Our Will is Conscious, but not Free

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University of Sussex 2011

Abstract

The effect of unconscious stimuli on motor actions and emotions is discussed. The nature of human will is examined through review of experiments on correlates of brain activity during volitional actions. The presented experiments suggest that decision-making is performed unconsciously and that we become aware of a decision by a self-interpretation process up to 10 seconds after it has been made. The decision can be modulated by conscious will before it is executed. The non-deterministic nature of will is explained and 'conscious' will is differentiated from 'free will'. Experiments with meditation practitioners are presented that suggest a possibility of minimizing unconscious brain activity and enhancing volitional control.

Keywords

Volition, consciousness, subconsciousness, free will

Introduction

We like to think that we are in a control of our actions and things around us and we struggle when this control is taken from us. The importance of the "I decided" feeling is so strong that our brain tries to compensate when causal events do not make sense, for example in split-brain (Carruthers 2007) or psychotic (Kapur 2003) conditions. The idea of having free will has been with us since the beginning of our society and all religions as well the legal system are based on the belief that we control what we do and that we are responsible for our actions. Some religions like Christianity go even further and claim that we can sin by thinking itself. This paper investigates the nature of human will by examining experiments with unconscious stimuli processing and volition. It looks at brain areas involved in volition and draws conclusions about free will based on the physiology of these areas as well experiments with meditation practitioners.

If there is free will, decision-making is undoubtedly a crucial part of it. According to Haggard (2008) who performed experiments on volition, there are four steps or sub-decisions in this process:

1. Whether to take any action at all
2. What are the goals and necessary movements
3. Late whether decision: final check that can potentially veto actions
4. When to take an action

According to the Two-systems theory (Carruthers 2007) a decision has both conscious and subconscious components. System 1 is subconscious and could be described as 'intuition'. It is active especially when we are deciding the 'what'. System 2 is conscious and can override System 1. It is influenced by experience and desires.

An obvious problem of System 2 and in fact any conscious decision or 'veto' action is that we first must be aware of the action we are overriding. How about unconscious stimuli? Can they be filtered at all? Are spontaneous decisions acts of free will that exists outside of our awareness of or are they completely deterministic? Finally, even if conscious decision-making is present, is there any free component that decides or are we just complicated machines that would be fully predictable should a perfect model of the brain be available?

Stimuli that affect us unconsciously

A vast amount of experiments have been performed on human perception, volition and subconscious signal processing. Gaal et al. (2008 and 2010) showed that when our future action can be influenced by a visual signal and the signal becomes unconscious through backward masking so that we are unaware of it, it can still influence a motor action. In this case, the unconscious signal remains present in early feed-forward visual processing area and interferes with another visual stimuli presented shortly afterwards. Binsted et al. (2007) tested healthy subjects in a blindsight task where an object they had to reach for was masked shortly after its presentation. Even though the subjects were unable to describe the object, they could still coordinate their motor actions, meaning that the planning and execution of the reaching task was independent of consciousness. Binsted et al. speculated whether the percept of awareness of an object is generally constructed post hoc during manipulative motor actions.

If we can be affected by stimuli that we are not aware of, how many times a day does this happen? Imagine randomly wandering about in town. You choose to turn left, to look up or into a shop window. How many of these decisions are free and how many are based on unperceived cues?

The effect of unconscious stimuli is not limited to motor actions. For example, people are able to learn to respond to unconscious stimuli so that their reward is maximized (Pessiglione et al. 2008) This could be regarded as implicit learning, a phenomenon where subjects are able to unconsciously learn rules that can be behaviourally expressed, although they are unaware of their existence (Cleeremans et al. 1998, Shanks 2005) Furthermore, unconscious stimuli like masked faces can affect amygdala associated with bodily and emotional fear responses (Whalen et al. 1998). It is common that one can suddenly feel threatened or happy, without explicitly knowing why. Both our actions and emotions are partially a result of stimuli we are not aware of, which makes them less spontaneous and free than we previously thought.

The role and nature of conscious will

If we are affected by unconscious stimuli, do we still have control over our actions and emotions? Haggard (2008) performed an experiment where subjects had to press a button when they wished so and remember the time they made that decision. It was shown that pre-supplementary motor area (preSMA) was active before the subject became aware of the volitional act. Another experiment that used a similar task but monitored subjects in an fMRI scanner confirmed activity in fronto-polar and parietal cortex up to 10 seconds before a volitional act entered awareness (Soon et al. 2008). The authors explained that unconscious signals present in the fronto-polar cortex were stored in precuneus before they became conscious and that they influenced SMA without the need of consciousness.

If simple decisions are made unconsciously and only enter awareness afterwards, the 'free will' or more generally 'will' is more of a percept that is constructed post-hoc and at least the 'what' decision is not conscious. This notion agrees with the idea of System 1 of the Two-Systems theory. After his own experiments with volition, Libet (1999) concluded that the role of free will is to 'veto' actions that 'pop out' from the subconsciousness and showed that there is enough time for will to do so. Haggard (2008) was of a similar opinion and indentified preSMA as the area that can be controlled by will and suppress actions before they enter SMA.

The awareness of conscious decisions that require more cognitive action and episodic memory has also been suggested to be constructed post-hoc (Metzinger 2006). Moreover, rostral lateral prefrontal cortex involved in episodic decision-making is influenced by recurrent connections (Koechlin et al. 2003), meaning that signals are sustained in the brain for some time and can be expressed in future neural activity. It could be that we are indeed complex machines and our actions are fully determined by past events as well as the present state of the brain and its inputs. Wegner (2003) has been criticised by many (for example Carruthers (2007), Sharlow (2007)) for completely dismissing the notion of free will because of evidence similar to the one summarised in this paper. His main argument was that will is only a feeling that we come to have by self-interpretation and that both this feeling and actual action have one common cause, hidden from our awareness.

Whether or not our will is completely deterministic, the current evidence shows it is not free. It is perhaps more precise to refer to our will as being 'conscious' rather than being 'free'. The nature of this conscious will can be examined by looking at brain areas involved in the decision-making.

Damage to parietal cortex, an area identified by Soon et al. (2008) as storing volitional decisions, results in unawareness of volition (Sirigu et al. 2004), meaning that volitional decisions can still made but a subject is not aware of making them. The fronto-polar cortex, also identified by Soon et al., has been shown to be responsible for action sequencing during experiments with patients with damage in this region (Dreher et al. 2008) It is interesting that there is activity in the fronto-polar cortex during volitional acts regardless of whether actions are pre-planned or not (Libet 1999). It could be argued that the fronto-polar cortex sequences not only conscious but also unconscious ('what') decisions and that unconscious decisions do not originate here like Soon et al. anticipated. Decisions then become available to the parietal cortex and subject becomes aware of them by self-interpretation (Wegner 2003, Soon et al. 2008), while the signal travels further to the preSMA area (Hallett 2007, Soon et al. 2008) where it can be modulated (or 'vetoed') by conscious will (Libet 1999, Haggard 2008). The fronto-polar cortex could be understood as a 'gate' where both unconscious and conscious decisions enter and are later executed in a particular sequence.

While the hierarchical nature of conscious decision-making in the lateral prefrontal cortex is relatively well understood through work of Koechlin et al. (2003) and Hallett (2007), it is not apparent from our current model of the brain where spontaneous unconscious volitional actions come from. The fronto-polar cortex is connected to (Petrides and Pandya 2004):

1. Lateral prefrontal cortex
2. Dysgranular insula associated with sleep patterns, as well as modulation of senses and mood (Flynn 1999)
3. Orbitofrontal cortex responsible for stimulus processing and reinforcement association, face and voice recognition and controlling of reward- and punishment-related behaviour (Rolls 2004)
4. Posterior Cingular cortex that affects emotions (Maddock 1999)
5. Other brain areas insignificant for this discussion

There probably is no single area that generates spontaneous actions. Rather, factors like homeostatic drive, emotions and current state of the brain could be combined when of before they enter the sequencing module (a similar idea has been proposed by Hallett (2007)) and together with neural noise (Haggard 2008) give rise to actions, possibly by 'winner-take-all' principle that governs the sensory-motor action execution in monkeys (Hallett 2007). Decision-making and will seem to be emergent products of a number of factors. In an emergent system, the whole is more than sum of its parts and there are global patterns of activity not present in the parts themselves (Holland 1998). However, although very complex an emergent process can still be deterministic if it is possible to predict its outcome by using a detailed model.

The element of neural noise very possibly adds unpredictability to our actions, although a recent study (Sadaghiani et al. 2010) showed that at least some neural noise is a result of non-random function influenced by cognition. Nevertheless, it is quite probable that there is non-deterministic and therefore partially spontaneous will as a result of randomness of neural activity in both conscious (cognitive) and unconscious neural signals. Although our will does not appear to be free, it is not completely deterministic either.

Can there be free will?

The complexity of unconscious neural activity can give us impression of randomness (Haggard 2008) as well as free will since we cannot cognitively trace origin our decisions. However, the experimental evidence suggests that this impression is false. One could argue that getting rid of unconscious influences could help us at least partially escape from being automata operating on past experiences, desires and emotions.

Recent studies on meditation showed that this might be possible with long practice. Zen meditation seeks awareness without thinking, a phenomenon referred to in English as not-thinking (Pagnoni 2008). The practice of *zazen* means sitting in a prescribed posture without letting thoughts disturb awareness of oneself and things around (Suzuki 1980). Practicing *zazen* means to perceive things as they are, being disattached from one's emotions, thoughts and sense of self (Pagnoni 2008) and staying completely aware of the 'here-now' without limitations of one's own comprehension. As Suzuki says in his book: "It is the readiness of the mind that is wisdom".

Pagnoni (2008) performed a study where he compared experienced Zen practitioners with control subjects matched by age and cultural background. The task was to concentrate on breathing and press a button if a signal was presented. The aim of the study was to investigate differences in "default mode of brain function" of the subjects, associated with spontaneous brain signals in absence of goal-oriented activity. Zen practitioners were able to return to breath concentration much quicker than the control subjects, suggesting that they had greater ability of voluntarily controlling spontaneous brain activity. Other studies (a good review provided in Cahn and Polich (2006)) showed that meditation practitioners are generally more attentive and better at tasks involved in examined meditation types. This is a result of the brain physiology itself being altered as an effect of long-term meditation practice (Lutz et al. 2004).

This evidence suggests that we do have the capacity to make our volitional acts more disassociated from unconscious and uncontrolled neural processes. However, this ability takes practice and effort and has not been fully understood so far.

Conclusion

A number of experiments regarding volition and unconscious processing have been reviewed. Brain areas associated with volition, especially the fronto-polar cortex that sequences actions have been discussed. It was suggested that factors including homeostatic drive, emotions, desires and current stimuli combine together and unconscious decisions are made in an emergent process of volition. These decisions can be further modulated by consciousness, but even this modulation is subject to brain activity hidden from our awareness. Whereas volition is conventionally thought to precede action, recent studies have shown that decisions are something we become aware of as a part of the decision-making process and that the sense of volition is purely interpretational. Therefore, the term 'conscious will' is more appropriate than the term 'free will'. Although the conscious will appears to be largely deterministic, the element of neural noise potentially adds some randomness to our actions. Even though we are not free in our decisions, we are not fully deterministic machines either.

Meditation, more particularly zazen where one drops their own judgements and can more readily embrace the 'here-now', is a way of at least partially escaping from the effect of unconscious brain activity. However, even if we do, our cognition is still affected by our history, desires, emotions and other elements the moment our subjective will is involved. Even if we try, there is perhaps no way that our will can be completely free. To 'want' something implies being affected by one's desires. These desires are a result of social and religious values, as well as our every day experience. The marketing business and a great part of the global economy work because of this fact.

If that is the case and there is no completely free will, how can we judge other people's actions? Our criminal system is based on the idea of free will and punishes those who do not act according to the law under the assumption that they choose so. While this might not be the case completely, the need of negative feedback given to the people who break the law is still valid, perhaps even more than if we considered our will to be free. Being sent to jail or made to pay a fine enters a person's brain and consequently affects their future actions. Even though this process may be more mechanical than the first creators of law might have thought, it is still completely valid and necessary.

In terms of understanding of our mind, we are perhaps in a similar place than our ancestors were when they were trying to understand the weather and the nature. There was no explanation of why the nature behaved the way it did so they created gods and even attributed personalities to them. The nature seemed to have its own will then but today we know about rules that govern it. Perhaps one day we will be able to appreciate the human mind for what it truly is.

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