



The function of the heart is not obvious

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ABSTRACT

It is widely believed that the function of the heart is obviously to pump blood. I argue here that it is not. The definition, presentation, and pathophysiological explanation of heart failure, as well as the measurement of cardiac dysfunction, are not as might be expected if the function of the heart was simply to pump blood. Far from being obvious, many central features of heart failure are still being investigated. This has important implications for philosophical debates about health and disease. According to naturalists like Christopher Boorse, medical practice is founded on a well-established body of physiological knowledge, which provides the one true account of the biological function of organs. On this naturalistic view, there should only be one account of the pathophysiology of heart failure in use in medical practice. This account of the pathophysiology of heart failure should be well-established, as opposed to uncertain. Medics should use this physiological knowledge to inform their clinical practice, and not vice versa. Clinical considerations, such as whether patients respond to therapy, should not inform debates about what the pathophysiology of heart failure is. I will show this is not the case. The handling of knowledge of the biological function of the heart in medical practice differs substantially from Boorse's account.

1. Introduction

A widespread belief found in the philosophical literature on disease and biological function is that the function of the heart is obvious. According to Christopher Boorse “Given a little knowledge about what happens inside mammals, it is obvious that the function of the heart is to circulate blood” (Boorse, 1976a, p. 75). Lennart Nordenfelt says that “The heart pumps blood. The result of the pumping, the distribution of blood, is the natural function of a heart in a human” (2006, p. 17). This may be an oversimplification, as the circulation of blood alters to meet changing metabolic demands during exercise. So Elseijn Kingma says that “The qualitative normal function of the heart is to pump blood, and the quantitative normal function of the heart is to pump blood at a certain rate, with a certain output, with regularity, etc” as required in different situations (Kingma, 2010, p. 249). In any case, on this view the function of the heart should be assessed by measuring the amount of

blood it pumps into the circulation in a given amount of time, which is called the cardiac output.¹ I take it that this is understood to be the function of the heart, meaning that if a patient has a normal cardiac output given their level of exertion, then that patient's heart is functioning normally. According to naturalist theories of disease at least, if a patient's heart is functioning normally, then they should not be diagnosed with the disease heart failure.

This seems clearly true. After all, it is well known that the heart is a sort of pump. The function of the heart has surely been known since the seventeenth century, when William Harvey discovered that the action of the heart circulates blood around the body (Harvey, 1952).² The intuition that the function of the heart is obvious informs philosophical debates about biological function and disease. Researchers working on biological function rely on it to exemplify their arguments, regardless of the account of biological function being defended. “As an example consider the function of the heart to propel the blood (which is the

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¹ Kingma also says that “In order to equate to health, normal or species-typical function must be performed at the right level: the heart, for example, must not merely pump blood, but it must pump blood at the right speed, pressure, etc. I call the former function ascription—pumping blood—the qualitative normal function of the heart, and the latter function ascription—pumping blood at the right level, speed, pressure, etc.—the quantitative normal function of the heart” (2010, p. 245). So, the quantitative function of the heart could involve supporting various parameters, such as blood pressure. Note that blood pressure here is the *arterial or perfusion* pressure, not the intracardiac, venous or filling pressures that are connected with heart failure below. Kingma follows commonplace intuitions, and associates heart failure with cardiac output. “Blood pressure, cardiac output, breathing and sweating are all very responsive to physiological demand, and maladjustments constitute well-known and typical diseases, such as high blood pressure, heart failure and dyspnea” (Kingma, 2010, p. 250).

² Boorse used Harvey's work to support his argument that physiologists' understanding of biological function is not aetiological. “The modern theory of evolution is of recent vintage; talk of functions had been going on for a long time before it appeared. When Harvey, say, claimed that the function of the heart is to circulate the blood, he did not have natural selection in mind” (Boorse, 1976a, p. 74). This is true, and I agree with Boorse that medics and physiologists do tend to think about biological function in terms of what something does at the moment, rather than in terms of what it evolved to do. Even so, Harvey's understanding of what the heart is doing and why it is doing it does not correspond to Boorse's goal oriented theory either. Claiming that talk of biological function in any modern sense has “been going on for a long time” is anachronistic, at least in the case of Harvey's work.

philosopher's favorite example and quite often the only one mentioned)" (Wouters, 2005, p. 125). In the debate about concepts of disease (Ereshfsky, 2009), many naturalists and normativists agree that the function of the heart is obvious (Boorse, 1976, p. 75; Engelhardt, 1980, p. 44–45; Nordenfelt, 2006, p. 17; Wakefield, 2007, p. 151–152).

The belief that knowledge of the biological function of some organs, such as the heart, is obvious has bolstered confidence that there is a well-established body of physiological knowledge that can serve at the foundation of medical practice. This is especially true for naturalist philosophers of medicine such as Boorse, who hold that objective knowledge of biological function provides the foundation on which all knowledge of disease is built. If, however, the function of the heart is not obvious, then the intuitions that are at the foundation of naturalist theories of health and disease would be undermined.

If Boorse's naturalist view is correct, and the function of the heart is what he says it is, then the disease heart failure should be understood in medical practice as atypically reduced cardiac output. I show here that this is not the case. This challenges the basic intuitions on which naturalist theories of health and disease are built. If even the heart does not have an obvious function, what grounds the assumption that there is a well-established body of physiological knowledge, that is so plainly true that it can be unproblematically assumed to provide the basis for medical practice?

I begin by discussing Boorse's bio-statistical theory, to highlight a number of features of this theory that are challenged by discussions of heart failure in medical practice (section 2). I discuss how Boorse intends his theory to be broadly descriptive of physiological or bodily medicine, and thus how descriptive accounts of medical practice can challenge his views. Indeed, he says that his ideal critics are those who confine themselves to real cases from the medical literature (Boorse, 1997, p. 63). I discuss how, if Boorse is correct, doctors should use well established knowledge of biological function to define and diagnose disease. If Boorse is correct, then doctors should have to know what the functions of organs are before they can define and diagnose disease of those organs. They should never do the reverse, and use clinical knowledge of who has a disease to inform their understanding of what the function of the heart is. Doctors should certainly never use clinical information about treatment to inform their understanding of biological function. There should also be only one, objectively true, account of what they function (or functions) of the heart is (or are).

I go on to explore the definition (section 3), clinical presentation (section 4), and physiological explanation (section 5) for heart failure, as well as the measurement of cardiac dysfunction (section 6), in some detail. I show that how knowledge of the function of the heart is handled in medical literature does not conform to naturalist expectations. Far from being well established knowledge, many medics are not certain about what the function of the heart is. Doctors sometimes rely on their knowledge of which patients have heart failure to inform debates about what the function of the heart is. Doctors also use clinical observations of which patients respond to therapy to inform their discussions of what cardiac dysfunction is. Furthermore, doctors have developed several different pathophysiological accounts of heart failure, which are employed all at once in the present day. I use this medical literature to show that Boorse's account of how biological function is understood in medicine does not match how it is actually handled in medical practice.

2. The bio-statistical theory

A debate about the concepts of health and disease has been going on since the 1970s. Christopher Boorse's work has provided a particular focus for this debate (1975, 1976a, 1976b, 1977, 1987, 1997, 2002, 2014). From the outset, Boorse's work was motivated by a desire to inform medical practice. Boorse (1976b) sets out how his work was framed as a response to the anti-psychiatry movement, spearheaded by Thomas Szasz, which argued that the whole notion of mental illness

was "scientifically worthless and socially harmful" (Boorse, 1976b, p. 61; Szasz, 1961, p. ix). Boorse agreed with this critique, in that he thought that psychiatry was floundering. He did not, however, agree that this meant that the prospect of a scientific notion of mental health needed to be abandoned.

"One may abandon the medical vocabulary altogether, as Szasz and the behaviour modifiers have urged, and found clinical psychology and psychiatry on something other than the model of health and disease. Or one may continue to use the health vocabulary in the same way in which it is used in physiological medicine – and accept the implications of such use in the psychological domain. To explore and defend the second option is the purpose of this essay" (Boorse, 1976b, pp. 61–62).

Boorse believed that physiological medicine, or medicine focussed on bodily rather than mental illness, had been much more successful than psychiatric medicine. He argued that this is because physiological medicine, in contrast to psychiatric medicine, is "a mature and fairly well-articulated body of thought" (Boorse, 1976b, p. 61). Rather than abandoning the notion of mental illness altogether, Boorse argued that the concepts of health and disease employed in physiological medicine should be articulated clearly, and exported into psychiatric medicine.

Boorse took on the task of providing an analysis of this concept of health and disease in physiological medicine (1975; 1976a; 1977). "Our goal in this paper is to analyse health and disease as understood by traditional physiological medicine" (Boorse, 1977, p. 543). So, Boorse's project from the outset was broadly descriptive in one domain, that of physiological medicine, and stipulative in another, that of psychiatric medicine. I say broadly, because Boorse recognised that there might be some examples in the medical and pathological literature which did not conform to the theory he put forward (1977, p. 565). Even so, Boorse said he would be content if the great bulk of physiological medicine conformed to his view, as if this was the case he would feel confident that he had latched on to the concepts that had medicine so successful. He felt that perhaps pathologists could tweak the way they understood disease for consistency's sake. "I am content for the BST to live or die by the considered usage of pathologists – which does not, of course, exclude that on reflection (as in Rawlsian equilibrium), pathologists might revise their usage slightly to achieve consistency with a simple and powerful theory" (1997, p. 53).

This potential for the revision to what would qualify as a disease is why Peter Schwartz has argued that Boorse's theories of health and disease should be understood as philosophical explication, rather than as purely descriptive conceptual analysis (Schwartz, 2014). Philosophical explication allows the philosopher to redefine old concepts, in a way that preserves what these did well, whilst clarifying what it was that made them successful and correcting inconsistencies and other problems. New concepts thus explicated need not have exactly the same extension as the older concepts. Even so, new concepts must agree with the old in the great majority of cases, and certainly in those considered paradigmatic instances of disease. Or else, Boorse would have to admit that physiological medicine had not been so successful after all. He has always emphasised the importance of matching his philosophy to "the stock of diseases recognised by medical usage" (Boorse, 1997, p. 53).

Boorse did not intend to make an analysis of the concepts of health and disease that medics and pathologists explicitly articulate. He found such concepts somewhat confused, and suggested that "One reason for this confusion is that physical medicine itself has never felt the need to produce any clear philosophical analysis of its notions of health and disease" (Boorse, 1976b, p. 62). Rather, Boorse's aim is to clarify the concepts that underlie the practice of physiological medicine. Boorse proposes that this successful concept, which underpins the physiological medicine, is *statistically normal part function*. He defines his bio-statistical theory as follows:

1 The reference class is a natural class of organisms of uniform

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