

## KATE HAMILTON-WEST

# PSYCHOBIOLOGICAL PROCESSES IN HEALTH AND ILLNESS



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## **KATE HAMILTON-WEST**



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To Tim, Honor and Phoebe

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## PREFACE

Conceptualisations of health, illness and disease have changed considerably over the past few decades. These changing conceptualisations have influenced (and been influenced by) the development of new fields of study, many of which span traditional disciplinary boundaries.

Perhaps the most important boundary to be bridged in health research is that between the study of the mind (psychology) and the study of the body (biology). The emergence of disciplines such as health psychology, behavioural medicine and psychoneuroimmunology reflects a growing recognition that while particular psychological and biological processes can be isolated for research purposes, this isolation can distort the processes we aim to understand. To understand the nature of biological processes and their implications for health, we must also consider the influence of psychological processes; to understand the nature of psychological processes and their implications for health, we must also consider the influence of biological processes.

This integration between psychological and biological approaches is essential if we are to tackle the health challenges facing us today. Take, for example, the rise in chronic illness associated with behaviours such as drinking, smoking and overeating. How do we get to the root cause of this problem?

Explaining the causes of human behaviour has traditionally been the domain of psychologists, and there are numerous theories within this field to explain why individuals may engage in behaviours that are apparently self-defeating. These theories, however, tend to explain health-related behaviour in terms of consciously accessible beliefs, attitudes and expectations. It is becoming increasingly evident that explanations at this level cannot fully account for behaviour. People who want to follow a healthy diet, quit smoking or cut down on alcohol frequently fail, despite their best intentions, and recent research suggests that biological processes may be to blame. 'Will power' apparently relies on limited resources, and the energy required to constantly resist temptation may simply 'run out'. Such resources may be even more limited during stressful periods or periods of illness as the organism must redirect resources towards dealing with more immediate threats. Research also suggests that behaviours such as drinking, smoking and overeating may function in a similar manner to the body's own homeostatic mechanisms, allowing the individual to maintain normal functioning during challenging periods.

So, while psychologists still play a key role in explaining health-related behaviours, there is now increasing recognition that theories must be expanded to incorporate a role for psychobiological processes and that these processes may not necessarily be accessible to conscious awareness or self-report. Other bodies of research are also important to this endeavour. Genetic research, for example, has important implications when considering to what extent health (and health-related behaviour) is 'written in the genes'. Perhaps the risk of disease is genetically predetermined. If so, does behaviour really matter? Perhaps some people are predestined to become obese or addicted to alcohol or cigarettes. If so, can we really do anything to change these outcomes?

Alternatively, perhaps it is the environment that is truly to blame. For example, epidemiological research highlights marked social gradients in health, both between and within countries. How do we account for these gradients? Why should life expectancy and the risk of disease depend on the country we live in or our occupation?

If we really want to tackle global health issues, should we be trying to change people's attitudes, genes or environments? It is clear that no one discipline can provide a complete answer to the health challenges that face us today. Scientists across a number of health-relevant disciplines will need to work together more closely, and we will need to train more scientists to work at the interface of psychology, biology and medicine.

## THE AIMS OF THIS BOOK

While integration of the disciplines is important if we are to further understand, prevent and treat disease, it is not necessarily easy to achieve.

Differences in terminology exist between relevant disciplines and these render much research inaccessible to readers from other disciplinary backgrounds. Differences in research methods also present barriers to integration. For example, the process of defining and measuring psychological constructs may appear mysterious to researchers who are more accustomed to studying biological processes. This means that, outside the discipline of psychology, psychological constructs can appear 'woolly' or difficult to apply. Researchers with a pure psychology background may find immune or endocrine processes just as mysterious. While the discoveries arising from the Human Genome Project undoubtedly have important implications for all disciplines concerned with understanding the causes of disease and illness, scientists outside the genetic field may not be aware of the methods used to differentiate environmental and genetic contributions to disease or identify disease genes.

The purpose of this book, then, is to begin to break down some of these barriers and provide an accessible introduction to psychobiological processes relevant to health and illness, summarising key findings across a number of disciplines. Research methods within these disciplines are also discussed and key terms are defined as we proceed (these are also listed in the Glossary at the back of this book). Since the literature summarised in the following chapters is both vast and diverse, we have not attempted to cover it all, but instead provide a useful entrée. The structure of the book is described in greater detail below.

## THE STRUCTURE OF THIS BOOK

## **CHAPTER 1**

The first chapter invites you to take a step back and consider what we mean by commonly used terms such as 'health', 'illness' and 'disease', as well as what it means to be 'normal' (or 'abnormal'). In this chapter we also explain what we mean by 'psychobiological processes'; we consider disciplines concerned with these processes and discuss the methods used to define and measure theoretical constructs.

## **CHAPTER 2**

In this chapter we summarise research focusing on stress – a concept that has been defined and measured in a number of ways and is therefore often viewed as particularly 'woolly'. Despite problems of definition, the stress concept is critical to an understanding of how changes in the external environment may influence processes within the body. Research focusing on psychobiological responses to stress also requires us to consider how the health effects of toxic environments should be measured – how do we quantify changes across multiple physiological systems, for example?

## **CHAPTER 3**

Here we turn our attention to positive processes in health and illness. If negative emotions can damage our health, do positive emotions have the power to cure? Why is it that some people appear relatively resilient to life's challenges? How do patients find positive meaning in their experiences of illness? Are happier people healthier (or vice versa)? This chapter also aims to highlight trends in the psychological research literature – particularly the growing body of research focusing on promotion of positive psychological outcomes (as opposed to amelioration of psychopathology).

## **CHAPTER 4**

In this chapter we consider the role that our genes play in determining personality, behaviour, health and well-being and how the Human Genome Project has contributed (and continues to contribute) to our understanding of the determinants of health and illness. You are invited to consider the opportunities and challenges presented by predictive genetic testing – is it useful, desirable or even ethical to predict an individual's risk of disease months or even years before symptoms appear? Would you want to know your risk? What are the implications of predictive genetic testing for the prevention and treatment of illness?

## **CHAPTER 5**

Here we discuss an aspect of human experience in which psychological and biological processes are particularly closely interrelated – the experience of pain. Like stress,

#### PREFACE

pain has proved difficult to define and measure, and a number of theories have been presented over the years to account for our experience of it. Nonetheless, pain is a very real and a very common problem. We consider how pain may influence and be influenced by psychological and biological processes and how understanding of psychobiological interactions may help to develop more effective treatments.

### **CHAPTER 6**

While the research reviewed in Chapters 1 to 5 highlights implications of psychobiological processes for health and illness at an individual level, it is also important to consider to what extent these processes may account for variations in the risk of disease at the group level. For example, do we see higher rates of infectious illness or heart disease in groups exposed to chronic stress over a number of years (the stress associated with long-term caregiving or economic hardship, for example)? If not, we need to question whether associations between psychological and biological processes observed in the laboratory have any relevance in the real world. In this chapter, then, we take a look at a number of 'at risk' populations and consider the extent to which real-world evidence supports the findings of laboratory research.

### **CHAPTER 7**

Next, we shift our attention from theory to intervention. In this chapter we consider to what extent psychobiological research has resulted in changes in the way we treat or prevent illness and disease. We discuss a wide range of approaches, including both coping-based interventions for patients with chronic illness and cognitive behavioural therapies for patients with chronic illness or pain. You are asked to consider the relative strengths and limitations of alternative approaches and the extent to which intervention effects may be explained by the theories and processes described in previous chapters.

### **CHAPTER 8**

We focus here on methodological issues. We consider what kind of evidence is needed to demonstrate that psychological processes *actually* produce alterations in physical functioning, or that psychobiological processes *actually* produce changes in health outcomes. We describe the principles of experimental design and discuss alternative research designs, considering the relative advantages and disadvantages of each. The methods available for evaluating the effects of intervention are also discussed and we consider the complexities involved in developing and applying theory-based interventions.

### **CHAPTER 9**

The final chapter presents a summary of the research discussed in previous chapters, highlighting themes that cut across disciplines and present opportunities for interdisciplinary collaboration. We draw some tentative conclusions regarding the nature of 'toxic' and 'optimal' conditions in relation to social, psychological and biological functioning and take a look into the future in order to consider how psychobiological research could benefit from recent technological advances. These include advances in information and communication technologies, brain imaging technologies and virtual reality applications. In this chapter we also consider how psychobiological research could be expanded to include a role for macro-level influences, those related to religion, culture and community.

## NOTES ON FEATURES OF THIS BOOK

### **KEY TERMS AND THE GLOSSARY**

Key terms are highlighted in bold the first time they appear and are listed at the end of each chapter. They are also listed in the Glossary at the end of this book, together with a brief definition or explanation – for a more detailed explanation please refer to the chapter.

### BOXES

Some points require a more detailed explanation than is practicable within the main body of the text. These are therefore explained in greater detail in boxes. Some boxes summarise controversies in the research literature – for example, 'Can stress shrink your brain?', 'Does coping influence cancer survival?'

While research findings are summarised throughout this book, it is also important to take a detailed look at individual studies – what methods did the researchers use, what did they find and what conclusions did they draw? The 'Research in focus' boxes provide detailed descriptions of key studies in relation to the topics discussed in each chapter.

### DISCUSSION QUESTIONS AND FURTHER READING

Each chapter ends with a list of discussion questions and further reading. These are to encourage you to delve further into the literature and relate the research discussed in each chapter to your own experience – clinical, research-based or real life.

## **ABOUT THE AUTHOR**

I completed a PhD in health psychology in 2003 and have since qualified as a chartered psychologist and practising health psychologist. I have a very long-held interest in health and have previously worked in medical education and training, in health and social care research and in health psychology education and training. I am now a lecturer in health psychology at the University of Kent. My research focuses on relationships between emotions and health and the psychological implications of living with chronic illness. Much of my current research is multidisciplinary and I enjoy collaborating with colleagues (both academics and clinicians) across a range of health-related disciplines.

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## THE MIND-BODY CONNECTION

## **OVERVIEW**

This chapter presents some key concepts relevant to an understanding of psychobiological and psychosocial processes in health and illness. Although the focus of this book is on psychobiological processes, the two are very closely related, so it is important to acknowledge the role of psychosocial processes before proceeding further.

The biopsychosocial model of health is introduced and contrasted with the biomedical model of health. This discussion is set in the context of changing conceptualisations of mind and body and the emergence of 'new' fields of enquiry, including health psychology, behavioural medicine and psychoneuroimmunology. In so doing, we consider how advances in research are helping us to uncover the true complexity of links between psychological, social and biological processes with respect to their implications for health and how such advances may inform the development of new approaches to the treatment and prevention of illness.

## LEARNING OUTCOMES

By the end of this chapter you should be able to:

- · explain what is meant by 'psychobiological processes'
- · explain what is meant by the terms 'health', 'illness' and 'disease'

- explain what is meant by 'normality'
- · discuss global trends in disease, mortality rates and the causes of ill health
- describe the biopsychosocial model of health and compare it with the biomedical model
- discuss the influence of the biopsychosocial model on the development of new disciplines
- · describe and differentiate between these disciplines
- · describe the process of defining and measuring a psychological construct
- explain why psychobiological processes are important for understanding, preventing and treating disease and illness.

## CHANGING CONCEPTUALISATIONS OF MIND AND BODY

This book is entitled *Psychobiological Processes in Health and Illness*, so, before proceeding further, it is useful to begin by considering what exactly we mean by the terms 'psychobiological', 'health' and 'illness'. While the latter two terms may *seem* intuitive, there has been considerable debate over the years regarding the definition of both 'health' and 'illness', and the distinction between **health**, **illness** and **disease**. Further, to explain the term 'psychobiological', we need to break the word down into its two constituent parts – 'psycho-' 'and 'biological'. In this chapter, then, we also consider why both psychological and biological processes are relevant to an understanding of health and illness and how these two types of processes have come to be combined into a single term.

#### 1.1.1 DEFINING HEALTH, ILLNESS AND DISEASE

What does it mean to be healthy? Well, we could start by considering that health indicates a lack of illness or a lack of disease – you are not ill, therefore you are healthy. This is a difficult starting point, though, since both illness and disease themselves are poorly defined (as discussed further below). Also, are you in optimum health if you are not diseased or is health something more than absence of illness?

The World Health Organisation, for example, has defined health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO, 1946: 100). According to this definition, though, we would probably *all* be considered unhealthy. For example, you may not consider yourself completely healthy because you get out of breath walking up stairs or are unable to complete a marathon. At what point is our well-being less than complete?

Perhaps what really matters is the individual's ability to perform daily functions, such as continuing to go to work, raise a family or drive a car. Disease does not necessarily preclude normal daily functioning, so what about a patient with a terminal illness who is still able to go to work – is this person healthy or ill?

Perhaps you could consider yourself to be a healthy person even if you are, from time to time, afflicted with a runny nose, headache or sore throat. If so, why do these symptoms not constitute a lack of health? Maybe, then, we should overlook symptoms that are highly prevalent in the population and consider whether or not the individual experiences symptoms that are abnormal.

This, too, raises problems. First, how do we define 'abnormal' and, second, is 'abnormal' necessarily unhealthy? In relation to the former point, what is 'normal' in terms of physical, social and mental functioning depends on a wide range of factors, including the individual's age, gender, social status and culture. In relation to the latter point, it is clear that an individual can fall outside the range of **statistical normality** without necessarily being ill. For example, Veatch (1981) points out that the seven foot tall basketball player is not considered ill, nor are people with freckles, although both can be considered to be statistically abnormal (see Box 1.1).

#### BOX 1.1

#### Statistical normality

Many human characteristics follow a **normal distribution**. This means that most individuals will be at or around the average value for the group (such as being the average height for a man or woman). The frequency of a particular measurement decreases as the distance from the average value increases (there are few very short or very tall people, but many people are of roughly average height). If measurements are plotted on a graph, with the measurement scale on the X axis and frequency on the Y axis, this results in a bell-shaped curve, or 'Gaussian function'.

Individuals falling at the tail ends of the distribution are considered statistically abnormal. The cut-off value used most commonly is 95 per cent – that is, scores outside of the 95 per cent range (the top 2.5 or bottom 2.5 per cent) are abnormal.

It is important, however, to consider the 'reference group' used to calculate the normal range. For example, many people will appear abnormal if compared against norms for a different cultural group or age group or gender.

Many indicators of health (such as the level of glucose or cholesterol in the blood) follow a normal distribution. Individuals with values outside the normal range (for healthy individuals) are considered abnormal, although this does not necessarily indicate that these individuals are unhealthy. Many measures of psychological characteristics (such as intelligence, aggression) yield scores that are approximately normally distributed – that is, there are lots of people of roughly average intelligence, but few individuals with exceptional genius. As with indicators of physical health, abnormal scores on psychological measures do not necessarily indicate a need for treatment.

Perhaps, then, we should consider the individual's evaluation of his or her apparent symptoms. Are they abnormal for the individual and a source of distress or are they typical, tolerable? Thus, being unable to run a marathon could constitute evidence of ill health if the individual is normally able to run the marathon very easily and experiences distress in relation to this loss of physical fitness. Is this person really ill, though, or do they simply need to adapt their training routine?

It is clear, then, that although we may know in very general terms what we mean by the word 'health', providing a precise definition for this concept is far from straightforward. Further, it is evident that the related constructs of 'illness' and 'disease' are similarly ambiguous.

Engelhardt (1981: 39) writes that 'the concept of disease is an attempt to correlate constellations of signs and symptoms for the purposes of explanation, prediction and control', while Boorse (1977) proposes that a disease is only an 'illness' if it is serious enough to be incapacitating and therefore undesirable for the bearer, a title to special treatment and a valid excuse for normally criticisable behaviour. Thus, 'the concept of disease acts not only to describe and explain, but also to enjoin to action. It indicates a state of affairs as undesirable and to be overcome' (Engelhardt, 1981: 33).

In general, then, although these constructs are very difficult to define, a number of conclusions can be drawn:

- *health* is essentially an evaluative notion, based on adherence to physical, social and mental 'normality', although what is normal depends on a range of factors, including age, gender, culture and social status
- *illness* can be considered as a deviation from 'normality' that is perceived by the patient as distressing and entitling them to special treatment
- *disease* can be considered as an organising construct for explaining and responding to constellations of symptoms
- while health is a positive state of affairs, to be promoted and aspired to, both illness and disease are considered as negative states, to be treated or otherwise overcome.

#### 1.1.2 THE ROLE OF PSYCHOLOGICAL PROCESSES

Thoughts, feelings and behaviours affect our health and well-being. Recognition of the importance of these influences on health and disease is consistent with evolving conceptions of mind and body and represents a significant change in medicine and the life sciences.

Baum & Posluszny, 1999: 138

It should be evident from the preceding discussion that psychological processes (thoughts, feelings and behaviours – also known as cognitions, emotions and actions) play an important role in health. First, as health is an evaluative notion, the same symptoms may be interpreted in different ways by different people. The individual's

interpretation of these symptoms will influence behaviours such as seeking medical help, over-the-counter remedies or alternative therapies, and these behaviours are likely to influence health outcomes.

Further, the very causes of ill health in humans are often psychological in nature, setting us apart from other animals. As Kass (1981: 19) points out, 'other animals do not overeat, undersleep, knowingly ingest toxic substances, or permit their bodies to fall into disuse through sloth, watching television and riding about in automobiles, transacting business, or writing articles about health.'

The way we respond to stress as a species also highlights the role of psychological variables in the aetiology of illness. For example, Sapolsky (2002) explains that, while lions or zebras mobilise a stress response when faced with a physical threat, humans have a unique propensity to worry themselves sick by dwelling on anticipated stressors, such as what to say in a job interview.

The recognition that health is the result of a combination of biological, social and psychological factors, is often referred to the **biopsychosocial model of health** (Engel, 1977), where the term 'model' indicates a 'complex integrated system of meaning used to view, interpret and understand a part of reality' (Veatch, 1981: 523). Engel (1977) contrasted this model to the (then dominant) **biomedical model**, which assumes disease to be fully explained by deviations from the norm of biological (somatic) variables.

These two models not only provide very different frameworks for interpreting and understanding illness but also give rise to different approaches to treatment and prevention. The biomedical model, with its focus on medical responses to biological alterations, has resulted in the development of drugs and vaccines that have contributed to a dramatic decline in mortality rates in the twentieth century. For example, immunisation programmes have contributed to the eradication of smallpox and reductions in susceptibility to diseases such as polio, diphtheria, tetanus, whooping cough, Hib, meningitis C, measles, mumps, rubella and tuberculosis (Department of Health, 1996, 2006).

As Engel points out, though, this model does not tell the whole story since biochemical defects represent only one factor among many that may culminate in active disease or manifest as illness. The human experience of illness may occur in the absence of an identifiable organic cause, and 'rational treatment' directed only at the biochemical abnormality does not necessarily restore the patient to health.

The biopsychosocial model, therefore, proposes a 'holistic' approach to illness, in which the task of the physician is to understand the human experience of 'illness' (rather than the more limited construct of 'disease') from the perspective of the patient (Engel, 1977) and 'it is recognised that the mind must not be bypassed or underestimated in any effort to deal with breakdowns, whether from stress or pathological organisms' (Cousins, 1990: xvi).

Engel's (1977) paper sparked considerable discussion surrounding the role of the doctor-patient relationship and doctor-patient communication in medical practice, and patients are now recognised as active participants in the treatment process, rather