Kant, Consciousness, and Supportive Care for Vegetative Patients

Foreword: Many biomedical standards underpinning clinical care are influenced by Immanuel Kant. The framework of moral conduct he envisions is compelling because it is relevant to most patient cases and instantiates dignity and respect as crucial components of the biomedical process. Nevertheless, the reliance of Kant’s moral philosophy on notions of conscious rationality complicates the ability of the healthcare system to adequately treat patients deemed vegetative. This is because patients in a vegetative state, due to substantial brain damage, have attenuated neural activity and lack the overt ability to report conscious experiences, but may nonetheless retain some experience of the world. Indeed, it is important to clarify at the outset that the project herein does not aim to provide an overtly exhaustive or taxonomic survey of the various disorders of consciousness, nor does it attempt to argue unilaterally that all patients in a vegetative state have a robust and fully preserved awareness. Instead, it uses these discussions as a stepping stone to deal seriously with three interrelated tasks: 1) cast doubt on the bimodal certainty with which many vegetative patients are treated as “conscious” or “nonconscious” within the clinic, 2) better understand how, with the emergence of more sophisticated neuroscience techniques, the rigidity of our clinical diagnostic criteria could be adapted, and 3) explore the ethical imperatives society harbors towards patients in the vegetative state. Such studies are important because the stakes of misdiagnosis in vegetative patients are a matter of life or death.

Introduction: One of the particularly challenging questions in healthcare is how to treat patients morally, such that their rights are respected not based on material characteristics (i.e., race, sex, age, etc.), but regarding the value inherent to their humanity. Fundamental to such a notion of biomedical ethics is the work of Immanuel Kant, who, in his *Groundwork on the Metaphysics of Morals*, argues that the superordinate principle onto which the rightness of actions is determined is the “categorical imperative,” an unconditioned principle to which one must always adhere (Kant 4:419). For Kant, an agent is moral when they strive to act in accordance with their desires, yet from a sense of duty, deny themselves their fulfillment. For this reason, morality entails a reflective distance on one’s own reasons for action, a paradigmatic example of what it means to be self-conscious, wherein one evaluates and considers the
content of the will and can deny one’s own immediate inclinations. Indeed, for Kant, self-consciousness is
the characteristic that serves as the fundamental basis of his “humans as ends” formulation of the categorical
imperative, in which he argues that, because conscious people are “ends in themselves,” right actions are
those that treat other rational beings as possessing equal moral worth and respect (Kant 4:429).
Central to Kant’s claim about morality, then, is an inherent dependence on conscious rationality, which is
incredibly useful for physicians situated in clearly defined medical circumstances. For instance, if a patient
is clearly determined to be conscious, can report his or her own phenomenological experiences, and can
perform the functions generally ascribed to a human being, then Kantian morality would require that the
medical team act to keep them alive, autonomous, and dignified. On the other hand, if a patient is
demonstrably non-conscious, then the physician has no moral obligations to the patient beyond respecting
the wishes of their family, as the patient is now a “non-person” (Lazaridis 2015). Where Kant’s framework
is severely complicated, however — that agents with moral worth are necessarily conscious and/or rational
— is in determining supportive care for patients in the vegetative state. This is because these patients, due
to brain damage, seem to reside in the penumbra between consciousness and non-consciousness,
maintaining substantial cortical function yet seemingly unaware of themselves and their surroundings
(Jennett et al. 2002). Naturally, some have wondered whether vegetative patients are conscious at all. If
not, they ask, are such patients entitled to the moral standards imparted on consciously rational individuals?
Indeed, the answers to these questions are still far from clear. As such, it is important to characterize the
nature of vegetative consciousness so that we may come to a better understanding of what our moral
obligations to these patients are.

Understanding the Vegetative State: The most serious attenuation of consciousness following brain
injury is coma, characterized by abnormally low activity across two distinct dimensions: alertness and
awareness (Bender et al. 2015). Downregulation in the ascending reticular activating system (RAS), as well
as in various cortical and subcortical structures, is thought to underlie these respective deficits (Young &
Pigott, 1999). The result is a unique state in which patients display no psychologically discernable attempt
at communicating with the external world, are unable to open their eyes despite vigorous stimulation, and
have no improvements in condition even after total discontinuation of analgesic/sedating drugs potentially hindering conscious awareness (Bender et al. 2015; Jennett et al. 1972; Young & Pigott, 1999). In some cases, coma can rapidly transform into an intermediary vegetative state — otherwise known as apallic syndrome or unresponsive wakefulness syndrome — in which patients are said to display high alertness but low awareness (Bender et al. 2015).

Once a patient is deemed to be vegetative, two prognostic trajectories are possible. If the patient is evaluated as being perpetually unresponsive and having “no chance” of recovery, usually twelve months following traumatic brain injury and six months following hypoxia, then they are classified as situated in a persistent vegetative state with far worse prognosis (Bender et al. 2015). On the other hand, if the patient becomes more aware (although not necessarily more alert), such that they are able not just to open their eyes but also to fixate their gaze and follow simple commands, then they are now referred to as minimally conscious (Bender et al. 2015). This account is consistent with recent work indicating (using positron emission tomography) that the vegetative and minimally conscious states cannot be distinguished on account of differences in thalamic or brainstem activity associated with the RAS and alertness, but instead with respect to differential metabolic preservation of the precuneus and frontoparietal network implicated in awareness (Stender et al. 2014). Thus, the following discussions will be restricted to the extent to which vegetative patients are consciously aware – that is, to borrow from Thomas Nagel, a sense of “what it's likeness,” the capability to have a phenomenal experience of oneself and one’s surroundings, however fragmented it may be (Nagel 1974).

Indeed, the first characterizations of the persistent vegetative state, while enlightening, were limited to evaluations of patient behavior at the bedside — a task tremendously complicated given the inherent nature of these patients’ unresponsive symptomatology. Jennett et al. (1972) offered one seminal account, describing a state of behavior in which the patient’s eyes were generally open (that is, they were wakeful), but nevertheless one in which the patient displayed no phenomenal conscious awareness that could be reasonably detected. The authors also noted that patients in the persistent vegetative state never spoke, were unresponsive to behavioral tasks associated with activity in the cerebral cortex, and displayed only primitive
postural and reflexive movements. However, a key limitation of studies of this sort was that, although their authors interpreted their findings as suggestive of a lack of cerebral cortical function consistent amongst patients in a vegetative state, such null conclusions were generally unfounded on the nuanced functional or neuroanatomic techniques only recently emerging. It is quite troubling, then, that despite their primitive and shallow analyses of the conscious state of vegetative patients, seminal papers of this kind had pervasive influences on the field at large, biasing the view of these patients to one built almost exclusively on negative terms. Consequently, vegetative patients became regarded not based on what they possessed neurologically, but rather on account of what they lacked. This triad of negatives — no awareness, no response to vigorous stimulation, and no suggestion of language expression or comprehension — became the theoretical basis, according to Shea & Bayne (2012), of a rigid and methodologically conservative “standard approach” to diagnosing vegetative patients in the clinic. Under this approach, it was only when patients displayed reproducible behavior suggesting conscious perception, and overtly reported their experiences, that they were not characterized as vegetative, but instead as conscious in some form or another (Bender et al. 2015; Naccache 2018; Royal College of Physicians 2003).

Prima facie, it may seem that the “standard approach” is a practical and beneficial system, which attempts to distinguish between conscious and non-conscious patients based on reportability (Shea & Bayne, 2012). As emphasized in the initial section, arriving at some semblance of distinction is crucial in clarifying the obligations society has toward vegetative patients in accordance with systems of Kantian morality. Thus, what is problematic about the “standard approach” is not its superordinate aim, but instead the rigid certainty with which it attempts to draw a line in the sand regarding conscious status. This is the case because of three reasons: 1) the true nature of vegetative consciousness is far from clear, 2) the approach’s requirement for reportability is incompatible with the reality of accurately diagnosing states of consciousness in verbally unresponsive patients, and 3) the repercussions are unprecedented when mistakes are undoubtedly made. As Bender and colleagues (2015) demonstrate, neither the Glasgow Coma Scale (GCS) nor the Coma Remission Scale (CRS), two indices used commonly in the clinic to assess consciousness, allows for a precise, operationalized differentiation between minimally conscious and
vegetative states. Furthermore, even the revised Coma Recovery Scale — the most widely used clinical inventory for this purpose thus far, which goes beyond verbal report and assesses everything from arousal level and audition, to visuoperceptual and oromotor capacity — harbors a false negative diagnostic error of 22% (Bodien et al. 2017). Most worrisome is the finding that, in all cases in which patients are thought to be vegetative (i.e., supposedly non-conscious according to a clinical evaluation), the rate of misdiagnosis is approximately 37%–43% (Bender et al. 2015).

Not only is clinical misdiagnosis a serious ethical matter, because it could result in emotional neglect or the premature termination of life-sustaining care, but furthermore, the demonstrated inadequacy of the “standard approach” raises profound questions about the nature of consciousness itself. One implication is that consciousness may not refer to a rigid categorical distinction that depends on verbal report but may instead be a continuous spectrum whose assessment relies on a far more diffuse and interconnected set of processes than is being currently assessed. Another implication is that some vegetative patients may reasonably possess some form of consciousness as well, perhaps lying somewhere in the ambiguity between demonstrable consciousness and the sheer unconsciousness with which they are often conflated. After all, it is not inconceivable that at least some vegetative patients have conscious experiences, and/or intend to report them, but are precluded by downstream motor or physiological deficits (Shea & Bayne, 2012).

Indeed, better approximating vegetative consciousness is the subject of the following sections and will be bolstered by findings across several functional paradigms. For now, we must recognize that, to truly assess the extent to which some vegetative patients may be conscious (and thus, how to treat them morally), we must look beyond shallow behavioral and clinical test batteries and delve into the realm of functional neuroanatomy.

**Support for Vegetative Consciousness:** As previously mentioned, defining a standard of moral conduct towards vegetative patients is contingent on the extent to which they are conscious. While initial behavioral assessments of the vegetative state were far from promising, converging evidence across a more sophisticated set of neuroimaging paradigms supports the possibility of vegetative consciousness in some form or another. Positron emission tomography (PET) experiments have been fruitful in this regard, finding
that — in contrast to “brain dead” patients who harbor no neural metabolism — patients in a vegetative state show neuronal metabolic activity approximately 40% of that seen in healthy individuals, and almost identical to that seen in patients under general anesthesia (Shea & Bayne 2012). Further studies across multiple modalities (i.e. vision, audition, and nociception) and techniques with distributed spatiotemporal sensitivities (i.e., fMRI, MEG, EEG, and PET), suggest that vegetative patients may have partial preservation of functional connectivity and integrity within several important corticothalamic networks (de Jong et al. 1997; Staffen et al. 2006; Di et al. 2007; Perrin et al. 2006; Menon et al. 1998; Laureys et al. 2002; Schiff et al. 2002). Of course, similar patterns of neural activation have been noted by Shea & Bayne (2012) in “priming” experiments associated with unconscious cognitive processing as well, and are as such, not by themselves determinant of a definite vegetative consciousness. However, these findings represent a powerful first stride in obtaining a better neuroimaging understanding of consciousness in the vegetative state.

Another area of increasing interest is in understanding the extent to which vegetative patients process and comprehend language. As Merleau-Ponty contends in *The Phenomenology of Perception*, it is “on the basis of [the conscious experience of ourselves] that all linguistic connotations are assessed, and precisely through it that language comes to have any meaning at all for us” (Merleau-Ponty XIV). As such, tremendously compelling for an account of vegetative consciousness are the findings noted by Coleman et al. (2007) and Owen et al. (2005), who have found, using fMRI and PET respectively, that patients in the vegetative state may be linguistically active. More specifically, vegetative patients in both studies showed distinct neuronal responses to verbal speech (but not acoustically matched noise) which mirrored, albeit at attenuated levels of activation, the pattern of neural activity observed in nonclinical subjects. This is consistent with recent reports that vegetative patients may be able to semantically process and encode language into working memory, such that in response to highly ambiguous (but not lowly ambiguous sentences) in an fMRI paradigm, they show upregulated activity in a fronto-temporal language network well characterized for this purpose in healthy subjects (Rodd et al. 2005; Davis et al. 2007). Important to consider is the finding that this activation is eradicated by even moderate amounts of anesthesia in
nonclinical subjects, strongly indicating that vegetative patients may indeed be the subject of an intricate set of neuronal processes above and beyond that which is expected in the purely non-conscious state (Shea & Bayne 2012).

A core feature of consciousness thus far not discussed is its dynamic modulability. As Demertzi and colleagues (2019) discuss, consciousness does not merely refer to (and should not merely be studied as) a static state of neural activation in response to stimulus presentation. Instead, perception, emotion, and cognition are impossibly complex, and therefore depend upon evolving, self-sustained, and coordinated processes of neural activity perpetually equilibrating one to their changing environment (Tononi et al. 2008; Northoff et al. 2017; Dehaene et al. 2011; Deco et al. 2016). Naturally then, one of the strongest areas of published evidence regarding disorders of consciousness has used so-called “active paradigms,” which attempt to better capture the dynamic nature of the vegetative brain. These studies consider, but are not limited to, neuroimaging tasks of mental imagery and analyses of activation complexity in evoked and/or spontaneous neural responses (Monti et al. 2010; Casarotto et al. 2016; Engemann et al. 2018). One such mental imagery study was conducted by Owen et al. (2006). Using two separate trial types, the authors attempted to discern the extent to which a twenty-three-year-old, diagnostically vegetative, car crash victim was consciously aware. In the first trial type, the patient listened to a standardized instruction and imagined what it would be like to play a game of tennis (i.e., motor imagery); in the second trial type, the patient was instructed instead to imagine herself walking through the different rooms within her home (i.e., spatial navigation). Fascinating was the finding that, over the course of the study, the vegetative patient’s blood oxygen level-dependent activity (BOLD, as assessed by fMRI) was virtually the same as that observed in 34 healthy participants, such that the tennis trial type produced increased BOLD activity in the supplementary motor area and the navigation trial type produced increased BOLD activity in a cluster of areas comprising the parahippocampal place area (Shea & Bayne 2012). Moreover, this result aligns with further work assessing both spatial navigation and motor imagery and provides yet another line of evidence that vegetative patients harbor a robust and *modulable* phenomenal experience beyond anything that can be reasonably attributed to complete non-consciousness (Owen & Coleman 2008a; 2008b).
**Future Directions & Revisiting Kant:** The explorations of the previous sections have illuminated a striking reality, that at least some patients in the vegetative state, though unable to verbally report their phenomenal experiences of the world, are likely the subjects of an intricate set of neuronal processes above and beyond that which is expected in the purely non-conscious state. This conclusion has several implications for the future, first for the way in which such patients are treated morally in the clinic, and second for the way in which the scientific community regards and theorizes about the nature of consciousness itself.

The first implication, as Shea & Bayne (2012) put it, concerns “the problem of error management.” That is to say, that, when one attempts to ascribe a state of consciousness to another individual, and to determine a proper course of clinical action on the basis of that classification, two types of error are possible: that of *commission* and that of *omission*. The former occurs when one erroneously judges an unconscious agent to be conscious (i.e., false positive), while the latter involves wrongly determining a conscious entity to be unconscious (i.e., false negative). In the context of vegetative patients, for whom the status of consciousness is uncertain, both options are imperfect, as errors of *commission* can lead to situations in which one continues end-of-life care even in the absence of patient responsiveness or when resources are limited, while errors of *omission* can lead to the termination of life-sustaining care for patients who are phenomenally aware. Indeed, what is certain upon the evidence presented throughout this paper is that conservative approaches to attributing consciousness to patients in the vegetative state (which favor errors of omission over errors of commission) are by far more costly to human life than liberal approaches like Shea & Bayne (2012)’s “cluster-kind” methodology. This is especially important because, while the prognosis is poor, the vegetative state is not unitary and irreversible, but one from which at least some patients may eventually recover (Baricich et al. 2017). Thus, we must take seriously the contention that in any case in which the conscious awareness of a patient (and thus our moral obligations to them) is under question, we must act not on account of our own interests or convenience, but instead unilaterally with respect to the patient’s interests. Furthermore, these actions must be dynamic rather than static in focus, mindful not only of the patient’s current state of consciousness, but also, and with a great deal of
seriousness, of all future states that may readily be achieved by them. As Kant outlines, “act in such a way that you treat humanity, whether in your own person or in the person of another, always at the same time as an end and never simply as a means” (Kant 4:419).

This is the “good will” towards vegetative patients, I argue:

“...good not because of what it affects, or accomplishes, not because of its fitness to attain some intended end, but good just by its willing, i.e. in itself; and, considered by itself, it is to be esteemed beyond compare much higher than anything that could ever be brought about by it in favor of some [personal] inclinations...Even if by some particular disfavor of fate...this [good will] should entirely lack the capacity to carry through its purpose; if despite its greatest striving it should still accomplish nothing...then, like a jewel, it would still shine by itself, as a [right action] that has full worth in itself” (Kant 4:394).

It is based on this philosophical ground, paired with the mounting body of neuroscientific literature discussed at length in previous sections, that until the conscious status of vegetative patients is more clearly defined in the coming years, such patients must be presupposed as conscious in some form (and given access to medical care) whenever their rights and life are called into question. As we move into the future, this is the Archimedean point from which we must not deviate without incontrovertible evidence that the patient’s vegetative state is one of pure non-consciousness. For this reason, the burden of proof (at least in the immediate future) must rest not with those attempting to make a case for vegetative consciousness, but instead with those aiming prematurely to dismiss it.

The second implication about the future concerns a broader, more systematic issue with the way in which the scientific community regards and considers the nature of consciousness itself. In particular, one of the most profound qualities of the vegetative state is that it directly complicates the conscious-nonconscious binary onto which many studies and diagnostic criteria in the field are built. Instead, it suggests that while some patients are definitely conscious, and others are entirely non-conscious, these should not be seen as categorical distinctions, but instead as two extreme polarities in a continuous spectrum of consciousness — a spectrum onto which various disorders of consciousness are differentially located. A great illustration of
this point is seen in a recent study by Demertzi et al. (2019), which analyzed the spontaneous fMRI dynamic connectivity in the brains of overtly conscious, minimally conscious, and vegetative patients. In doing so, the authors found four patterns of interareal coordination in the cerebral cortex which corresponded to various states of consciousness. Pattern 1 was primarily associated with overtly conscious and minimally conscious (but not vegetative) patients and was defined by neural interactions with extremely high spatiotemporal complexity, modularity, long-distance coordination, and network efficiency (i.e., highest dynamic coherence). On the contrary, Pattern 4 was predominantly associated with vegetative (but not conscious and minimally conscious) patients and was defined by neural dynamics with extremely low complexity, modularity, coordination, and efficiency (i.e., lowest dynamic coherence). Indeed, these may refer to the poles of the consciousness spectrum. More important, however, were the intermediary patterns (2 and 3), which were characterized by moderately complex dynamics in the occipital cortex and whole brain respectively, and were equally probable across conscious, minimally conscious, and vegetative patients. Indeed, these intermediary patterns (and their equitable representation amongst the different conscious states) suggest that the distinction between the complexity of neural activity in conscious and nonconscious patients is not a sharply defined bimodality; instead, the neural dynamics characterizing different states of consciousness seem to diffusely bleed into one another. If this continuous account of neural dynamics underlying human consciousness is adopted by more scholars within the field, as it has been already by Noel and colleagues (2019) in their account of a graded multisensory perceptual awareness in vegetative patients, then one of the huge areas in the future of consciousness research will be how best to organize such a spectrum. Through this pursuit, perhaps the full scope and complexity of human consciousness may be better captured and appreciated.

Concluding Remarks: This paper illuminates several important discussions in the field of vegetative consciousness. First, it addresses the key limitations and high diagnostic errors of current methods for assessing vegetative consciousness in the clinic. Second, it reviews numerous studies, using functional neuroimaging techniques with varying spatiotemporal resolutions, in order to highlight a number of fascinating features about vegetative patients: that they have partial preservation of important
corticothalamic “islands of activity” associated with cognition in healthy individuals, that they show task-related upregulation of regions implicated in semantic processing and encoding of language into working memory, and finally, that they demonstrate a dynamic and modulable awareness of their surroundings. While more work needs to be done, this evidence suggests not only that certain vegetative patients are conscious in some form or another (and thus due the same moral protections given to others under biomedical frameworks of Kantian morality). But more importantly, these findings make a larger and more profound case about the nature of consciousness itself, asserting that it is perhaps a continuous rather than categorical enterprise whose evolving understanding depends on a ground-up dismantling of the conscious-nonconscious binary. My sincere hope in writing this paper is, that through an expansion of intellectual explorations of this spirit, the study of consciousness will be viewed less as an airy and intangible fascination with the human mind, and increasingly as a necessary pursuit with real consequences for human life and conduct.
References


