

# Chapter 4

## Measuring Consciousness in the Clinic

**Nithin Nagaraj**

*Consciousness Studies Programme, National Institute of Advanced Studies,  
Bengaluru, India*

### ABSTRACT

*We don't doubt for a moment that we are conscious, but what is 'Consciousness'? Understanding consciousness, its nature, and characteristics has remained a hard problem for several centuries. While philosophers, neuroscientists, physicists, psychologists, and psychiatrists grapple with this hard problem, clinicians are in need of a practical way to 'measure' consciousness (or its surrogate). Determining whether a patient is conscious or not, and measuring the degree of consciousness, could be critical and potentially life-saving in a clinical scenario. In this chapter, we will review recent scientific approaches for modelling and measuring consciousness, and their clinical applications with an emphasis on a host of issues (theoretical, philosophical, methodological, technological, & clinical) and challenges that need to be satisfactorily and convincingly addressed going forward.*

### INTRODUCTION

'Consciousness' or conscious experience is the subjective qualitative feeling of 'what it is like to be?' (Nagel, 1974). Even as you read these words, you experience visual perceptions of words on a white background. At the same time, you may have an inner experience of a rich set of thoughts, feelings and bodily sensations (such as the tingling sensation in your toe) – these together with the sensory perceptions constitute your mind, body and world.

DOI: 10.4018/978-1-7998-0326-3.ch004

The central puzzle in gaining an understanding of ‘Mind’ which all theories of mind have to address is the nature and properties of ‘Consciousness’. Not surprisingly, there is no universally agreed upon theory or even a singular definition of consciousness, but its central importance in understanding of mind is more or less universally accepted. The very existence of consciousness, its nature and relationship with other nonconscious aspects of reality (‘Matter’) remains heavily disputed till date with the entire spectrum of philosophical positions possible, namely – the non-existence of consciousness (only matter or only mind ever exists); as a derived existence or emergent property (of matter, or mind which are taken as more fundamental); as a dualistic existence (consciousness and non-conscious entities both fundamentally exist but are distinct and different), and finally as a non-dualistic fundamental element of reality (consciousness alone exists – matter and mind being emergent manifestations). There are also in-between positions which do not fall in any of the positions described above.

The exact nature of relationships between Consciousness-Mind-Matter is far from being philosophically settled. However, clinicians are more interested in knowing whether this conscious experience can in fact be measured in the clinic (under an appropriately chosen definition of consciousness). Recently, it has been fiercely debated by philosophers, scientists and medical practitioners whether conscious experience could at all be reduced to some kind of neural activity in brain networks. If indeed one can measure consciousness via measuring activity in the brain, then it can be readily used in the clinic to determine whether an incommunicative patient is conscious or not. Furthermore, measuring the level of consciousness (or its surrogate) could well be critical and potentially life-saving in a clinical scenario.

While there are differing viewpoints on this topic of measuring consciousness without any consensual agreement, there have been several attempts to study consciousness scientifically in the past couple of decades. The recent emphasis on developing a ‘Science of Consciousness’ is evident in the number of scientific measures of consciousness that have been proposed in the literature (Seth et al., 2008; Nagaraj & Virmani, 2017; Virmani & Nagaraj, 2019 and references there in). We shall delve into these, but first we take an overview of the approaches to understanding consciousness from different disciplines.

## **The Problem of Consciousness: Debate Across Disciplines**

As previously alluded, the puzzle of consciousness – its definition, properties and relationship with ‘mind’ and ‘matter’ is a rich debate spanning several disciplines. Here, we provide a brief overview of this debate (by no means exhaustive).

The history of the deliberation on what constitutes consciousness probably goes back to the history of humans itself. Spiritual beliefs in preliterate cultures indicate

10 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/measuring-consciousness-in-the-clinic/239076](http://www.igi-global.com/chapter/measuring-consciousness-in-the-clinic/239076)

## Related Content

---

### An Approach to Participative Personal Health Record System Development

Vasso Koufi, Flora Malamateniou and George Vassilacopoulos (2011). *E-Health, Assistive Technologies and Applications for Assisted Living: Challenges and Solutions* (pp. 119-138).

[www.irma-international.org/chapter/approach-participative-personal-health-record/51386](http://www.irma-international.org/chapter/approach-participative-personal-health-record/51386)

### Functional Role of the Left Ventral Occipito-Temporal Cortex in Reading

Geqi Qian and Jinglong Wu (2013). *Biomedical Engineering and Cognitive Neuroscience for Healthcare: Interdisciplinary Applications* (pp. 192-200).

[www.irma-international.org/chapter/functional-role-left-ventral-occipito/69919](http://www.irma-international.org/chapter/functional-role-left-ventral-occipito/69919)

### Grid Computing in 3D Electron Microscopy Reconstruction

J.R. Bilbao Castro, I. Garcia Fernandez and J. Fernandez (2009). *Handbook of Research on Computational Grid Technologies for Life Sciences, Biomedicine, and Healthcare* (pp. 392-409).

[www.irma-international.org/chapter/grid-computing-electron-microscopy-reconstruction/35704](http://www.irma-international.org/chapter/grid-computing-electron-microscopy-reconstruction/35704)

### Cuff-Less Non-Invasive Blood Pressure Measurement Using Various Machine Learning Regression Techniques and Analysis

Srinivasa M. G. and Pandian P. S. (2022). *International Journal of Biomedical and Clinical Engineering* (pp. 1-20).

[www.irma-international.org/article/cuff-less-non-invasive-blood/290387](http://www.irma-international.org/article/cuff-less-non-invasive-blood/290387)

### Biomechanical Properties of the Foot Sole in Diabetic Mellitus Patients: A Preliminary Study to Understand Ulcer Formation

V. B. Narayanamurthy, Richa Poddar and R. Periyasamy (2014). *International Journal of Biomedical and Clinical Engineering* (pp. 1-17).

[www.irma-international.org/article/biomechanical-properties-of-the-foot-sole-in-diabetic-mellitus-patients/115881](http://www.irma-international.org/article/biomechanical-properties-of-the-foot-sole-in-diabetic-mellitus-patients/115881)