

## **Cognitive neuroscience and the “Mind-Body problem”**

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**Abstract:** In recent years we have witnessed an upsurge of interest in the study of the human mind and how it relates to the material body, the brain. Cognitive neuroscience is a multidisciplinary science that tries to explain how the mind arises from the structure and workings of the brain. Can we equate the study of mind-body relationship with cognitive neuroscience? Are there aspects of mind-body relationship that are not covered by cognitive neuroscience? Is cognitive neuroscience able to explain human behaviour and experience? These are the questions that are addressed in this “Beginner’s Guide to Cognitive neuroscience and it’s relation to the Body-Mind question”.

**Key words:** cognitive neuroscience, brain, consciousness states, dualism

## **Kognitivna znanost in “vprašanje duševnosti in telesa”**

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**Povzetek:** V zadnjih letih smo priča povečanemu zanimanju za raziskovanje človekovega uma in njegove povezave z materialnim telesom, oziroma možgani kot njegovim delom. Kognitivna nevroznanost je multidisciplinarna znanost, ki se trudi razložiti, kako duševno vznikne iz strukture in procesov delovanja možganov. Bi lahko enačili raziskave odnosa med duševnostjo in telesom s kognitivno nevroznanostjo? Ali imamo opravka tudi z vidiki odnosa med duševnostjo in telesom, ki jih kognitivna nevroznanost no zajema? Ali je kognitivna nevroznanost zmožna razložiti človekovo vedenje in izkušnje? To so prašanja, ki jih naslavljamo v tem »Začetniškem vodiču o kognitivni znanosti in njenem odnosu do vprašanja duševnosti in telesa.«

**Ključne besede:** kognitivna nevroznanost, možgani, stanja zavesti, odnos duševnosti in telesa

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## The question to be pondered

The relation between body and mind has accompanied human thought probably since the time that individuals of *Homo sapiens sapiens* species became aware of themselves as entities separate from their environment. It has been the subject of discussion since the dawn of society and civilization. And while rejected as a valid scientific endeavour in the times of orthodox positivism and the reign of behaviourism within psychology, it has in recent years, encouraged by the development of the cognitive paradigm, come back with a vengeance. Closely related to the topic of consciousness and the question of limits of artificial intelligence, the number of publications on the mind-body issue has lately been growing exponentially.

Hence, it is no surprise that it was also chosen as the leading topic of the 2003 edition of the yearly Cognitive science conference organized by the Slovenian cognitive science society (Kononenko & Jerman, 2003). What is surprising, though, is that in the early draft of the program there was no session on cognitive neuroscience. When queried about the possibilities of including such a session, the organizers replied: "Sure, but make it somehow related to the topic of the conference, perhaps naming it 'Cognitive neuroscience and the mind-body problem'." To a self-proclaimed and deeply convinced cognitive neuroscientist with interest and research history in the subject of consciousness, the proposed title of the session seemed a complete tautology. What else could cognitive neuroscience be, but a scientific journey into the subject of the Body-Mind problem?

Even though - or rather precisely because - seen as preposterous, the request of the organizers has provoked a thoughtful immersion into the question of the nature of relation between the cognitive neuroscience and the mind-body problem. What follows are its results. Before inviting the reader to join me in considering the possible answers, I would first like to make an important disclaimer.

**Disclaimer:** What follows is not a comprehensive or exhaustive overview of all the possible positions on the body-mind problem and their arguments. If looking for one, please consult the work of Paul Churchland (1988), Owen Flanagan (1991) and others. Overloaded by the sheer possibilities that the subject offers and the details being discussed by various authors, which often seem to cloud the vision and disorient the explorer, the aim of the paper is rather opposite. Namely, I want to oversimplify the question by considering a selection of possible stances and reviewing some of the arguments that support them. The paper is thus a record of the effort of a cognitive neuroscientist to find and define his place in a vast field of thought. At best, it is a Beginner's Guide to Cognitive neuroscience and its relation to the Body-Mind question.

## **Cognitive neuroscience = Mind-Body problem**

A natural possibility to consider in unravelling the relationship between cognitive neuroscience and the mind-body problem is to see them as completely overlapping. To understand why, consider the definition of cognitive science:

*“Cognitive neuroscience, the branch of neuroscience that studies the biological foundations of mental phenomena”* [WordNet Dictionary® 2.0]

To be more elaborate, we can describe cognitive neuroscience as a science that aims to explain how mental phenomena like perception, memory, learning, attention, problem solving and others arise as the result of the working of the brain, i.e., how mind is instantiated in the brain.

To be able to achieve that, cognitive neuroscience combines theoretical background, methods and empirical findings from a number of sciences, each providing its unique view and constraints to the development of a comprehensive account of how the brain thinks. Cognitive psychology describes in detail the mental phenomena to be explained and offers cognitive models of mental processing. Computational science builds computational models and simulations of the proposed theoretical accounts, verifying that the explanations offered by cognitive psychologists could actually work. Neuroscience provides insight into the structure and working of the brain, enabling us to see if the cognitive processes can actually be carried out by the brain as envisioned by cognitive psychologist and computational modellers, and at the same time supplying them with novel ideas and venues to explore. Cognitive neuropsychologists and neuropsychiatrists look at the malfunctioning brain, testing if the proposed models of normal cognitive function can also explain the symptoms encountered in the damaged brain, and at the same time contributing important new empirical data and theoretical insights.

By combining resources of the abovementioned sciences in a systematic and purposeful manner (e.g. Kosslyn, 1996; Marr, 1982; Repovš, 2001), cognitive neuroscience hopes to unravel the question of mind-body relation by being able to describe and explain in detail how the structure and the processes of the brain enable or give rise to the cognitive processes of the mind. In short, cognitive neuroscience is all about mind-body problem, and “cognitive neuroscience and the mind-body problem” indeed seems to be a tautology. Of course, in order to prove A equals B, it is not merely enough to show that all of A is B, but also that all of B is A. And here it is where I have to admit my initial mistake. While all of cognitive neuroscience deals with the mind-body problem, even a brief overview of the questions traditionally raised within the mind-body discussion shows that not all of it necessarily belongs into cognitive neuroscience. Therefore, from the point of view of cognitive neuroscience, talking about “cognitive neuroscience and the mind-body problem” is nonsensical as

the relationship between body and mind is all that cognitive neuroscience deals with, but coming/looking from the mind-body problem point of view, one can rightfully ask oneself what is the role and contribution of cognitive neuroscience in tackling the mind-body problem.

### **Cognitive neuroscience < Mind-Body problem**

Cognitive neuroscience offers a specific approach to answering the question of the relation between the mental and the physical, the mind-body problem, based on a set of specific assumptions. The approach that cognitive neuroscience subscribes to is basically a reductionist approach that aims to answer the question of what are the structural and functional components of the brain that enable the observed cognitive processes and give rise to the capacities and properties of the mind. The explanatory strategy employed by the cognitive neuroscientist is what Atkinson (1998) calls decompositional analysis, and it compares to reverse engineering. While engineers construct machines from a plan of what and how the machine is to do, specifying the components needed to accomplish the task, a reverse engineer tries to work out the unknown design of a machine by analyzing it. He/she works under the assumption that the machine is composed of parts that carry out certain functions and attempts to explain how the system accomplishes the task in terms of its parts and/or their respective functions.

The basic working assumption of cognitive neuroscience is that the mental events are nothing more than a special kind of physical events, that there is nothing to the mind other than the spiking of neurons dipped in the soup of hormones and neurotransmitters - a philosophical position officially categorized as materialism, or physicalism.

Undoubtedly, not everybody subscribes to the approach and assumptions promoted and held by cognitive neuroscience, and not every possible aspect of the mind-body relationship can be covered by it, which effectively limits cognitive neuroscience to but one of the possible ways to tackle the mind-body problem. The areas of mind-body relationship not covered by cognitive neuroscience can be broadly divided into two categories, namely, things that it does not study or aim to explain and things that it cannot explain. Let us consider them in turn.

#### **A/ There are many aspects of the Mind-Body relationship and cognitive neuroscience does not deal with all of them**

The goal of cognitive neuroscience is to explain, in causal terms, what of and how the brain gives rise to the mind. It tries to find general principles, processes and mechanisms that should be able to explain the mind-body relationship. As far as individual

idiosyncrasies are concerned, it uses them as an important source of constraints for the theories and models it proposes, but it is in principle not interested in them for their own sake. Now, as much as prediction and understanding from a third person’s point of view presents a crucial interest of science, there is also much to be gained from answering the “what is it like” question dealt by first person accounts of mental phenomena. While cognitive neuroscience has built an impressive armoury of instruments and methods of dealing with the former, it has not shown much interest for the later. The richness and relevance of the information about the mind-body relationship that can be gained by phenomenology and first person accounts are beautifully presented in some of Luria’s work (e.g., 1968, 1972) and a number of enchanting books by Oliver Sacks (e.g., 1985, 1995). They persuasively show that to fully understand the way the mind is inseparably connected to and dependent on the functioning of the brain, one has to look into the individual’s experience and the way it is influenced by the changes of the brain.

Mind and body being intricately connected, important insight into the mind-body relationship can be gained not only by looking how changes in the brain cause and affect the individual experience of the mind, but also by considering the opposite question of how the individual experience of the mind and the context of social systems and cultures in which it is placed affects the workings of the brain.

The brain is not a pre- or hard-wired machine, but rather a system crucially determined by the experience gained through its lifetime and the context in which it develops. As much as one has to acknowledge the “wetness” of the mind, i.e., the fact that the mind is crucially dependent on the characteristics of the brain, for which Kosslyn and Koenig (1992) argued so eloquently, one also has to acknowledge the “wetness” of the brain, i.e., the fact that the structure, functions, the working of the brain are codetermined by the individual, social and cultural contexts in which the mind is placed, of which a captive example was presented by Donald (1991). Both phenomenology and socio-cultural context are just two of possible aspects of mind-body relationship that cognitive neuroscience does not aim to study or explain, but are important for a wholesome understanding of the mind-brain relationship.

### **B/ Qualia that accompanies human consciousness cannot be explained by cognitive neuroscience**

Beside the aspects of mind-body relationship that cognitive neuroscience does not study, there are also subjects which do fall within its interest, but cannot – in the opinion of some researchers – be explained by it. Probably the most renowned is the case of subjective quality of conscious experience. Most likely, everybody would agree that when perceiving stimuli, entertaining thoughts or having feelings, a certain quality of experiencing them (qualia) exists in our consciousness. The problem as stated by David Chalmers (1995) is that while cognitive neuroscience can explain

how the brain enables informational processing of the mind, it is incapable of explaining the qualitative experience that accompanies it, nor the mere fact that it does. No matter what knowledge we gain about the visual processing of colour and how precisely we are able to describe it, the quality of sensory experience of red cannot be known unless experienced. As ancient Sufi would say about coffee: “He who tastes, knows; he who tastes not, knows not”.

The problem of qualia points to the existence of an “explanatory gap”, an inability to explain human experience fully by describing the “mere” mechanical processes of the brain. To be able to achieve that, something “extra” (that is, of a different metaphysical type) must be added to “fill the gap”. A provoking example of the explanatory gap is provided in Searle’s (1980) Chinese room thought experiment. Not everybody agrees that an explanatory gap exists. Daniel Dennett (1991) presents a number of arguments and thought experiments aimed at “Quining Qualia” altogether, while Gerald Edelman (1988) accepts the notion of qualia but incorporates it in his cognitive neuroscience theory of the mind.

### **C/ Human behaviour and experience cannot be fully explained within cognitive neuroscience**

While the jury is still out on the question of qualia and the ability of science to explain the subjective quality of experience in reductionist terms, there is another and much more provocative assertion being made, namely, that to explain human behaviour and experience fully, one has to go beyond the study of the structure and the processes of the brain. The assertion can be traced to different forms of dualism and a number of theories proposing that processes, influences or “energies” beyond the ones being studied by “classical” science have to be considered and taken into account.

There are a number of possible ways to tackle that assertion. I would like to start out from the assumption that cognitive neuroscience has what it takes to explain human behaviour and experience and deal with the question of how the mind arises from the functioning of the brain, and then see what would it take to convince me to the contrary. In doing that, I would like to draw a parallel to the rise of cognitive paradigm in psychology.

Before the victorious march of the cognitive paradigm, behaviourism dominated psychology in the first half of the twentieth century. Behaviourism built on the simple assumption that all human behaviour is just a learned response to external stimuli. In order to explain human behaviour, one would just need to study the ways in which stimuli (S) become associated with appropriate behavioural responses (R), or shortly the S@R relationships. The behaviourist enterprise moved along with a forte, compiling huge amounts of empirical data, until it slowly became apparent that not all of behaviour could be explained by learned responses. Ingenious experiments like the ones carried out by Tolman (1932, 1948) have shown that what guides human and

animal behaviour are not just levers being pressed by external stimuli, but rather internal cognitive representations and informational processing forming and transforming them.

The switch from behaviourism to cognitive psychology was based on recognition that in order to explain human behaviour, one has to study the cognitive system that mediates between stimuli and responses. And that is what cognitive psychology and cognitive neuroscience is about: it studies the processes, functional and material structure of the brain in order to explain how external stimuli are processed and represented in the mind, and how those internal representations and processes guide human behaviour.

In my opinion, any new switch of paradigm from cognitive neuroscience to something beyond it would have to be based on the same type of evidence that propelled forward the cognitive paradigm. Such evidence would have to show that it is not enough to study the [S→C→R] relationship. It would have to show that the study of brain and cognitive processes that it gives rise to is not enough to explain the varieties of human behaviour and experience. It is my belief that no such compelling evidence exists as of today and that cognitive neuroscience is still in the early days of an exciting and revealing journey.

## **In conclusion**

Due to the fact that it is directly accessible to us and we can experience it directly, the human mind, the consciousness, the psyche has always been and will remain a difficult and controversial subject of study. We “know” what it is like to be conscious, to have a mind, and before accepting any third person’s theory of it we demand that the theory makes sense to us personally in the sense that it agrees with our feelings of being conscious – a difficult if not impossible task for any theory of mind.

Cognitive neuroscience has so far proved to be the best attempt at providing a coherent and comprehensive scientific explanation of the mind-body relationship, by employing methods and knowledge of existing brain and mind sciences and combining them in a multidisciplinary endeavour bound by a common, cognitive paradigm.

Having that special, personal characteristic, it is completely understandable that any third person’s account of the mind, like the one offered by cognitive neuroscience, needs to be complemented by the look from inside provided by first person accounts of it and it’s relation to the brain. It might also well be that to be able to capture fully the nature and richness of the subjective experience, new conceptual tools and sciences need to be developed. At the same time, however, one must be careful not to be swayed by the special nature of subjective experience and not to “imagine things and causes that do not exist ... invent false gods and superstitions” (Minsky, 1985, p. 232) in order to satisfy the liveliness, the richness, the intensity of the subjective experience of possessing a mind.

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