

Book Review

The Actor's Brain:  
Exploring the Cognitive Neuroscience of Free Will

Sean A. Spence  
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Sean Spence's *The Actor's Brain* sees free will through the wide-angle lens of cognitive neuroscience by furnishing the readers with a terrific amount of evidences from neuroscience. Spence's work does not offer only a close examination of the recent studies on volition. In chapter 10, he proposes a new overview on the volitional control as a result of the empirical studies quoted in the previous chapters. The human capacity for volition is presented as a multidimensional space subject to multiple constraints. The volitional control is represented by the 'human response space', the range of behavioral responses that the agent is enabled to perform. 'Human response space' is set by multiple constrains (i.e., factors which determine the boundaries of the human response space), as result human freedom is not a *binary* property, something that humans have or do not have, but a *scalable* property, something that humans have *more* or *less* depending on these constrains. Accordingly, the human response space can be expanded or contracted by changing these constrains. Both internal and external to the subject, these constrains are (i) *anatomical* (chs. 2, 4, 6); (ii) *physiological* (ch. 4); (iii) *neurochemical* (ch. 4); (iv) *psychological* (chs. 2, 8, 7); (v) *emotional* (ch. 9); (vi) *social* (ch. 9); (vii) *genetic* (ch. 9). These constrains are not static as they may be altered in different manners in order to "sculpt" the response space (e.g., drug therapies may potentially restore the response space). Throughout the whole book, Spence explores and examines these constrains.

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In chapter 1, he focuses on the journey of the motor signal, which allows the subject to move the right index, through the *central nervous system* and the *peripheral nervous system*.

In chapter 2, Spence considers the ‘anterior’ frontal lobes in order to walk backwards towards the initiation of the action. Voluntary behavior is the result of the integrated work of (1) dorsolateral prefrontal cortex (DLPFC), involved in the ‘self-generation’ of the action and the planning of action of a response, (2) orbitofrontal prefrontal cortex (OFC), implicated in relating the relative ‘reward value’ to objects or targets towards which the action is directed, and (3) frontopolar cortex (BA 10), involved in planning an alternative response to that programmed by DLPFC. DLPFC and BA 10 plan two different alternative responses, whereas the preference is determined by OFC which attributes ‘value’ to these perceived behavioral alternatives. Finally, premotor cortex (PMC) has the role in determining the ‘script’, the ‘pattern’ of motor events’, that the motor cortices may be subsequently called upon to execute.

In chapter 3, Spence faces the timing of volition. Indeed, conscious awareness of acting seems to arise later than the onset of the motor programming and the content of motor programming. These findings suggest that the intention of acting is subject to a double ‘delay’. First, the intention of acting precedes our awareness of movement onset. However, the onset of motor programming precedes the finalization of the content of such motor programming. Second, the intentional act is temporally related to the late RP (namely *readiness potential*, the brain’s electric activity related to voluntary action), whereas the onset of motor programming is temporally linked to the early RP.

In chapter 4, the main issue pertains to how the brain initiates, modulates, and terminates action, in the absence of a central controller. At a neuroanatomical level, several brain regions are involved in volitional behavior, especially five basal ganglia-thalamo-cortical ‘circuits’ – re-entrant loops in which information is recurrently re-cycled, in trajectories that are circular – that contribute to volitional control in several manners (e.g., suppression or execution of finely tuned and overly learned motor routines, motor skill acquisition, emotional behavior). At the neurochemical level, volitional behavior is analyzed in terms of neurotransmitters (i.e., dopamine, serotonin, noradrenaline, acetylcholine) whose different levels of distribution may affect both higher and lower aspects of volition. At a cognitive level, Spence follows Tim Shillice’s model of volition’s cognitive architectures. According to this

model, the human executive system is composed by a lower and a higher system. The lower system performs the routine, automated, and stereotypical behaviors by means of *schemata* – overly learned and simple motor routines which are automated and triggered by cues in our external environment. The higher system (or, executive system) performs consciously planned and spontaneous novel behavior by means of a ‘*Supervisory Attentional System*’ (SAS).

In chapter 5, Spence focuses upon abnormalities of volitional experience, with particular regard to those instances when human agents may be deprived of both their motor control and their sense of agency. Relatively complex behaviors may arise unbidden (e.g., anarchic hands, namely limbs that ‘will not do’ what their owners ‘wish them to do’) or under the ‘influence’ of ‘external forces’ (e.g., a patient with schizophrenia moves her hand but *feels* as if she is subject to the play of ‘cosmic strings’). According to Spence, the organic causes of these diseases are structural and functional abnormalities located in several distributed brain regions, and seem to impair agency via two mechanisms: (i) a disinhibition of ‘lower’ motor centres giving rise to relatively stereotypic and contextually inappropriate motor routines (e.g., anarchic hands); (ii) a disturbance in the perception of voluntary movement (e.g., alien agency).

Chapter 6 is dedicated to avolition, the apparent *absence* of voluntary behaviors. Avolition is present in schizophrenic patients as they exhibit limited behavioral repertoire and a poor responsiveness to their environment. The poverty of the behavioral repertoire indicates that in avolition the prefrontal and anterior cingulate should be implicated in some way. Indeed, avolitional patients exhibit greater prefrontal lobes deficit, whether in terms of ‘function’ or ‘structure’. According to Spence, avolitional syndromes may emerge when the executive system is impaired (e.g., by genetic factors impacting the dopaminergic and glutamatergic systems), so that the agent’s behavioral repertoire is limited to the performances of the subordinate slave system.

Chapter 7 faces a volitional disorder: hysteria. Hysterical patients exhibit unusual, but purposeful, behaviors (‘motor hysteria’), which are apparently *without any organic cause*. According to Spence, hysteria phenomena come and go in response of social milieu of the patient, insofar as they are products of social influences on the subject’s executive motor system. Indeed hysterical signs appear to be dependent on the patient’s ability to attend to its production. In hysterical patients, distraction or sedation reveals the emergence

of normal action, so that the attention is central to the patient's performance of the abnormal act. Spence points out that certain environments encourage the exhibition of hysterical motor signs whereas other environments serve to reverse such behaviors. This means that hysteria is an instance of the 'conspecific' influences on the subject's motor executive system.

In chapter 8, Spence discusses about the cognitive neurobiological basis of an inherently interpersonal behavior: deception. Also deceptive behavior is based on the above examined twofold volitional system. The executive motor system is implicated in producing 'lie' as a novel response and in suppressing the 'true' response by readdressing the value of falsehoods higher than the truths' one. The subordinate slave systems produces the 'true' response, hence it is the 'baseline', the default response of the brain, which is however inhibited by the executive system while deception.

Chapter 9 faces the moral issue whether bad things that human agents do to others are 'chosen' or 'determined'. According to Spence, human beings are not 'perfectible': they are animals who can and will behave 'well' and 'badly', according to their needs and desires: evil and good are both features of human nature. Thereby deviant acts are only examples of abnormal behaviors. Here 'abnormal' has a statistic sense, that is, the characterization of 'normal' depends on our assumptions about what it is that 'most people' do in some specified circumstances. Although 'abnormal' violence may be the result of human response space's decrease determined by contingent factors such as structural/functional anomalies in the perpetrator's brain and genetic abnormalities concerning with neurotransmitter metabolism, Spence recognizes that these biological anomalies are not a sufficient condition for acting badly. The causal power of these anomalies is effective only under specific circumstances (e.g., aberrant influences located within experiential and social spheres), which means that bad behavior is the result of the interaction between the genes, the brain and the social environment.

Finally, in the Epilogue, Spence tries to solve 'Libet's paradox', namely, how can we defend 'free will' if our intentional acts are all *unconsciously* initiated? According to Spence, even though we cannot control our unconscious processes, we can consider an action as morally evaluable if the subject is consciously aware of his/her actions. In conscious awareness, (a) the subjects feel like they are controlling conscious thoughts, and (b) they are conscious of what they are thinking or doing. Consequently: «without consciousness, we cease to be moral agents» (p. 382).

In summary, Spence’s book serves as an excellent source book for those philosophers who are interested in neurobiological and naturalistic foundations of free will. His model of human response space may be seen as a characterization of free will in the terms of cognitive neuroscience in order to elaborate a compatibilist view on free will, which attempts to conciliate free will with determinism of natural sciences. Hence his account on free will reminds of Hobbes’ compatibilist defense, where free will is not conceived as the subject’s capacity of choosing otherwise, but rather of acting *without coercion*, according to his/her own needs and desires.

