

## NEURAL GRAFTING: IMPLICATIONS FOR PERSONAL IDENTITY AND PERSONALITY

**Tuija Takala<sup>1</sup> and Tom Buller<sup>2</sup>**

<sup>1</sup>*University of Helsinki* and <sup>2</sup>*University of Alaska Anchorage*

**Abstract.** It is often suggested that advances in neurosciences will force us to re-think our customary notions of personal identity and personality. In this paper, we study a number of philosophical positions on these notions, especially in connection with mentally degenerative illnesses and neural grafting. We conclude that while the possible future treatments are likely to change the personalities and personal identities of patients, these changes will not pose any new challenges to the notions of personal identity and personality.

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### 1. Introduction

Not so very long ago, the idea that the brain could be ‘repaired’ would have seemed fanciful. If the brain were damaged or diseased, or functioned abnormally, there was very little that could be done about that. Furthermore, the common understanding was that brain cells, unlike other types of cells in the body, could not be replaced. Advances in neuroscience and the development of a variety of new neuro-technologies have changed our understanding about brain repair. Although still at an early stage, technologies such as deep brain stimulation, neural stem cell transplants, invasive and non-invasive brain-computer interfaces (BCI’s), and neuroprosthetics offer the prospects of significant therapeutic benefit to individuals suffering from neurodegenerative disorders, for example, Parkinson’s and Alzheimer’s disease or those who have suffered spinal cord injury (Anderson et al. 2004; Hochberg 2006; Okano and Sawamoto 2008).

Researchers, medical professionals, and patients are naturally excited about the future possibilities of neural grafting and related techniques. But the science behind them is still in its infancy and questions as to how the treatments would

actually work and whether they can be made safe remain open. Also, if tissue for transplants continues to be harvested from human embryos, a number of additional ethical issues will stay on the agenda. For the purposes of this paper, these problems will be bracketed, and it will be assumed that the therapies in question can be made to work safely and that the biomaterial needed can be obtained in an ethically acceptable way. The assumptions allow us to concentrate more specifically on the issues of personal identity and personality.

The implications of neural grafting on personality and identity can be considered from many angles – biologically, psychologically, and medically, to mention a few. The contribution of philosophers lies in giving content and meaning to the concepts employed. In bioethics, much of the discussion has had to do with telling persons (beings with personal identity and moral value) apart from nonpersons (beings without personal identity and hence with less or no moral value). Debates on the justified treatment of newborns, infants, animals, and people with significantly limited mental capacities often turn on this distinction. And during recent years, living wills and advance directives have added new nuances to the language of personhood. One of the questions that arises is: is the demented person or the seriously ill patient the same person who wrote the living will, and, consequently, is the document still valid? On a more theoretical level, similar issues are raised in Derek Parfit's *Reasons and Persons*, when we are asked to ponder the questions of identity in relation to "teletransportation" (Parfit 1984, 199–217). What if we could produce an exact and detailed blueprint of our bodies, transmit it to another planet, and then produce precise copies of the originals out of a different bunch of matter? If we did this, would we re-emerge on the surface of the other planet, or would the process only create copies of us?

## 2. Views on identity

Let us begin by different notions of personal identity and personality, and the implications of neural grafting on them. The literatures on neuroethics and personal identity are on the increase, but to date few contributions have tackled the issues together and at depth. Even in a recent issue of *Theoretical Medicine and Bioethics* (2010), which was dedicated to personal identity and bioethics, only one neuro issue, whole brain transplantation, was mentioned in passing. Cell-based interventions on the brain cover a wider range of activities and, arguably, a wider range of ethical and philosophical questions (e.g. Gillon 1996, 131–132).

The notion of personal identity is complex, and philosophers disagree on its exact content and scope. Sven Ove Hansson (2005), discussing implantation ethics more generally, stipulates (following Birnbacher 1995) that personal identity is an all-or-nothing matter, while personality changes occur gradually. The central thought here is something like the following: in order for it to be correct to say that X is identical to Y it must be the case that X and Y are alike in every respect; for if either X or Y has properties that the other lacks, then they are not identical.

Accordingly, identity does not admit degrees. In other words, after an operation you either are or are not the same person (personal identity), but you can be, say, more or less aggressive than before (personality). In this regard, it has been customary to distinguish between *numerical* and *qualitative* identity: over the course of an individual's life there will be significant qualitative changes, for example, in terms of beliefs and memories; however, these changes are consistent with the notion that it is one and the same person over time. Hansson does not give too many reasons for defining the concepts in this way; and since there are other possibilities, we shall briefly examine the grounds for thinking that personal identity is, as he maintains, an all-or-nothing affair.

One possible metaphysical justification for this idea could be found in the position sometimes referred to as "generous ontology" (e.g. Olson 2010, 259–270). According to this view, there are multiple subpersons (existing in a given time) and crosspersons (existing over time) of me. And while these can be and are different from one another as far as their personalities go, the identity-defining "me" in all of them is the same. Another way of understanding personal identity as an either-or matter is to think of it in terms of thresholds. It is impossible to say when exactly a person with a declining hairline becomes bald or when the evening turns into night, yet we can somehow make the distinction. Perhaps judgments of personal identity observe a similar logic. Your brother who returns from a seven-year trip around the world might be significantly different from the person who began the journey all those years ago, but you have, despite this, little problem in recognising him as your brother (the being with your brother's personal identity). Consider, however, your other brother who has (due to some freak accident or illness) come to believe that he is Jim Morrison. He holds on to this belief unfalteringly, does not recognise his friends or family, and seems to have no recollection of his previous life. In this case you might be inclined to say that he has lost his personal identity (and perhaps gained a new one).

There is a problem, however, since this manner of talking seems to link identity with the mental states or the psychological continuity of the person in question, yet these are not the only ways in which personal identity can be understood. Two main alternatives exist. Our personal identity can be mainly connected with physiology. This understanding of personal identity is often utilised in discussions justifying, for instance, organ donation cards. The idea is that the organs still somehow belong to the dead; that there is a physiological continuity of personal identity that survives our demise. Or alternatively, we can understand personal identity primarily as a social category. For instance, a foetus or a small child does not really have a personal identity in many normal senses of the word – yet it is usually endowed with one through social recognition. Similar thinking occurs when, say, relatives have become 'different persons' because of illness, trauma, or life-changing experiences. In these situations, social roles seem to uphold personal identity: "She is still my mother / sister / daughter / friend".

In a relatively early contribution, Georg Norhoff (1996) presents a slightly different categorisation of the ways in which we can understand the brain and its

relationship with personal identity. Norhoff does not assume that personal identity is an either-or matter, but talks about it as something that can change (cf. Hansson 2005). According to Norhoff, there are three main views on the relationship between the brain and personal identity. First, some philosophers assume that “personal identity is closely related to mental states which by themselves can neither be reduced to psychological functions nor to neurophysiological functions” (Norhoff 1996, 179). For those holding views like this, cell insertions into the brain do not, as such, threaten the patient’s personal identity. If we are interested in changes in personal identity, we should investigate changes in mental states. The second view is attributed to Parfit. According to this, what matters is psychological continuity (Norhoff 1996, 179). As long as patients have the same psychological features before and after, say, brain tissue transplantation, their personal identity, in terms of psychological continuity, remains untouched (enough). The third view is the one held for instance by Thomas Nagel, according to which “we are our brain”. Within this school of thought, every insertion of tissue into the brain must be seen as alteration of personal identity (Norhoff 1996, 180; Nagel 1986). Obviously, trauma, other neuro-interventions, and, quite simply, the mere passing of time (and subsequent changes in our brains), must also be seen as identity changing.

If we take the view that our brain identity determines our personal identity, a number of further questions need to be addressed. One could argue that at the brain level we can make a distinction between structural and functional identity. Structural damage does not always manifest itself functionally, as new regions of the brain can become active and start performing the functions that were previously processed by the now-compromised parts. There can also be functional diseases of the brain, such as certain psychiatric diseases, that cannot be pinned down to structural disorders. However, if we are mainly concerned with the structural identity of the brain, then introducing any ‘foreign material’ to the brain (by, for instance, cell insertions or neuroprosthetics) would necessarily change its identity. Whether this is automatically a bad thing is, of course, a question of its own.

A distinction can also be drawn between restoring or preserving brain function and otherwise altering it. In regenerative medicine by neural grafting, the goal can be to restore and preserve rather than to change. It could, therefore, be said that in cell-based interventions the goal is to restore the personal identity of the patient to what it was before the onset of the disease (Norhoff 1996). Again, it is not clear whether this would be ethically more acceptable than altering the personal identity of the patient. And then there is the further question: in what sense is the illness a part of the person that now is? One is here reminded of the classical example of Margot, the happy demented lady with an advance directive (Dworkin 1994). If we cannot legitimately act upon the advance directive that the before-dementia Margot signed because she is now a different person, should we then, following the same line of thought, decline to perform cell-based interventions on the brain in attempts to restore people’s prior-to-illness personalities? The latter would

mean ‘killing’ the person with the illness, as the after-the-onset-of-the-illness individual would no longer exist after successful treatment.

When we assess cell-based interventions on the brain and their impact on personal identity, the evaluation can be based on the similarity of mental states, on psychological or physiological continuity, or on social factors. In each case, the conclusions are bound to be different. Perhaps an additional category, or a sub-category of the idea of psychological continuity, could be founded on our own subjective view of our personal identity. In this approach, the crucial question would be whether I myself recognise me as the same person after an operation.

Surprisingly, a recent study (Lipsman et al. 2009) seems to indicate that people are not markedly concerned about changes in identity and personality, when these are side-effects of life-saving or life-extending procedures. For many patients who participated in the study, becoming unrecognisable to one’s family would be an acceptable outcome of a treatment that prolongs the physical existence of their bodies. The authors attribute this to people believing that there is more to them than their personalities and personal identity. An alternative interpretation is that the people interviewed assumed some kind of private continuity – thinking that *they* would still somehow recognise themselves as the beings before the operation. If this were not the case, on a purely and consistently person-centred account, the patients could – seen from their own viewpoint – just as well die. That is, if they do not after the treatment recognise themselves as the persons who started it, the pre-operation person has ceased to exist in the process.

### 3. Plasticity and repair

The idea of a ‘brain transplant’ is something that has fascinated philosophers and science-fiction writers for a long time. For philosophers, the fascination appears to rest on the belief that this type of transplant raises difficult questions about personal identity. For example, imagine that there are two people, Smith and Jones, and we could swap their brains around so that Smith’s brain is in Jones’ body, and vice versa, without any loss of psychological function. Does Smith have a new body or does he have a new brain? And what if we swap only the parts of the brain that underlie cognitive function and leave those parts responsible for autonomic function where they are? As mentioned above, in very broad terms one can identify two main positions. According to the ‘psychological view’ a person’s existence over time is a matter of psychological continuity: there is an overlapping chain of memories, beliefs, and intentions from an earlier to a later time. According to the ‘physical view’, a person’s existence over time is a matter of physical continuity, for example, continuity of a functioning brain.

Within the context of current neuro-regenerative medicine, a ‘brain transplant’ is dissimilar to the case of Smith and Jones, as it involves the transplant of very small amounts of neural tissue in attempts to repair damaged or disease parts of the brain or spinal cord. The source of the tissue may be the patient herself, or

another person, or possibly an animal. Since these transplants involve a small amount of brain tissue and, in principle, need not be psychologically disruptive, it might plausibly be claimed, therefore, that these types of transplant do not present substantial questions regarding personal identity. For example, one could consider the case of a person who has recently been diagnosed with Alzheimer's disease and has suffered only minimal cognitive decline. A successful transplant of neural stem cells may be able to prevent further decline and even be able to restore lost cognitive function. In such a case there would appear to be good reason to claim that personal identity has been preserved. The case of Smith and Jones is challenging because we are transplanting the whole or a substantial part of the brain. When there is substantial psychological and physical continuity prior to and after the transplant of neural tissue, there would appear to be good reason to think that the person survives the transplant.

Emerging neuro-technologies are providing a variety of novel treatments for those suffering from brain damage or disease. These treatments or interventions include the transplantation of organic material, as in the case of stem cell transplants, as well as neural prosthetic interventions, for example neural implants. This range of different types of intervention – whether biological or synthetic, or chemical or electronic – leads one to consider the relationship between personal identity and the identity of brain, and the nature of the brain's physical realisation. For the sake of argument, let us imagine that neural grafting and transplantation has progressed to the stage where it is a practical and successful treatment for Alzheimer's disease. By transplanting non-diseased stem cells from the patient's own brain we are able to generate new brain cells and reverse the effects of the disease. Furthermore, thanks to advances in genetic testing this transplantation can occur early on and thus prevent the loss of significant mental function caused by the disease. On such a scenario it seems plausible to contend that it would be rational, other things equal, for a person to agree to this type of transplant. The transplant prevents the loss (or further loss) of the psychological elements that are generally thought to determine the person's personality. Furthermore, since the stem cells are the person's own and are physically integrated into the physical, functioning brain, there would seem to be no particularly good reason for thinking that the transplant would present any challenge to the physical continuity of the person. In this regard, this type of intervention presents less of a challenge to the integrity or 'authenticity' of the person's personality than do cases of psychopharmacological cognitive enhancement (Parens 2005). For the neural transplant need not involve any change in the psychological characteristics of the person.

If this conclusion is correct, then we can imagine a number of variations to the case. First, instead of transplanting the person's own non-diseased stem cells we could transplant adult stem cells from another person, foetal stem cells, or even stem cells from another animal. Second, we could attempt to repair the brain and restore brain function through the use of neuroprosthetics. For example, we could imagine the installation of a 'brain chip' that replaces the diseased neurons in the brain, or perhaps we have developed a way of 'rewiring' the brain such that other

healthy parts of the brain can take over the tasks performed by the diseased parts (Maguire Jr. and McGee 1999). If the other conditions remain the same, that is to say, there are no changes to the person's personality or the overall level of neural functioning, then, as above, there would seem to be no good reason for the person to be concerned about a possible loss of identity. (This is not to rule out the possibility that all of these types of transplant *could* involve a significant loss of cognitive function, for example, loss of memory, or a change in personality). One tentative conclusion to be drawn from the above seems to be that even though one might grant that physical continuity is an important element in personal identity, the physical can be variously realised and can, in theory (and practice) include both biological and non-biological parts. Furthermore, this conclusion seems to hold whether one holds a psychological or physical view of personal identity, or maintains that we are essentially animals rather than persons (Olson 1997).

#### 4. The extended mind

The idea that the brain can be variously realised can be taken one step further by considering what is termed the Extended Mind hypothesis. According to the Extended Mind (EM) thesis, cognitive processes and aspects of the mind itself need not be 'in the head', but can extend into and incorporate parts of the world. In conjunction with the internal, neural states, these external elements form part of a 'coupled system' in which cognition is distributed (Clark and Chalmers 1998). EM can be understood as a functionalist thesis, one that maintains that the physical realisers or vehicles of cognition can lie outside the skin-and-skull boundary. As Andy Clark states, the original argument for EM took the form of a series of thought-experiments seeking to challenge the view that the mind is confined to the head (Clark 2005). One of these thought-experiments describes a person, Otto, who suffers from a mild form of Alzheimer's Dementia and who carries a notebook in which he writes information. Otto hears that there is a new exhibition at the Museum of Modern Art (MOMA) and consults his notebook to retrieve the museum's address – 53<sup>rd</sup> Street. According to EM, it is appropriate to maintain that Otto believed that the museum was on 53<sup>rd</sup> Street *prior* to him consulting the notebook, since the notebook plays the same functional role for Otto as biological memory does for a 'normal' person. This functional role is defined in terms of four key features: the notebook is a constant in Otto's life; the information contained therein is reliable; the information is automatically endorsed by Otto; and he has previously endorsed the information on a conscious level. The central contention that Clark and Chalmers wish to defend is that the mind "ain't just in the head". More specifically, they wish to argue that various aspects of the mind, for example dispositional states like beliefs, can be externally realised. Otto has the belief that MOMA is on 53<sup>rd</sup> even though the relevant information is stored outside of his head. The matter that we wish to address in the present discussion is the implication that EM has for questions of personal identity.

For the sake of argument, let us grant that Otto's notebook works well and that in functional and phenomenological terms Otto-and-the-notebook is similar to Otto prior to the onset of Alzheimer's disease. In this regard, we can view the notebook as a highly sophisticated neuroprosthetic. We can grant also that there are differences between Otto's new state and his prior one: retrieving information from the notebook is not exactly like retrieving information from his biological brain. Despite these differences, however, there would appear to be good reason to claim that Otto is one and the same person despite the fact that parts of his mind are now externally realised. In Otto's case, we have a high degree of psychological continuity and integration, and the notebook is regarded by Otto as a part of his person. Accessing the notebook might not be the same as the normal case of retrieving memories or information from one's brain, but does this difference provide us with sufficient reason to challenge the notion that Otto's identity is preserved? Possibly, if it were plausible to claim that the continuity of personal identity requires the physical realisers to be internal, or that the methods of memory retrieval must be of a certain kind; but what argument is there for such claims?

One reason for thinking that identity has been preserved is that one might claim that Otto has simply undergone a rather novel form of neurosurgery: he now has a neuroprosthetic that is positioned outside of the skull. This, however, misunderstands EM. As we understand it, EM is not simply the claim that the brain can be variously realized; rather, it is the hypothesis that aspects of cognition can be distributed beyond the skin-and-skull boundary and into the world. Rather, it is the hypothesis that aspects of cognition can be distributed beyond the skin-and-skull boundary and into the world. Accordingly, it is incorrect to describe the case of Otto as one in which we have given him a new brain, for EM claims the cognitive processes do not need to occur *in* the brain.

If one is prepared to accept EM as a *bona fide* hypothesis about extended cognition, that is to say, one accepts the view that beliefs and other aspects of the mind can be extended outside the skin-and-skull boundary and into the world, then this would seem to suggest that the person need not coincide with the physical boundary of the body. If Otto's notebook works well enough for it to be appropriate to claim that he still retains the capacities for personhood, it is legitimate to regard Otto-and-the-notebook as a person. Accordingly, the physical boundary of the body does not mark the boundary of Otto *qua* person. Furthermore, if we can imagine persons as extended outside of the body, then we can hold still more radical notions of how persons can be constituted and identities preserved. For example, one can imagine an elderly couple who have been married for many years in which one member of the couple serves as the 'memory' for both. Suitably and inexorably intertwined in this way one might think it appropriate to claim that the couple represents in more than a purely metaphorical sense a single person (Nelson 2003). A similar conclusion was drawn by Maquire Jr. and McGee (1999) in their account of the variety of mechanical devices that are being designed to augment the mind's capacities and functions and, in particular,

the ways in which cognitive processes can be shared and distributed among persons. By creating novel ways in which information can be gained, stored, and transferred among persons, neuro-technologies are suggesting that our notion of a ‘person’ may be up for revision and that the continuity of personal identity over time may be consistent with substantial change in the person’s physical realization.

### **5. Discussion**

Leaving the more metaphysical ruminations on personal identity aside, there could be an alternative way of understanding the implications of neural grafting on personality and personal identity. We could assume that identities can and do change and that, for most purposes, ‘personality’ can be used interchangeably with ‘personal identity’. Only in extreme cases are personality changes so drastic that we are forced to talk about individuals losing their personal identities (and perhaps gaining new ones). Our personalities change gradually over time, the changes can be more or less pronounced and more or less intentional, and they can occur due to a multitude of reasons. While the genes and the brain that we are born with determine our personalities to a certain degree, early development and various environmental factors further contribute to the persons we become. Traumatic experiences – be those physical or mental – can change our personal characteristics; and so can good experiences. We can teach ourselves to become less aggressive and we can train our brains to better perform specific functions. Our brain’s ability to perform various functions can also be compromised if we fail to use our brains. And the list goes on.

Is it, then, possible to evaluate the ethical implications of neural grafting to our personalities without solving the deep metaphysical problems concerning personal identity and the brain? Up to a point, maybe yes, although the results might not be entirely satisfactory to the philosopher. As a way forward, we could compare cell-based interventions on the brain with other practices that have relevantly similar features. Brain surgery can alter personality, that is, it can have an impact on how we appear to others and how we view ourselves. But in most cases other considerations, such as the need to remove a life-threatening tumour, are seen as more important; or are, at the very least, given careful consideration when decisions are made. Could not cell-based transplants into the brain be viewed similarly? And what if, in addition to removing the tumour, the surgery is expected to do away with an unwanted psychological characteristic, say excessive aggression? If we have no major problems with this despite its obvious effect on the patient’s personality, why should neural grafting raise further issues? One could, of course, claim that the significant difference between the approaches is the introduction of a foreign element into the brain – something that occurs in cell-based interventions but not in the surgical removal of tumours. But why should this make any ethical difference? Our brains can, in both cases, change structurally as well as func-

tionally (the latter if, for instance, a previous personality is restored by the operations). And adding extraneous material in itself does not seem to be problematic, as evidenced by the general acceptance of organ transplants, insulin injections, hormone pills, cochlear implants, and pacemakers. The critic's last resort would, perhaps, be to say that technological interventions on the brain are somehow special and more suspicious. But if structural and functional changes are already allowed, this view is difficult to uphold. The introduction of technical devices and chemical substances into our bodies can also, indirectly, change the structure and functioning of our brains. Even external devices, such as smart phones that make satellite navigation and the internet available to us continually, are subtly changing the way in which our brains function.

Neural grafting will change the personalities and personal identities of patients. This is partly the intended result of successful treatments, particularly in the case of mentally degenerative diseases. Different treatments will have different implications for different patients; and, as with all medical interventions to the human body, risks and benefits need to be carefully assessed. However, we see very few reasons for thinking that cell-based and related interventions on the brain would create any entirely new problems or that we should be particularly alarmed by them.

Addresses:

Tuija Takala  
Social and Moral Philosophy  
Faculty of Social Sciences  
P.O. Box 24  
FI-00014 University of Helsinki  
Finland  
E-mail: tuija.takala@helsinki.fi

Tom Buller  
University of Alaska Anchorage  
Philosophy Department  
3211 Providence Drive  
ADM/Humanities – 254  
Anchorage, AK 99508  
USA  
E-mail: aftgb@uaa.alaska.edu

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