OVER-EMPHASIZING THE SPECIFIC FUNCTIONS AND DYSFUNCTIONS OF THE BODY AND THE BRAIN-MIND ENTAILS TACIT CREATIONISM

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August 28, 2024

Abstract

Notions of function and dysfunction are fundamental for neuroscience, psychology and psychiatry, but remain contentious. We propose that some of these controversies arise from tacit creationism, which incorrectly views aspects of evolved systems as if intentionally designed. Many philosophers agree that "failure to perform a normal function" is fundamental to the concepts of physical disease and mental disorder. However, unlike machines and computers, bodies and brain-minds are variable in multiple respects, and these variations may have advantages and disadvantages in different environments. Indeed, in the case of bodies and brain-minds it may be difficult to draw a bright line between normal and excessive activation of an adaptive defense in a particular context. The metaphors of body as machine, or the brain-mind as computer, encourage the notions that components of bodies and brain-minds have specific functions like those of the parts of machines, and that disorders have clear boundaries. Rejecting tacit creationism, and accepting the messy reality of organic complexity, as well as the fuzzy boundaries of disorder, offers a better way forward for neuroscience, psychology, and psychiatry.

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Running Title: Function, Dysfunctions and Tacit Creationism

Corresponding author: D Stein

Words: 2619

Figures: 0

Abbreviations: 0

Graphical abstract/text: 0

Dr. Stein has received consultancy honoraria from Discovery Vitality, Johnson & Johnson, Kanna, L'Oreal, Lundbeck, Orion, Sanofi, Servier, Takeda and Vistagen.

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ABSTRACT

Notions of function and dysfunction are fundamental for neuroscience, psychology and psychiatry, but remain contentious. We propose that some of these controversies arise from tacit creationism, which incorrectly views aspects of evolved systems as if intentionally designed. Many philosophers agree that "failure to perform a normal function" is fundamental to the concepts of physical disease and mental disorder. However, unlike machines and computers, bodies and brain-minds are variable in multiple respects, and these variations may have advantages and disadvantages in different environments. Indeed, in the case of bodies and brain-minds it may be difficult to draw a bright line between normal and excessive activation of an adaptive defense in a particular context. The metaphors of body as machine, or the brain-mind as computer, encourage the notions that components of bodies and brain-minds have specific functions like those of the parts of machines, and that disorders have clear boundaries. Rejecting tacit creationism, and accepting the messy reality of organic complexity, as well as the fuzzy boundaries of disorder, offers a better way forward for neuroscience, psychology, and psychiatry.

Keywords: Function, dysfunction, tacit creationism, disease, mental disorder, philosophy

The notions of function and dysfunction are fundamental for neuroscience, psychology and psychiatry. However they spur continuing controversy, with ongoing debate about how best to conceptualize and operationalize function and dysfunction, including a large body of work in philosophy of biology, medicine, and psychiatry (Allen *et al.* , 1998; Schwartz, 2007; Griffiths & Matthewson, 2018; Keeling *et al.* , 2019). Here we propose that some of the controversies about function and dysfunction arise from tacit creationism, which incorrectly views aspects of evolved systems as if they were intentionally designed. Viewing bodies as devised machines, or minds as programmed computers, leads us astray in important ways.

There is widespread agreement that the concept of function in biology ultimately depends on how a trait contributes to gene transmission. Philosophers disagree, however, about the nature of dysfunction and disease. Boorse, known for his naturalist position, argues that disease occurs when a part of the body fails to perform its natural function, which is essential for survival and reproduction (Boorse, 1975, 1997, 2014). In contrast, Wakefield's definition of disorder as "harmful dysfunction" is partly normative, and he argues that dysfunction is present when a trait fails to perform the function for which it was naturally selected (Wakefield, 1992, 2007; Faucher & Forest, 2021).

Both these positions, as well as many others in philosophy of medicine, concur that "failure to perform a normal function" is fundamental to the concept of physical disease. We know that the function of a radiator is to cool the engine. Thus, when the radiator fails, a car overheats and malfunctions. Similarly, the heart is a pump and insufficient blood circulation causes the malfunction we call congestive heart failure, although this view may well be an oversimplification (Binney, 2018; Ruse, 2018). However, not all bodily traits have functions as specific as pumping for the heart. Many traits have multiple functions, and many functions are served by multiple traits, so expecting each trait to serve a specific function misrepresents the messy reality of biology and disease (Nesse & Stein, 2012).

Genes make proteins that make tissues, but the process is very different from the manufacture of a machine. Machines have blueprints of the ideal type, but organisms have genomes that vary between individuals. Parts of a machine tend to be discrete, each with a specific function envisioned by an engineer. In contrast, many parts of a body have blurry boundaries and multiple functions. For instance, the immune system includes dozens of different kinds of cells, many playing multiple roles. Specific genes and hormones are not regulated

via simple feedback systems but instead by vast networks of molecules, with roles for multiple small RNAs expressed in response to certain cues, in confoundingly convoluted sequences of causation.

Many philosophers of psychiatry would similarly concur that "failure to perform a normal function" is fundamental to the concept of mental disorders. Furthermore, the advent of the digital age has allowed us to conceptualize the brain-mind as a computer. Thus mental disorders may be due to hardware problems (that is, brain defects) or software glitches (for example, cognitive distortions). However, the brain-mind is an embodied cognitive-affective processing system, and mental disorders invariably involve complex interactions of biological and psychological mechanisms. The term "wetware" may be useful in highlighting this organic complexity, and steering us away from simplistic computer models (Stein, 2021).

These distinctions between body and machine have important implications for our concepts of function and dysfunction. A machine must conform to an ideal type, as specified by the engineer. In contrast, the body is variable in multiple respects, and these variations may have advantages and disadvantages in different environments. Indeed, in the case of bodies it may be difficult to draw a bright line between normal and excessive activation of an adaptive defense in a particular context. Fever is an adaptive response that is helpful in combating infection, but in some circumstances a high fever may cause seizures, so a physician may use a drug (such as an antipyretic) to dampen an adaptive defensive (Nesse, 2023).

In the case of the brain-mind, drawing a bright line between normal and excessive activation of adaptive defenses may be even more difficult. Anxiety is an adaptive defense that is useful in the face of threats (Marks & Nesse, 1994; Stein & Nesse, 2015). However, cues indicate only that danger might be present, so the optimal system is like a smoke detector; it has to express many inexpensive false alarms to ensure a protective response to catastrophic threat (Nesse, 2001). Importantly, most instances of anxiety are "false alarms" from a normally functioning control system. Clinicians assess the magnitude of threat and intensity of distress to judge whether a dysfunction is present, but excessive anxiety does not necessarily imply that the underlying mechanisms are defective, and clinicians often sensibly provide treatment to relieve anxiety even when there is no evidence of system failure.

Social anxiety offers a special case for debate (Campbell-Sills & Stein, 2005; Wakefield *et al.* , 2005). Most people are cautious when they are the focus of group attention for the good reason that even a small misstep can rupture relationships or arouse envy or condemnation. Social anxiety functions to inhibit actions that might cause social harm, but how much is enough? Should we consider benefits and costs to kin as well as the individual? Is the current level of social anxiety too much or too little given this individual's roles in this social group at this time and place? Or should we be asking what aspects of the individual's behavior are optimally expressed or inhibited in this situation now? Such questions emphasize the specific difficulties in determining whether or not mental dysfunction is present (Bolton, 2008; First & Wakefield, 2013; Stein *et al.* , 2021), as well as the more general issues of complexity and vagueness in psychiatry (Kendler, 2012; Keil *et al.* , 2017; Fried & Robinaugh, 2020).

Defining what is functional and what is dysfunctional is much harder for behavior control systems than for parts of a machine. Reifying constructs such as social anxiety disorder, as if they represent failures of specific parts in a machine, is a clear example of tacit creationism. While there are brain mechanisms that regulate social anxiety, anxiety, and differences that make some brains more vulnerable, it is increasingly unlikely that excess social anxiety will be found to arise from specific brain circuitry or neuronal molecules. It is, instead, a particular state of an organic embodied cognitive-affective processing system that varies considerably from individual to individual and from situation to situation in ways that defy attempts to crisply define function and dysfunction.

Some evolutionary theorists have tried to define "the function" of depression, or to link distinct subcategories with different functions, as if they were products of design. However, the varieties of low mood are states shaped by natural selection because they increase fitness when they are expressed in a variety of overlapping situations in which reduced motivation and self-esteem are useful (Nesse, 2019). Emotions have vague boundaries and overlapping causes, quite different from the discrete modes that might be triggered in a

machine (Nesse & Ellsworth, 2009). In distinguishing between normal low mood and pathological depression, confidence is possible only for extreme cases, and providing treatment may be worthwhile even when system disruption is unproven.

We sometimes forget how deeply metaphoric our ordinary language concepts are (Lakoff & Johnson, 2010). For example, the notion of disease maps onto a number of different extended metaphors, including disease as "breakdown", disease as "imbalance", or disease as "attack" (Stein, 2008). The metaphors of body as machine, or the brain-mind as computer, encourage the notion that components of bodies and brain-minds have specific functions like those of the parts of machines. They do serve functions, but many, especially emotions and other aspects of behavioral control systems, do not have a specific function, unless that function is very broadly framed as "adjusting the individual's cognition, physiology, behavior, and emotions to better cope with situation X" or as "contributing to gene transmission" (Nesse & Ellsworth, 2009).

The idea that there are "natural kinds" in biology, akin to the elements in the periodic table, and analogous to the artefactual kinds in machines, encourages attempts to define them in terms of necessary and sufficient criteria (Stein, 2021, 2022). In biology, however, kinds are often "soft," with vague outlines, fuzzy borders, and multiple functions and inordinately complex connections that frustrate efforts to establishing necessary and sufficient criteria. This is not to diminish the value of investigating the complex proximal and distal mechanisms that underlie soft biological kinds, it is rather to emphasize their complexity (Bechtel & Richardson, 1993; Mitchell, 2003; Wimsatt, 2007), and the need to avoid tacit creationism.

It may be countered that in the case of a machine, there may also be dysfunctional states, such as a car not starting, that are due to a range of different causes. However, when a car does not start, this is typically due to one or other very specific defect, such as the battery being dead, or the ignition mechanism not working. In the case of anxiety and depression, however, a range of different mechanisms may synchronically and diachronically contribute. Viewing anxiety and depression as products of a specific defect in a machine obscures the organic complexity of living systems. The notion that these conditions are caused by genetic, anatomic, or physiological defects that disrupt a specific function has been contradicted by decades of research that has failed to demonstrate specific biomarkers or causes.

Reluctance to give up a view of bodies as machines and brain-minds as computers is understandable. The metaphor has inspired essential searches to find specific defects in specific parts that disrupt their specific functions. In some cases, these searches have paid remarkable dividends; consider the discovery that pancreatic dysfunction decreases insulin production and leads to diabetes, which responds to external administration of insulin. However, in many cases this type of specificity is not found. In some cases, such as Alzheimer's dementia, we can still hope that the search will succeed. But giving up tacit creationism and accepting the messy reality of organic complexity may well offer a more fruitful way forward for neuroscience, psychology, and psychiatry.

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