

Building blocks of 'free will': In conversation with Dick Swaab

**Authors:**Chris Jones¹ Dawie J. van den Heever² **Affiliations:**

¹Department of Systematic Theology and Ecclesiology, Faculty of Theology, Stellenbosch University, Stellenbosch, South Africa

²Department of Mechanical and Mechatronic Engineering, Stellenbosch University, Stellenbosch, South Africa

Corresponding author:

Chris Jones,
chrisjones@sun.ac.za

Dates:

Received: 24 Apr. 2020

Accepted: 28 Aug. 2020

Published: 20 Nov. 2020

How to cite this article:

Jones, C. & Van den Heever, D.J., 2020, 'Building blocks of "free will": In conversation with Dick Swaab', *HTS Theologiese Studies/Theological Studies* 76(1), a6056. <https://doi.org/10.4102/hts.v76i1.6056>

Copyright:

© 2020. The Authors.
Licensee: AOSIS. This work is licensed under the Creative Commons Attribution License.

The issue of free will is a complex one that has occupied the minds of many theologians and philosophers through the ages. The two main aspects of free will are the freedom to do otherwise and the power of self-determination. This means that an agent must be able to choose from alternative possibilities and that he or she must be the author or source of that choice. Defined as such, it is clear that the issue of free will is undeniably closely linked with the concept of moral responsibility. However, if we live in a deterministic world, where everything is governed by the laws of nature, including our thoughts and behaviour, does this leave room for free will and moral responsibility? As Dutch neurobiologist and author Dick Swaab argues, the answer is an emphatic 'no'. In this article, we will look at Swaab's case against free will. We will also see what modern neuroscience has to say about this hot topic and whether it supports or discredits Swaab's views. And finally, we will touch on what this all means for moral responsibility.

Contribution: This article is part of a special collection that reflects on the evolutionary building blocks of our past, present and future. It is based on historical thought and contemporary research. It fits well with the intersectional and inter-disciplinary nature of this collection and journal.

Keywords: Free will; Dick Swaab; Neurobiology; Determinism; Compatibilism; Libertarianism; Unconscious will; Free will and brain illness; Readiness potential; Magnetic resonance imaging.

Introduction

Many theologians and philosophers through the centuries have been grappling with the complex issue of free will. In theology, these included Augustin, Luther, Edwards, Anselmus, Lipsius and Luis de Molina, amongst others. Almost all the famous philosophers have reflected on this issue: Descartes, Voltaire, Hume, Leibniz, Kant, Sartre, Daniel Dennett, Harry Frankfurt and others (Meuleman & Van Vlastuin 2014:1). According to Dutch theologians Meuleman and Van Vlastuin (2014), it is:

[S]triking that [Robert] Kane in his *Oxford Handbook of Free Will* (Kane 2011) does not give a definition of the concept of free will. This indicates the complexity of the issue. The complexity of free will is illustrated by the interrelatedness of free will with issues such as responsibility, morality, consciousness, mind-body relationship and psychiatry (Kane 2011). Instead of giving a single definition of free will, Kane (1999; 2007), König (1996), Campbell (2011) and Mawson (2011) give several perspectives on free will when dealing with this issue. (p. 1)

Although this is a very complex issue and not easy to formulate a 'concrete, all-encompassing vision of free will' (Meuleman & Van Vlastuin 2014:1), we should not shy away from it. There is currently a renewed interest in free will not only by philosophers and theologians but also from neuroscientists, experts from other disciplines and the media. This interest probably has to do with our human beings' anxious search for answers to the essence and meaning of life and our existence (Meuleman & Van Vlastuin 2014):

[T]he fact that [Dick] Swaab's book [*Wij zijn ons brein. Van baarmoeder tot alzheimer*] has enjoyed its 14 reprints in the Netherlands and that it featured continuously in the best sellers list for over two years is a symptom of the great interest society has for the issues which are at stake in this area of research. (pp. 1–2)

According to Meuleman and Van Vlastuin (2014:2), 'neurobiological concerns' – which will be the focus of our article – 'touch upon important questions about responsibility, accountability, morality and autonomy'. They reason that 'at its core, the issue of free will has to do with the real identity of the human being' (Meuleman & Van Vlastuin 2014:2). With this in mind the following important question comes to the fore: do people really have a free will because they can choose? We, however, do not think that free will is determined by the fact that we make

Note: Special Collection entitled Challenging Building Blocks: The coherence of cosmological evolution, life, consciousness, morality and building the 21st century, sub-edited by Chris Jones (SUN) and Juri van den Heever (SUN).

Read online:

Scan this QR code with your smart phone or mobile device to read online.

choices, because all organisms continually make choices. It is rather about whether the choice is completely free (or not). So, the question arises: can people by any means make decisions without internal or external constraints determining that choice?

According to Swaab (2018:333), the well-known Dutch neurobiologist, as stated in his above-mentioned book,¹ Darwin said as far back as 1838 that the existence of free will in human beings is an illusion, because human beings rarely analyse their motives, and their actions are mostly instinctive. Swaab argues that in our discussions of free will, three things are usually referred to. In the first place, an action is free if there are alternative possibilities – in other words, if you have the choice not to do something specific. In the second place, it must be done with a reason. A third characteristic of free will is that you have the idea that you are doing the act out of yourself (Swaab 2018:333–334), but actually it is only an idea. This is in accordance with the Stanford Encyclopaedia of Philosophy (2013:n.p.) that mentions the most common features of free will as the freedom to do otherwise and self-determinism. These aspects are combined to define free will as ‘a philosophical term of art for a particular sort of capacity of rational agents to choose a course of action from amongst various alternatives ...’ (Standard Encyclopaedia of Philosophy 2013:n.p.). It is clear to see that the concept of free will is intricately connected with the concept of moral responsibility. The core of this connection revolves around the inclination to only attribute praise or blame to agents if they themselves are the authors of their actions. Some philosophers even use the control necessary for moral responsibility in their definition of free will (Fischer 1994:3; Mele 2006:17; Wolf 1990:3–4). However, according to the Dutch philosopher Spinoza (1632–1677), there is no such thing as free will. He argues against this doctrine (Archie 2006):

[A]s a result of demonstrating that the activity of our minds is equivalent to the activity of our bodies. The mind is more or less active (or contemplative) in accordance with the body’s activity or sensing. (n.p.)

Alexander Bain (1868), a Scottish philosopher, said that:

[S]pinoza denied free-will, because it was inconsistent with the nature of God, and with the laws to which human actions are subject ... There is nothing really contingent. Contingency, free determination, disorder, chance, lie only in our ignorance. The supposed *consciousness* of freedom arises from a forgetfulness of the causes that dispose us to will and desire. Volitions are the varying [*sic*] appetites of the soul. (p. 414)

Swaab then refers to the following questions asked by Spinoza (in his *Ethica III*) to illustrate that absolute free will does not exist. Does a baby freely decide what he wants to drink? Does a bad person freely decide to take revenge? Does a coward decide he wants to flee? Does a chatterer decide that he wants to say something whilst he actually can’t restrain his talkativeness? In this way Spinoza tried to make it clear that

1. We used the Afrikaans translation by Daniel Hugo: *Ek is my brein. Van baarmoeder tot Alzheimer.*

such traits are fixed forever. You can’t do anything to change that (Swaab 2018:334). According to Swaab, neurobiology shows us that there is currently no absolute freedom and that our behaviour is determined from birth. He interestingly links his research with theology by referring to Calvinism to clarify his own determinism. He calls it ‘neurocalvinism’. Neurocalvinism in this sense alludes to predestination, the strict Protestant belief that the course of every person’s life is predetermined by God. Meuleman and Van Vlastuin (2014:1) had written an interesting article in this regard, examining whether the two kinds of determinism, as seen by certain neuroscientists and traditional Calvinism, are compatible. They then argued ‘that this is not the case and that the neurosciences propagate a stronger kind of determinism than Calvin and that the two therefore are different in principle’ (Meuleman & Van Vlastuin 2014:1). Swaab (2018:334) reasoned that numerous hereditary factors and environmental influences during our early development have established the structure and function of the brain for the rest of our lives. Dawie van den Heever (2019:65) strikingly said in this regard in his article entitled ‘The neuroscience of morality’: ‘[w]e are complex machines made by nature and shaped by our environment’. The result is that we not only have all kinds of talents, skills and possibilities but also many limitations. For example, one cannot suddenly decide that from now on you are going to apply a certain talent whilst you know you do not have it. We also have little influence on our moral choices, so it seems. We approve or reject things, not because we necessarily have thought so deeply about them, but because we cannot do otherwise. Swaab (2018:335) reasoned in this respect that ethics is a result of our ancient social instincts aimed at doing what will not harm the group, as Darwin said long ago. As adults, one can do little about modifying the brain and shaping one’s behaviour. Our character has already been formed and society largely dictates to us how to act. We are, therefore, not only restricted from the ‘inside’, but also from the ‘outside’. Van den Heever (2019) built on Croatian philosopher Boris Kožnjak (2015:42) by saying that:

[E]verything in the universe is perfectly determined and obeys the laws of nature. We do not know the positions of all particles, but we do have a very good idea of the forces of nature. (p. 46)

He then continues his reasoning by stating that (Van den Heever 2019; cf. Bode et al. 2014:637):

[A]ccording to determinism, these very same laws of nature that we use to send rockets to outer space can also account for mental processes and, thus, all voluntarily actions and decisions. Thus, no thought or action can exist without a preceding cause. However, according to Plato and Aristotle, the deterministic worldview stood in conflict with concepts such as morality and responsibility that require free will. (p. 46)

In this regard, it is important to refer to the three streams that the understanding of free will is divided into. There are two flavours of determinism. The first is called incompatibilism or hard determinism.² This view says that free will is incompatible with determinism, and according to Meuleman and Van Vlastuin (2014), it:

2. Representatives are Martin Luther, Baruch Spinoza, Laplace and Derk Pereboom.

[P]ostulates that no one has a free will because everything is already fixed. Choices have already been made by (in religious determinism) God or (in natural determinism) by the causal necessity of natural law. (p. 1)

The second flavour of determinism is compatibilism,³ which says that free will is compatible with determinism that 'free will is true regardless [of] whether determinism is true or not. Compatibilists believe that fully determined actions can be seen as acts of free will' (Meuleman & Van Vlastuin 2014:1).

And the third stream of understanding free will is the (Meuleman & Van Vlastuin 2014):

[L]ibertarian view⁴ [that] does not defend that the will is free to do what it wants but that the will is free to decide what it wants. Libertarianism does not deny that man is influenced by his environment, but this influence is not so strong that human activity is merely a plaything. (p. 1)

Libertarian free will, therefore, typically denies determinism and believes that some non-physical soul or mind can override physical causality. The distinction between compatibilists and libertarians is that the latter say 'that free will means that one is free to determine what one wants', whilst 'compatibilists say that free will is the possibility that one is free to [do] what one wants to do (or not)' (Meuleman & Van Vlastuin 2014:1). In other words, it is a 'hypothetical freedom' (Meuleman & Van Vlastuin 2014:1).

On this track of thought, Imhof and Fangerau (2013) reasoned that in the views of 'hard determinism' philosophers are confronted with 'the complete opposite position (so-called "libertarianism"), which argue[s] for the possibility of indeterminism and thus the capability to make free decisions' (Kane 2005:40–52). Van den Heever (2019:47) explained that '[t]his philosophical view [libertarianism] says that a person could have done otherwise under the same circumstances and conditions if he or she "willed" to do so'. He then makes clear that libertarianism, 'given the same past, an agent must have alternative possibilities available to him, and the origin of his actions must lie within him' (Bode et al. 2014:637; Imhof & Fangerau 2013:203). The libertarian view of free will naturally leads to some sort of dualism where one needs to posit a substance or property other than physical matter that can be the author of free choice such as a soul or a mind.

Having said this, what does modern science, and more specifically neurobiology, tell us about the matter of human free will?

The unconscious will

We make many decisions in a fraction of a second, or based on our gut feeling, or intuition. Often, we make choices without really thinking about it consciously. Our unconscious

3. Important representatives are Thomas Hobbes, Jonathan Edwards, David Hume, G.E. Moore, Daniel Dennet and Harry Frankfurt.

4. Representatives of this vision, amongst others, are Rene Descartes, Immanuel Kant, Roderick Chrisolm, Robert Kane and Carl Ginet.

brain makes crucial and complex decisions within seconds. But this only happens after the brain has performed a huge number of analyses. Swaab (2018:336) compared it with a modern aircraft that can fly and land on autopilot without interference from the pilot. In this way the brain also works in a superb way unconsciously to a great extent. But for this, the brain must be trained and the unconscious brain must over a long period of time be fed intensively with information. Functional scanning has shown that we use different brain networks for conscious thinking and for making intuitive decisions. To a large extent, the brain has to work automatically and subconsciously because we are bombarded with large amounts of information. Through selective attention, we unknowingly extract from this wealth of information what is important to us. Nobel Laureate Daniel Kahneman (2011:20), in his international bestselling book, *Thinking, Fast and Slow*, refers to two systems in the mind, uncreatively called System 1 and System 2. System 1 operates in the background, it has no sense of voluntary control, but it is automatic, quick and requires little or no effort. It is often associated with the unconscious mind. System 2 on the other hand is slow, requires mental effort and is often associated with consciousness, the subjective experience of agency and choice (Kahneman 2011:20–21).

Conscious considerations (System 2) are certainly not always better than unconscious decisions. It can even get in the way of a good decision. Important financial decisions such as buying a house, according to psychologist Ed de Haan (cited in Swaab 2018:337), are sometimes made even better on the basis of intuition, that is, without careful conscious consideration (System 1). One can also grapple with a problem for long periods of time without constantly and consciously thinking about it, and then suddenly, whilst doing something completely different, you get the solution. So, our behaviour is, for the most part, so it seems, controlled by unconscious processes. Factors from our cultural and social backgrounds are also crucial when making unconscious decisions. Physical factors such as temperature and light also play a major role in our actions. During long summers as reasoned by Swaab (2018:338), explosions of aggressive behaviour can occur. The formidable decision to make war has been decided upon during summer in the northern and southern hemisphere for centuries. In this regard, Swaab (2018:338) referred to Schreiber's study of 2131 battles over the past 3500 years. The amount of daylight or the temperature seems to have been the deciding factor in this extremely important decision when a war should begin. Obviously, making all these unconscious decisions has its drawbacks as well. Our unconscious racist and sexist views also often come to light in unguarded moments. But the brain cannot help but operate for the most part like a purposeful subconscious automaton, which nevertheless makes rational decisions. Unconscious, implicit associations allow us to make an enormous number of complex decisions quickly and effectively – something that would be impossible if careful consideration of all the pros and cons was necessary. As can

be deduced from this, according to Swaab (2018:337–338), there is no place for a conscious free will in all these unconscious decisions.

Because our overworked brain is constantly making decisions, Harvard psychologist Dan Wegner (as quoted by Swaab 2018) speaks about an unconscious will instead of a free will. The unconscious will makes quick decisions based on what we experience in the environment. The way our brain came into being during development, and what we have learnt since, plays a crucial role in this. Because of the complex, ever-changing environment in which we live, there can be no proof that our lives are predetermined in any predictable way, and because of the way our brain has evolved, there can be no absolute free will. However, we constantly feel that we (can) make free choices, and then we call it free will. According to Wegner (quoted in Swaab 2018), it is an illusion and it can be proven experimentally.

In 1983, scientist Benjamin Libet and his co-researchers conducted an ingenious experiment to determine the relationship between conscious intent and brain activity in a simple movement task (Libet et al. 1983). Previously, in 1964, a pair of German researchers discovered the *Bereitschaftspotential*, also known as the readiness potential (RP; Kornhuber & Deecke 1965). The RP is a slow build-up of cortical potential, measured with an electroencephalograph (EEG), detectable moments before a self-initiated, voluntary action. Libet et al. (1983) wanted to see where the conscious intent to move would fit in relation to the action, and, more importantly, in relation to the RP. A dualist libertarian view of free will tells us that voluntary movements are caused by conscious intentions and, therefore, the RP should be preceded by the conscious intention to move. But the Libet experiments showed the opposite, with the RP preceding the conscious intention to move. This was measured by having participants watch a specially designed clock face whilst recording brain activity with EEG. The participants were instructed to flex the wrist of their dominant hand whenever they felt like doing it and to notice the position of the revolving dot on the clock at the exact moment they became aware of their intention to move. Their hand movement was measured with an electromyogram (EMG), and it was found that the conscious intention to move preceded the action by 200 milliseconds (ms). However, the onset of the RP preceded the conscious intent to move by another 350 ms.

This seems to suggest that there is unconscious brain activity that is responsible for spontaneous voluntary action. Furthermore, it suggests that conscious awareness of the action (often) only arrives after the initiation of the act. Many similar studies have been conducted using different brain imaging technologies, with all corroborating these findings (Fried, Mukamel & Kreiman 2011:1; Lavazza 2016:3; Soon et al. 2008). Many of these studies have been pushing the cortical activity further back, widening the gap between the brain activity indicative of movement and the conscious intent. For instance, Fried et al. (2011), using an invasive

technique of implanting electrodes directly into the exposed brain, witnessed the suggestive brain activity up to one and a half seconds prior to the participants' report of their conscious intent to move. Using functional magnetic resonance imaging (fMRI) and advanced statistical pattern recognition techniques, Soon et al. (2008) could predict movement up to 7 s before participants were consciously aware of their intent to move. In the Soon et al. (2008) study, the researchers also included a choice, that is, the participants had the free choice whether to move either their left hand or their right hand. As we have seen this is an important feature when discussing free will: the freedom to do otherwise, having alternative possibilities. And still the authors were able to predict which hand will move several seconds before the participants 'freely' chose to move. In a follow-up study by Soon et al. (2013), the complexity of the task was increased, requiring participants to either add or subtract two numbers per trial. In this abstract decision-making task, the choice could be decoded up to 4 s prior to the conscious moment the decision was made as reported by the participants. This does not bode well for the libertarian view of free will. A form of determinism seems to reign.

In this regard, Susan Blackmore, a British psychologist and writer, claims that consciousness is the story that is told afterwards. She says, as quoted by philosopher Raymond Tallis (2011):

[T]he human brain is a machine which alone accounts for all our actions, our most private thoughts, our beliefs ... All our actions are products of the activity of our brain. (p. 52)

Dutch neuroscientist, Victor Lamme (2010:213), agreed and said in this regard: '[o]ur activities do not follow our thoughts. It is just the opposite'. According to Meuleman and Van Vlastuin (2014):

[O]ther scientists such as Sternberg (2010) share this view. It follows therefore that ethics are included in the condition of the human brain. The task of the human brain during one's life is only to ensure that the body functions well and to give the brain the opportunity to survive. A more deterministic vision of life (*sic*) is almost impossible, and it includes the implication that ethics disappear. (p. 5)

Rita Carter (2010), an Oxfordshire science writer, lecturer and broadcaster, confirms this in her book *Mapping the Mind* by referring to the importance of some of Libet's findings:

[I]f, as it seems to show, the unconscious brain kicks off a movement, and the conscious decision to make the movement comes in its wake, the implication is that the brain itself is the force that initiates the action. Rather than causing action, consciousness merely reflects what the brain is already doing. If this is true of all actions it follows that our behaviour is simply the end product of automatic brain processes – and our notion of a 'free will' is illusory. (p. 313)

Libet was not comfortable with the implications of his own findings and the backseat spectator role it forced onto consciousness. He desperately tried to save the notion of free will and the authoritative role of consciousness in what

has become known as the 'free won't' or veto concept. He controversially suggested that the initiation of voluntary action preceded unconsciously, but that a last-minute (rather last few milliseconds) inhibition or veto of the action can be carried out consciously (Libet 1999:47; Velmans 2002:11). He reasoned that in the 150 ms after conscious awareness of the act to move, but before movement (remember, movement happened 200 ms after conscious awareness, and he left 50 ms for the neural signal to travel from the brain to the site of action), a person can consciously veto or cancel the action, thus restoring free will (or free won't). However, this raises the question, if our decision to act develops unconsciously, why doesn't the decision to veto the act also have its own unconscious precursors? And that is exactly what Filevich, Kühn and Haggard (2013:e53053) showed in their aptly titled article, 'There is no free won't: Antecedent brain activity predicts decisions to inhibit'. This squashed Libet's attempt to save even the slightest sliver of conscious free will and doomed him, and all of us, to accept his findings.

However, even though these studies strip consciousness of its despotic power and even though consciousness lags a little behind reality, it remains useful. We make conscious plans and consciously learn to drive a car and then execute it automatically after much practice. The fact that many of our actions come into being unknowingly does not preclude us from acting consciously if we focus our attention on something (Swaab 2018:338–340).

Free will and brain illness

Free will has been defined as the possibility of making a decision without internal or external constraints determining the choice. In addition, you must be able to recognise the consequences of your actions in order to speak of an act based on free will. In the case of a brain disease, there can be both an internal limitation and an impossibility to judge your own actions. It can have legal consequences. And thus, we have to consider the issue of moral responsibility which, as already mentioned, is tightly interwoven with the concept of free will. If determinism is indeed true, should anyone be held morally responsible for their actions? Swaab (2018:343) referred to some enlightening examples: the neatly dressed woman who suffers from Gilles de la Tourette's disease and suddenly starts using obscene language in her neat clothes with her handbag on her lap during a conversation with her doctor, surely doesn't do it out of free will? Can you hold a paedophile morally responsible for his actions if you realise this behaviour arises from a certain genetic background and atypical brain development? Is paedophilia, so understood, a free choice? How free is it when someone who, because of a combination of his genetic background and his mother's cigarette smoking during her pregnancy with him, has attention-deficit hyperactivity disorder (ADHD) and clashes with the law? We know that malnutrition during pregnancy poses a great(er) risk of antisocial behaviour. How free is such a person when he or she, because of such behaviour, has to

deal with the police? Can you blame a young person in puberty, who still has to learn to cope with his or her brain that has, because of sex hormones, started to function completely differently, when he or she commits a crime?

We have learnt a great deal about the brain's role in moral decision-making and moral behaviour from brain lesion studies. Brain lesions or brain damage to different brain structures can have a whole host of different unwanted effects and cause a range of impairments and inappropriate behaviour. For example, paedophilia and other unprovoked sexual behaviour can result from lesions, which impair basic motivational mechanisms such as sexual drive (Moll et al. 2005:800). Brain damage and degeneration because of dementia to certain brain areas have been linked with homosexual paedophilia, hypersexuality and aggressive behaviour (Baird et al. 2007:1045; Moll et al. 2008:164). Normal adults who suffer damage to certain cortical areas can develop defects in decision-making and planning that can lead to abnormal social conduct. The patients typically have intact social knowledge, that is, they behave inappropriately even though they can indicate which behaviours are considered to be morally appropriate by society (Cameron et al. 2018:261–262; Damasio, Tranel & Damasio 1990:81). Brain imaging studies have also found structural and functional abnormalities in several brain areas in psychopathic individuals (Moll et al. 2005:800). Another study showed that when damage to the frontal parts of the brain occurs in infancy, it can lead to impairment of the acquisition of moral rules and social conventions, thus resulting in severely impaired social behaviour (Anderson et al. 1999:1032). The normal developing brain also presents its own moral dilemmas. Magnetic resonance imaging studies have found that the brain during puberty is structurally and functionally very susceptible to significant increases in the natural sex hormones, such as oestrogen, progesterone and testosterone. This can influence sex, eating and sleeping habits (Arain et al. 2013:449–450). The brain continues to develop, transform and change during adolescence and continues up to about 24 years of age. Given these natural occurring changes in the brain, and the effects of brain lesions, dementia and other environmental effects, the questions then become clear, 'to what extent must we hold such individuals morally responsible for their behaviour and actions?' Should they be held responsible at all? Were their actions and behaviour really self-determined? Were they the authors of their actions? Do we ascribe free will to these agents?

The complexity of the concept of free will is also illustrated by the rare 'alien-hand' syndrome that occurs when there is no longer good communication between the two halves of the brain. Swaab reasons this could be because of bleeding that damaged the connection between the two brain halves, the corpus callosum. Because of such damage, the activity in one part of the brain can no longer be coordinated with the activity in the other part of the brain. The 'alien hand' then performs uncontrolled actions that can be completely

opposite to those of the healthy hand. For example, one hand wants to put on the pants, whilst the other hand tries to pull the pants off at the same time. Where is the free will for these actions? An 'alien hand' patient tells how she woke up a few times as her left hand tried to strangle her. This information was used, as Swaab refers to, in the movie *Dr Strangelove*⁵ in which Peter Sellers constantly tries to avoid with his one hand the other hand from strangling him. When the above patient was awake, her left hand attempted to loosen the buttons of her dress, against the 'will' of her right hand. Her left hand also fought with her right hand to pick up the phone. The feeling that you no longer have control over your own limbs, and the absence of the feeling that you initiate the movement yourself, is frightening. It gives the patient the illusion that someone or something else is initiating his or her movements. The above-mentioned patient indeed felt that she no longer had control of her own hand and thought she was being controlled 'from the moon'. So, it seems that if you are aware of what is happening, but lack the feeling that you have made that decision (free will), your body feels like a foreign object.

This is further illustrated by Gazzaniga (2000) and colleagues' studies on split-brain patients over the span of 40 years, which have resulted in many insights into brain processes, including perception, attention, memory, language, reasoning abilities and even consciousness. In the 1960s and the 1970s, a last resort treatment for severe epilepsy was a procedure in which the corpus callosum was intentionally severed, which gave the patients the tag of split-brain patients. The seminal work on the split-brain patients revealed that the left and right hemispheres of the brain approach problems differently – almost as if they are two distinct persons. In one famous example, a patient was shown two pictures. One picture, that of a chicken claw, was shown exclusively to the left hemisphere, and another picture, that of a snow scene, was shown exclusively to the right hemisphere. This was possible because visual information presented to the left visual field projected exclusively to the right hemisphere and visual information presented to the right visual field presented exclusively to the left hemisphere. The patient was presented with the two pictures and asked to pick pictures that were associated with these pictures from an array of pictures in view in front of him. The patient responded by choosing a picture of a shovel with the left hand (remember that the left hand is controlled by the right hemisphere) and a picture of a chicken with his right hand (controlled by the left hemisphere). These are the correct associations. But when asked why he chose these specific pictures, he replied (and remember that language is localised to the left hemisphere), 'Oh, that's simple. The chicken claw goes with the chicken, and you need a shovel to clean out the chicken shed' (Gazzaniga 2000:1316). This shows that the left hemisphere is unaware of what the right hemisphere has seen and interprets the response in a context that is consistent

with the information available to it. These type of experiments and results have moved researchers to refer to the left hemisphere as the 'interpreter' (Gazzaniga 2000:1316). It suggests that '[t]he left hemisphere possesses a unique capacity to interpret behaviour and unconsciously driven emotional states' (Gazzaniga 2000:1316). The left hemisphere will interpret the information available to it and confabulate stories to make sense of the current context. Gazzaniga highlights many differences between the two hemispheres and the different functions they are responsible for. Relating to our topic at hand, Gazzaniga says (2000):

[E]ven though each cerebral hemisphere has its own set of capacities, with the left hemisphere specialized for language and speech and major problem-solving capacities and the right hemisphere specialized for tasks such as facial recognition and attentional monitoring, we all have the subjective experience of feeling totally integrated. Indeed, even though many of these functions have an automatic quality to them and are carried out by the brain prior to our conscious awareness of them, our subjective belief and feeling is that we are in charge of our actions. These phenomena appear to be related to our left hemisphere's interpreter, a device that allows us to construct theories about the relationship between perceived events, actions and feelings. (p. 1293)

In the case of the 'alien hand' syndrome and the split-brain patients, there seem to be two 'wills' in one brain, each wanting to do something differently, but with the left hemisphere the only one being able to communicate. So, the understanding of free will also depends on good left and right connections between the brain halves (Swaab 2018:343–344).

The idea that we are absolutely free to choose anything is not only wrong but it has also caused many miseries in the words of Swaab. In the past, it was generally accepted that our sexual orientation, for example, heterosexuality, homosexuality, bisexuality, intersexuality, etc., would also be a matter of choice. And that is why a person has been punished for homosexuality that was viewed wrong according to most religions until recently. There are still some countries that punish gay people who practically live out their sexual orientation. In line with this kind of argument, homosexuality was considered a disease by medical science. Only in 1992, according to Swaab, homosexuality was removed from the International Classification of Diseases. Prior to that, vain attempts were made to cure homosexuals of their suspected brain disease by imprisonment and by horrific interventions, such as aversion therapy. And none of that helped. In his review of Swaab's book referred to previously in this article, Cookson (2014) said that 'sexual orientation' according to Swaab is 'absolutely fixed in the womb' and that Swaab has:

[C]arried out considerable research on the biological origins of homosexuality. Indeed his work played a significant part in changing a scientific view, held widely until the 1980s, that gender identity was determined largely by social influences during childhood ... Precisely what combinations of genes, hormones and other chemicals induce future homosexuality, bisexuality or heterosexuality in the embryonic brain – and how they work – remains mysterious. (n.p.)

5. For more information on this, visit <https://www.amazon.com/Dr-Strangelove-Learned-Stop-Worrying/dp/B000P407K4/>.

Cookson (2014) further stated that ‘whatever the causes’, Swaab is:

[A]damant that events after birth do not effect sexual orientation. Children brought up by lesbians are not more likely to be gay; homosexuality should never be regarded as a ‘lifestyle choice’; and attempts by some religious groups to ‘cure’ people of homosexuality are doomed. (n.p.)

In brain diseases such as multiple sclerosis, it has been repeatedly stated that the will to tackle the disease with a positive mindset will promote healing. Not only is there no evidence for this, but in addition, this view means that if the illness takes a serious turn, the (poor) patient must hear that he or she has not tried hard enough to overcome and beat the disease (Swaab 2018:344–345). In light of this, Swaab is curious to see how long it will take before other behavioural patterns, such as aggressive and delinquent behaviour, paedophilia, kleptomania and ‘stalking’, will be understood and accepted not as a matter of free will but as innate.

Swaab (2018:345) insinuated that an absolute free will is an illusion. This is not a new idea, for Benedict de Spinoza, as already referred to, has stated in the *Ethica* (1677, statement 48): there is no unconditional or free will in the mind. Determinism reigns supreme. But where does that leave us with the question of moral responsibility? According to Swaab (2018:345), if society can accept determinism, that behaviours are innate, even the inappropriate and immoral behaviours, that it would have far-reaching consequences in how we must treat the offenders. We believe that offenders should still be held morally responsible for their actions and behaviours. The cause of these actions and behaviours, in a deterministic sense, can be attributed to the brain. We want to remind the readers of an earlier quote by Meuleman and Van Vastuin (2014:2), and we will repeat it here: ‘at its core, the issue of free will has to do with the real identity of the human being’. And as Swaab so rightly points out in the title of his book, we are our brains. Our real identity is tied up in the complexity of our brains, in the complex neural wirings inside our skulls. If our brain is the cause of our behaviour, then we are the cause of our behaviour and we should be held morally responsible. However, the way we treat offenders must radically change. We should not blame and seek punishment for offenders out of a sense of revenge. Offenders should not be punished for the sake of punishment. We must rather think of treatment or rehabilitation. Blaming and punishing can only be accepted if it will deter future harmful behaviour and contribute to reforming the offender. If it can reliably be shown that a person’s paedophilic tendencies are caused by a brain tumour in his frontal lobes, and that removal of the tumour will cure him of his immoral behaviour, should he be punished or should the tumour be removed? Do we still need to seek vengeance and punish such an individual after the tumour has been removed and his behaviour returns to normal and he is no longer a danger to society? These are the types of questions we are inevitably confronted with given the denial of free will.

Acknowledgements

Dick Swaab is an internationally renowned brain researcher and is the leader of a team of researchers at the Netherlands Institute of Neuroscience. He was a professor of neurobiology at the University of Amsterdam and for 30 years the head of the Institute for Brain Research.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this research article.

Authors’ contributions

C.J. and D.J.v.d.H. contributed equally to the writing of this research article.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

References

- Anderson, S., Bechara, A., Damasio, H. & Damasio, A., 1999, ‘Impairment of social and moral behavior related to early damage in human prefrontal cortex’, *Nature Neuroscience* 2(11), 1032–1037. <https://doi.org/10.1038/14833>
- Arain, M.A., Haque, M., Johal, L., Mathur, P., Nel, W., Rais, A. et al., 2013, ‘Maturation of the adolescent brain’, *Neuropsychiatric Disease and Treatment* 9(1), 449–461. <https://doi.org/10.2147/NDT.S39776>
- Archie, L.C., 2006, ‘Baruch Spinoza, “human beings are determined”’, in *Philosophical ethics*, viewed 23 January 2020, from <http://philosophy.lander.edu/intro/spinoza.shtml/>.
- Bain, A., 1868, *Mental science*, D. Appleton and Company, New York, NY.
- Baird, A., Wilson, S., Bladin, P., Saling, M. & Reutens, D., 2007, ‘Neurological control of human sexual behaviour: Insights from lesion studies’, *Journal of Neurology, Neurosurgery & Psychiatry* 78(10), 1042–1049. <https://doi.org/10.1136/jnnp.2006.107193>
- Bode, S., Murawski, C., Soon, C., Bode, P., Stahl, J. & Smith, P., 2014, ‘Demystifying “free will”: The role of contextual information and evidence accumulation for predictive brain activity’, *Neuroscience and Biobehavioral Reviews* 47(1), 636–645. <https://doi.org/10.1016/j.neubiorev.2014.10.017>
- Cameron, C., Reber, J., Spring, V. & Tranel, D., 2018, ‘Damage to the ventromedial prefrontal cortex is associated with impairments in both spontaneous and deliberative moral judgements’, *Neuropsychologia* 111(1), 261–268. <https://doi.org/10.1016/j.neuropsychologia.2018.01.038>
- Campbell, J.K., 2011, *Free will*, Polity Press, Cambridge.
- Carter, R., 2010, *Mapping the mind*, Phoenix, London.
- Cookson, C., 2014, *We are our brains*, in D. Swaab (ed.), viewed 19 March 2020, from <https://www.ft.com/content/b4d9a12c-901a-11e3-8029-00144feab7de/>.

- Damasio, A., Tranel, D. & Damasio, H., 1990, 'Individuals with sociopathic behavior caused by frontal damage fail to respond autonomously to social stimuli', *Behavioural Brain Research* 41(2), 81–94. [https://doi.org/10.1016/0166-4328\(90\)90144-4](https://doi.org/10.1016/0166-4328(90)90144-4)
- Filevich, E., Kühn, S. & Haggard, P., 2013, 'There is no free won't: Antecedent brain activity predicts decisions to inhibit', *PLoS One* 8(2), e53053. <https://doi.org/10.1371/journal.pone.0053053>
- Fischer, J.M., 1994, *The metaphysics of free will: An essay on control*, Blackwell Publishers, Oxford.
- Fried, I., Mukamel, R. & Kreiman, G., 2011, 'Internally generated preactivation of single neurons in human medial frontal cortex predicts volition', *Neuron* 69(3), 548–562. <https://doi.org/10.1016/j.neuron.2010.11.045>
- Gazzaniga, M., 2000, 'Cerebral specialization and interhemispheric communication. Does the corpus callosum enable the human condition?', *Brain* 123(7), 1293–1326. <https://doi.org/10.1093/brain/123.7.1293>
- Imhof, C. & Fangerau, H., 2013, 'Neuroscience and the Bereitschaftspotential: Current debates about free will and autonomy', *Neurology, Psychiatry and Brain Research* 19(4), 201–206. <https://doi.org/10.1016/j.npbr.2013.07.003/>
- Kahneman, D., 2011, *Thinking, fast and slow*, Penguin Books, London.
- Kane, R., 2005, *Minds, selves, and agent causes: A contemporary introduction to free will*, pp. 40–52, Oxford University Press, Oxford.
- Kane, R. (ed.), 2011, *The Oxford handbook of free will*, Oxford University Press, Oxford.
- Kane, R.H., 1999, 'Responsibility, luck, and chance: Reflections on free will and indeterminism', *Journal of Philosophy* 96(1), 217–240. <https://doi.org/10.5840/jphil199996537>
- König, A., 1996, 'Providence', in A. Van Egmond & D. Van Keulen (eds.), *Freedom: Studies in reformed theology*, pp. 181–194, Callenbach, Baarn.
- Kornhuber, H. & Deecke, L., 1965, 'Hirnpotentialänderungen bei Willkürbewegungen und passiven Bewegungen des Menschen: Bereitschaftspotential und reafferente Potentiale', [Brain potential changes in arbitrary movements and passive movements of humans: Willingness potential and reafferent potentials], *Pflügers Archiv – European Journal of Physiology* 284(1), 1–17. <https://doi.org/10.1007/BF00412364>
- Kožnjak, B., 2015, 'Who let the demon out? Laplace and Bosovich on determinism', *Studies in History and Philosophy of Science* 51(1), 42–52. <https://doi.org/10.1016/j.shpsa.2015.03.002/>
- Lamme, V., 2010, *De vrije wil bestaat niet, over wie er echt de baas is in het brein*, Bert Bakker, Antwerpen.
- Lavazza, A., 2016, 'Free will and neuroscience: From explaining freedom away to new ways of operationalizing and measuring it', *Frontiers in Human Neuroscience* 10(1), 262. <https://doi.org/10.3389/fnhum.2016.00262>
- Libet, B., 1999, 'Do we have free will?', *Journal of Consciousness Studies* 6(8–9), 47–57.
- Libet, B., Gleason, C.A., Wright, E.W. & Pearl, D.K., 1983, 'Time of conscious intention to act in relation to onset of cerebral activity (readiness potential): The unconscious initiation of a freely voluntary act', *Brain, A Journal of Neurology* 106(3), 623–642. <https://doi.org/10.1093/brain/106.3.623>
- Mawson, T.J., 2011, *Free will: A guide for the perplexed*, Continuum, London.
- Mele, A.R., 2006, *Free will and luck*, Oxford University Press, Oxford.
- Meuleman, A. & Van Vlastuin, W., 2014, 'Calvin and Swaab: A comparison with respect to free will', *In die Skriflig* 48(1), Art. #1763, 6 pages. <https://doi.org/10.4102/ids.v48i1.1763>
- Moll, J., De Oliveira-Souza, R. & Zahn, R., 2008, 'The neural basis of moral cognition. Sentiments, concepts, and values', *Annals of the New York Academy of Sciences* 1124(1), 161–180. <https://doi.org/10.1196/annals.1440.005>
- Moll, J., Zahn, R., De Oliveira-Souza, R., Krueger, F. & Grafman, J., 2005, 'The neural basis of human moral cognition', *Nature Reviews: Neuroscience* 6(1), 799–809. <https://doi.org/10.1038/nrn1768>
- Soon, C., Brass, M., Heinze, H. & Haynes, J., 2008, 'Unconscious determinants of free decisions in the human brain', *Nature Neuroscience* 11(5), 543–545. <https://doi.org/10.1038/nn.2112>
- Soon, C., He, A., Bode, S. & Haynes, J., 2013, 'Predicting free choices for abstract intentions', *Proceedings of the National Academy of Sciences of the United States of America* 110(15), 6217–6222. <https://doi.org/10.1073/pnas.1212218110>
- Stanford Encyclopedia of Philosophy, 2013, *Free will*, viewed 23 January 2020, from <https://stanford.library.sydney.edu.au/archives/spr2013/entries/freewill/>.
- Sternberg, E.J., 2010, *My brain made me do it: The rise of neuroscience and the threat to moral responsibility*, Prometheus Books, New York, NY.
- Swaab, D., 2018, *Ek is my brein. Van baarmoeder tot Alzheimer*, Protea Boekhuis, Pretoria.
- Tallis, R., 2011, *Aping mankind, neuromania, Darwinitis and the misrepresentation of humanity*, Acumen, Durham.
- Van den Heever, D., 2019, 'The neuroscience of morality', in J. Van den Heever & C. Jones (eds.), *Moral issues in the natural sciences and technologies*, pp. 45–66, AOSIS, Cape Town. <https://books.aosis.co.za/index.php/ob/catalog/book/114/>.
- Velms, M., 2002, 'How could consciousness experiences affect brains?', *Journal of Consciousness Studies* 9(11), 3–29. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.581.2105&rep=rep1&type=pdf>.
- Wolf, S., 1990, *Freedom within reason*, Oxford University Press, New York, NY.