Neuroscience and Biobehavioral Reviews 74 (2017) 185–203

Contents lists available at ScienceDirect

Neuroscience and Biobehavioral Reviews

journal homepage: www.elsevier.com/locate/neubiorev

Review article

Symptoms and the body: Taking the inferential leap

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ARTICLE INFO

Article history:
Received 12 August 2016
Received in revised form 1 December 2016
Accepted 11 January 2017
Available online 17 January 2017

Keywords:
Symptom perception
Medically unexplained symptoms
Predictive coding

ABSTRACT

The relationship between the conscious experience of physical symptoms and indicators of objective physiological dysfunction is highly variable and depends on characteristics of the person, the context and their interaction. This relationship often breaks down entirely in the case of "medically unexplained" or functional somatic symptoms, violating the basic assumption in medicine that physical symptoms have physiological causes. In this paper, we describe the prevailing theoretical approach to this problem and review the evidence pertaining to it. We then use the framework of predictive coding to propose a new and more comprehensive model of the body-symptom relationship that integrates existing concepts within a unifying framework that addresses many of the shortcomings of current theory. We describe the conditions under which a close correspondence between the experience of symptoms and objective physiology might be expected, and when they are likely to diverge. We conclude by exploring some theoretical and clinical implications of this new account.

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http://dx.doi.org/10.1016/j.neubiorev.2017.01.015
0149-7634/

1. The disease model and medically unexplained symptoms

Standard medical practice is premised on a disease model that typically comprises two phases. The diagnostic phase begins when symptoms are reported to a physician, who looks to determine their cause through history taking, physical examination and, where appropriate, medical investigations. This information, which mainly concerns the patient's body, is mapped onto a set of pathophysiological criteria that allow for diagnosis and treatment. In the therapeutic phase, the aim is to remedy dysfunction and thereby remove the patient's symptoms.

This apparently logical process is often successful, but it sometimes fails dramatically. A particularly compelling (and common) example of this is when the patient reports symptoms despite tests indicating that their body is healthy, or where "successful" treatment for diagnosed disease fails to resolve symptoms. In such cases, doctors often make renewed attempts to identify disease, reflecting one of the fundamental assumptions of this model: that physical symptoms have physiological causes, and can therefore be reduced to them. If the symptoms persist but a disease cause remains elusive, then the patient may be given a diagnosis that simply describes their complaint (e.g., chronic fatigue) or another label that identifies them as suffering from "medically unexplained symptoms" (MUS). Although the biopsychosocial model has ensured that symptoms are no longer seen as purely biological phenomena, medical practice continues to be dominated by the view that "real" symptoms reflect bodily dysfunction, and that those symptoms that cannot be validated objectively are "in the mind" or simply made up.

In this paper, we draw on previous approaches to develop a novel model of symptom perception that transcends the artificial distinction between "explained" and "unexplained" physical symptoms, whilst explaining the variable relationship between symptoms and physiological dysfunction. The central principle underpinning this account is that physical symptoms, as felt and expressed by patients, are not a direct record of bodily activity, but an inference based on implicit predictions about interoceptive information, derived from prior knowledge. An important implication of this account is that symptoms often result from an "inferential leap", resulting in an experience that is only loosely coupled with dysfunctional processes in the peripheral body, and occasionally has no relationship at all. We use this framework to describe the conditions under which a close correspondence between subjective symptoms and objective physiology might be expected, and when the two are likely to diverge. We conclude by exploring some clinical and empirical implications.

1.1. Extent and varieties of MUS

Physical symptoms that occur in the absence of detectable physiological dysfunction are ubiquitous. In a population-based study in Germany ($N = 2552$), for example, 81.6% of people reported at least one medically unexplained symptom causing at least mild impairment (Hiller et al., 2006). In primary care, up to three quarters of all symptoms reported are thought not to be attributable to organic disease. About 25% of general practice patients have clinically relevant MUS (e.g., Fink et al., 2007; Körber et al., 2011) and 8–10% of primary care patients have a history of multiple, distressing MUS (e.g., Kroenke et al., 1997). Symptom burden in individuals with MUS seems to be continuously distributed, ranging from non-consulting people with minimal disability (Watson and Pennebaker, 1989) to those with numerous, chronic, severely disabling symptoms (e.g., Jasper et al., 2012).

The economic burden is considerable. In the USA, the annual medical cost of MUS was previously estimated at $256 billion (Barsky et al., 2005), while in the UK they are said to account for approximately 10% of the National Health Service Budget (Bermingham et al., 2010). Up to 42 million work days are lost to MUS in the UK each year (Bermingham et al., 2010), with the associated loss of productivity being estimated at $19,000 (US) per patient over 10 years ago (Hiller et al., 2003).

The disease model clearly struggles to accommodate MUS. It is not clear what these conditions should be called (e.g., Creed et al., 2010) or how they should be classified (e.g., Kroenke et al., 2007).Various terms have been used apart from MUS, including "psychosomatic symptoms", "functional symptoms", "subjective health complaints", "somatization", "somatic symptom distress", and "bodily distress". However, there is little agreement on which is most appropriate (Creed et al., 2010; Kroenke et al., 2007) or on the level of description and analysis needed (i.e. as symptoms, syndrome, disorder, or disease). Within general medicine, particular clusters of MUS are often termed functional somatic syndromes, a category that includes irritable bowel syndrome, chronic fatigue syndrome, fibromyalgia and numerous other specialty-specific conditions (Brown, 2007). In psychiatry, particular constellations of MUS are classified as somatoform disorders in the International Classification of Diseases (ICD-10; WHO, 1992), a practice that was mirrored in the Diagnostic and Statistical Manual (DSM-IV-TR; APA, 2000) until its most recent revision when the term "somatic symptom disorder" was coined (DSM-5; APA, 2013). For the somatoform disorders, the emphasis is on symptoms, with diagnoses like somatization disorder (which pertains to individuals with multiple MUS) implying that sufferers have a general tendency to experience MUS that encompasses all bodily systems. This is also true of other systems for classifying patients with multiple MUS (e.g., Fink and Schröder, 2010; Kroenke et al., 1997; Rief and Hiller, 1999), developed in response to concerns about the sensitivity and specificity of the ICD-10 and DSM-IV criteria.

There has been much debate about the overlap between (and within) the functional somatic syndromes and somatoform disorders (e.g., Henningsen et al., 2007; Wessely et al., 1999; Wessely