

A Complex, Contagious, Evolutionary Habit

Arulanandam Shalini,¹*MBBS*, Sechachalam Sreedharan,²*MBBS*

Yawning is often noted in medical seminars and conferences – be they surgical, orthopaedic, gastro-enterological, endocrinological or neurological. Yet, this condition receives little coverage by professors in medical schools. On the contrary, most lecturers have an adverse reaction to it – when the overworked medical student opens his mouth to raise the topic, the fierce pathology lecturer demands that it be covered up.

Yawning – what is the physiology underlying it? Why is it that when you yawn, the whole world yawns with you? And what are the implications of the “infectiousness” of yawning?

Yawning, a brainstem-mediated bodily response that is common to all vertebrates, is observed in human fetuses as early as at 15 weeks of intra-uterine life. A yawn involves a deep inspiratory breath and slow expiration, accompanied by wide opening of the jaw, and sometimes by limb-stretching and lacrimation. The bronchial stretching on inspiration stimulates a cholinergic response that reduces peripheral vascular tone, thereby increasing peripheral blood flow. Venous return is also increased by the drop in intra-thoracic pressure. The blood-rich lateral pterygoid muscles (involved in jaw-opening) and the soleus muscle (leg-stretching) also contract, expelling blood and increasing blood flow to the circulation. Now you see what the physiologists at medical school left out...

Askenasy¹ proposed that yawning brings about an increase in oxygenation of the “yawn centre” of the brain, which is located in the brainstem close to the ascendant activatory reticular system (AARS). This may be the body’s reflex to combat drowsiness and maintain the required level of alertness. This may explain why Olympic athletes tend to yawn more frequently just before their events.

Drowsiness (as a result of boredom, mediated via connections from the pre-frontal area to the AARS) is generally the most common trigger for yawning. However, the “yawn centre” is also stimulated by a wide range of other cortical and subcortical input, hormones and neurotransmitters.

Yawning is noted to be a symptom of many neurological and psychiatric illnesses, such as encephalitis, cerebral hypoxia, CNS neoplasia, schizophrenia, and depression.

It is also seen in people suffering from Eustachian tube disorders, gastric and biliary illnesses, and different syndromes of hormonal imbalance involving adrenocorticotrophin (ACTH) and melanocyte-stimulating hormone (MSH). Yawning is one of the symptoms of drug overdose (from substances such as naloxone, sodium valproate, imipramine, serotonin and pentobarbital), and of withdrawal (from drugs such as heroin, morphine, ketamine, methadone, and pentazocine). As you can see, then, the dethroned Olympic sprinter Ben Johnson may have been yawning for more than one reason.

Why then, is yawning “infectious” among normal healthy individuals, and is the explanation of increasing cerebral oxygenation and alertness sufficient to justify the persistence of this primal (and seemingly useless) behaviour over time?

The question of why yawning is “contagious” has been monkeyed around with. Anderson et al² showed that adult chimpanzees yawned more frequently when viewing videos of other chimpanzees yawning, compared to when watching videos of chimps opening their mouths for other purposes (e.g., snarling and eating). Half of the adult human subjects also showed this same response to videos of adults yawning. Yet interestingly, neither infant chimpanzees nor human children under the age of five showed any sign of being “infected” by others’ yawning.

It has been suggested by these scientists that yawning is a sub-conscious form of empathic behaviour; a manifestation of our origins as social beings. The ability to empathise requires a certain maturity of intellect, and children below the age of five are apparently unable to “put themselves in another’s shoes”. This probably explains why the sight and sound, of tired, yawning parents woken from sleep in the middle of the night has little effect in inducing guilt or sleep in the minds of their little offspring. Research has also shown that “potential lovers”, or people attracted to each

¹ Medical Officer, Naval Medicine and Hyperbaric Centre, Republic of Singapore Navy, Singapore

² Medical Officer, Singapore Armed Forces, Singapore

Address for Correspondence: Dr A Shalini, Naval Medicine and Hyperbaric Centre, Republic of Singapore Navy, AFPN 6060, Sembawang Camp, 36 Admiralty Road West, Singapore 759960.

other, had an increased tendency to induce each other to yawn than other individuals with less in common.³

This presents the possibility of using “suggestibility to yawning” as a research tool to assess the mental and social make-up of adult human beings. Would autistic patients, for example, who have a decreased or abnormal ability to relate to others, be less susceptible to infectious yawning? Perhaps a “cross-infectivity index” for yawning could be used to assess the level of subconscious empathy between future life-partners – dating agencies, take note!

Yawning may also have served as a social signal between members of ancient human communities: collective loud yawning and stretching serving as a wake-up call in the morning, and signifying bed-time at night. It is possible that, like speech, which evolved from involuntary noises, through short signals, to complex language over evolutionary time, yawning could be trained to be produced voluntarily. In fact, Dr Anderson has shown that macaque monkeys can be trained to yawn on-demand.

If one day, humans could be trained similarly to yawn, and internally suppress yawns at will, our society would reach new levels of graciousness. No longer would we give

boring lecturers grief by initiating yawning epidemics in class. We would be models of courtesy and attentiveness even in the face of the most long-winded conversationalists. And children could be trained to yawn themselves to sleep at eight o'clock on the dot, giving their parents much-needed reprieve.

The power of the yawn is such that even thinking or reading about yawning may itself induce yawning... just in case you go away thinking that the yawns you have had over the past few minutes were due to the quality of this article.

REFERENCES

1. Askenasy JJ. Is yawning an arousal defence reflex? *J Psychol* 1989;123:609-21.
2. Anderson JR, Myowa-Yamakoshi M, Matsuzawa T. Contagious yawning in chimpanzees. *Proc Biol Sci* 2004;271(S6):468-70.
3. Platek SM, Critton SR, Myers TE, Gallup GG. Contagious yawning: the role of self-awareness and mental state attribution. *Brain Res Cogn Brain Res* 2003;17:223-7.