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The function of the heart is historically contingent

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ABSTRACT

Some philosophers of medicine argue that there are objective facts about the biological function of organs, and that these facts are used to objectively define diseases. The function of the heart is taken to be particularly obvious and well established. Contrary to this, I argue that the function of the heart is not fixed by nature, but rather that it is historically contingent. The disease heart failure results from the dysfunction of the heart. In opposition to the common-sense intuitions of philosophers, medics do not define heart failure simply as a reduced cardiac output, and up to half of patients with heart failure have a normal cardiac output. The present day medical definition of heart failure is thus counter-intuitive. In the early twentieth century, however, medics did define heart failure as a reduced cardiac output. This view was opposed in the 1930s, when a similar definition of heart failure to the one used today was put forward. I look closely at this historical episode, in order to explore the reasons for this development. I use this history to argue that present day knowledge of heart failure is not the inevitable result of careful observation of patients, but rather is historically contingent.

1. Introduction

A prominent view in the philosophy of medicine is that “the classification of human states as healthy or diseased is an objective matter, to be read off the biological facts of nature without need of value judgements” (Boorse, 1997, p. 4). This naturalist view is opposed by normativists, who argue that a person's disease status is not an objective matter, largely because they maintain that biological facts about the function of organs are value laden. Even though this debate between naturalists and normativists/constructivists is focused on the role that *values* play in medicine, the *objectivity* of knowledge about disease is also an important point of contention. “The crucial difference between the positions then is that for naturalists, diseases are objectively malfunctioning biological processes that cause harms. For the constructivist, diseases are harms that we blame on some biological process because it causes the harm, not because it is objectively dysfunctional”. For the naturalist, knowledge of disease status, biological function, and biological processes that might be considered harmful, is objective knowledge.¹

According to naturalists, then, biological functions are supposed to be fully determined by the way the natural world is. Daniel Hausman expresses this view nicely, arguing that the function of an organ “is not a human evaluative choice; it is nature's “choice.”” (Hausman, 2012, p. 520). The facts about biological functions are not supposed to depend on the social and cultural context in which the medical researchers who

discovered them were working. Whether or not these facts are true is not supposed to be determined by the historically situated choices of researchers. Facts about biological function are not supposed to be historically contingent.

This naturalistic account is not intended to be an idealised account of what knowledge of disease should be. Rather, it is intended as a descriptive account of what knowledge of disease actually is, at least in the case of somatic diseases, as opposed to psychiatric diseases (Boorse, 1976, p. 62). For instance, Christopher Boorse has always maintained that he has tried “to choose that analysis which best fits medical usage” (2014, p. 693). Accordingly, medical researchers are actually supposed to have discovered the biological function of many organs, and to use this knowledge to determine the disease status of patients. On this naturalistic view, the functions of organs are knowable, and in many cases known.

As researchers are supposed to have discovered these objective truths, compelling evidence for them ought to be available. This does not imply that every claim made by medical researchers about the function of an organ needs to be well established and irrefutably correct for the naturalistic position to be tenable. Of course, medical researchers are only human. They may be wrong from time to time, or draw hasty conclusions based on flimsy evidence. Even so, in many cases we should be able to find the overwhelming evidence that compels medical researchers to believe the things they do about biological function and disease.

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¹ Although normativists reject the views that disease status and biological function are objective, many normativists do not reject the view that there are objective biological facts about what is making patients sick. This history may well conflict with these views as well. I focus on naturalists because objectivity is central to their view.

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Indeed, the function of one organ, the heart, is allegedly so firmly established that it appears obvious. According to Boorse, it is obvious that the function of the heart is to circulate blood (Boorse, 1976, p. 75). As I have discussed elsewhere (Binney, 2018), this view is widely held by philosophers. If disease is sub-normal function, as naturalists maintain, then the disease that arises from cardiac dysfunction – heart failure – should be defined as, and only diagnosed in patients with, sub-normal cardiac output.

As I have shown elsewhere (Binney, 2018), this is not how heart failure is defined or diagnosed in medical practice today. In relatively recent guidelines the European Society of Cardiology defined heart failure as follows:

“Heart failure can be defined as an abnormality of cardiac structure or function leading to failure of the heart to deliver oxygen at a rate commensurate with the requirements of the metabolizing tissues, despite normal filling pressures (or only at the expense of increased filling pressures)” (McMurray et al., 2012, p. 1792).

The bracketed clause “or only at the expense of increased filling pressures” means that, according to this definition, it is possible for patients with an adequate cardiac output to have heart failure. According to this definition, it is not necessary that a patient with heart failure have a reduced cardiac output. Indeed, as many as half of patients with heart failure have normal cardiac output (Carlsson et al., 2012). It is also possible to have “high output heart failure”, where a greater than adequate volume of blood is pumped around a patient's body (Mehta & Dubrey, 2009). Heart failure is not defined or diagnosed in the way that the common-sense intuitions of philosophers suggest that it should be (Binney, 2018).

This discrepancy between common-sense and medical practice raises the question of why it is that medical researchers claim the things they do about heart failure. Although these counter-intuitive views are reasonable, I argue here that the evidence for them is not so overwhelming that it must compel all reasonable people to accept them. If history had proceeded differently, other perfectly reasonable ways of understanding biological function, pathophysiology and disease status could have developed. Knowledge of the function of the heart is not fully determined by nature. Rather, it is historically contingent.

To do this, I will look back in history to the period where something like the definition of heart failure given above first emerged (section 2). In the early twentieth century, many doctors argued that heart failure should be defined as the inability of a patient's heart to pump an adequate amount of blood forwards into the circulation. This view was championed by the British doctor James Mackenzie (1853–1925) (section 2.1). Mackenzie's views were challenged by the American doctor Tinsley Randolph Harrison (1900–1978), who argued that the available evidence showed that Mackenzie's views were false (section 2.2). Harrison found that many patients in heart failure had normal cardiac outputs, and argued that heart failure should instead be defined as the inability to maintain a normal cardiac output without raised blood pressure in the heart and vessels returning blood to the heart. This conclusion framed subsequent discussions about how to define heart failure in the decades to come.

I will argue that Harrison was not forced to this conclusion by the observations that he made. Alternative interpretations of his results were possible and plausible, some of which could have preserved the view that heart failure was defined as the inability to maintain an adequate cardiac output. I use this historical work to argue that the definition of heart failure accepted today is not ‘nature's choice’. I argue that the culturally bound decisions of medical researchers partly determine what heart failure is, and thus how the function of the heart is understood in medical practice (section 3).

As I argue that there were alternative ways to respond to anomalous results in addition to the way that historical actors actually chose to do this, my claim about the historical contingency of knowledge about heart failure is related to the philosophical thesis on the

underdetermination of knowledge by experience. The standard objections to this underdetermination thesis may apply to this case and should be considered.

One standard objection to this thesis are that the underdetermination of knowledge by experience is only a *logical* problem, which does not actually manifest in scientific practice. This objection was raised by Larry Laudan, who argued that many alleged instances of underdetermination “founder precisely because they suppose that the logically possible and the reasonable are coextensive” (1990, 267). Laudan argued that all sciences use ampliative inferences. Consequently, there are always logical alternatives to the inferences drawn, but this does not make these logically available alternatives reasonable things to believe. I will argue that these alternative routes of inquiry were not just logically possible, but also that they would have been reasonable to consider.

Another standard objection is that even if underdetermination is not just a *logical* problem, it may only be a *transient* phenomenon that will resolve in the fullness of time (Stanford, 2016; Sklar, 1975). The complaint is that as research continues, all the apparently available alternative options will eventually be closed off, leaving researchers with the one true avenue of inquiry. As many of these alternative options are still entertained by medical researchers in the present day (Binney, 2018), I argue that it is unreasonable for scholars to dismiss alternative accounts of the function of the heart as an unimportant, transient phenomenon.

Arguments about historical contingency are also associated with extreme and pernicious forms of relativism. For instance, H. Tristram Engelhardt has long since argued that “The medical facts with which bioethics deals are not timeless truths, but data given through the formative expectations of our history and culture” (Engelhardt, 1996, p. 190). This view has been challenged by several scholars on the grounds that it is an extreme form of relativism (Boorse, 1997; Lennox, 1997; van der Steen & Thung, 1988, p. 94). The main concern is that if there are no ahistorical and timeless truths about diseases and their causes, then medical knowledge is reduced to whatever researchers believe to be true. As Boorse puts it, “if we abstract away from all questions of truth and falsity, then cows jump over the moon” (Boorse, 1997, p. 77). Engelhardt's work is seminal for philosophers, like me, who would argue that facts about disease and pathophysiology are not fixed by the way the natural world is. However, I agree with James Lennox (1997), who argues that Engelhardt does not show how medical knowledge can be socially and culturally conditioned without collapsing into such an extreme form of relativism. Although the historical contingency I discuss here does entail a form of relativism, I argue that this history is not consistent with pernicious forms of relativism.

This view of medical knowledge is contentious, as it relates to debates about the social construction of medical knowledge in both the philosophy and the history of medicine. Social construction can mean a great variety of different things, but Elsej Kingma has recently offered a general characterization of social constructivism as the claim that “a social construct is not fixed or inevitable, but is the contingent result of social and historical processes” (2012, p. 37), and I adopt this view here. Kingma is hopeful that viewing medical knowledge as socially constructed in this sense will be profitable, but concedes that she has not provided an argument that this is actually the case, and she provides no case studies to support this view (2012, p. 55). Paul Thagard (1999), by contrast, uses the case study of gastric ulcers caused by *Helicobacter pylori* to reject the view that medical knowledge of diseases and their causes are socially constructed. Thagard argues that “ulcers and *H. pylori* bacteria are real entities independent of any mental and social constructions and that the theoretical claim that *H. pylori* is an important causal factor in ulcers can be accepted as true” (Thagard, 1999, p. 81). Thagard argues for medical realism, by which he means that “diseases and their causes are real and that scientific investigation can gain knowledge of them” (Thagard, 1999, p. 81). I am not able to fully discuss the implications of my case study of heart

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