Nada Gligorov[1]

What is an Identity Crisis?

Abstract: *The use of brain technology that contributes to psychological changes has spurred a debate about personal identity. Some argue that neurotechnology does not undermine personal continuity (Levy, 2011) while others argue that it does (Kreitmair, 2019; Schechtman, 2010). To make these assessments, commentators fail to identify psychological changes that cause personal discontinuity. In this paper, I present a view that identifies personal continuity with the maintenance of a self-concept. I argue that a concept of self requires the ability to self-ascribe physical and psychological features and that the diachronic self emerges with self-ascriptions of features that require endurance over time. I maintain that an adequate concept of self does not depend on the maintenance of any particular combination of self-ascriptions and that it can be maintained despite even significant changes in psychological or physical traits. Finally, I apply the self-concept view to identify changes that can result in discontinuity of self.*

1. Introduction

The proliferation of brain technology, including deep brain stimulation (DBS), brain–computer interfaces (BCI), and direct-to-consumer neurotechnologies, has spurred a debate on the effects of the use of these technologies on personal identity (Baylis, 2013; Gilbert, 2015;

Correspondence:
Email: gligorn@amc.edu

[1]   Alden March Bioethics Institute at Albany Medical College, 43 New Scotland Avenue, Albany, NY 12208, USA.

Kreitmair, 2019; Levy, 2011; Nyholm and O'Neill, 2016). Some commentators argue that the potential to directly control brain function will allow individuals, particularly those who have neurological or psychiatric conditions, to become more authentic (Levy, 2011). Others highlight the potential perils of direct brain intervention and cite a variety of threats to personal identity and authenticity (Kreitmair, 2019; Schechtman, 2010). The literature, however, does not provide sufficient guidance about the type of psychological changes that might affect personal identity.

In this paper, I present a view that can be used to assess whether changes to self caused by brain interventions can result in a discontinuity of self over time. I begin by making clear in Section 2 that I am proposing a view of personal continuity and not a criterion of personal identity through time. In Section 3 of the paper, I propose a self-concept view where the diachronic self depends on the maintenance of a concept of self. In addition, I argue that a concept of self depends on the ability to self-ascribe physical and psychological features and that the temporal element of the self emerges as individuals become able to self-ascribe features that require endurance over time. In addition, I argue that, although the maintenance of a concept of self requires a cluster of self-ascriptions, an adequate concept of self does not depend on the self-ascription of any particular combination of physical and psychological traits. I argue further that forming and maintaining a self-concept that establishes personal continuity is not reliant on the maintenance of a narrative. Instead, I maintain that individuals can establish personal continuity before they are able to form a narrative and can keep personal continuity even after they are no longer able to maintain a narrative. In Section 4, I argue that the most adequate view of continuity over time is subjectivist and relies on a first-person selection of traits most important to an individual. Thus, I characterize an identity crisis as the first-person feeling of discontinuity. Based on this, I argue that use of brain technology poses a threat to the maintenance of a self-concept if and only if it contributes to a first-person feeling of discontinuity. In Section 5 of the paper, I identify the type of changes that might lead to an identity crisis.

2. Personal Continuity, Not Identity

There are distinct ways of approaching personal identity over time, including metaphysical or numerical approaches that establish when a

person remains one and the same entity through time. Diachronic numerical identity for persons can be formulated thusly: if a person's life is conceived of as truncated into distinct stages, for example a stage at age 7, a stage at age 17, and a stage at age 37, persistence through time would require that the relationship of identity be maintained among those stages.

Given the significant changes, both biological and psychological, that occur during any individual's life, establishing identity for persons across time becomes the problem of identity through time. There are a variety of proposed solutions to this problem. Many of them begin by narrowing down the properties to only those necessary and sufficient for the maintenance of personal identity through time. These approaches focus on devising a criterion, based on either biological (Perry, 1978; DeGrazia, 2005) or psychological features (Locke, 1690/1995; Shoemaker, 1970; Perry, 1972; Rorty, 1976; Parfit, 1984), for diachronic identity despite significant changes in biological or psychological attributes.

Criteria of numerical identity do not rely on first-person assessments of continuity over time. By this I mean that when selecting the necessary and sufficient conditions required for the persistence of identity through time, these criteria are not aimed at capturing the types of psychological or physical features identified by each individual as constitutive of their self. For example, there are criteria of numerical identity that prioritize the importance of maintenance of core memories for identity through time. These criteria are not based on the relative importance of memories to each individual for their concept of self, nor are these accounts based on the *de facto* importance of memory for an individual's sense of continuity over their life. Instead, these accounts allow for divergence between an individual's own sense of continuity, i.e. a first-person assessment, and determinations of continuity based on the criteria of numerical identity, i.e. a third-person judgment of identity through time.

Motivated by the distinction between the questions of what constitutes identity through time and what constitutes the self, Schechtman (1996) argues that metaphysical criteria of identity do not answer the types of questions that are most central to the common-sense notion of identity, which are often related to the moral and the practical importance of maintenance of identity. For example, when I am worried about surviving a pandemic, my concern is primarily about first-person continuity, i.e. will *I* survive it, and not merely whether an individual numerically identical with me will survive. The argument is

that the criteria of numerical identity provide accounts of personal identity without characterizing the self. When an individual is contemplating the use of DBS, which might promise relief from physical symptoms but might also impose psychological changes, the worry is not will I remain the same entity over time, the worry is will I still be the same self who enjoys the same activities, prioritizes the same values, and loves the same people. The criteria for numerical identity through time may answer the former, but not the latter question.

To satisfy both the quotidian concerns related to the self and those related to maintenance of identity, Schechtman (1996; 2014) proposes an account that fixes diachronic identity through the construction of a first-person narrative. Schechtman maintains that the self is constituted through an accurate, linear, and coherent narrative that incorporates the values, preferences, and the moral commitments of any given individual, and identity is maintained through time if the narrative remains accurate, linear, and coherent. An inability to maintain such a narrative may result in an identity crisis. This identity crisis is not merely an unfelt discontinuity in numerical identity as the ones described in fission cases invoked by personal identity theorists (Nozick, 1981; Parfit, 1984); instead, it is an inability to maintain or re-establish a biographical narrative. It is the type of experience that might cause an individual to proclaim: 'I don't know who I am anymore' or 'I am not who I used to be'.

An additional proponent of narrative identity is DeGrazia (2005), who countenances the practical importance of self-constitution questions and adopts narrative identity to resolve ethical issues that arise in medicine, where disease and medical treatment may alter an individual's psychological features and thereby, perhaps, even their self. DeGrazia argues that identity through time is fixed using a biological criterion where an individual remains the same as long as they persist as the same biological animal. Hence, unlike Schechtman, he does not argue that a narrative is required in order to establish numerical identity through time, thus he omits adequacy and accuracy criteria and argues that an individual can construct their narrative based on a subjective prioritization of personality traits, values, and past deeds to answer the question 'Who am I?'. Together, these two first-person accounts of continuity have dominated discussions of identity in situations where neuro-interventions, either surgical or pharmacological, lead to psychological changes.

There are two primary reasons to doubt that narrative identity is necessary for the maintenance of the diachronic self. First, narrative

identity is too restrictive because it excludes individuals, either animal or human, who have a diachronic self despite the inability to establish or to maintain a narrative. Second, narrative views fail to account for the maintenance of continuity of self despite even significant psychological changes associated with some neurological conditions that affect an individual's ability to maintain a narrative.

In this paper, I build on some of the features of narrative identity views, but I reject the identification of continuity with a narrative. In line with both Schechtman and DeGrazia, I maintain the distinction between questions of self-constitution and those of maintenance of numerical identity through time. In this paper, I focus only on providing a first-person account of the continuity of the self in order to identify situations where psychological changes may lead to an identity crisis. To evaluate the moral significance of psychological changes that result from DBS or BCI, it is important to identify whether they have effects on the first-person sense of continuity. This is a dimension of continuity that traditional criteria of personal identity do not capture. For this reason, the aim of the paper is to characterize the concept of self that captures the first-person experience of continuity and identifies circumstances in which an individual might experience and identity crisis.

The primary purpose of this paper is not to establish a metaphysical criterion of identity through time. The notion of the self proposed in this paper is psychological, in the sense that the character and the boundaries of the self are set by human psychology and that may be determined empirically. Throughout the paper, I omit the term 'identity' in favour of 'continuity' and I use the term 'personal continuity' instead of 'personal identity'. I occasionally continue to utilize the more evocative term 'identity crisis', especially in Section 5, but I define it as a first-person continuity crisis.

3. The Self-Concept View

The self-concept view identifies personal continuity with the maintenance of a concept of self over time. The notion of concept utilized in this paper is one where the possession of a concept is exhibited by the individual's ability to reliably identify a particular object or entity characterized by the concept. In effect, my view is an attempt at characterizing the structure of concepts of self. I am not committed, however, to the view that there is a self that is independent from our ability to individuate a particular self through the utilization of that

concept. This way of conceiving of the self is compatible with evidence that a unitary self might not be identifiable at the neurological level of explanation (Gazzinga, 1998; Farah and Heberlein, 2007), although I disagree with the conclusion sometimes drawn from this evidence that the self is an illusion.

Aspects of my account are compatible with Gallagher's (2013) pattern theory of the self. For example, we both commit to the view that the self emerges as an individual establishes their self as distinct from everything else in their environment. In addition, like Gallagher, I assume that the individual needs to have psychological abilities required for intersubjective existence, including the ability to identify one's own psychological states, and to ascribe such states to others. Our views are distinct because, as Gallagher argues, the pattern theory of self is a 'meta-theory of self that describes schemas for possible theories of self' (*ibid.*, p. 3). My view is a proposal for how individual selves are established. Moreover, I develop a diachronic view of the self, which explains how continuity is maintained over time.[2]

The development of a self-concept rests on the ability to self-ascribe certain features. For example, for any feature, say the feature of having thumbs or having limbs, an individual should be able to self-ascribe, under the right condition, thumbs or limbs, i.e. form beliefs of the sort 'This is my thumb'. A concept of self, in its most rudimentary form, serves to distinguish an individual from the rest of the world. Having a concept of self means that a person can distinguish between themselves and other objects or creatures. As a concept of self becomes more complex, an individual becomes able to make fine-grained distinctions that allow them to form a concept of self that is composed of a set of physical and psychological features. A developed self-concept includes self-ascriptions of physical features, i.e. those pertaining to one's body, and psychological features, such as

---

2 An application of Gallagher's pattern theory of self was proposed by Dings and de Bruin (2016). They maintain that a particular pattern of self emerges from the interaction between the individual and the environment and describe how both psychiatric conditions and DBS might affect this pattern. The pattern theory of self allows for narrative identity to be a necessary component of the maintenance of self, and my argument is attempting a view without that requirement. Although my account could be subsumed into a pattern theory view as it is in line with the claim that selves emerge from the interaction between the individual and the environment, broadly construed, my view excludes accounts on which narratives are a necessary component of the pattern.

thoughts, beliefs, and sensations.[3] In addition, it requires the self-ascription of character traits, such as being introverted, funny, coura-geous, bookish, and so forth. One might also identify with certain past happenings or actions in their life, say as being the person who was bullied in high school or as one who had their first kiss in fifth grade.

Self-ascription of some traits does not establish continuity over time. For example, one might self-ascribe physical features, such as having two legs and two thumbs, but those do not require a continuing self. One could self-ascribe limbs to a synchronic self. A diachronic concept of self emerges as one self-ascribes belonging to categories of things that continue over time. For example, to self-ascribe the attri-bute of being an animate object, one would have to have at least a rudimentary concept of an object as distinct from other objects. And as a concept of object includes features that require the persistence through time, self-categorizing as a distinct object would require self-ascribing endurance through time. In addition, to categorize oneself as an animate object, one would need to be able to distinguish between animate and inanimate objects and be able to distinguish between those two categories of objects. To do that, one would not need to have the explicit thought to the effect 'I am an animate object' — but they would need to be able to display the implicit possession of the concept 'animate object'. Here, I am not attempting an empirically accurate rendition of the developmental stages of concept formation. The purpose of this recounting is to illustrate how self-ascriptions of attributes would lead to a concept of self that maintains continuity. The rudimentary concept of self forms through the self-ascription of attributes that require a bearer that continues through time.

Similarly, self-ascriptions of mental states, i.e. the ability to identify certain pains as *my* pains or certain doubts as *my* doubts, could be achieved with a synchronic concept of self. One could, from moment to moment, self-ascribe certain psychological states to oneself, e.g. being in pain, without being able to do what Locke argued is required for personal identity: '…it is the same self now it was then, and it is by the same self with this present one that now reflects on it…' (Locke, 1690/1995, pp. 180–1). But as one attempts to self-categorize

---

[3] Throughout the paper I categorize some traits as physical and some as psychological to capture the various features of an individual that might be self-ascribed or that might change over time. I use these two categories as short-hand to circumvent the need to list all the relevant changes each time they are mentioned. This categorization is not an endorsement of a view that there are psychological features that are not physical.

as being an individual who experience pains and thoughts, the category 'individual' requires the concept of endurance over time. As one's conceptual framework expands and as the number of self-ascribed attributes increases, a continuity of the self over time is established because the attributes incorporated into the concept of self require continuity over time. For example, having a memory requires continuity over time. One can have a painful sensation with only a synchronic concept of self. But to have a memory of pain, one must have at least a very rudimentary concept of a self that endures through time. Thus, self-ascribing a memory requires a diachronic concept of self. This should not be taken to mean that a diachronic concept of self actually requires the veracity of memories. On my account, one has a diachronic concept of self as long as one has a memory of an event that happened in the past even if the memory does not accurately characterize the events or the individual having the memory. As I will discuss in Section 4, there is empirical evidence that supports the claim that maintenance of memories is not most crucial for the maintenance of a concept of self. In addition to memory, self-ascriptions of other psychological characteristics, such as personality traits, temperament, moral values, require a bearer that endures over time.

A concept of self is complex because it requires the acquisition of several additional concepts, such as concepts required for identifying objects, for identifying legs, for identifying inanimate objects, etc. Similarly, it requires the possession of related psychological concepts, such as the concept of memory, or pain, or thought. In addition, to think of oneself as funny or courageous one would have to have at least a minimal conception of courage or of what might be required to have a good sense of humour. Thus, a concept of self requires the possession of other concepts. In effect, having a concept of self requires the possession of a conceptual framework that allows individuals to characterize themselves as having physical and psychological traits. Each of those features require the possession of a concept. More broadly, one could argue that having a concept of self requires the endorsement of a folk-psychological conceptual framework that attributes to each individual and to oneself a certain set of psychological features, such as beliefs, desires, and sensations, to explain and predict human behaviour. This conceptual framework would include the ascription of the concept of self to other people. In other words, each individual assumes that other individuals sufficiently similar to them also have a concept of self. Thus, the possession of a concept of self requires at least a minimal endorsement of a

common-sense psychological framework. The structure of the concept of self would then in turn depend on both the character of the background conceptual framework endorsed by each individual and by the role the concept of self plays in that framework.

Everyone has a variety of physical and psychological features, but not all those features are self-ascribed, e.g. a low level of vitamin B, and even the ones that are self-ascribed, e.g. being flat-footed, are not all incorporated into one's concept of self. A concept of self is formed through a selection of self-ascriptions based on the individual's own judgment about which one of those traits is most important for the maintenance of their self through time. Based on my view, continuity is identified with the maintenance of a concept of self formed through a first-person selection of self-ascriptions. It is important to note that concepts of self are not always formed through a consciously moderated selection of traits. Self-ascriptions could become incorporated into a concept of self without the individual realizing that a particular trait has become important for their continuity. In fact, it could be the case that one might become aware of a particular self-ascription as constitutive of one's concept of self only when it is in some way challenged. For example, I might realize how important a good sense of humour is to me only when others do not laugh at my jokes. Before I defend my subjectivist approach in Section 4, I will examine the relationship between linguistic abilities and self-concepts.

3.1. Continuity as maintenance of concepts not narratives

As I described earlier, a concept of self begins as rudimentary, and it develops in complexity as individuals expand their background conceptual framework. Although the establishment of a rudimentary concept of self does not require linguistic abilities, a complex concept of self includes linguistic concepts but does not require a narrative. For example, a child might have a self-concept that includes a number of self-ascriptions, based on preferences and even personality traits, that help that child establish continuity and that can account for the fact that the child cares about what happens to them and why they might look forward to some future happening or dread others. It would be too demanding, however, to require that this child's self-concept or even the child's self-ascriptions depend on the possession of a linear, coherent, and accurate autobiographical narrative. Similarly, older adults might begin experiencing changes in their vocabulary and in their verbal ability, especially those with amnestic types of dementia,

such as Alzheimer's dementia. Thus, their ability to maintain a linear, coherent, and accurate narrative might diminish over time. Nonetheless, they can maintain a concept of self that helps undergird a sense of continuity because they retain some of their self-ascriptions as well as the ability to self-ascribe. By not requiring the maintenance of a narrative, the self-concept view can account for a first-person concept of self and self-continuity in more individuals.

Narrative identity is also restrictive because it requires linguistic abilities. If the requirement for continuity is maintenance of a narrative, then only linguistic creatures can establish a continuity of self. The reason to opt for a view that allows for self-concepts without a linguistic structure is because there is evidence that pre-linguistic humans, i.e. infants, seem to possess concepts (Baillargeon, Spelke and Wasserman, 1985; Spelke, 1982; Wynn, 1992; Simon, Hespos and Rochat, 1995; Koechlin, Dehaene and Mehler, 1998). Similarly, there is evidence that some birds can make distinctions that indicate that they possess concepts (Clayton, Bussey and Dickinson, 2003; Emery, Dally and Clayton, 2004; Carey, 2009). If these data establish concept possession, then linguistic ability is not required for all concepts.

Given that my view is that a concept of self is embedded in a folk psychology, having a concept of self of the kind most adult humans have includes linguistic concepts. As Nelson and Fivush (2020) argue, the self is multimodal, as it might include sensory, representational, and linguistic content. The rudimentary concept of self developed in infancy is not linguistic and it stands to reason that individuals whose linguistic abilities are compromised through progressive neurological diseases might slowly revert back to this least complex self-concept, which allows them to distinguish themselves from their environment, but not to maintain a complex self that require the possession of primarily linguistic concepts,

The rudimentary concept of self is necessary for the first-person maintenance of self and is the basis for the complex concept of self. The only self-ascriptions that are required for the maintenance of self on my view are those that underpin the establishment of the rudimentary concept. Hence, if a person cannot maintain or distinguish themselves from the environment, they do not have a concept of self. It is this rudimentary concept of self that permits me to argue that

concepts of self are possible even for creatures or persons that do not have linguistic abilities.[4]

Much of the complex concept of self begins to emerge in childhood and it requires concepts of abstract objects or psychological states, which are linguistic in character. The maintenance of a complex concept of self rests on a selection of self-ascriptions identified by the individual as required for continuity through time. And, as I will argue in the final section of the paper, it is the loss of continuity of this self that underlies an identity crisis.

Given that I think that a diachronic concept of self can be established without reliance on linguistic content, I disagree with the view that narratives are required for the maintenance of self. In addition, even self-concepts that have linguistic components do not require a narrative. As stated earlier, children have concepts of self without having an autobiographical narrative. However, possession of a narrative and having a self-concept are not incompatible. It might be the case that many individuals possess and maintain a narrative that provides coherence between their past and future selves. For example, both DeGrazia (2005) and McAdams (2013) argue that narratives provide both the motivation and the self-regulation required to act in accordance with one's concept of self. However, the basis of continuity and of the maintenance of a self over time is not the maintenance of that narrative, but the maintenance of a self-concept.

Concepts of self, even when they include linguistic components, do not depend on a narrative for their structure as there is no reason to assume that narratives are necessary for the ability to self-ascribe. As I argued previously, self-ascription can occur pre-linguistically and linguistic self-ascription can occur prior to and without a narrative. This does not exclude the possibility that some self-ascriptions might be the result of an autobiographical narrative. My argument is not that

---

4   I would like to distinguish my view from the account of the minimal self presented in Zahavi (2005). Zahavi argues that self-awareness is a precondition for awareness. In other words, and individual cannot be phenomenally conscious of an experience, say a pain, without being self-aware, which is that there is something it is like for that individual to experience pain. My view is not taking a stance on which theory of consciousness is most apt to characterize self-consciousness. The primary aim of my argument is to characterize the concept required to maintain a diachronic self, which would in principle be compatible with a view that a sense of self, as Zahavi characterizes it, arises from phenomenal self-awareness. This, however, does not exhaust the concept of self that I have in mind, which is a multimodal concept and would likely require both phenomenal and access consciousness, as formulated by Block (1995).

there are not narrative selves; rather, the argument is that both self-ascriptions and self-concepts are prior to narrative selves. Most importantly, the deterioration or perhaps even of the loss of a narrative is not an indication of a loss of self, as will be demonstrated in Section 4.

4. Defending Subjectivism About the Self

The view of the self I propose is subjectivist because judgments of accuracy and adequacy of a self-concept are fixed from the first-person perspective. Given that this type of subjectivist view can be seen as overly permissive, I will respond to (what strikes me as) one of the primary objections to my view, which is that I do not set any normative, *a priori* criteria for the accuracy or adequacy of self-concepts.

In what follows, I argue that subjectivism about the self is the most suitable account to fit a combination of available data and intuitions about the self. First, I will show why accuracy criteria for self-ascriptions are not enough to establish an objective criterion for the accuracy of a self-concept. Second, I demonstrate that prioritizing the feeling of continuity from the first person, instead of establishing specific self-ascriptions as necessary for the maintenance of self, best accommodates data about the resiliency of self over time. Third, I show how subjectivism about accuracy and adequacy can be maintained even when concepts of self are formed because of social and relational influence.

Schechtman (1996) proposes an accuracy criterion when she argues that a narrative needs to be free of factual errors. Schechtman argues that, when constructing their narrative identity, individual's might make both factual errors and errors of interpretation. Her argument is that factual errors can undermine the accuracy of one's self-construction, and ultimately narrative identity, while errors of interpretation are more tolerable.

There are two reasons to resist these reasonable limits to subjectivism about the self. The first is that the criterion of accuracy proposed by Schechtman is suited to assess whether certain facts are true of an individual, i.e. whether an individual possesses a particular feature. However, a concept of self is a selection of self-ascriptions. To assess whether somebody has an accurate concept of self requires a criterion to determine whether they have made the right selection of self-ascriptions for their continuity, and not merely whether they have

made accurate self-ascriptions. As I have stated before, the concept of self is a selection of self-ascriptions and an objectivist criterion of the self would need to adjudicate between accurate and inaccurate concepts of self. The accuracy criterion offered by Schechtman may be used to identify inaccurate self-descriptions, but not to adjudicate whether the particular selection of self-ascriptions accurately represent one's self.

The second reason to doubt the usefulness of accuracy criteria for self-ascriptions is that the truth of most self-ascriptions is a matter of interpretation, which narrows even further the domain of the accuracy criterion proposed by Schechtman. For example, if an individual thinks they are charitable or humorous, the extent to which an individual possesses those attributes is a matter of interpretation. Picking any objective criterion, e.g. the amount of money donated to charities, would always underdetermine whether an individual can be considered charitable. This is also true for physical traits. For example, an individual's height is an empirically evaluable fact, but whether they are considered tall depends on context. Average heights vary across countries and somebody who might be considered tall in the US might be of average height in Europe. Predicates such as 'tall', 'average', or 'short' are all vague and can be made more precise only within a certain context. Thus, the requirement that self-concepts be free from factual errors is not adequate as it would exclude a very limited number of concepts of self, such as those that are based primarily on factually false self-ascriptions, e.g. an individual thinking that they are 100 feet tall or that they are Napoleon.

An objectivist account of the self was proposed by Erler (2011), who argued that an individual ought to have a view of themselves that incorporates how others see that person and how they treat them. Although this account moves away from proposing solely an accuracy criterion of self-ascriptions, it presumes that other people's interpretations of the applicability of self-ascriptions are more likely to be accurate. For example, if my mother and I are assessing whether I am charitable, our accuracy depends on applying a criterion for what counts as being charitable. Although my mother and I might agree on the same definition and the same application of the term 'charitable', our agreement would not indicate that our utilization of that term is universal or that it is objective. And if we had a disagreement about either the definition or the application of charitability as it applies to me, Erler's requirement would be that I somehow prioritize my mother's view on charitability over my own. Prioritizing other

people's ideas of who an individual is raises ethical perils, including the potential to accentuate harmful restrictions on self-concepts that will be discussed latter in this section.

The second feature of my subjectivism is the claim that no self-ascription or combination of self-ascriptions is necessary for the maintenance of continuity. A person with a self-concept comprised of a combination of physical or psychological features at age 35 may experience significant changes over time and may self-ascribe a very distinct set of features at age 65. The reason to think that continuity of self does not depend on the maintenance of particular self-ascriptions is the evidence for the relative resiliency of self-concepts.

To support my argument that self-concepts are resilient, I will describe evidence on the maintenance of self despite even significant changes. These data are clustered around features that were traditionally considered necessary for the maintenance of identity over time, such as continuity of memory or persistence of character.

First, individuals can withstand even significant losses to their memory without experiencing a corollary loss of self-concept. For example, Eustache *et al.* (2013) assessed the concept of self in patients with advanced Alzheimer's dementia (AD) by using the I-AM test which requires spontaneous self-definition by finishing sentences of the form 'I am…' with a self-description. They also utilized the IMAGE test, which requires rating of self-descriptive statements, such as 'I'm an honest person' or 'I tell lies far too often'. The study showed that even individuals with advanced AD had a persistent sense of self. Another study by Addis and Tippett (2004) investigated the connection between concepts of self in individuals with AD and their autobiographical memory. They discovered that patients with AD in the mild-to-moderate stages had what was characterized as a 'weaker sense of identity'. However, deficits in memory only very weakly correlated with their performance on the identity measures, indicating that loss of autobiographical memories was not the primary culprit for the weaker sense of self in individuals with AD.

Second, as Quoidbach, Gilbert and Wilson (2013) demonstrated, people maintain their personal continuity despite significant changes in personality over a lifetime. In addition, several recent studies designed to identify the essential aspects of the folk-psychological conception of self demonstrated that persistence of personality traits was not considered primarily important for continuity. In a series of studies, Strohminger and Nichols (2014) identified changes in moral beliefs as most important for continuity of self, while psychological

changes, such as shyness or absent-mindedness, were the second most important. Strohminger and Nichols investigated more targeted changes, such as asking participants to imagine a person taking a pill that could change a more specific aspect of themselves. This approach revealed that changes in morality, including changes in moral behaviour (e.g. lying or cheating) and moral traits (e.g. being compassionate or generous), were considered the most determinative of discontinuity in, what they called, personal identity. In a study further investigating the importance of moral tenets on the continuation of identity, Heiphetz, Strohminger and Young (2017) identified that maintenance of widely held moral beliefs, e.g. that murder is wrong, was most important for continuity of self over time.

Taken together, these data seem to indicate that, despite even significant, normal or pathological, changes, concepts of self remain resilient, where the only change that precipitated judgments of discontinuity were radical changes in moral commitments. But even in those situations, it is not clear that an individual undergoing those changes experienced a discontinuity of self. For example, individuals with certain types of dementia, such as behavioural-variant frontotemporal dementia (bv-FTD), undergo just the type of moral changes described by Heiphetz, Strohminger and Young (2017): they are more likely to exhibit morally, and sometimes even legally, prohibited behaviour such as stealing, paedophilia, or even murder (Darby, Edersheim and Price, 2016). Nonetheless, several studies note the discrepancy between the patient's and caregiver's judgments about continuity of self for individuals with bv-FTD (*ibid.*; Rankin *et al.*, 2005), where caregivers noted the large changes in behaviour and personality while the individual with dementia did not. Thus, it is important to note that, despite predicted importance of basic moral commitments to continuity, even radical changes in morality might not cause a first-person discontinuity.

All this can be taken to support my claim that even significant changes in self-ascription need not precipitate a loss of a concept of self. I would like to underscore here that my argument is not that there aren't any changes in self-ascription that would lead to the loss of self. My claim is that the limits of the resiliency of self-concepts need to be established through empirical investigation. On my account, not every change in self-ascriptions would lead to a loss of self, but the account I propose could countenance that certain psychological changes would result in a felt discontinuity. This is the issue I explore in Section 5.

I will now defend the third element of subjectivism about the self. To accomplish that, I will tackle accounts of the genesis of self-concepts that could be seen as undermining the claim that concepts of self are created based on an independent first-person selection of self-ascriptions. Based on some accounts, social, communal, or familial influences cause the prioritization of certain traits important for one's concept of self. For example, Nyholm and O'Neill (2016) argue that it is our perception of the moral desirability of certain traits that guides personal identity formation.

Similarly, some approaches characterize the construction of personal identity as relational and therefore restricted by social, communal, and familial influences (Baylis, 2013). Baylis characterizes these influences as sometimes negative and as promoting the construction of an identity that might constrain individuals from being true to themselves (*ibid.*). Based on this view, each person's self-ascriptions depend in part on how society characterizes that individual. A woman might be expected to be caring, motherly, and selfless, and she might in fact self-ascribe those traits, but her self-ascriptions are not arrived at independently; instead, society has a large role to play in the types of self-ascriptions each individual prioritizes for their sense of continuity over time. In line with this view is the idea that people might be hindered from forming self-concepts that are contradictory to social expectations for their gender, race, ethnicity, and so forth.

The view I am proposing can explain how social influences can be determinative of a concept of self. Based on my account, there are certain traits that are pre-social and pre-linguistic. These self-ascriptions are those that allow for the very basic distinctions of the individual from the environment, including identification of certain physical and some basic psychological aspects that establish continuity over time. The development of a rudimentary concept of self might require interaction with other individuals, i.e. one's parents. This would be akin to the way in which certain kinds of social triggers are required for the development of language. However, rudimentary concepts of self do not depend on the learning of any socially established categories that sometimes lead people to self-ascribe features that given a different set of social circumstances they would not be inclined to self-ascribe.

More developed concepts of self, that include differentiation of oneself from other people by self-ascribing a unique combination of psychological and physical features, require the learning and the adoption of a conceptual framework that is developed within a

particular cultural context. The concepts within that framework will depend on communally established categories. For example, a self-attribution of courage requires the acquisition of the concept of courage. Although the concept might have some universal features, the specification of the concept will differ across cultures. Further-more, learning what it takes to be courageous will include learning about who should be attributed courage, and if one lives in society where courage is associated with only particular professions or kinds of individuals, then an individual who is not in those groups might also be less likely to self-ascribe courage and to develop a self-concept that includes that attribute.

Learning what is appropriate or expected for each person based on sex, gender, race, nationality, etc. might make it more likely that self-ascriptions are not always independently selected. Instead, it might be the case that each of our self-concepts are guided by generalizations or stereotypes established for certain categories of individuals. This need not always be a forceful imposition of an unsuitable concept of self, as some individual's endogenous concepts of self might align with socially, regionally, or culturally established generalizations.

Nonetheless, this social and relational aetiology of self-concepts should not undermine the argument for the primacy of the first-person standards for accuracy and adequacy of self-concepts. There are several reasons for this. One is that the causal origins of a concept of self are not also an accuracy criterion for the concept of self. Just because social and normative influences lead to the development of certain self-ascriptions, there is no reason to think that those influences lead to an accurate concept of self, as Baylis (2013) points out. Another reason is that utilizing the aetiology of a concept of self to establish an objectivist account can accentuate unwanted and restrict-ive stereotypes. Thus, adopting a subjectivist account that prioritizes the first-person selection of self-ascriptions for the maintenance of self would diminish the unwanted social and normative restrictions on the self. Yet another reason is that the limits to both psychological and physical transformation have been expanding and the types of traits that could be acquired through medical or technological means have enlarged as well. We can change in ways that were not possible before and the biological limits to our concept of self are becoming obsolete. This in turn makes on objectivist account of the continuity of self inadequate given that individuals can opt to change their traits to achieve coherence with their desired self-concept.

5. Change and Discontinuity

At this point, I can return to the issues raised by neurotechnology when their use contributes to psychological changes. There are studies that document psychological changes in people who had undergone DBS as treatment for medical conditions (Baertschi *et al.*, 2019; Gilbert, 2012; Gilbert *et al.*, 2017; Schüpbach *et al.*, 2006). There is uncertainty to what extent use of DBS is the primary contributor to those changes (Gilbert, Viaña and Ineichen, 2018) or whether other factors might lead to those changes. For example, Baertschi *et al.* (2019) and Gilbert (2012) argue that some of the post-operative psychological changes associated with DBS treatment are the result of the burden of normalcy (BoN) syndrome. BoN syndrome can be used to describe the psychological changes associated with successful treatment when the patient is expected to transition from conceiving of themselves as being chronically ill to being well. I will set these issues aside because my goal is to address the question of what types of changes to the concept of self, regardless of aetiology, could result in a continuity crisis, which is the first-person sense of discontinuity of self that could be expressed by saying 'I don't know who I am anymore' or 'I am not who I used to be'.

Given that on my account a concept of self is a selection of self-ascriptions, it can explain why even significant psychological or physical changes do not result in personal discontinuity. Many traits that one self-ascribes are not traits that are part of one's concept of self and thus much change can occur without causing a continuity crisis. A personal discontinuity, on my account, could arise when there are shifts in the self-ascriptions that are constitutive of one's concept of self. These changes could be the result of large shifts in self-ascriptions constitutive of a concept of self of the kind that could be the outcome of a religious conversion or drastic change in lifestyle.

In addition, a change in a concept of self could arise due to a change in a single prized self-ascription. For example, if a comedian no longer thinks of themselves as funny. Or if an Olympic runner becomes unable to run. Thus, a continuity crisis may arise gradually or suddenly depending on the aetiology of the change in the concept of self. On my account, personal continuity is maintained so long as an individual is not experiencing a continuity crisis.

Finally, a continuity crisis trails changes in self-ascription, but they do not precede them. It is possible for an individual to anticipate a change in self-ascriptions as a result of a medical intervention, but the

sense of discontinuity is the result of the change. In addition, and this could be in line with some of the data on the resilience of the self, an individual might be wrong in their prediction that particular changes in self-ascription will cause a feeling of discontinuity.[5] With this view of personal discontinuity as our basis, I will now investigate whether psychological changes caused by neurotechnology result in a discontinuity of self.

A continuity crisis could occur when an individual experiences changes in certain self-ascriptions and becomes unable to re-establish their most recent concept of self. Based on the self-concept view, there are three discernible circumstances in which such an identity crisis could arise. The first one could arise when there is a conflict between one's self-concept and the way others see that person and the way they treat them. This could arise in situations where restrictive stereotypes about groups of people could stifle more independent development of a self-concept. In addition, it could occur in situations where certain self-ascriptions prioritized by the individual are not morally acceptable to their community. Also, it could happen in a situation where an individual's self-concept clashes with certain physical or biological limits.

All these types of situations could be precipitated by brain technology. For example, Agid *et al.* (2006) describe patients who after undergoing neurostimulation as treatment for Parkinson's disease reported a variety of psychological sequalae. Some patients experienced changes in bodily self-ascriptions and others experienced psychological changes. Interestingly, for some patients the psychological changes caused difficulties in their close relationships. For example, one patient felt that their spouse wished to retain pre-treatment roles of caretaker and patient even after recovery from physical symptoms had been achieved and the patient was able to assume more independence. This study showed that if brain stimulation contributes to changes in self-concept, those changes could

---

[5]   I argued in Section 3 that one of the advantages of my account is that it is more inclusive than narrative accounts because it extends the possession of a concept of self to young children and animals. It is possible, however, that children, for example, might not be able to experience a continuity crisis. This might be either because very young children only have a rudimentary concept of self, which is likely fixed and does not change, or because they cannot become aware of the changes that usually lead to a discontinuity. Thus, on my account, the set of individuals who might have a continuity crisis is smaller than the set of those who have a concept of self. I am grateful to an anonymous reviewer for pointing this out.

precipitate a clash between patient self-concepts and caretaker views of the patient. Gilbert (2012) and Baertschi *et al.* (2019) report that some patients who experience the sudden relief of their physical symptoms have difficulty re-establishing their concept of self after DBS and report something akin to an identity crisis. For example, they might report that they cannot recognize themselves without the physical symptoms they had before. Nonetheless, the data are mixed as some patients report feeling more like themselves after DBS (Gilbert, 2012).

The second circumstance in which an identity crisis could occur is when there are substantive changes to the individual's background conceptual framework in ways that alter concepts constitutive of their self. For example, one could experience such a crisis through displacement or immigration. If we assume that aspects of our self-concept are culturally or socially developed, then changing environments might affect one's concept of self. This might be because, as Nyholm and O'Neill (2016) argue, we self-ascribe traits that are considered morally favourable or desirable in some way, and as there are regional variations in values, moving among cultures might cause changes to the background framework constitutive of one's concept of self. Again, such a change could be precipitated through technological intervention. For example, Maslen, Pugh and Savulescu (2015) address the issue of whether DBS for anorexia nervosa might effect change in desires or values, such as the desire to be thin or valuing being thin. DBS could precipitate changes that might require the recalibration of one's self-concept and the abandonment or changes in either desires or values.

A shift in conceptual framework could also come from the contrast between the neuroscientific perspective on the self and the first-person perspective. Leunberger (2021) argues that neural interventions can make conspicuous to the individual undergoing a neural intervention that their actions, feelings, etc. have neural underpinnings. According to Leunberger, an uncontrolled shift from the first-person perspective to a biochemical perspective, which is sometimes caused by the use of neural intervention, could lead someone to question the accuracy of their identity.

Kreitmair (2019) similarly emphasizes this clash when she argues that being inundated with data about ourselves, e.g. smart devices that track and record our bodily function, could affect our selves as well. Changes in perceptual data or the gaining of new sensory access might also lead to shifts in self-ascription. For example, when an individual

receives a cochlear implant, access to auditory stimuli would lead to new perceptual beliefs, such as that cars make honking noises or that babies cry loudly. This might alter self-ascriptions through the addition of new concepts to the background conceptual framework within which concepts of self are embedded. In addition, access to auditory stimuli would lead to new auditory self-ascriptions, e.g. 'I'm hearing a loud cry'. Whether any of these changes leads to an identity crisis is not known, but it raises the possibility of such a crisis given that they lead to changes in self-ascription.

A third situation in which an identity crisis could occur is when one's rudimentary self-concept begins to erode. For example, in cases of very advanced dementia, individuals become unable to self-ascribe enough traits to establish continuity over time. But, in such cases, an individual becomes unable to establish a concept of self rather than unable to establish continuity between an earlier and a current concept of self. Thus, it might be the case that instead of a continuity crisis, severe dementia might induce a loss of a self-concept.

In sum, a continuity crisis might occur in situations where: there is a mismatch between one's own concept of self and the way others see the individual; there are significant changes to concepts that are constitutive of one's concept of self; and when an individual becomes unable to maintain a rudimentary concept of self.

I contend that the primary criterion for whether an individual is undergoing a continuity crisis is the first-person report that such a crisis is occurring. I identified three potential situations when an identity crisis might occur. Brain technology, I argued, might precipitate situations one and two, as the psychological changes associated with DBS could, in principle, cause a recalibration of elements of one's concept of self. But there is no *a priori* reason to think that brain interventions, even when they result in psychological changes, will result in a continuity crisis.

As I mentioned in Section 4, not all traits of an individual are self-ascribed nor are all self-ascribed traits incorporated into a self-concept, thus many changes in traits or self-ascriptions will not influence one's concept of self. To the extent that brain interventions change traits incorporated into one's concept of self, they still need not result in a discontinuity because all that is required for continuity is the maintenance of some cluster of self-ascriptions, but not the maintenance of particular self-ascriptions. Even changes to self-ascriptions incorporated into a self-concept need not cause an identity

crisis as continuity could be maintained through a recalibration of one's self-concept.

In order to identify the types of conditions that might give rise to an identity crisis, we would need to do empirical work investigating the boundaries of the resiliency of self-concepts. In addition, more data are needed on the prevalence of identity crises and the types of conditions that give rise to them. It seems plausible that patterns would emerge as there might be psychological universalities regarding how a self-concept is formed and types of situations that might give rise to a discontinuity. Thus, to determine what kinds of psychological changes might result in a continuity crisis, we should rely on empirical evidence that establishes an association between psychological changes and first-person discontinuity. This is the type of evidence that would help us improve how we inform individuals interested in the use of neurotechnology about the potential side effects of the treatment. Knowing what type of changes in psychology would give rise to a continuity crisis would allow us to both alleviate the fear of such crises when those are unlikely to occur and to accurately warn people when a particular neurotechnology poses a high risk of an identity crisis.

6. Conclusion

In this paper, I argued for the view that personal continuity depends on the maintenance of a concept of self over time. I argued that a rudimentary concept of self is established through the self-ascription of a combination of physical and psychological attributes that establish an individual as distinct from everybody else. I also argued that a complex concept of self is formed through the first-person selection of particular self-ascriptions. Moreover, I argued that an identity crisis is best defined as a first-person sense of discontinuity that might occur in situations where an individual becomes unable to establish continuity between their past and current self-concept. I showed that, although brain technology might precipitate changes in self-ascriptions, there are no *a priori* reasons to think that those changes in self-ascriptions will result in an identity crisis. To support this view, I described evidence for the relative resiliency of self-concepts despite even significant changes in self-ascriptions over time precipitated by changes in memory or in personality. I concluded that even when the use of brain technology contributes to psychological changes, those

are not a threat to personal continuity unless they cause an identity crisis.

References

Addis, D.R. & Tippett, L.J. (2004) Memory of myself: Autobiographical memory and identity in Alzheimer's disease, *Memory*, **12** (1), pp. 56–74. doi: 10.1080/09658210244000423

Agid, Y., Schüpbach, M., Gargiulo, M., Mallet, L., Houeto, J.L., Behar, C., Maltête, D., Mesnage, V. & Welter, M.L. (2006) Neurosurgery in Parkinson's disease: The doctor is happy, the patient less so?, *Journal of Neural Transmission*, **70** (Suppl.), pp. 409–414. doi: 10.1007/978-3-211-45295-0_61

Baertschi, M., Flores Alves Dos Santos, J., Burkhard, P., Weber, K., Canuto, A. & Favez, N. (2019) The burden of normality as a model of psychosocial adjustment after deep brain stimulation for Parkinson's disease: A systematic investigation, *Neuropsychology*, **33** (2), pp. 178–194. doi: 10.1037/neu0000509

Baillargeon, R., Spelke, E.S. & Wasserman, S. (1985) Object permanence in five-month-old infants, *Cognition*, **20** (3), pp. 191–208. doi: 10.1016/0010-0277(85)90008-3

Baylis, F. (2013) 'I am who I am': On the perceived threats to personal identity from deep brain stimulation, *Neuroethics*, **6** (3), pp. 513–526. doi: 10.1007/s12152-011-9137-1

Block, N. (1995) On a confusion about a function of consciousness, *Behavioral and Brain Sciences*, **18** (2), pp. 227–247. doi: 10.1017/S0140525X00038188

Carey, S. (2009) *The Origin of Concepts*, Oxford: Oxford University Press.

Clayton, N.S., Bussey, T.J. & Dickinson, A. (2003) Can animals recall the past and plan for the future?, *Nature Reviews Neuroscience*, **4** (8), pp. 685–691. doi: 10.1038/nrn1180

Darby, R.R., Edersheim, J. & Price, B.H. (2016) What patients with behavioral-variant frontotemporal dementia can teach us about moral responsibility, *AJOB Neuroscience*, **7** (4), pp. 193–201. doi: 10.1080/21507740.2016.1236044

DeGrazia, D. (2005) *Human Identity and Bioethics*, Cambridge: Cambridge University Press.

Dings, R. & de Bruin, L. (2016) Situating the self: Understanding the effects of deep brain stimulation, *Phenomenology and the Cognitive Sciences*, **15**, pp. 151–165. doi: 10.1007/s11097-015-9421-3

Emery, N.J., Dally, J.M. & Clayton, N.S. (2004) Western scrub-jays (Aphelocoma californica) use cognitive strategies to protect their caches from thieving conspecifics, *Animal Cognition*, **7** (1), pp. 37–43. doi: 10.1007/s10071-003-0178-7

Erler, A. (2011) Does memory modification threaten our authenticity?, *Neuroethics*, **4** (3), pp. 235–249. doi: 10.1007/s12152-010-9090-4

Eustache, M.L., Laisney, M., Juskenaite, A., Letortu, O., Platel, H., Eustache, F. & Desgranges, B. (2013) Sense of identity in advanced Alzheimer's dementia: A cognitive dissociation between sameness and selfhood?, *Consciousness and Cognition*, **22** (4), pp. 1456–1467. doi: 10.1016/j.concog.2013.09.009

Farah, M.J. & Heberlein, A.S. (2007) Personhood and neuroscience: Naturalizing or nihilating?, *American Journal of Bioethics*, **7** (1), pp. 37–48. doi: 10.1080/15265160601064199.

Gallagher, S. (2013) A pattern theory of self, *Frontiers in Human Neuroscience*, **7**. doi: 10.3389/fnhum.2013.00443

Gazzaniga, M. (1998) *The Mind's Past*, Berkeley, CA: University of California Press.

Gilbert, F. (2012) The burden of normality: From 'chronically ill' to 'symptom free'. New ethical challenges for deep brain stimulation postoperative treatment, *Journal of Medical Ethics*, **38** (7), pp. 408–412. doi: 10.1136/medethics-2011-100044

Gilbert, F. (2015) A threat to autonomy? The intrusion of predictive brain implants, *AJOB Neuroscience*, **6** (4), pp. 4–11. doi: 10.1080/21507740.2015.1076087

Gilbert, F., Goddard, E., Viaña, J.N.M., Carter, A. & Horne, M. (2017) I miss being me: Phenomenological effects of deep brain stimulation, *AJOB Neuroscience*, **8** (2), pp. 96–109. doi: 10.1080/21507740.2017.1320319

Gilbert, F., Viaña, J.N.M. & Ineichen, C. (2018) Deflating the 'DBS causes personality changes' bubble, *Neuroethics*, **14** (Suppl. 1), pp. 1–17. doi: 10.1007/s12152-018-9373-8

Heiphetz, L., Strohminger, N. & Young, L.L. (2017) The role of moral beliefs, memories, and preferences in representations of identity, *Cognitive Science*, **41** (3), pp. 744–767. doi: 10.1111/cogs.12354

Koechlin, E., Dehaene, S. & Mehler, J. (1998) Numerical transformations in five-month-old human infants, *Journal of Mathematical Cognition*, **3**, pp. 89–104.

Kreitmair, K.V. (2019) Dimensions of ethical direct-to-consumer neurotechnologies, *AJOB Neuroscience*, **10** (4), pp. 152–166. doi: 10.1080/21507740.2019.1665120

Leuenberger M. (2021) Losing meaning: Philosophical reflections on neural interventions and their influence on narrative identity, *Neuroethics*, **14** (3), pp. 491–505. doi: 10.1007/s12152-021-09469-5

Levy, N. (2011) Enhancing authenticity, *Journal of Applied Philosophy*, **28** (3), pp. 308–318. doi: 10.1111/j.1468-5930.2011.00532.x

Locke, J. (1690/1995) *An Essay Concerning Human Understanding*, London: Everyman Press.

Maslen, H., Pugh, J. & Savulescu, J. (2015) The ethics of deep brain stimulation for the treatment of anorexia nervosa, *Neuroethics*, **8** (3), pp. 215–230. doi: 10.1007/s12152-015-9240-9

McAdams, D.P. (2013) The psychological self as actor, agent, and author, *Perspectives on Psychological Sciences*, **8** (3), pp. 272–295. doi: 10.1177/1745691612464657

Nelson, K. & Fivush, R. (2020) The development of autobiographical memory, autobiographical narratives, and autobiographical consciousness, *Psychological Reports*, **123** (1), pp. 71–96. doi: 10.1177/0033294119852574

Nozick, R. (1981) Personal identity through time, in Nozick, R., *Philosophical Explanations*, Cambridge, MA: The Belknap Press.

Nyholm, S. & O'Neill, E. (2016) Deep brain stimulation, continuity over time, and the true self, *Cambridge Quarterly of Healthcare Ethics*, **25** (4), pp. 647–658. doi: 10.1017/S0963180116000372

Quoidbach, J., Gilbert, D.T. & Wilson, T.D. (2013) The end of history illusion, *Science*, **339** (6115), pp. 96–98. doi: 10.1126/science.1229294

Parfit, D. (1984) *Reasons and Persons*, Oxford: Clarendon Press.

Perry, J. (1972) Can the self divide?, *Journal of Philosophy*, **69** (16), pp. 463–488.

Perry, J. (1978) *A Dialogue on Personal Identity and Immortality*, Indianapolis, IN: Hackett Publishing Company.

Rankin, K., Baldwin, E., Pace-Savitsky, C., Kramer, J. & Miller, B. (2005) Self awareness and personality change in dementia, *Journal of Neurology, Neurosurgery, and Psychiatry*, **76** (5), pp. 632–639. doi: 10.1136/jnnp.2004.042879

Rorty, A. (1976) *The Identities of Persons*, Berkeley, CA: University of California Press.

Schechtman, M. (1996) *The Constitution of Selves*, Ithaca, NY: Cornell University Press.

Schechtman, M. (2010) Philosophical reflections on narrative and deep brain stimulation, *The Journal of Clinical Ethics*, **21** (2), pp. 133–339.

Schechtman, M. (2014) *Staying Alive: Personal Identity, Practical Concerns, and the Unity of a Life*, Oxford: Oxford University Press. doi: 10.1093/acprof:oso/9780199684878.001.0001

Schüpbach, M., Gargiulo, M., Welter, M.L., Mallet, L., Béhar, C., Houeto, J.L., Maltête, D., Mesnage, V. & Agid, Y. (2006) Neurosurgery in Parkinson disease: A distressed mind in a repaired body?, *Neurology*, **66** (12), pp. 1811–1816. doi: 10.1212/01.wnl.0000234880.51322.16

Shoemaker, S. (1970) Persons and their past, *American Philosophical Quarterly*, **7**, pp. 269–285.

Simon, T., Hespos, S. & Rochat, P. (1995) Do infants understand simple arithmetic? A replication of Wynn, *Cognitive Development*, **10**, pp. 253–269.

Spelke, E.S. (1982) Perceptual knowledge of objects in infancy, in Mehler, J., Garrett, M. & Walker, E. (eds.) *Perspectives on Mental Representation*, Hillsdale, NJ: Lawrence Erlbaum Associates.

Strohminger, N. & Nichols, S. (2014) The essential moral self, *Cognition*, **131** (1), pp. 159–171. doi: 10.1016/j.cognition.2013.12.005

Wynn, K. (1992) Addition and subtraction by human infants, *Nature*, **358**, pp. 749–750.

Zahavi, D. (2005) *Subjectivity and Selfhood: Investigating the First-Person Perspective*, Cambridge, MA: MIT Press.