



Article

# Yawning in the history of psychiatry

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## Abstract

Yawning is a fascinating physiological behaviour that has been poorly addressed except in old medical books. Whereas the purpose of this behaviour is still not clearly identified, the ancient authors made it a clinical symptom, especially a psychological one. After presenting some current notions about yawning, we review publications on yawning written by physicians, from antiquity to the twentieth century, and, in particular, those dealing with psychological and psychiatric aspects.

## Keywords

Charcot, history of psychiatry, psychopathology, yawning

## Introduction

Yawning is a mysterious and fascinating physiological behaviour that has been poorly addressed except in old medical books. Whereas the purpose of this behaviour is still not clearly identified, authors from earlier times made it a clinical symptom, especially a psychological one. After presenting some current notions about yawning, we will discuss some of the meanings that earlier authors attributed to it. From the release of tainted humours to the awakening of animal spirits and improved brain oxygenation, the metaphors that developed from these theories are all characterized by their popular success, which endured until the time of Jean-Martin Charcot (1825–1893) and even into our own day (Guggisberg, Mathis, Schnider and Hess, 2010).

## About yawning

Yawning is a phylogenetically ancient phenomenon coordinated by a network of supratentorial and infratentorial centres mainly located in the brainstem and hypothalamus. It is a stereotyped and often repetitive motor act characterized by a gaping of the mouth accompanied by a long inspiration, followed by a brief acme and a short expiration. It is not merely a simple opening of the mouth, but a complex coordinated movement bringing together flexion followed by extension of the neck, a wide dilation of the laryngopharynx with strong stretching of the diaphragm and anti-gravity muscles. Highly stereotypical, since no environmental input changes the sequence of movements, yawning is observed in cold-blooded and warm-blooded vertebrates, from reptiles with rudimentary ‘archaic’ brains to human primates, in water, air and land environments

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(Walusinski and Deputte, 2004). Yawning appears to be an ancestral vestige maintained throughout evolution with little variation, bearing witness to its early phylogenetic origins. Like any phylogenetically old behaviour, yawning can be observed early in ontogeny, at 11–12 weeks of foetal life (Walusinski, 2012).

Three different types of yawning can be distinguished. ‘Universal yawning’, which is seen in all vertebrates, is associated with daytime circadian rhythms, i.e. sleep/arousal and hunger/satiety. ‘Emotional yawning’, which is only seen in mammals and birds, has a calming effect after stress. Ethologists call this type of behaviour a displacement activity. Finally, ‘contagious yawning’ is observed only in great apes (from orangutans to bonobos and humans), in elephants, in dogs under certain conditions, and perhaps in social parrots (budgerigar) and rats; this is the ability to respond to yawning in others (Walusinski, 2010: 113–18). Many emotional responses (laughing, crying) and many behaviours (vomiting, scratching, and hysterical behaviours such as the dancing manias in medieval Europe) are considered contagious, but are not as consistent and automatic as contagious yawning (Provine, 2012). While the neural structures necessary for yawning appear to be located within the brain stem, there is growing pharmacological research indicating that yawning is under the control of several neurotransmitters and neuropeptides in the diencephalon and, more precisely, in the paraventricular nucleus of the hypothalamus. Yawning is induced by dopamine, nitric oxide, excitatory amino acids, acetylcholine, serotonin and adrenocorticotrophic hormone-related peptides, mainly oxytocin. It is inhibited by opioid peptides and GABA agonists (Krestel, Bassetti and Walusinski, 2018). Excessive yawning is caused by pharmacological drugs (primarily selective serotonin re-uptake inhibitors) and numerous pathologies, including migraine headaches, stress and anxiety, head trauma and stroke, basal ganglia disorders, focal brain lesions, epilepsy, multiple sclerosis, and neuromyelitis optica spectrum disorders (Walusinski, 2009). So it can be assumed that yawning exteriorizes homeostatic processes in the systems controlling arousal, hunger and sexuality.

## From antiquity to the Renaissance

The first medical writings on yawning are found in *De flatibus liber*, a treatise on wind written by Hippocrates in 400 BC. He observed:

Yawning precedes a fever, because the large quantity of accumulated air ascends all at once, lifting with the action of a lever and opening the mouth; in this manner the air can exit with ease. Like the large quantities of steam that escape from cauldrons when water boils, the accumulated air in the body is violently expelled through the mouth when the body temperature rises.<sup>1</sup>

Works by the following authors are also relevant: Pliny the Elder (23–79), e.g. *Naturalis Historiae*; d’Aulus Cornelius Celsus (29 BC–37 AD), e.g. *Medicina*; Claude Galien (129–216), e.g. *De Spirandi difficultate libri tres*; Oribase (325–95), e.g. *Synopsis ad Eustathium*; Avicenna (980–1037), e.g. *Canons*; and Jérôme Cardan (1501–76), e.g. *Hieronymi cardani in hippocratis coi prognostica*. These authors considered yawning and pandiculation to be ‘a perversion of movement’, used to establish a prognosis with an unfavourable progression. This is in line with what Ibn Sina, known as Avicenna (980–1037), explained in *The Canon of Medicine*: patients with excessive yawning and fatigue fell to the ground, secondary to a probable vasovagal syncope (Shoja et al., 2009).

## From the end of the Renaissance to the seventeenth century

Scipion Dupleix (1569–1661), philosopher and historiographer of French kings Henri IV and then Louis XIII, published a wonderful collection in 1626: *La curiosité naturelle rédigée en questions*

*selon l'ordre alphabétique*. For the word 'yawn' he provided the following discussion to his curious reader, so well phrased and close to our contemporary ideas:

Why do we yawn when seeing others yawn? This is due to the common disposition of spirits or inside air, creating between us considerable sympathy, consent, and affinity, which moves and affects these spirits alike by recollection only. And for this same reason we cannot help singing when we hear others sing, our attention being otherwise occupied. (Duplex, 1626: 18)

In 1664, Rene Descartes (1596–1650) presented his theory on nerves in his *Les Traitez de l'Homme et la formation du foetus*:

The spirits that are in the brain enter into specific nerves; at the same time, they carry the strength to move a specific limb. Having discussed respiration and other simple and ordinary movements of this type, I will explain how exterior objects act on the sensory organs.

He concluded his explanation thus: 'By way of example, you can also observe how this machine can sneeze, yawn, cough, and make the necessary movements to discharge a variety of other excrements' (Descartes, 1664: 222). This demonstrates that, nearly a thousand years after Hippocrates, the evacuation of humours was still considered a primary effect of yawning.

Herman Boerhaave (1668–1738), a Dutch botanist, Christian humanist, and physician of European fame, is referred to as the founder of clinical medicine, medical teaching at the University of Leiden, and the modern academic hospital. In 1739 in *Praelectiones Academicae*, he provided the first novel explanation of yawning:

Yawning and pandiculation favour the equitable distribution of spiritus in all the muscles and unblock the vessels of which sleep may have slowed the functions. In certain cases, yawning and pandiculation favour blood flow and re-establish the nervous influx; their action fights the excessive predominance of the flexor muscles and returns everything to its place. . . . Yawning involves extending most of the muscles controlled by the will at almost the same time, while expanding the lungs amply and inhaling a great deal of air slowly and gradually. After the air has been held for some time and is rarefied, it is imperceptibly released by exhalation and the muscles finally return to their natural state. The effect of yawning is thus to move all the humours of the body through all the vessels, to accelerate their movement, to distribute them equally and as a result, to give the sensory organs and muscles of the body the capacity to perform their functions. (Boerhaave, 1739: 586)

Pierre Brisseau (1631–1717), physician at the Royal Hospital in Douay (France) and known for his demonstration of the true nature and location of cataracts, considered the nerves as channels in which animal spirits circulated, and he used this to explain nervous diseases. In his *Traité des mouvements simpatiques*, Brisseau (1692) interpreted yawning as a prodromal sign of epilepsy:

The signs of an imminent attack of epilepsy are a disturbance of the soul and the senses, heaviness and pain in the head, vertigo, irritating insomnia, weariness in the joints, trembling of the limbs, ringing in the ears, yawning, heart palpitation, difficulty breathing, nausea, cardialgia, etc. All of these signs are more or less present in epileptics. . . . Because blood circulates with difficulty around the lungs, yawning makes it easy to deduce that someone is about to be struck by a fit of epilepsy. (Brisseau, 1692: 80)

## **Eighteenth century**

In 1733, George Cheyne (1671–1743), known for his contribution to vegetarianism, wrote *The English Malady or a Treatise of Nervous Diseases of All Kinds*, the great first-person account of

psychopathological disorders and probably the most widely read and influential psychiatric work published in English in the eighteenth century. Cheyne discussed the nature and causes of nervous distempers in part one, the treatment of nervous distempers in part two, and detailed a variety of cases illustrating his therapies in the final part. He explained:

All nervous distempers whatsoever from yawning and stretching, up to a mortal fit of an apoplexy, seem to me to be but one continued disorder, or the several steps or degrees of it, arising from relaxation or weakness, and the want of a sufficient force and elasticity in the solids in general, and in the nerves in particular, in proportion to the resistance of the fluids in order to carry on the circulation, remove obstructions, carry off the excrements, and make the secretions. . . . Those nervous distempers that are attended with spasms, cramps, convulsions, or violent contractions of the muscles, are all of the convulsive tribe of hypochondriacal and hysterical fits, or the convulsions of the epileptic kind, down to yawning and stretching. These seem to be produced by some hard-pointed concretions, saline particles, or some noxious acid or acrimonious stream, wind, or obstructed perspiration, lodged in the small vessels, or upon any place where there are the greatest collections of nerves, viz. in the alimentary tubes, the cavities of the brain, the trunk of the body, or the interstices of the muscles, where twitching, stimulating and wounding the nerves, or their membranes, raises a general disorder in all nervous or sensible fibres, whence the same is derived upon the whole muscular system, and there provokes violent throws, contractions, cramps, and spasms, until tormenting and wearying out the elastic fibres, at last, by their struggles and efforts, the destructive matter is discharged or removed. (Cheyne, 1733: 435)

Johannes de Gorter (1689–1762), a student of Hermann Boerhaave, became a Professor of Medicine in Harderwijk (the Netherlands). He wrote prolifically in all areas of medicine, constructing a kind of nosology in the early eighteenth century. He holds a key place in the history of knowledge on yawning because in his book *De Perspiratione insensibili* (1755: 241), he attributed yawning ‘to a need for faster blood circulation and to cerebral anaemia’. This marks the birth of an idea that would persist for two centuries, repeated by almost all authors: yawning improves brain oxygenation:

By this action, the blood in the veins, running through the muscles, is urged more towards the veins, and the major supply of blood to the heart is led from there continuously, with an abundant diversion of blood to the brain and the cerebellum for the spirits of the secretions. In some people, there is a slower flow of blood to the brain, frequently causing them to yawn and stretch, as in drowsiness, leisure, and when starting to wake from sleep. (de Gorter, 1755: 242)

Albrecht von Haller (1708–77), a Swiss physician and poet, introduced the notion of ‘irritability’, the property of tissues to be stimulated. He was the first to record proof of this phenomenon and distinguished nerve impulses (sensitivity) from muscular contraction (irritability). In the same vein as de Gorter, he suggested the following: ‘Why do we yawn when we feel like sleeping? In order to clear the lungs in which the blood is moving more slowly’ (von Haller, 1766: 196).

David Hartley (1705–57), an ingenious English physician, sought to unite the physical and psychological worlds by means of speculative associative neurophysiology, influenced by the discovery by Isaac Newton (1642–1726) of the theory of vibrations, an alternative to the theory of animal spirit. Hartley’s fame rests upon *Observations on Man, his Frame, his Duty, his Expectations*, which he published in 1749. It was republished in several editions and numerous translations throughout the late eighteenth and early nineteenth centuries. He proposed that perceived sensations and voluntary acts were dependent on the vibration of particles that composed human tissue and were invisible to the eye, travelling the length of the nerves and thereby giving substance to the ‘animal spirits’ of Descartes. In this way, he therefore prefigured the concept of molecules:

Depending on the circumstances, yawning and stretching may be considered part of the five classes of vibratory movements. When yawning occurs during attacks of fever and other diseases, it appears caused by sudden, strong contractions in the membranes of the mouth, throat, trachea and oesophagus, whereas stretching appears to be caused by skin contractions. (Hartley, 1749, vol. 1: 102)

Glassman and Buckingham (2007) suggest that ‘Newton’s foresight developed further by Hartley, that communication at any scale might take advantage of an energetic repetitiveness, which both spoke of as “vibration”, remains valid’. We now know that neural activity involves oscillations on several different scales.

Joseph Raulin (1708–84) tried to classify the nervous disorders of the ladies he treated at the court of the French king Louis XV. He compared spasms and convulsions and used the expression of the period – vapours – to describe what would later be known as hysteria:

A woman experiences anxieties, yawning, hiccoughs, spasms, and irregular movements in her nerves, of which she complains bitterly; her family, friends, and neighbours respond with indifference. This is a case of vapours. These light vapours progress imperceptibly, the patient becomes sad, she sheds tears, or she seems cheerful, she uses expressions that are not understood, or she says pretty things, she laughs, she sings, or she alternates tears and laughter, always being beside herself. We laugh as she does, attributing this to vapours. (Raulin, 1758: 5)

Robert Whytt (1714–66), a famous Scottish physician, was one of the most accomplished neuro-physiologists and pathologists of his time. He clarified the components of the light reflex within the eye and described tubercular meningitis. His explanation of ‘sensations’ (sensitivity) in involuntary movements makes him a forerunner in the area of reflexes. He also established a clear distinction between voluntary and involuntary actions. His interest in the effect of emotions during disease makes him the father of psychosomatic pathology:

The different parts of our body receive from nerves not only the power to feel and move, but also a very specific sympathy that is either general and spreads out over the entire animal system, or particular, meaning that it is mainly exerted between certain parts. Whether we want to or not, we close both our eyelids every time there is a threat to one of our eyes. A sudden bright light striking our eyes sometimes causes blindness. Hippocrates observed that the sudden sight of a snake can make the face go pale. When a hungry person sees food he likes, he experiences a more abundant secretion of saliva than before having seen the object. Yawning and vomiting often occur by the simple sight or sound of someone yawning or vomiting. In this work on nervous disorders, I will mainly examine those that have the effect of a weak, delicate and unusual nervous constitution; and in this category I place the majority of symptoms that physicians have commonly described as windy, spastic, hypochondriacal, hysterical and vaporous . . . heart palpitations, rapidly changing pulse, most often natural, sometimes unusually slow, and other times quick or frequent, more often faint than strong, and in certain cases irregular or intermittent . . . a dry cough with breathing troubles, or a convulsion or tightening of the bronchi, an accident that may come back periodically, yawning, hiccoughs, frequent sighing, a feeling of suffocation or constriction that seems to be caused by a lump or large object lodged in the throat, fits of crying and convulsive laughter. (Whytt, 1755: 100)

Gaspard Lavater (1741–1800), born in Zürich, officiated until his death as a pastor in churches in his native city. His oratorical fervour and genuine depth of conviction gave him great personal influence. He is best known for his theory of physiognomy, published in four volumes between 1775 and 1778. The fame of this book, which found admirers in France, England and Germany, rests largely upon the handsome style of publication and the accompanying illustrations, inspired by the writings and drawings of the Italian polymath Giambattista della Porta (1535–1615). These

were the result of a philosophical movement dating back to antiquity that consisted of deciphering an individual's personality from his facial features. Lavater's chapter on yawning was particularly novel:

During the most passionate moments, the jaw often has an involuntary movement just as during moments when the soul is unaffected; pain, pleasure and boredom also cause yawning, but it is true that vivid yawning is a convulsion that is very prompt during pain or pleasure, whereas the yawning of boredom shows its character by the slow pace at which it occurs. (Lavater, 1775: 180; 1803: 159)

## Nineteenth century

The French pioneer of experimental physiology, François Magendie (1783–1855), is known for describing the foramen of Magendie, the Magendie sign or Magendie-Hertwig<sup>2</sup> sign (a skew deviation of the eyes in acute cerebellar lesions; a downward and inward rotation of the eyes on the side of the lesion, and an upward and outward deviation on the opposite side due to a lesion in the cerebellum). He held the Chair of Medicine at the Collège de France from 1830 to 1855. A contemporary of Sir Charles Bell (1774–1842), Magendie demonstrated Bell's discovery, verifying by experiments the differentiation between the ventral roots as being motor nerves and the dorsal roots as being sensory nerves, the so-called Bell-Magendie law. Magendie defended his thesis in medicine (on the use of the soft palate) on 27 March 1808, which included an original chapter on yawning. In an argument that remains relevant today, Magendie (1808: 12) dismissed the possibility that yawning served as ventilation:

Yawning, classified by physiologists among inhalation phenomena, has not been sufficiently studied, in my opinion. . . . Yawning mainly consists in the pandiculation of the masseter, temporal, and pterygoid muscles and in the prolonged contraction of the submandibular muscles. I do not completely exclude the purpose given by physiologists to yawning, but I think it must be seen as accessory. Another reason makes me persist in this idea: yawning is almost always accompanied by the pandiculation of other muscles in the body, and important muscles such as the masseter and pterygoid muscles must necessarily take part in the well-being resulting from this elongation. Do we not observe in the jaw muscles the two kinds of pandiculation seen in the trunk and the limbs? In one, the most frequent kind, we extend the limbs, we arch the trunk backwards, the flexors are elongated, and the extensors contracted. In the other, the opposite happens, meaning that the trunk and the limbs are in the greatest degree of flexion possible: the extensors are elongated, the flexors are strongly contracted. We find these two kinds of pandiculation in the muscles of the lower jaw during simple yawning: the levators are elongated, the depressors contracted; in a particular state that has not yet been described, the levator muscles as well as all facial muscles enter into a violent contraction and we experience a sensation that is perfectly identical to the one felt during yawning.

Augustin Jacob Landré-Beauvais (1772–1840) was a French surgeon and physician, best known for distinguishing rheumatoid arthritis from gout. After being an assistant to the famous Philippe Pinel (1745–1826) at La Salpêtrière hospital, he wrote one of the first books on the signs of diseases, published in 1809. Arguing that yawning was a clinical symptom, he associated it with various pathological states:

Yawning generally occurs before febrile shivering. It sometimes occurs in ataxic fevers and frequently precedes rashes and haemorrhages. Attacks of gout, hysteria or hypochondria are often presaged by continuous yawning. Frequent yawning is sometimes observed during early pregnancy. Yawning is a phenomenon that occurs after serious injuries, excessive evacuation, and internal inflammations. When



accompanied by serious symptoms, it is a very worrisome sign. Frequent yawning during ataxic fevers may be considered very dangerous, particularly in connection with other phenomena that precede weakness. The same is true for yellow fever, the plague, and phlegmasia complicated by ataxic fever. Frequent yawning sometimes occurs in women during childbirth, indicating that the delivery will be difficult and that the mother's strength is oppressed or weakened. A feeling of weariness and heaviness in the limbs and less lively sensations immediately precede yawning. It is followed by increased cheerfulness and vivacity. The pulse becomes quicker and the temperature often increases. The secretion of tears and saliva is more abundant. If we relate these phenomena to what preceded the yawning – fatigue, boredom, an exterior cold – it seems that the objective of this effort is to improve the circulation in the lungs where the air flow is blocked by either spasm or plethora. (Landré-Beauvais, 1809: 234)

John Mason Good (1764–1827), an English physician who was acquainted with the principal European languages, wrote on medical, religious and classical subjects. He explained yawning and pandiculation in *A Physiological System of Nosology* (Good, 1817) and in *The Study of Medicine with a Physiological System of Nosology* (Good, 1825), taking a very different approach from his contemporaries on the continent. He never evoked the ventilatory mechanism, but saw yawning as a simple muscular effort necessary for the balance between extensors and flexors. He regarded yawning and stretching as morbid affections:

Yawning and stretching then, are amongst the signs of debility and lassitude. And, hence, everyone who resigns himself ingloriously to a life of lassitude and indolence, will be sure to catch these motions, as a part of that general illness which he covets. And, in this manner, a natural and useful action is converted into a morbid habit. There are loungers to be found in the world, who, though in the prime of life, spend their days as well as their nights in a perpetual routine of these convulsive movements, over which they have no power; who cannot rise from the sofa without stretching their limbs, nor open their mouths to answer a plain question without gaping in one's face. The disease is here idiopathic and chronic: it may, perhaps, be cured by a permanent exertion of the will, and ridicule or hard labour will generally be found the best remedies for calling the will into action. (Good, 1835: 285)

Étienne-Jean Georget (1795–1828), known for being a dedicated worker and an ardent scholar, was only 33 when he died. He submitted his doctoral thesis, *Dissertation sur les causes de la folie*, in 1820, a prelude to his masterpieces, *De la folie* (Georget, 1820) and *De la physiologie du système nerveux et spécialement du cerveau* . . . (Georget, 1821). Rejecting any metaphysical consideration, he took an organic approach to the question of mental illness, believing it to be a single idiopathic brain disease with a great variety of manifestations. 'Due to this view, he was one of the earliest psychiatrists to believe in the unity of all mental diseases as representing different stages of one process' (Zilboorg, 1941: 392). After clearly establishing that hysteria is psychological in origin, Georget (1821, vol. 2: 267) listed the clinical manifestations attributed to hysteria, including yawning:

Some patients have worries, agitation, numbness throughout the muscular system, cramps in the muscles of the limbs, or in those of the larynx and chest, causing the phenomena that we shall present. These patients often have repeated and tiresome yawning.

Numerous authors adopted this symptomatology of the hysterical fit preceded by a rapid succession of yawns. They include Scipion Pinel (1795–1859) in his *Traité de pathologie cérébrale* (Pinel, 1844), Jean-Louis Brachet (1789–1858) in his *Traité de l'hystérie* (Brachet, 1847), and Robert Brudnell Carter (1828–1918) in *On the Pathology and Treatment of Hysteria* (Carter, 1853).

In 1843, Marie-Stanislas Rattier (1793–1871), a Professor of Philosophy, developed original ideas on the expression of emotion and on forms of communication that did not involve language:

There are several sorts of languages, since the soul has a thousand ways to manifest on the outside and express what is happening within. The entire organism seems to have no other purpose than to express the life of the soul, and as if it were not enough that the body interpret thought, there is nothing in the outer natural world that cannot become the symbol of psychological facts. . . . Yawning and its accessory movements, while they can be taken as the first signs and main phenomena of boredom, can also be spontaneous manifestations of various states of the soul. . . . Yawning occurs, pandiculation follows. We experience discomfort which seems to be universal. Those who are inclined to sleep feel fatigued and fall asleep; others become agitated and cannot find a way to position their body that relieves their torment. (Rattier, 1843: 252)

Harry-William Lobb (1829–89) made remarks on hysteria that position him as a precursor to Jean-Martin Charcot (1825–93):

Any bad news, or trouble, or sudden fright, will send these patients off into a series of true hysterical fits, laughing, crying, yawning, hiccoughing, with the globus hystericus, and complaints of choking; but never loss of consciousness or actual convulsions. After the more active form of fit, they may lie for hours in semi-syncope, breathing slowly, heart faintly beating, probably experiencing a delicious reverie, from which they are loath to be disturbed. (Lobb, 1858: 240)

Robley Dunglison (1798–1869), who was the first Professor of Anatomy and Medicine at the University of Virginia and personal physician to Thomas Jefferson (1743–1826), gives this account in his *Human Physiology*:

Pandiculation and stretching is a frequent concomitant of yawning, and appears to be established instinctively to arouse the extensor muscles to a balance of power, when the action of the flexors has been predominant. In sleep, the flexor muscles exercise that preponderance which, in the waking state, is exerted by the extensors. This, in time, is productive of some uneasiness; and hence, occasionally during sleep, but still more at the moment of waking, the extensor muscles are roused to action to restore the equipoise or perhaps, as the muscles of the upper extremities, and those engaged directly or indirectly in respiration, are chiefly concerned in the action, it is exerted for the purpose of exciting the respiratory muscles to increased activity. (Dunglison, 1856: 301)

Jean-Louis Brachet (1789–1858), an eminent physiologist and neuropsychiatrist, broadened the thinking:

Yawning is not a purely local phenomenon pertaining exclusively to respiration. It is a general phenomenon pertaining to the complete system. . . . We therefore think yawning, as well as pandiculation, occurs when the brain, alerted by the torpor seizing the system, tries to prevent the consequences by soliciting acts of excitation and arousal; thus, all muscles contract, the locomotive as well as the respiratory muscles. This general contraction is already a means of stimulation. (Brachet, 1855, vol. 2: 231)

Almire Lepelletier de la Sarthe (1790–1880), an active proponent of physiognomy, expressed this categorical judgement:

When yawning is customary, we can assume the following about the subject: limited intelligence, without initiative, slow and lazy mind, inactive, soft character, weak, indolent, timid, indifferent, melancholic, boring, incapable of vigorous resolution or undertaking a long, difficult or perilous enterprise, at times clever and cunning, and given to contemplating theft and fraud in his dealings. (Lepelletier de la Sarthe, 1864: 275)



Jean-Martin Charcot (1825–93) dedicated his Tuesday lesson on 23 October 1888 to what he designated as hysterical yawning, and Georges Gilles de la Tourette (1857–1904) transcribed the lesson. A young 17-year-old patient ‘yawned around eight times per minute, 480 times per hour, or 7200 times in fifteen waking hours’ (Charcot, 1887: 2). Interrupted by sleep, this yawning returned when the patient awoke ‘and [could persist] for weeks and months without any noticeable deterioration of general health’. Charcot and Gilles de la Tourette developed detailed arguments to convince their listeners of the hysterical aetiology: premonitory urges, contraction of the limbs, anaesthesia of the right arm, dyschromatopsia in the right eye only, ‘pain elicited by pressure on the left ovary’, yawning attacks alternating with ‘convulsive attacks’ – all of these examples of ‘stigmata that, aside from the yawning itself, do not permit the observer to doubt’. When examining Ler . . . Augustine, the maid with this kind of exceptional yawning, Charcot (1887: 4) noted bitemporal amputation of her visual field, amenorrhoea, and complete loss of taste and smell. He considered all of these symptoms as ‘permanent stigmata of hysteria’, especially since they were associated with convulsive attacks. Gilles de la Tourette evoked the notion of anorexia and reported recurrent episodes of vomiting. Although galactorrhoea is not indicated, this patient probably suffered from a large adenoma in the pituitary gland (prolactinoma?) with possible intracranial hypertension. Today, a patient with these symptoms would not be diagnosed with hysteria, which would be unlikely to be considered, but it was concluded: ‘There is no point in further discussion; all of the various accidents in our patient are clearly hysterical – everything here is due to hysteria. What is the prognosis in this case? There are positive points: pronounced hysteria in older women is much more tenacious and persistent, sometimes incurable’ (Gilles de la Tourette, Huet and Guinon, 1890: 97). Unfortunately, the outcome of this case is not documented anywhere.

In 1891, Henrietta Russell, an American journalist and novelist, published a book called *Yawning*. In this, she described natural gymnastics, comparable to present-day relaxation, and explained the benefits of yawning, which results from relaxation and produces a feeling of release and well-being (Russell, 1891: 11).

## Twentieth century

The first and only French medical school thesis centred on yawning is that of René Trautmann (1875–1956). His defence took place in 1901 in Bordeaux (Trautmann, 1901). In addition to a very rich historical chapter, Trautmann reviewed multiple kinds of repeated pathological yawning. For example, he considered yawning in a syphilis patient as a symptom confirming general paralysis.

In 1905 John Hughlings Jackson (1835–1911) described a personal clinical case (Hughlings Jackson, 1905). While performing a funduscopy on a patient, he suddenly observed a retinal paleness attributed to an arteriolar spasm that was quickly followed by yawning, which restored the appearance of the retina. This is an opportunity to recall that, although yawning is usually benign, when repetitive yawning occurs in a patient, it may warn of a premortem or permanently disabling condition. Medical reports of premortem yawning identify multiple causes of shock, including vasovagal reflex (as for Hughlings Jackson’s patient), severe hypoxia/anaemia/hypoglycaemia, stroke, and intracranial hypertension (Rothenberg, 2020).

A German physician, Valentin Dumpert, noted in 1921 that yawning results from a massive contraction of the diaphragm and is part of pandiculation, rather than being directly tied to breathing. He was the first to overturn the paradigm of ventilatory yawning and to pioneer today’s neuromuscular theory in which yawning has a diencephalic origin:

Yawning is only incomprehensible when considered alone. On the contrary, it becomes clearer if we see it as part of a more general reflex, the reflex of stretching. It is well known that yawning hardly ever occurs

without general stretching of the body. This is striking in certain animals, such as dogs or cats. It is also evident in small infants, and very often in adults. (Dumpert, 1921: 82–95)

The period following World War I was marked by the encephalitis lethargica pandemic, first described by Constantin von Economo (1876–1931) in Austria (von Economo, 1917)<sup>3</sup> and by Cruchet, Moutier and Calmettes (1917) in France. In addition to the lethargic forms that were often fatal, or the curable forms that left the patient with Parkinson's disease and abnormal movements (oculogyric crises), a rarer form of encephalitis manifested itself through stubborn and fatal insomnia, very often accompanied by a rapid succession of yawns. In 1921, Jean-Athanase Sicard (1872–1929) and Jean Paraff (1888–1960) published a case of repetitive yawning associated with uncontrollable laughter, comparable to gelastic epilepsy, in a case of encephalitis lethargica (Sicard and Paraff, 1921).

Von Economo's (1929) book on encephalitis lethargica was published in English in 1931. In it, the author suggested localizations of sleep and wake centres. The list of post-encephalitic sequelae is long:

Many years ago I proved the existence in the substantia nigra of an important shunting station for automatic rhythm of movement and progression of acts of mastication and swallowing. Now in post-encephalitic disturbances we repeatedly find a rhythmic repetition or tic-like recurrence of movements of mastication and swallowing or convulsive yawning and sounds of clucking and sucking. But other tics and compulsive movements occur as well, particularly in those groups of muscles in which the non-encephalitic tics locate themselves by preference and not, as might be expected, in those muscles which are generally affected by the acute encephalitic hyperkinesis. We see therefore blepharospasms, mimetic tics, tics of clucking and hissing, also torticollis and tics of the upper and lower extremities, but we also find fits of yelling and yawning, &c. Often these tics may be influenced by the position of the body, for instance they cease on lying down. But not infrequently they may be influenced by suggestion, for instance by hypnosis, or may be suppressed for some time by willpower. (von Economo, 1931: 118)

Based on five observations, Paul Delmas-Marsalet (1898–1977) demonstrated in 1937 that repeated yawns could reveal a frontal tumour that physicians might at first consider to be functional or hysterical:

Mr. R. . . ., aged 53, suddenly experienced an excruciating headache located in the two frontal regions, soon followed by vertigo, requiring him to stop and return home with the help of a bystander. Examined a few hours after this incident, the patient presented clear intellectual blunting. He responded slowly to questions; his responses were laconic and seemed to indicate fatigue, lack of interest, or even boredom. As he was being questioned, he strikingly began to yawn continually, putting his hand over his mouth each time and excusing himself by saying, 'Excuse me, doctor, but I can't help myself'. The yawning was very intense, when the patient was lying motionless in his bed as well as when he was talking to someone, but it was clear that conversation considerably increased the frequency of the phenomenon. The yawning was not followed by any somnolence and did not precede any narcoleptic manifestation. (Delmas-Marsallet, 1937: 183)

Sir James Purves-Stewart (1869–1949) also discussed this semiology in the numerous editions of his book *The Diagnosis of Nervous Diseases* (Purves-Stewart, 1924).

## Currently

What Jean-Martin Charcot named '*échokinésie*' refers now to resonance or replication. Contagious laughing or yawning are examples of resonance or unconsciously mirroring a behaviour. Individuals

with schizophrenia experience impaired empathic resonance. Lower contagion rates can be an indirect tool for evaluation (Haker and Rössler, 2009).

Yawning often occurs during states of increased sleep propensity. Depression is associated with sleep problems and tiredness. Yawning is not reported as a symptom of depression, but occurs in many cases as a result of treatment with antidepressants. These findings are in agreement with a tonic hyperarousal in typical depression which is reduced by all standard antidepressants (Hensch et al., 2015). For clinicians, it is of interest to know whether yawning is reduced in untreated depression and whether it predicts treatment outcome. It should be noted that currently the most frequent cause of excessive yawning is treatment with the class of antidepressants known as selective serotonin reuptake inhibitors (SSRI) (Beale and Murphree, 2000; Gutiérrez-Álvarez, 2007).

## Conclusion

History shows us that our predecessors did not fail to observe troubling and repetitive yawning. Some of their interpretations may now seem anecdotal. However, a patient seeking help with this symptom must not be ignored, even if it is mixed with a large variety of other symptoms. The list of possible causes is long and requires a careful neurological examination, including brain imaging if necessary. Psychiatrists should start by looking for an iatrogenic pharmacological effect and should inform the pharmacovigilance centre.

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This work required no approval from an institutional review board and was prepared in accordance with ethical guidelines of the journal.

## Notes

1. From an 1816 French translation by E. Pariset. This and other quotes have been translated into English by Anna Fitzgerald.
2. Richard Karl Wilhelm Theodor von Hertwig (1850–1937).
3. Published in English by Wilkins and Brody, 1968.

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