

Cartesian theories on the passions, the pineal gland and the pathogenesis of affective disorders: an early forerunner

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The relationship between physical and functional alterations in the pineal gland, the ‘passions’ (emotions or feelings) and psychopathology has been a constant throughout the history of medicine. One of the most influential authors on this subject was René Descartes, who discussed it in his work *The Treatise on the Passions of the Soul* (1649). Descartes believed that ‘passions’ were sensitive movements that the soul, located in the pineal gland, experienced due to its union with the body, by circulating animal spirits. Descartes described sadness as one of the six primitive passions of the soul, which leads to melancholy if not remedied. Cartesian theories had a great deal of influence on the way that mental pathologies were considered throughout the entire 17th century and during much of the 18th century, but the link between the pineal gland and psychiatric disorders it was definitively highlighted in the 20th century, with the discovery of melatonin in 1958. The recent development of a new pharmacological agent acting through melatonergic receptors (agomelatine) has confirmed the close link between the pineal gland and affective disorders.

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The passions (feelings or emotions in modern scientific terms) have played a key role in the conceptualization of human nature ever since classical antiquity, due to their close spiritual links with the concept of the human soul (Berrios, 1985). In fact, in Greek culture the belief took root that a corruption of the passions, the ‘animal part’ of the human being, altered the cognitive processes – mainly the emotions – and were the cause of madness.

One of history’s most influential authors in this field is the great philosopher René Descartes (1596–1650), who provided an entire neuropsychophysiological doctrine on this subject. Descartes used Greek philosophical analysis to leave the way open for a duality of the human body (*res extensa*) and soul (*res cogitans*) (Carter, 1983). In his physiological work, he also adopted most of the theories that had been common currency since classical antiquity, which were essentially the ideas of the Alexandrian pneumatic school as regards the so-called ‘animal spirits’. These spirits are the ‘biochemical’ foundations for all Cartesian neuropsychophysiological doctrine.

For Descartes, the nervous system consisted of the brain and the nerves. In his anatomical view, the inner layer (the ventricle walls) is the most important part of the brain and is completely covered with pores, which are the spaces between the nervous filaments that make up a type of grid or network. These filaments go straight to the outer layer of the brain (the shorter ones) or form part of the nerves in the stricter sense, which are located throughout the body (the longer ones). On their journey around the body, the nerves have a distal valvular mechanism to maintain and control the spiritual flow (Souques, 1938). As is well known, Descartes postulated that the human soul must have a specific anatomical seat, the pineal gland (López-Muñoz & Boya, 1992). He believed that from this position, the soul supervised the communication between the human machine and its surroundings and acted as an internal influence that exerted control over the precise functioning of the human body, including the passions. Descartes also believed that the inner structure of the pineal gland, like that of the rest of the brain and nerves, consisted of filaments separated by pores (Souques, 1938). In order to carry out its function, the pineal gland exuded fine particles suspended in the blood from the plexus choroideus and the epiphysary arterioles (‘a very subtle wind, or rather a flame which is very pure and very vivid’), which

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transformed them into *esprits animaux*. In Cartesian physiology, active movements of the pineal gland sent the animal spirits to the cerebral ventricle system and from there to the outer regions of the body, passing through the vast amount of pores that, in theory, were within the walls of the ventricles. According to this theory, the ventricular pores were able to open or close depending on the type and degree of sensory stimulation and could thereby limit the flow of animal spirits from the pineal gland to the muscles along the nerve tubes, producing movement.

One of the major controversies in Cartesian philosophical doctrine is the influences that act on thought and extension (Gorham, 1994; Albuquerque *et al.* 2003). In the philosopher's opinion, the possible relationship between both entities is twofold, as it is possible that the soul moves the body and that the body is, in turn, able to influence the soul. Descartes used the term 'passion' to refer to this interaction and defined these as the sensitive movements experienced by the soul as a consequence of its union with the body. Descartes focused on this issue in his final work published during his lifetime, *The Passions of the Soul* (1649) (Descartes, 1989) and defined the passions of the soul, of which he lists 49, as '... apprehension, resentments, or emotions of the soul, attributed particularly to it, and caused, fomented, and fortified by some motion of the spirits' (Art. XXVII).

In Descartes' opinion, there were only six primitive or primary passions, which are indivisible, as referred to in Art. LXIX: '... it may easily be noted that there are but six such, to wit: admiration, love, hatred, desire, joy and sadness, and all the others are compounded of some of these six, or are sorts of them'. Sadness is therefore one of the six pure passions of the soul. Descartes believed that all the passions are necessary (they are beneficial by nature, he said) and even that:

sadness is in some sort superior to, and more necessary than joy..., because it is of more moment to repel things noxious and destructive, than to acquire such as add some kind of perfection, without which it is possible to subsist. (Art. CXXXVII)

Furthermore, he maintains that sadness is not in itself necessarily bad for the soul as it is what informs the soul of the ill from which it is suffering.

The only danger that passions can cause to health lies in their excess or misuse, which led to melancholy if it was not remedied. Descartes thereby concluded his treatise with an article entitled: 'That from them [the passions] alone all the good and evil of this life depends' (Art. CCXII), in which he said that wisdom: 'teaches us so to make ourselves masters of them, and manage them with so much dexterity, that the evils

they cause may be easily endured'. There is a clear psychosomatic aspect to Cartesian theories in terms of the aetiopathogeny of diseases (Lindeboom, 1979; Albuquerque *et al.* 2003).

The spirit of Cartesian physiology provided a framework and inspiration for the way man was understood throughout the entire seventeenth century (the iatromechanical and iatrochemical currents) and much of the eighteenth century (the vitalist current of the Enlightenment) (Brazier, 1984). Cartesian influence was also apparent in the specific field of psychopathology. Thomas Willis thought that melancholy was the consequence of a disorder in the brain and the animal spirits inside it. Archibald Pitcairn, founder of the Edinburgh School, turned to a disorder of the flow of animal spirits that circulated in the nerves, leading to disordered and delirious thoughts in melancholy. Likewise, the theory pioneered by Descartes on the role of the passions in the origin of mental illnesses began to assume scientific importance at the end of the eighteenth century, when madness gradually came to be seen as an abnormal way of associating ideas (Postel, 1979). However, it was not until the nineteenth century, as a result of romantic and positivist medical trends, that the emotional symptomatology began to be used in the diagnostic criteria for numerous pathologies in the psychiatric field and especially those of an affective nature (Berrios, 1985).

From a strictly psychological perspective, Descartes' theory of the passions has become receivable today with the theories of emotions of contemporary authors. In fact, the modern concept of 'passion', unlike that of 'emotion', is closely linked to the psychopathology of thought, in that it assumes a deformation (an overvaluation) of the subject's ideas. In this sense, the psychoanalytical theories of Hartvig Dahl also use the pairings of emotions model and, in a manner similar to the Cartesian 'happiness-sadness' pairing, postulates the 'happiness-depression' pairing (Dahl & Stengel, 1978).

But where the Cartesian theories acquire a greater role today, thanks to the latest advances in the fields of neurophysiology and psychopharmacology, is in his pioneer character in linking the pineal gland and affective disorders. The start of current scientific knowledge about the pineal gland occurred in 1958, when Aaron B. Lerner and collaborators at Yale University isolated, from bovine pineal glands, an indolamine (*N*-acetyl-5-methoxytryptamine), which was named 'melatonin' (from Greek *melas*, black or dark) (Lerner *et al.* 1958). The observation that melatonin was capable of increasing the levels of serotonin in the pineal gland allowed professionals to hypothesize about its potential utility in the treatment of affective disorders, as the serotonergic theory of depressions

had already been put forward at the end of the 1960s, postulating a deficit in this indolamine in the synaptic gap in the serotonergic pathways of patients with mood disorders. Thus, Anton-Tay *et al.* (1971) suggested that this hormone, synthesized and released from the pineal gland, might have an antidepressive effect, an argument reinforced by the observation of the euphoric effect caused by melatonin, following administration to healthy volunteers. This implication of a melatonergic system in the genesis of depression has recently acquired more support, after confirmation in experimental studies with *knock-out* mice for melatonin receptors type 1 (MT₁) that these animals, lacking in the abovementioned receptor, behave similarly to those subjected to experimental models of depression (Weil *et al.* 2006). Finally, this link has been definitively closed with the approval by the European Medicines Agency in 2008 of agomelatine, an antidepressant drug that acts specifically on melatonergic mechanisms (agonist of MT₁/MT₂ receptors). This drug has confirmed his antidepressant efficacy in clinical trials, in both short- and long-term studies (Loo *et al.* 2002).

On the subject that concerns us, René Descartes was the first author to reveal a psychophysiological theory linking the pineal gland and affective disorders. Today, this connection constitutes a scientific research line that is extremely promising.

Declaration of Interest

None.

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