restored them to their pre-illness self and their caregivers agreed with this assessment. Individuals with Parkinson's disease may struggle to preserve their identity throughout their illness (Vann-Ward et al., 2017), so the possibility of such restoration is clinically important.

In addition to its use to treat movement disorders, DBS has been used to treat psychiatric conditions including obsessive-compulsive disorder (OCD) (Rapinesi et al., 2019) and depression (Kisely et al., 2018). Although a variety of brain areas may be targeted in DBS for any given disorder, both the target areas and the symptoms to be addressed are distinct for movement disorders versus psychiatric conditions. Given that therapies for these conditions aim to treat symptoms closely associated with personality and sense of self (e.g., mood, emotions, behavior), it is particularly important to better understand both the actual effects of DBS and other electroceuticals on the self, and how their potential effects are perceived by clinicians, patients, and the broader public.

To date, relatively few studies have examined changes to the self following DBS for psychiatric conditions. An important series of articles by de Haan et al. (2013, 2015, 2017) are based on interviews with people who underwent DBS for OCD. One of these focused explicitly on self-related changes and found that patients report a

variety of experiences; furthermore, their understanding of these experiences depends in part on how they think about personhood (de Haan et al., 2017). Klein et al. (2016) interviewed patients who had enrolled in DBS trials for OCD or depression and found that many of their participants felt the device would allow them to be their authentic selves, although some also worried that the device would cause them to have inauthentic emotions or worried that it would diminish their sense of agency. Another study asked clinicians who treat patients with DBS for movement or psychiatric disorders for their perceptions of patients' personality changes. They reported a range of effects, noting in particular that changes in patients with depression tended to reflect a return to their premorbid personality (Thomson et al., 2019). These studies suggest that, in some cases, personality changes after DBS may be best understood in terms of alleviation of symptoms, and so may be perceived as positive.

Finally, two studies have examined public perceptions of the potential for personality change with DBS and other psychiatric interventions. One of these compared public perceptions of two broad kinds of psychiatric treatments, pharmaceutical and neurosurgical, and found that identity concerns are not a major theme in comments on online media articles (Cabrera et al., 2019). However, in a series of focus groups, Cabrera et al. (2020) found that members of the public without a psychiatric diagnosis were concerned about the potential of psychiatric neurosurgery to threaten one's authenticity, feeling that the surgery could cause cognitions or actions that were not those of the person's "true self."

In addition to this empirical literature, a theoretical neuroethics literature has emerged in which different authors consider how to understand these effects of DBS in terms of various aspects of selfhood, including personality, identity, autonomy, authenticity, agency, and self, which Gilbert et al. (2018) have shortened to "PIAAAS." These authors have recently argued that the proliferation of theoretical work on PIAAAS characteristics has resulted in a "DBS bubble," in which speculation far outstrips the available evidence of changes to these characteristics. They worry that overemphasis on the potential effects of DBS on the self may lead to patients' being reluctant to access this treatment (Gilbert et al., 2018). Similarly, we have argued (Bluhm et al., 2020) that the theoretical literature (a) has been too narrowly focused on a small number of striking cases and (b) assumes that any observed changes are the direct result of neurostimulation, rather than being the result of a number of different factors that also include the specific disorder being treated and patients' and their families' understanding of the treatment. We called for neuroethicists to attend to the broader qualitative literature, which provides a more nuanced understanding of patients' experiences of DBS.

Another factor that complicates understanding the perceived effect of electroceuticals on patients' sense of self is how to define terms related to the self. The characteristics discussed by neuroethicists often have technical meanings in philosophy and neuroethics, so that it is not clear that study participants view their own experiences the way they are described by neuroethicists. While empirical researchers are certainly justified in using these concepts to interpret their participants' descriptions of their experiences (e.g., Hariz et al., 2011; Klein et al., 2016), patients are unlikely to understand and describe their experiences in the same terms. de Haan et al. (2017) provided a comprehensive analysis of the different notions of personality and self, pointing out the ambiguity of these concepts and the lack of criteria for determining "whether a change entails becoming more or rather less oneself" (p. 6). Their study does not propose another definition or provide the participants with a definition of personality, person, or personality change. Instead, they sought to capture these perceptions of change by asking whether participants considered themselves to be "changed as a person." Similarly, Thomson et al. (2020) chose not to use a specific theoretical framework for understanding "personality," but adopted their participants' own understanding of this term.

Finally, while patients who have undergone DBS are clearly the most important source of information for understanding their own experiences, with their family members and healthcare providers supplying additional perspectives, interviews focusing on DBS experience do not provide the entire story. This is because people bring to their experience broader social narratives and beliefs about their illness, about its treatment, and about themselves as a person who has that illness (Mattingly & Garro, 2000). These narratives and beliefs are particularly important for contextualizing patients' beliefs about, and experiences of, how DBS affects the self.

Our aim in this article is to contribute to a broader understanding of how electroceuticals used for depression are perceived as potentially affecting patients' selves. In addition, we are interested in how perceptions of electroceuticals affecting patients' selves compare with other therapies, and in the implication of these perceptions for the theoretical discussion of personality change in neuroethics. We therefore recruited three groups of participants: patients with depression, psychiatrists, and members of the general public. In addition, we asked about three different electroceuticals: ECT, rTMS, and DBS. Because our aim was to explore the variety of ways in which different groups of people think about the potential effects of electroceuticals for depression on the self, we do not analyze either participant groups or specific electroceuticals separately. To our knowledge, no study has examined perceptions of the effects of DBS, ECT,

and rTMS on self among patients, psychiatrists, and members of the general public. A better understanding of the perceptions of these interventions' effects will add to the empirical literature, as well as broaden the theoretical discussion by neuroethicists on electroceuticals and changes to self-related characteristics. It will also, from a practical perspective, lead to a better understanding of people's beliefs about electroceuticals' effects on personality and self and thus will help to inform clinicians' conversations with patients.

Method

This study was approved as exempt by the Michigan State University IRB, as it involved interviews, an exempt category within the 45 CFR 46.101(b) 2 Pre-2018 Common Rule. Written consent was therefore not required; however, we provided an information sheet about the study that contained information similar to an informed consent document and we asked for verbal consent at the beginning of each interview.

To recruit participants, we used email to contact a number of psychiatrists practicing in Michigan, who were selected to represent a wide range of experience with the three electroceuticals. We sent a follow-up email to those who did not reply after 2 weeks. To recruit patients with depression and members of the public, we distributed information about the study to mental health clinics, depression disease support groups, clinician networks, as well as in public places in mid-Michigan and social media posts. For patients with depression, we aimed for a variety of experiences with the electroceuticals, and for members of the public we aimed to have a range of experience with providing care for a friend or family member with depression (from no experience to extensive experience). We interviewed a total of 48 participants (16 per group). Participants' demographic characteristics and experience with electroceuticals are presented in Supplemental Table 1.

We conducted 30 to 60-minute semi-structured interviews, in person, by phone, or by video conference call, between February 2019 and May 2019. We provided participants with a document that briefly described the electroceuticals and asked them to read it before the interview (see Supplemental File: Information about Electroceuticals). They were also able to refer to it during the interview itself, if they wished. We began the interviews with general questions about the participants' demographic information, background, and experience, and we also asked patients and members of the public to describe the electroceuticals to us to help ensure that they understood the therapies being discussed. This was followed by specific questions about their attitude toward and concerns about one or two of the electroceuticals, depending on the

amount of time available (See Supplemental File: Interview Guide). The specific electroceutical(s) discussed with each participant were selected based on their interest, experience, or knowledge of that electroceutical. Each interview was recorded and then anonymized and transcribed.

Our analysis used qualitative content analysis methods (Hsieh & Shannon, 2005; Sandelowski, 2000). Data analysis began as soon as the first interview transcripts were available. This allowed us to identify emergent issues that warranted further exploration in subsequent interviews. Following a directed approach to coding (Hsieh & Shannon, 2005), we created a draft codebook that included a priori codes based on core aspects of the initial questions asked during the interviews, as well as emerging codes categorizing the various kinds of potential effects on personality or sense of self that our participants identified when asked to expand on and explain their initial answers (Supplemental Table 2). To create the draft codebook, we analyzed the first two transcribed interviews from each stakeholder group, beginning with the group of psychiatrists. We then analyzed an additional two transcripts from each stakeholder group to see if the codebook needed to be adjusted. After this, the team convened to reach consensus on the framework, codes, sub-codes, and codebook. We used the developed codebook from the psychiatrist group (the group where we started the interviews) as a basis when we coded the transcripts of the other two stakeholder groups, while allowing for the emergence of other codes. We used the web-based software Dedoose for coding and analysis. Any discrepancies in coding were addressed during team meetings, allowing us to reach a final consensus.¹

In this article, we focus on participants' views about the potential effect of the three electroceuticals on the self. Like de Haan et al. (2017), we wanted to leave interpretation of "effects on self" up to our participants. However, because we were not interviewing only people who had been treated with one or more of the electroceuticals, de Haan et al.'s question about whether they felt "changed as a person" did not fit. Instead, like Thomson et al. (2020), we used the terminology "personality" and "sense of self." This decision was the result of extensive discussion among our research group; we deliberately chose terms that are familiar, but open to interpretation, and also broader than the terms that tend to be used in academic discussion. We also encouraged our participants to elaborate on what they meant by "personality" and "sense of self," and to explain what kinds of changes they thought might occur. During data analysis, we also were careful to parse out differences in the way participants interpreted "personality" and "sense of self." We also asked participants to compare the perceived effects of several the electroceuticals used for depression with

the effects of the other depression therapies (medications and psychotherapy) or of DBS for essential tremor. This enabled us to explore the ways in which participants' views were shaped by the specific nature of an electroceutical as a therapy for depression and by their beliefs about the possible effects of brain stimulation itself.

In our "Results" section, we present relevant transcript excerpts to highlight and illustrate key themes. We identify which of our three participant groups each speaker belonged to. Where it is not clear in the quote itself, we also note the electroceutical(s) referenced in brackets after each excerpt. Non-content words and expressions have been removed for readability.

Findings

Our results show that participants think that electroceuticals have the potential to affect the self in a variety of ways. Here, we describe our results pertaining to (a) the perceived effects of electroceuticals on personality and sense of self, and (b) how these effects are thought to compare with those of common treatments for depression and with DBS for a motor disease.

Perceived Effects of Electroceuticals on Personality and Sense of Self

Our participants suggested a variety of ways in which electroceuticals might affect an individual's personality and sense of self, including both positive and negative effects. Beliefs about the potential positive effects of electroceuticals tended to connect the treatments' effects on depression with their effects of the self. They reasoned that if electroceuticals improve your mood, that would also influence personality traits and sense of self. In discussing ECT, one patient said, "I think because it can be effective and my mood lifts, I might be a little more outgoing perhaps, a little less withdrawn, a little bit more gregarious." This suggests an indirect effect of electroceuticals on personality, via changes in symptoms:

But then if the person had a positive response to ECT, like an invigorated sense of self from that because, their level of functioning improves. . . . So their sense of self is going to be dramatically improved. (Public; ECT)

The negative effects of electroceuticals on personality or sense of self were similarly indirect. Here, participants suggested two ways in which negative effects could occur: either the failure of the treatment to improve symptoms could leave someone "a little bit irritable and upset," which "would cause a change in your personality or mood" (Public; DBS), or side effects of the treatment might include unwanted changes in personality or sense

of self. Of particular concern in this latter case was the potential for ECT to cause memory loss.

A number of participants, particularly from the patient and public groups, had more ambivalent views on electroceuticals. They did think that electroceuticals could affect personality or sense of self, but did not characterize these changes as positive or negative. Here again, there was a tendency to emphasize the close connection between mental illness and personality, and the sense that treating depression would therefore influence personality. Other participants thought that the treatments could lead to both positive and negative changes, as in the case of one patient who noted that treatment with ECT affected their memory and “numbed [them] out a little bit.” They continued: ECT “has helped with the depression . . . I smile more. So yeah, it impacted my personality for sure.”

In addition to affecting personality or sense of self by treating the symptoms of depression, electroceuticals might also affect these attributes because participants believe that they will do so:

[J]ust by the fact that you’re doing [TMS], it can change you emotionally because psychologically you can think, “Oh, this can affect me,” and then you will have these thoughts and stuff and not necessarily it has to be from the treatment, but it was just psychological stuff. (Public; TMS)

Psychiatrists who discussed this possibility often noted that this is also the case with medications. Patients’ self-perceptions might be shaped by knowing that they have to take the medication because they had a mental disorder. Thus, the effects of electroceuticals on personality or sense of self are ultimately likely to be the result of some combination of the treatment itself, its effects on depression, and patients’ beliefs about the effects of the treatment on both their symptoms and their selves.

In some cases, participants also distinguished between, and explained their interpretation of, the terms “personality” and “sense of self,” saying that their answer about the effects of electroceuticals would depend on what was meant by these terms, or that they thought that electroceuticals would affect one, but not the other. Some participants, especially psychiatrists, saw personality as involving a core set of enduring traits, and that electroceuticals would not “change essentially who a person is” (Psychiatrist, ECT). Patients were more likely to think of electroceuticals as potentially affecting personality. Some participants in each group specified specific traits that electroceuticals could change, such as creativity, mood, energy levels, or gregariousness. Of particular note is the frequent reference made to self-esteem, which psychiatrists, in particular, mentioned as increasing with improvement in depression symptoms and connected with an individual’s sense of self.

Comparisons With Other Treatment

Across all groups, participants believed that other treatments for depression, specifically psychotherapy and medications, could have similar effects on personality or sense of self to those of the electroceuticals. One patient suggested that “whether I am receiving the ECT, or psychiatric medication, or counseling, I think because it can be effective and my mood lifts . . . probably most of those therapies have the potential to [change personality].”

Despite the perception that the kinds of changes would be similar for different treatment modalities, participants suggested that there would still be important differences between the effects of electroceuticals on personality and sense of self and those of other therapeutic modalities. In particular, electroceuticals were perceived as causing changes more quickly, and therefore more dramatically, than medications and, especially, psychotherapy. The quick action of electroceuticals was perceived as the result of “directly changing the firing patterns of the neurons” and therefore as a “higher power” intervention (Patient; DBS compared with medications). Participants also noted that the more gradual changes occurring with psychotherapy could be monitored and guided by a professional over time. With regard to pharmaceutical interventions, some participants noted that their effects were temporary, so that “for the time you’re taking them, they might have the potential to affect your personality” (Public, compared with DBS), although another participant suggested that the effects of DBS should also diminish if stimulation were discontinued.

Another factor that was raised as a possible influence on self-related changes was the location of the effects. One psychiatrist pointed out that “antidepressants are floating widely in the brain and in the body” compared with DBS, so they might be more likely to affect aspects of personality not related to depression. In all groups, when asked to compare the effects of DBS for depression on personality or sense of self with those of DBS for movement disorders, people mentioned the difference in the location of stimulation, believing that such changes were more likely to occur in patients being treated for depression.

Discussion

To date, most empirical research on people’s views of electroceuticals and the self has focused on patients, family members, or healthcare providers with DBS experience. This is, of course, important, as these groups are in the best position to observe actual changes. Yet it only provides part of the picture; it is important to get a broader understanding of how electroceuticals are perceived because these broader perceptions influence patients’

willingness to undergo these procedures, providers' willingness to administer or refer patients for them, and the ways in which patients and their families think about these therapies. Moreover, even individuals who *are* familiar with the effects of electroceuticals on the self from first- or second-hand experience understand and interpret these experiences against the background of broader social and cultural understandings of electroceuticals and of the self. Thus, our study provides insight into the background views and perceptions that individuals bring to treatment with these interventions.

In addition, it is important to expand the neuroethical discussion about the effect of electroceuticals on the self beyond DBS to include other electroceuticals such as ECT and rTMS. Examining and comparing perceptions about different electroceuticals can reveal similarities and differences that could be useful for patients when deciding which treatment to use and for physicians when addressing these concerns with patients. A better understanding of how people perceive different electroceuticals can also help us understand which concerns may be electroceutical-specific and which may apply to depression treatments more generally.

How Are Electroceuticals Perceived as Affecting Personality and Sense of Self?

Comparing stakeholder groups revealed that people tended to interpret the concept of "personality" in different ways. Some participants, especially psychiatrists, used the term to refer to a set of enduring traits that remain largely unchanged over time. These participants tended to say that because electroceuticals do not change these enduring traits, they have no effect on personality. This view may reflect specialized meanings of the term "personality" in psychology and in psychiatry (Ineichen et al., 2016), or the long-term patterns of thought and behavior associated with personality disorders.

Other participants, especially patients and members of the public, tended to use the term "personality" more loosely, describing traits that are relatively changeable. This understanding of personality was more continuous with the idea of "sense of self" as something that could be fairly easily changed by electroceuticals. Members of this group believed that electroceuticals positively change personality traits and aspects of self because they treat depressive symptoms, which would lead to improved mood and functioning. Participants who distinguished strongly between personality and sense of self also acknowledged that treatment with electroceuticals does have the potential to alleviate depressive symptoms, which can lead to positive changes in aspects of self. A better understanding of how participants think about these terms is important because it will help both in future

research on patients' perceptions and in communication with patients in the clinic. In the context of research, explicit discussions about terminology can make certain that participants are answering the questions that researchers intended to ask. In the clinic, such conversations will ensure that patients' concerns about the potential effects of electroceuticals are being addressed and that they understand accurately the information their physicians are trying to convey.

Some of our participants suggested that changes to self would be expected when you are treating a mental illness. electroceuticals used to treat mental illnesses such as OCD and depression are intended to relieve a patient of personality traits that are perceived as pathological, or that cause distress to the patient. In the literature on DBS and self-related characteristics, it has been argued that these changes to self are not negative, but are restoring the individual to their original state. For example, Lipsman and Glannon (2013) argue that the device does not take away an individual's agency and free will but rather, "releases constraints imposed on him by anhedonia and avolition and restores his experience of being in control of his behavior" (p. 469). Treatment side effects might produce unintentional, problematic changes, including memory loss with ECT, which was frequently mentioned by our participants. Although there has been little discussion of ECT and the self in the recent neuroethics literature, Johnstone (1999) interviewed women who had undergone ECT and who explicitly linked memory loss with a changed sense of who they were, or a loss of self; see also Knight et al. (2017). More generally, the distinction our participants made between intended/desired and unintended/unwanted effects on the self also reflects the neuroethics literature. For example, according to Schermer (2011), changes to narrative identity may only be morally problematic if the patient perceives them as disruptive to their identity.

Another possibility some participants raised is that perceived changes to personality and sense of self may not occur as direct results of a therapy, but rather might be indirect effects of patients' beliefs that a treatment will have these effects. This suggests a complex interaction among depression, self-perception, and therapy. Previous work has shown that patients taking mood-altering medications may believe both that they are a threat to, and are important for (re)finding, one's authentic self (Stevenson & Knudsen, 2008), or may think that they foster agency in recovery (Cartwright et al., 2018). Simply being prescribed an anti-depressant can also influence patients' sense of self, including by leading them to view themselves as someone with a mental or biochemical disorder who needs medication (Bluhm et al., 2014; Knudsen et al., 2002; Wills et al., 2020). It is also possible that shame and stigma associated with mental illness play a

role in shaping these perceptions. For example, Bluhm et al. (2014) found that some young people are reluctant to take medication because they perceived this as reinforcing their diagnosis; they did not want to identify, or to be identified, as a sick person. Wills et al. (2020) observed a similar reluctance in their study and also noted that, once they began to take antidepressants, their participants believed that even though they might appear more normal to others, they experienced a loss of self. These effects of therapeutic interventions on patients' self perceptions are likely to be even greater in the case of electroceuticals than with medications, given that electroceuticals are typically a "last resort" used when psychotherapy and medication have failed.

There is also some evidence that, like patients, clinicians and members of the public also think there is a complex relationship between the effects of a therapy and patient's perceptions of those effects, including the placebo effect. Thomson et al. (2019) found that clinicians who treated patients with DBS attributed personality changes to multiple factors, including both the stimulation itself and patients' expectations about the treatment. Members of the public also appear to judge the "reality" of depression based on the need for treatment, although they may tend to take depression more seriously when a more drastic intervention is involved (Cabrera et al., 2019). More work is needed to determine whether people's assessments of different therapies vary with the severity of depression they are intended to treat.

How Do Electroceuticals Compare With Other Therapies?

Asking our participants to compare the potential effects on the self from psychotherapy, medication, and DBS to treat essential tremor (as opposed to using it to treat depression) revealed additional complexity in participants' perceptions of how electroceuticals might affect personality or sense of self. The differences in our participants' views on the relative effects of electroceuticals and psychotherapy or electroceuticals and medications are likely the result of a convergence of different factors. Some suggested that the suddenness of the effects of an electroceutical might mean that it would have a more dramatic influence than psychotherapy, which accords with Schechtman's view that sudden, rather than gradual, changes caused by DBS are potentially a threat to personal identity (Schechtman, 2010). Other participants thought that the slow and gradual effects of psychotherapy would result in a more meaningful change, which reflects our previous finding (Cabrera et al., 2019) that members of the public frequently see the hard work of psychotherapy as more conducive than antidepressants to

both long-term recovery from depression and personal growth. Both of these views also suggest that people distinguish between changes caused by the electroceutical and changes caused by the patient themselves, and consider them to have different implications for alterations to personality.

Another concern our participants raised is that electroceuticals may cause permanent changes to the self due to their effects on the brain. Discontinuing a medication was viewed as diminishing its potential effects on personality or sense of self, although our participants did not distinguish here between the effects of stopping therapy and the possibility that depression might subsequently return. By contrast, some participants emphasized the potentially permanent effects of electroceuticals on the brain, referring to the involvement of different neural circuits or to the greater effect of electroceuticals on brain chemistry, especially implanted electroceuticals which interact in a much more localized and direct way with the brain. Thomson et al. (2020) also found that, prior to undergoing DBS for Parkinson's disease, some of their participants noted that the effects of DBS on personality might be permanent.

Similarly, when participants were asked to compare the effects of electroceuticals for depression with the effects of DBS for essential tremor, they tended to focus on differences in the target(s) of stimulation and to suggest that DBS for essential tremor would be less likely to affect a patient's personality or sense of self because it was targeted to improve motor symptoms, rather than symptoms (e.g., mood, emotions) perceived as being more central to the self. People did not tend to consider the possibility that improvement in the symptoms of essential tremor might also affect people's sense of self in the same way that they recognized changes in the symptoms of depression could have effects on personality and/or sense of self (as discussed above).

While it is true that DBS for essential tremor and for Parkinson's disease target areas related to motor control and DBS for depression aims to affect behaviors, emotions, and cognitions that are central to aspects of an individual's personality or sense of self, we still do not have a thorough understanding of which targets are most effective for a given condition, or which are most likely to cause self-related changes. The neuroethics literature on self and DBS has focused mainly on changes in patients with a motor disorder (specifically, Parkinson's disease) and at least some of those changes appear to be side effects directly caused by neurostimulation (Ford, 2006; Schechtman, 2010; Witt et al., 2013). In the case of DBS for anorexia nervosa, Maslen et al. (2015) have argued that the implications of this therapy for changes to self-related characteristics depend on the specific brain areas targeted. Their conclusion is also applicable

to DBS for other conditions. Moreover, stimulation of a specific brain area has effects beyond that area, as other linked brain circuits may be affected as well. This is even more important when considering ECT and rTMS, which are thought to stimulate more diffuse areas of the brain than DBS.

In sum, comparison between electroceuticals to treat depression and other depression therapies or DBS for motor disorder suggests that views on how electroceuticals might influence personality or sense of self are influenced by several factors. These include the importance of self-reflection (especially with regard to psychotherapy); the indirect effects on personality due to the alleviation of depressive symptoms; the different ways that therapies affect the brain (both the “directness” of the neural effects and the specific location targeted); and the duration of therapy and permanence of its effects. These factors seem to interact and none of them appear to have a stronger effect than the others. Further research may help to clarify the relationships among these effects and how they differ for different electroceuticals and different treatments.

What Are the Implications for Neuroethics?

Our study also demonstrates the theoretical importance of broadening the discussion of the effects of neuromodulation therapy on the self to (a) incorporate the views of a wider range of individuals, including those who have little or no knowledge of these therapies, and (b) address people’s understanding of electroceuticals other than DBS.

There is a large literature in neuroethics on changes to self-related characteristics following DBS. Theoretical discussion of these changes has drawn on empirical investigation of patients’ experiences; however, there is disagreement about the conceptual and normative implications of the empirical findings. Early theoretical work on this question was largely influenced by a small number of reports of changes to self-related characteristics following DBS (Agid et al., 2006; Schüpbach et al., 2006), including individuals who reported that their depression lifted immediately once the stimulator was activated (Schechtman, 2010), or who developed a gambling addiction after starting treatment with DBS (Smeding et al., 2007). Much of the early work in neuroethics on DBS and personality changes has focused on whether these changes are best understood as affecting personality, identity, autonomy, agency, authenticity, or some other aspect of the self (dubbed PIAAAS changes by Gilbert et al., 2018; see also (Baylis, 2013; Kraemer, 2013; Schermer, 2011)).

As this work has proliferated, critics have argued that it forms an unsustainable “bubble” (Gilbert et al., 2018,

2020) that is not supported by empirical findings. These concerns have led to several articles that examine the DBS-and-self literature itself and try to make sense of both the theoretical claims being made and the empirical evidence on which those claims are based. Gilbert et al. (2018) have argued that it is important to get a better understanding of how often DBS patients experience major changes to self-related characteristics, and they worry that patients who may be helped by DBS will be discouraged from undergoing the surgery if these risks are exaggerated. We have previously pointed out that looking at a wider range of empirical studies shows that not all self-related effects are as dramatic as those on which neuroethicists have largely focused (Bluhm et al., 2020). We argued that neuroethicists should use a broader understanding of self-related changes that takes into account not just stimulation-related effects on the self, but also how patients’ self-understanding is influenced by their experience of life with a disorder, and of their understanding of the disorder and the therapies used to treat it. While there may seem to be tension between these two arguments, both in fact advocate for a clearer understanding of the phenomenon and for better communication with patients and their families about life after DBS surgery.

Most recently, Pugh (2020) has argued that empirical research on changes to self-related characteristics following DBS should include interviews with patients, caregivers, and family members at different points before and after treatment. This will allow a “far reaching” understanding of these changes. We would add to this the importance of understanding public perceptions of the potential effects of DBS (and other electroceuticals) on the self, as this would help with the development of a lay understanding of “personhood,” “personality,” and other self-related characteristics. As Pugh notes, there are both similarities and differences between public and philosophical accounts of these concepts. Investigating how clinicians, patients, and family members understand these concepts is particularly important in light of recent calls to develop instruments for measuring personality changes (Gilbert et al., 2019; Ineichen et al., 2016).

Another important way of expanding our understanding of self-related changes is to examine electroceuticals other than DBS. Studies also have found self-related changes following ECT (Johnstone, 1999; Knight et al., 2017; Rose et al., 2003). Reflecting the concerns of our participants, these findings are related to memory loss after undergoing ECT. While the evidence suggests that contemporary techniques for administering ECT are associated only with temporary memory loss (Semkovska & O’Grady, 2017), the belief persists that memory loss is permanent and that it affects not only recent memories is at core of concerns of self-related changes. According to

narrative identity theory, “a person creates his identity by forming an autobiographical narrative—a story of his life and this narrative” (Schechtman, 1996, p. 95). Thus, memory loss threatens the individual’s narrative identity, and that is arguably one of the reasons people fear the possibility of ECT-related memory loss. In addition to concerns about memory, Knight et al. (2017) found that the experience of ECT itself has important implications for narrative identity. Those of their participants who reported a good experience with ECT felt supported by healthcare providers and believed that they retained control over their treatment—and they were subsequently able to integrate their ECT therapy into their own narrative.

With regard to rTMS, there has been relatively little discussion of its potential effects on self-related characteristics. Cheshire (2018) surveyed the research on the potential of rTMS to influence cognitive processes that, he suggests, are related to characteristics associated with the self. rTMS is currently marketed to “healthy” individuals as a means of (e.g.) improving working memory or enhancing experiences of positive emotions (Iwry et al., 2017). Further discussion of rTMS and the self should also take into account the literature on its use for these enhancement purposes, as the enhanced characteristics are also intimately related to the self. While our study does not definitively show that people view different electroceuticals as having different effects on the self, it does establish that this avenue of investigation is worth pursuing.

Broadening the neuroethics discussion on electroceuticals and the self is not solely of theoretical interest. From a practical perspective, a better understanding of people’s beliefs about electroceuticals’ effects on the self will help to inform clinicians’ conversations with patients. While people are familiar with psychotherapy (“talk therapy”) and medication as treatments for depression, fewer non-specialists have heard of electroceutical treatments, particularly newer therapies like rTMS and DBS. We previously found that members of the public often used their knowledge of older treatments, such as ECT and lobotomy, to make sense of newer surgical interventions in psychiatry, including DBS (Cabrera et al., 2019). These framing effects can be problematic considering that people’s old negative views can be extrapolated onto newer treatments. In the case of ECT, in particular, public understanding is influenced by inaccurate or outdated portrayals in movies and other media (McDonald & Walker, 2001). As electroceuticals become more widely discussed with patients, it will be important to better understand both the actual and the perceived characteristics of different interventions.

The exploratory nature of this article means that it has several limitations. Although we aimed to include

people with varying amounts of experience with and knowledge of different electroceuticals, our small sample size means that we cannot definitively determine how experience influences people’s perceptions of how electroceuticals affect the self. We also acknowledge that many of our participants lacked previous knowledge of the electroceuticals and this shaped our results. Our findings therefore shed light on how the broader public may come to view these therapies, although they do not necessarily reflect the views of those individuals with greater familiarity with electroceuticals. We identified a number of different factors that people cited in explaining their views, but were also not able to distinguish how these different factors relate to each other in the case of specific electroceuticals, or whether there are clear differences in how the effects of specific electroceuticals are viewed relative to those of psychotherapy or of medication. Here again, future research with larger groups will be helpful.

Conclusion

In this article, we highlighted the importance of understanding the perceived effect of electroceuticals on self across a variety of viewpoints. By including the perspectives of psychiatrists and patients with varying degrees of experience with electroceuticals, as well as members of the general public, we broaden the neuroethics literature to include perspectives that had not previously been explored in depth. Furthermore, our article emphasizes a critical need for further research (beyond DBS) regarding the actual and perceived effects of ECT and rTMS on the self. Understanding the differences and similarities among stakeholder perceptions and between electroceuticals is important because it will help inform clinicians’ conversations with patients, help patients distinguish between treatment options, and contribute to public understanding of these interventions. Moreover, a better understanding of these perspectives can inform policy and decisions about funding for these therapies. Future studies on how different groups perceive the possible effects of electroceuticals on the self also will provide further depth to the normative and conceptual discussion among neuroethicists.

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Supplemental Material

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Note

1. The analytic team for this study comprised one neuroethicist (L.Y.C.) and one philosopher (R.B.), as well as two undergraduate students (E.C. and M.C.). The two students did the initial coding, which was then checked by each of the two senior researchers.

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