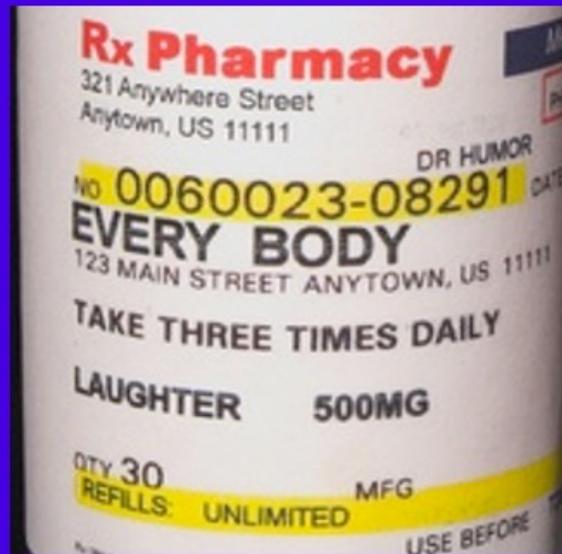


# Laughter is the Best Medicine!



**Joseph B. Weiss, MD, FACP, FACG, AGAF**  
**Clinical Professor of Medicine**  
**University of California, San Diego**

The value of humor and laughter has been underappreciated in modern medical practice. There is a growing body of scientific evidence that laughter induces many important physiological responses. These include hormones, neurotransmitters, cytokines, and other metabolites that influence the immune response, mood, cardiovascular, pulmonary, and neurological function. This program provides an understanding of the physiology and health benefits of laughter.

## Course Objectives:

- 1) Discuss the current understanding of different types of humor and the importance of various cultural differences and sensitivities.
- 2) Discuss the current understanding of humor's health benefits in disease and wellness.
- 3) Discuss advantages, cautions, and concerns in the use of humor with medical, paramedical, and employee staff.
- 4) Discuss advantages, cautions, and concerns in the use of humor with patients.
- 5) Discuss situations and conditions where humor may be inappropriate, and laughter can have adverse physiological consequences.
- 6) Discuss humor as an effective tool in coping with stress.

## At the conclusion of this activity, learners should be better able to:

- 1) Understand the mechanical and anatomical actions of laughter and its health benefits.
- 2) Describe the effect of humor and laughter on cytokines and their impact on the immune response.
- 3) Describe the neuroendocrine and physiological consequences of humor and laughter.



The concept of laughter and humor in medicine has a very long history, but its scientific basis has only recently been elucidated, and this is the focus of the lecture. As background, humorism, or humoralism, is a theory of the physiology of the human body that originated in Egypt or Mesopotamia but was systemized by Ancient Greek and Roman physicians and philosophers. The four basic humors (Greek χυμός chymos juice) of Hippocratic medicine are black bile (Gk. melan chole), yellow bile (Gk. chole), phlegm (Gk. phlegma), and blood (Gk. haima), and each corresponds to one of the traditional four temperaments. A humor is also referred to as a cambium (pl. cambia or cambiums). At around the same time ancient Indian Ayurveda medicine had developed a theory of three humors, which they linked with the five Hindu elements. The humors directly controlled health and personality and if the four basic humors are in balance, known as eucrasia, health is preserved. An excess or deficiency of any of the humors would lead to a dyscrasia of disease, disability, and changes in temperament.

From the time of Hippocrates until the advent of modern medical research in the nineteenth century humorism was the accepted basis of medical practice. Greeks, Romans, Islamic, and subsequent generations of medical approaches adopted and adapted this classical medical philosophy to the theory of the four elements: earth, fire, water, and air. Earth was believed to be predominantly present in the black bile, fire in the yellow bile, water in the phlegm, and all four elements present in the blood. It was believed that each of these humors would wax and wane in the body in part dependent on diet, activity, season, occupation, and local geography. Methods of treatment such as bloodletting, emetics, purges, and physics were administered with the intent of expelling a harmful surplus of a specific humor. Herbs, botanicals, foods, and fluids associated with a particular humor were utilized to counter symptoms of disease. Paracelsus further developed the idea that medicinal substances to affect the humors could be found in herbs, minerals, and in alchemical compounds.

There are still remaining fragments of the theory of the four humors in the current medical language. For example, the term humoral immunity or humoral regulation is still used today when discussing antibodies and hormones in the blood of the circulatory system. The term blood dyscrasia is still used to refer to any blood disease or abnormality. Some of the adjectives used to describe personalities are based on the humoral theory. Theophrastus and others described those with too much blood as being sanguine. Those with too much phlegm were described as being phlegmatic. Too much yellow bile was considered choleric, and those with too much black bile were described as being melancholic.

**The art of medicine consists of keeping the patient amused while nature heals the disease.  
- Voltaire**

**Even if humor does not add years to your life, it certainly adds life to your years.**

## **Concerns about Using Humor in Healthcare Settings**

1. Will patients (or colleagues) consider it unprofessional?
2. Will I be seen as incompetent?
3. Will patients misinterpret humor as indifference about their condition?
4. Doesn't improving my sense of humor just increase my workload?
5. Will patients think I won't consider them sick if we share some laughs together?
6. What should I do if I really don't think the patient's humor is funny?
7. What should I do if the patient's humor is offensive, or goes too far in some way? Be honest and tell them you really don't enjoy that kind of humor. Be flexible, open, and supportive of their humor generally; but there are limits to joking, as with any other behavior.

## **General Guidelines for Using Humor in Healthcare Settings**

1. Always establish your competence in the eyes of the patient first. Premature use of humor may undermine development of the patient's confidence or trust in you.
2. Be sure other nearby patients/family members are not facing a crisis at the moment.
3. Always adopt a "toe in the water" approach. Ease into a playful interaction to gauge whether any of your efforts at humor would be reacted to favorably.
4. Be sensitive to whether the patient is responding positively or negatively to humor. Don't force humor or laughter upon the patient if s/he is not receptive.
5. Remember that patients may not feel like laughing.
6. Avoid joking with other staff in the presence of patients who are about to undergo a test, surgery, etc. - unless you already have a good joking relationship established with them.
7. Laugh together at unexpected circumstances that arise.
8. Poke fun at yourself - but not in a way that suggests lack of competence.
9. Never joke about staff incompetence.
10. Never joke at the patient's expense.
11. Never use humor when you are about to deliver bad news; compassion and empathy are called for.
12. Do not use joking to avoid discussion of sensitive issues with the patient.
13. Remember that many patients have no history of using humor under stress.
14. Remember that patients may have religious convictions which stress reverence in the midst of serious illness. This may be incompatible with any form of lighter interaction.

## **Conditions Where Hospital Humor is Always Inappropriate**

1. During any acute crisis.
2. When the patient needs to cry.
3. When the patient needs quiet time.
4. When a patient in an adjacent bed is very sick or coping with bad news.
5. When the patient is trying to come to grips with any emotional crisis.
6. When the patient is trying to communicate something important to you.
7. Avoid: Ethnic jokes, sarcasm, mockery, humor at the expense of any other person.
8. If you have any doubts about the appropriateness of humor in a situation, try another approach (e.g., compassion, concern, and touch).

## Evidence-Based Medicine

**“Over two million articles are published annually in the biomedical literature in over 20 000 journals”**



*New York Times Bestseller*

# ANATOMY *of an* ILLNESS

AS PERCEIVED BY  
THE PATIENT



*Reflections on  
Healing and Regeneration*

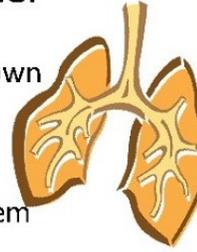
NORMAN COUSINS

## **Gelotology: the study of humor and laughter**

- This is what the physiological and psychological study of laughter is called.
- It was founded by American psychologist, William Fry, from Stanford University.

## Physiology of Laughter

- Moves diaphragm rapidly up and down
- Exercises the respiratory muscles
- Inflates the lungs
- Stimulates the cardiovascular system
- Increases oxygen in the blood



## Biochemistry of Laughter

- Stimulates brain to produce catecholamine
- Produces epinephrine and dopamine
- Releases endorphins into the system



### Results:

- Increased alertness, and eventually increased sense of well-being.
- Increased lymphocyte production helping to fight pain and inflammation.



### ***Social Benefits:***

- *Strengthens relationships*
- *Attracts others to us*
- *Enhances teamwork*
- *Helps defuse conflict*
- *Promotes group bonding*

**nature** International weekly journal of science

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Published online 4 June 2009 | Nature | doi:10.1038/news.2009.541

**Human-ape links heard in laughter**

Similarities between laughter of tickled apes and humans mirrors genetic ties between species.

Lucas Laursen

Human laughter is rooted in the emotional displays of the common ancestor we share with apes, suggests an analysis of the vocalizations of tickled juvenile apes and humans.

Human speech is unique among animals, but researchers have long debated how our laughter might relate to similar vocalizations made by other primates. Scientists from Charles Darwin to Dian Fossey, author of *Gorillas in the Mist*, have compared the laughter of non-human primates with that of



Evolution and paleontology

tickling laughter evolution apes

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RESEARCH ARTICLE

**Laughing Rats Are Optimistic**

Rafal Rygula, Helena Pluta, Piotr Popik

Published: December 26, 2012 • <https://doi.org/10.1371/journal.pone.0051959>

When tickled, rats emit ultrasonic chirps of "laughter."



These sounds seem to indicate joy. Researchers have found that rats will *perform tasks* to receive tickling as a reward.

# The New York Times

## Laughter May Be Effective Medicine for These Trying Times

Doctors, nurses and therapists have a prescription for helping all of us to get through these difficult times: Try a little laughter.



Getty Images

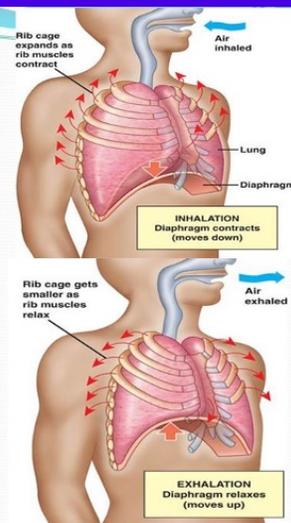
By Richard Schiffman

Published Oct. 1, 2020 Updated Oct. 2, 2020

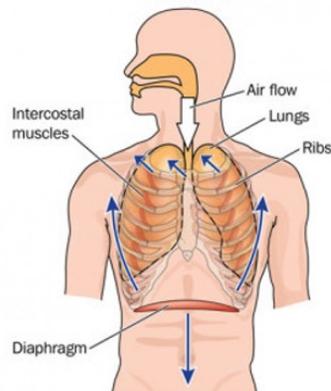
## Diaphragm

The diaphragm controls breathing

- Contracted during inhalation, relaxed during expiration
- Air flows from high pressure to low pressure
- When inhaling, air pressure lower on the outside of lungs than the inside lungs
- When exhaling, air pressure higher on the outside of lungs than the inside of lungs

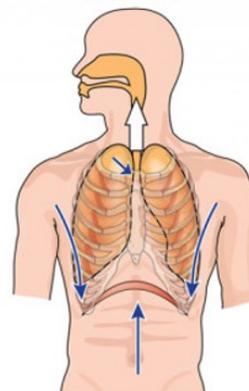


### Inhalation

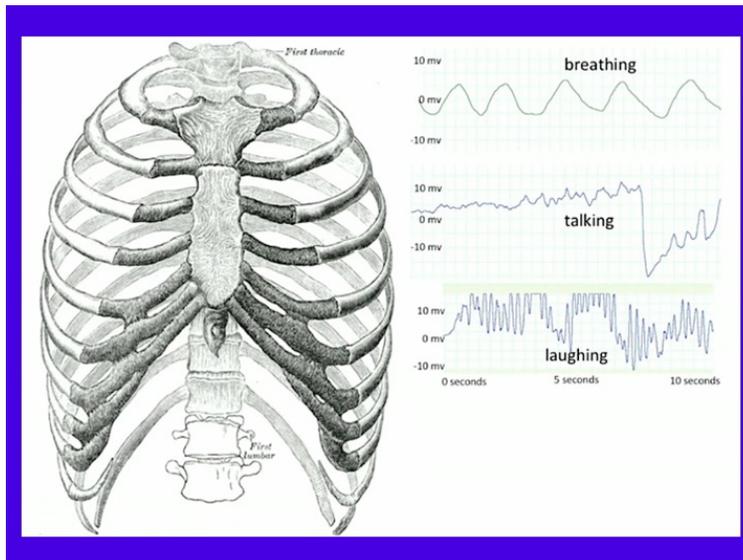


Air flows into lungs due to increased lung volume following contraction of diaphragm and intercostal muscles

### Exhalation



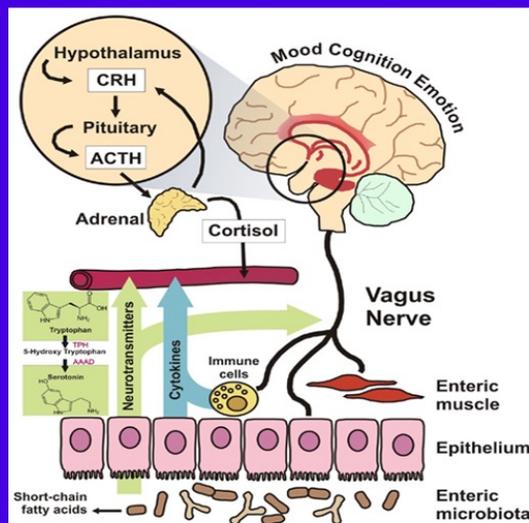
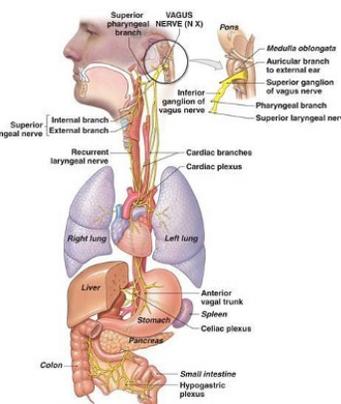
Air expelled from lungs due to relaxation of diaphragm and intercostal muscles

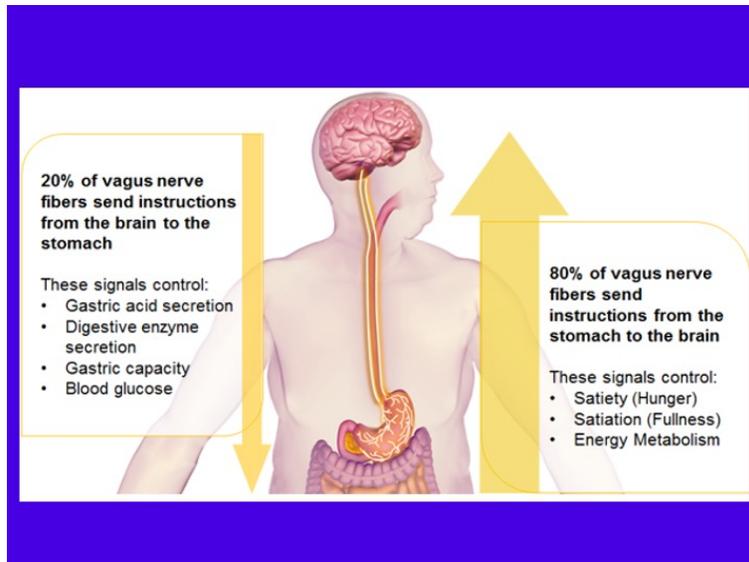


Vagus – Latin for wandering, root of words vagabond, vagrant

### Cranial Nerve X – Vagus

The vagus nerve is a critical nerve for supplying parasympathetic information to the visceral organs of the respiratory, digestive and urinary systems. It is important in the control of heart rate, bronchoconstriction & digestive processes.





## The effect of mirthful laughter on the human cardiovascular system ☆

Michael Miller <sup>a, \*</sup>, William F. Fry <sup>b</sup>

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<https://doi.org/10.1016/j.mehy.2009.02.044>

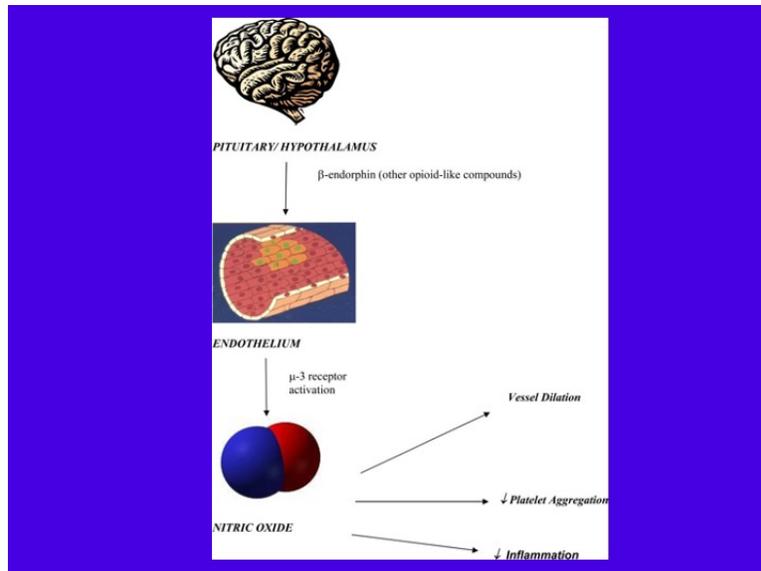
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Original Manuscripts

## Neuroendocrine and Stress Hormone Changes During Mirthful Laughter

Lee S. Berk <sup>DHSc, MPH \* ,</sup> Stanley A. Tan <sup>MD, PhD, MPH †,</sup> William F. Fry <sup>MD ‡,</sup> Barbara J. Napier <sup>BS \* ,</sup> Jerry W. Lee <sup>PhD §,</sup> Richard W. Hubbard <sup>PhD \* ,</sup> John E. Lewis <sup>PhD \* ,</sup> William C. Eby <sup>MD, PhD \*</sup>



## Journal of Epidemiology

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Original Article

### Associations of Frequency of Laughter With Risk of All-Cause Mortality and Cardiovascular Disease Incidence in a General Population: Findings From the Yamagata Study

Kaori Sakurada, Tsuneo Konta, Masafumi Watanabe, Kenichi Ishizawa, Yoshiyuki Ueno, Hidetoshi Yamashita, Takamasa Kayama

[+ Author information](#)

Keywords: laughter, mortality, cardiovascular disease, Yamagata study

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2020 Volume 30 Issue 4 Pages 188-193

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### Social laughter is correlated with an elevated pain threshold

R. I. M. Dunbar, Rebecca Baron, Anna Frangou, Eiluned Pearce, Edwin J. C. van Leeuwen, Julie Stow, Giselle Partridge, Ian MacDonald, Vincent Barra and Mark van Vugt

Published: 14 September 2011 | <https://doi.org/10.1098/rspb.2011.1373>

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Research Articles, Behavioral/Cognitive

## Social Laughter Triggers Endogenous Opioid Release in Humans

Sandra Manninen, Lauri Tuominen, Robin I. Dunbar, Tomi Karjalainen, Jussi Hirvonen, Eveliina Arponen, Riitta Hari, Iiro P. Jääskeläinen, Mikko Sams, and Lauri Nummenmaa  
Journal of Neuroscience 21 June 2017, 37 (25):6125-6131; DOI: <https://doi.org/10.1523/JNEUROSCI.0688-16.2017>

**Journal of Aging Research**

Journal overview | For authors | For reviewers | For editors | Table

Journal of Aging Research / 2010 / Article

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Abstract
Introduction
Methods
Results
Discussion
Acknowledgments

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Volume 2010 | Article ID 343574 | <https://doi.org/10.4061/2010/343574>

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## Humor Therapy: Relieving Chronic Pain and Enhancing Happiness for Older Adults

Mimi M. Y. Tse<sup>1</sup>, Anna P. K. Lo,<sup>2</sup> Tracy L. Y. Cheng,<sup>3</sup> Eva K. K. Chan,<sup>4</sup> Annie H. Y. Chan,<sup>5</sup> and Helena S. W. Chung<sup>6</sup>

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## Humor During Clinical Practice: Analysis of Recorded Clinical Encounters

Kari A. Phillips, Naykky Singh Ospina, Rene Rodriguez-Gutierrez, Ana Castaneda-Guarderas, Michael R. Gionfriddo, Megan Branda and Victor Montori  
The Journal of the American Board of Family Medicine March 2018, 31 (2): 270-278; DOI: <https://doi.org/10.3122/jabfm.2018.02.170313>

Article   Figures & Data   References   Info & Metrics   PDF

**Abstract**

**Objective:** Little is known about humor's use in clinical encounters, despite its many potential benefits. We aimed to describe humor during clinical encounters.

**Design:** We analyzed 112 recorded clinical encounters. Two reviewers working independently identified instances of humor, as well as information surrounding the logistics of its use.

**Results:** Of the 112 encounters, 66 (59%) contained 131 instances of humor. Humor was similarly

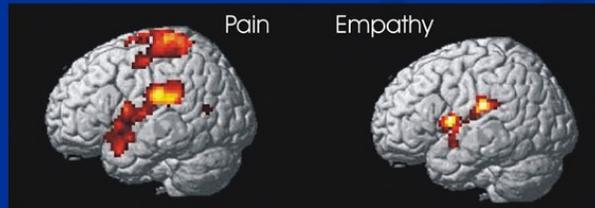
**In this issue**

**JABFM**  
The Journal of the American Board of Family Medicine  
Vol. 31, Issue 2  
March-April 2018  
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Cover (PDF)  
Index by Author

## Mirror Neurons

### ■ Mirror Neurons:

- Frontal lobe neurons that fire when performing certain actions or when observing another doing so
- The brain's mirroring of another's action may enable imitation and empathy



### Happiness Chemicals and how to hack them

<b>DOPAMINE</b> THE REWARD CHEMICAL <ul style="list-style-type: none"><li>• Laughter exercise</li><li>• Completing a task</li><li>• Doing self-care activities</li><li>• Eating food</li><li>• Celebrating little wins</li></ul> 	<b>OXYTOCIN</b> THE LOVE HORMONE <ul style="list-style-type: none"><li>• Laughter exercise</li><li>• Playing with a dog</li><li>• Playing with a baby</li><li>• Holding hand</li><li>• Helping your family</li><li>• Giving a compliment</li></ul> 
<b>SEROTONIN</b> THE MOOD STABILIZER <ul style="list-style-type: none"><li>• Laughter exercise</li><li>• Meditating</li><li>• Running</li><li>• Sun exposure</li><li>• Walking in nature</li><li>• Swimming</li><li>• Cycling</li></ul> 	<b>ENDORPHIN</b> THE PAIN KILLER <ul style="list-style-type: none"><li>• Laughter exercise</li><li>• Essential oils</li><li>• Watch a comedy</li><li>• Dark chocolate</li><li>• Exercising</li></ul> 

## Humor Physical Health Effects

Muscle Relaxation

Stress Hormone Reduction

Immune System Enhancement

Pain Reduction – Endorphin Release

Cardiovascular Exercise

Blood Pressure Reduction

Pulmonary Clearing - Respiration Improved

Oxygenation Increased

Free Radical Scavenging Increased

## Humor Mental Health Effects

Anxiety Reduced  
Fear Decreased  
Resilience Enhanced  
Joy & Zest Increased  
Mood Improved  
Stress Reduction  
Optimism Improved  
Relationships Strengthened  
Teamwork Enhanced  
Group Bonding Promoted  
Conflict Defused

## Neuroendocrine Enhancement

- Cortisol -
- Renin -
- Angiotensin -
- Serotonin +
- Dopamine +
- Endorphin +
- Enkephalins +
- Acetylcholine +
- Oxytocin +
- Epinephrine -
- Norepinephrine -
- 3,4,-dihy-drophenylacetic acid (dopac) -
- Growth hormone -
- Brain-derived neurotrophic factor (BNDF) +
- Nitric oxide (NO) "laughing gas" +
- Hypocretin (orexin) -
- Gamma Aminobutyric acid (GABA) +

## Immune Enhancement

Immunoglobulin A +  
Immunoglobulin G +  
Immunoglobulin M +  
Gamma Interferon +  
White Blood Cells +  
Complement  
Natural Killer Immune Cells +  
Helper "T" Cells +  
Cytotoxic "T" Cells +  
B Lymphocytes  
T Lymphocytes +  
Interleukin 1, 2, 4, 6 -  
Tumor Necrosis Factor -  
C Reactive Protein (CRP) -

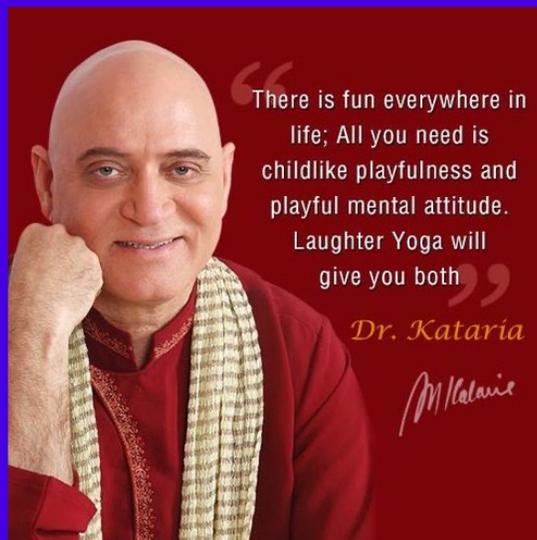
One minute of anger weakens  
the immune system for 4 to 5 hours.

One minute of laughter boosts the  
immune system for 24 hours.



## Laughter Inducers

- Alcohol
- Cannabis
- Salvinorin A (hallucinogenic psychoactive photochemical from *Salvia divinorum* sage of the diviners)
- Lacosomide (anti seizure sodium channel blockers)
- Sumatriptan (serotonin agonist)
- Laughter Yoga



## Laughter has similar health benefits to exercise



Researchers found that 20 minutes of laughter can lower your blood pressure and alter your appetite hormones like exercise would.



Fifteen straight minutes of laughter has the same health benefits as 30 mins of sit ups.

Laughing 100 times is equivalent to 15 minutes of exercise on a stationary bicycle.



## Laughter – Downside

- Cataplexy
- Pseudobulbar palsy
- Multiple sclerosis
- Parkinson's
- Epilepsy (gelastic seizures)
- Bipolar disorder
- Kuru
- Increased hernia protrusion
- Foreign body inhalation
- Asthma
- COPD
- Asphyxiation
- Aneurysm
- Headaches
- CVA
- Arrhythmia
- Syncope
- Pneumothorax
- Dislocated jaw
- Infectious fomites
- Brain tumor
- Dementia
- Cardiac rupture
- Esophageal rupture
- Pontine infarction
- Incontinence

### **Conditions Where Humor is Inappropriate**

1. During any acute crisis. (But it can help adjust to the crisis afterwards.)
2. When the patient needs to cry.
3. When the patient needs quiet time.
4. When a patient in an adjacent bed is very sick or dying.
5. When the patient is trying to come to grips with any emotional crisis.
6. When the patient is trying to communicate something important to you.

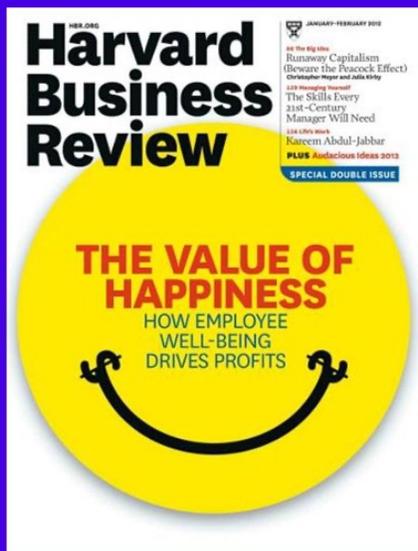
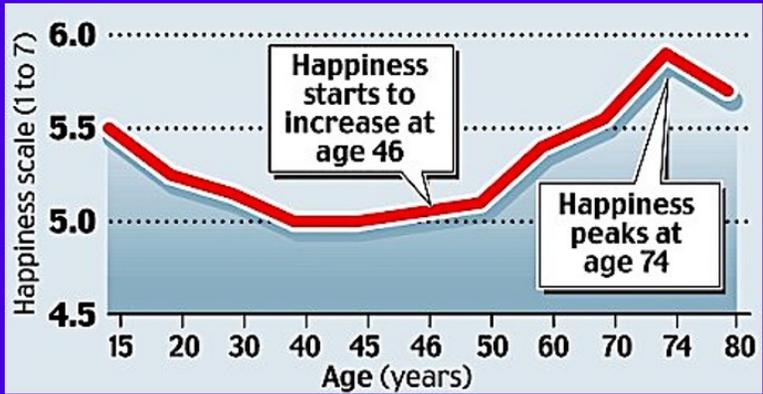
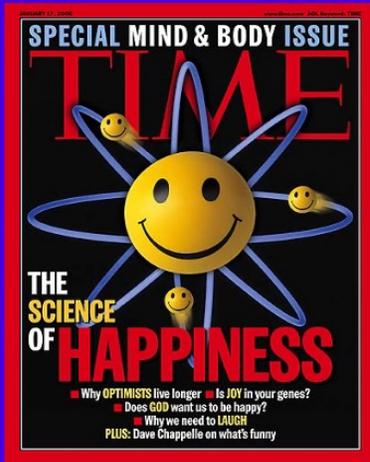
Nothing is more frustrating than having someone appear to not take seriously something you're trying to communicate, and that is very important to you. This can destroy your rapport.

7. If you have any doubts about the appropriateness of humor in a situation, try another approach (e.g., compassion, concern, and touch).

#### 8. Avoid:

- a) Ethnic jokes, sarcasm, and mockery.
- b) Humor at the expense of any other person. Laugh with, not at.
- c) Joking about any patient or their condition.

The image shows a screenshot of a webpage from Scientific American. At the top, there is a navigation bar with a 'Subscribe' button, the 'SCIENTIFIC AMERICAN' logo, a 'Cart 0' icon, and links for 'Sign In' and 'Stay Informed'. Below the navigation bar is a horizontal menu with categories: 'THE SCIENCES', 'MIND', 'HEALTH', 'TECH', 'SUSTAINABILITY', 'EDUCATION', 'VIDEO', 'PODCASTS', 'BLOGS', and 'PUBLICATIONS'. The main content area features the sub-header 'BEHAVIOR & SOCIETY' and the article title 'What's So Funny? The Science of Why We Laugh' in a large, bold, serif font. Below the title is a short introductory sentence: 'Psychologists, neuroscientists and philosophers are trying to understand humor'. The entire page is set against a dark blue background.



# Laughter

(*n.*) When a smile has an orgasm.

## Types of Humor

Wit / Pun / Wordplay – clever

Satire – mock person or object

Slapstick – silly, physical comedy

Parody/Mimicry – imitate, mock

Self-Deprecating – mock self

Sarcasm – camouflaged contempt

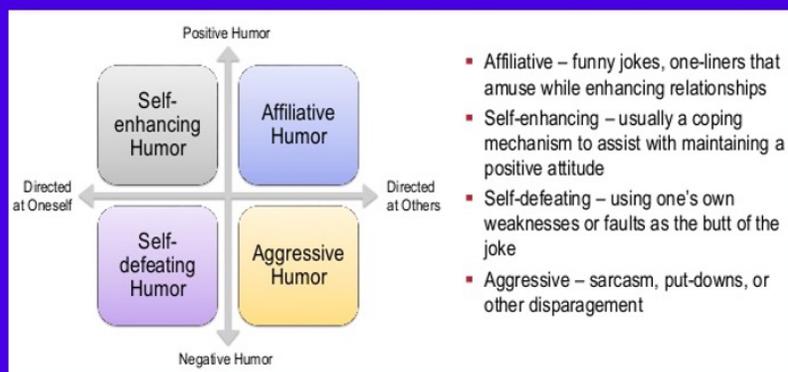
Irony – unexpected

Sophomoric – juvenile

Sexual / Scatological – forbidden

Dark – sinister topic with ironic amusement

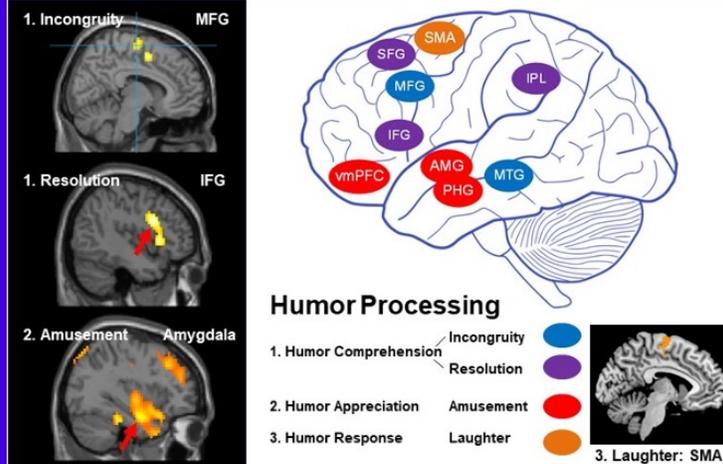
Hurtful / Negative – hate, bigotry



# Appreciation of different styles of humor: An fMRI study

[Yu-Chen Chan](#) , [Wei-Chin Hsu](#), [Yi-Jun Liao](#), [Hsueh-Chih Chen](#), [Cheng-Hao Tu](#) & [Ching-Lin Wu](#)

[Scientific Reports](#) **8**, Article number: 15649 (2018) | [Cite this article](#)

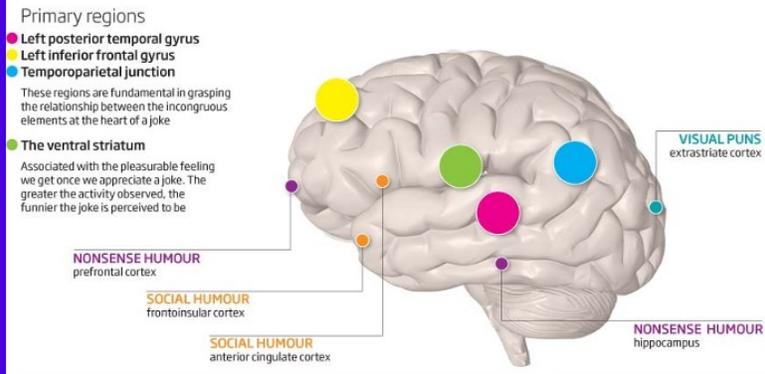


amygdala (AMG), inferior frontal gyrus (IFG), inferior parietal lobule (IPL), medial frontal gyrus (MFG), middle temporal gyrus (MTG), parahippocampal gyri (PHG), superior frontal gyrus (SFG), supplementary motor area (SMA), ventral medial prefrontal cortex (vmPFC),

## Humour in your head

These are the regions of the brain involved in our appreciation of jokes, and even the areas associated with specific types of humour

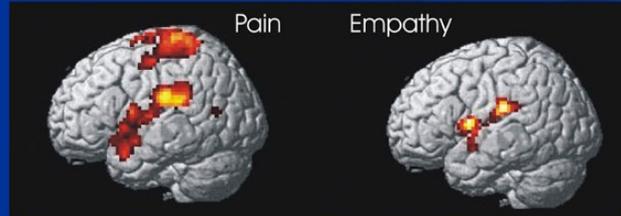
©NewScientist



## Mirror Neurons

### ■ Mirror Neurons:

- Frontal lobe neurons that fire when performing certain actions or when observing another doing so
- The brain's mirroring of another's action may enable imitation and empathy



Children laugh over 300 times per day, but adults only 4 to 15 times a day. Why?

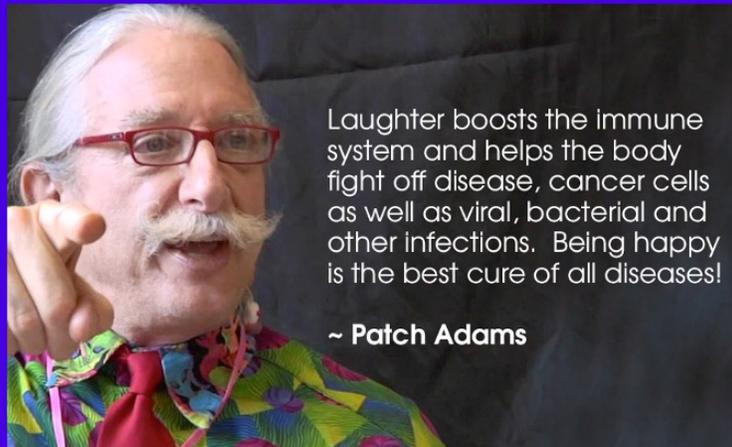
Health experts recommend we laugh 10 to 15 minutes per day for ongoing health benefits.



## Creating opportunities to laugh



- Watch a funny movie or TV show.
- Go to a comedy club.
- Read the funny pages.
- Seek out funny people.
- Share a good joke or a funny story.
- Check out our bookstore's humor section.
- Host game night with friends.
- Play with a pet.
- Go to a "laughter yoga" class.
- Goof around with children.
- Do something silly.
- Make time for fun activities (e.g. bowling, miniature golfing, karaoke).



Laughter boosts the immune system and helps the body fight off disease, cancer cells as well as viral, bacterial and other infections. Being happy is the best cure of all diseases!

~ Patch Adams

The secret to living well and longer is:

“Eat half, walk double, laugh triple,  
and love without measure.”

Tibetan Proverb

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### CME Questions:

- 1) Which organ systems are positively influenced by humor and laughter?
  - a. Immune System
  - b. Cardiovascular System
  - c. Pulmonary system
  - d. All of the above \*
  
- 2) Laughter and Humor affect which of the following hormones and neurotransmitters?
  - a. Serotonin
  - b. Dopamine
  - c. Oxytocin
  - d. All of the above \*
  
- 3) Laughter and Humor can be:
  - a. Beneficial
  - b. Enjoyable
  - c. Inappropriate
  - d. All of the above \*
  
- 4) Publications in the medical literature confirm that the therapeutic use of humor and laughter may:
  - a. Improve cellular immunity
  - b. Led to muscle relaxation
  - c. Result in a reduction in pain perception
  - d. Trigger an attack of asthma
  - e. All of the above \*
  
- 5) The elderly usually prefer humor that:
  - a. Makes light of the frailty of advanced age
  - b. Uses stereotypes of their own ethnicity
  - c. Challenges their cognitive abilities

- d. Uses dark or gallows humor
- e. Is mild and gentle \*

6) Laughter can be a cause for concern in potentially aggravating:

- a. COPD
- b. Asthma
- c. Urinary stress incontinence
- d. Inguinal hernia
- e. All of the above \*

7) To help reduce stress in the health care environment humor is best used:

- a. When having to deliver bad news to a patient
- b. At the first interaction with a new patient
- c. When dealing with an angry patient
- d. To cut a colleague or coworker down to size
- e. None of the above \*

8) Humor is universal and thus there is no need to tailor it to the sensitivities of the recipient.

- a. True
- b. False \*

9) Humor that is simply overheard by a third party cannot be used as a basis for a complaint against an individual, their employer, or the facility.

- a. True
- b. False \*

10) The use of humor needs to be taken seriously as it can be harmful as well as beneficial.

- a. True \*
- b. False