

# Tourette Syndrome: Thanks, I hate it

Ronnie Li

Camp Twitch and Shout Parent Workshop

Athens, GA

July 6, 2023

# Hey, I'm Ronnie!

- Ph.D. Candidate in Neuroscience, Emory
  - Machine learning, bioinformatics, genomics
- B.S. in Neuroscience, Brown
- Qingdao, China → Long Island, NY → Providence, RI → Atlanta, GA
- Drawing/painting, rapping, reading, racquet sports, working on a memoir, loves memes
- [www.ronnieli.com](http://www.ronnieli.com)



# Outline and Objectives

Section	Learning Objectives
Scientific literacy: Fool me once	Differentiate between correlation and causation Recognize common signs of bad science when consuming popular media
New research on TS	Identify the major innovative therapies being developed for Tourette
My symptoms and challenges	Understand and validate the many struggles faced by people with Tourette Appreciate the complexity of ethical and moral issues when dealing with coprolalia

# Scientific Literacy

## Learning objectives

1. Differentiate between correlation and causation
2. Recognize common signs of bad science when consuming popular media

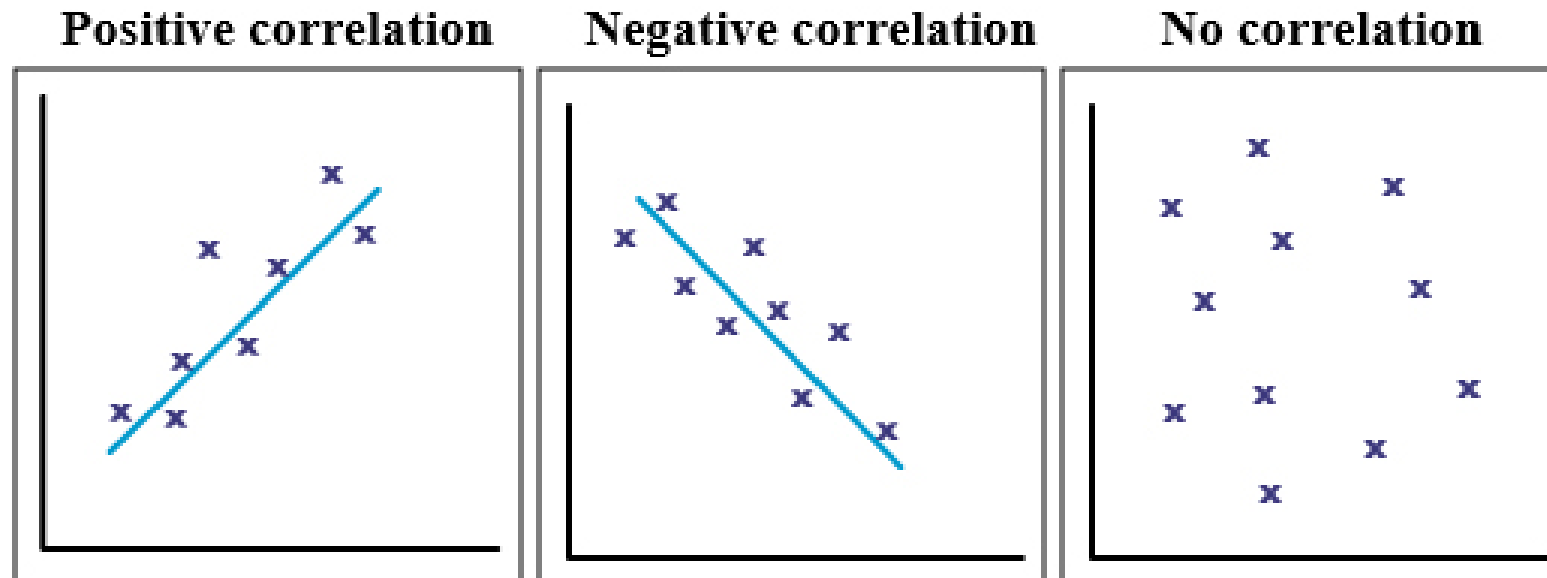


*"The drug has, however, proved more effective than traditional psychoanalysis."*



# Correlation is not causation!

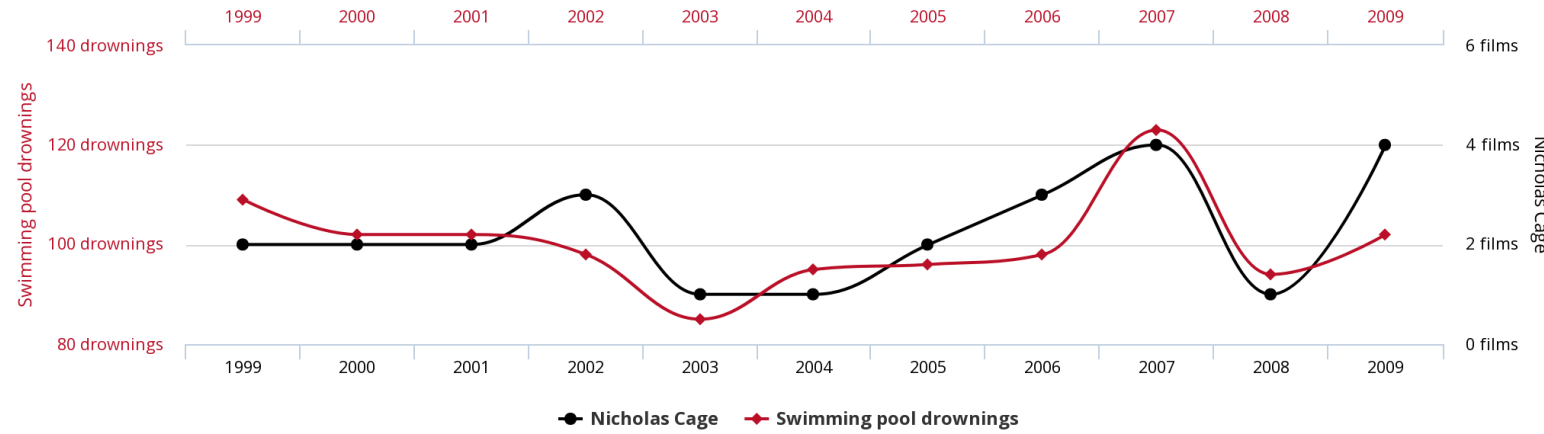
- Correlation: two variables move in coordination with each other
- Causation: one variable actually influences another



## Number of people who drowned by falling into a pool

correlates with

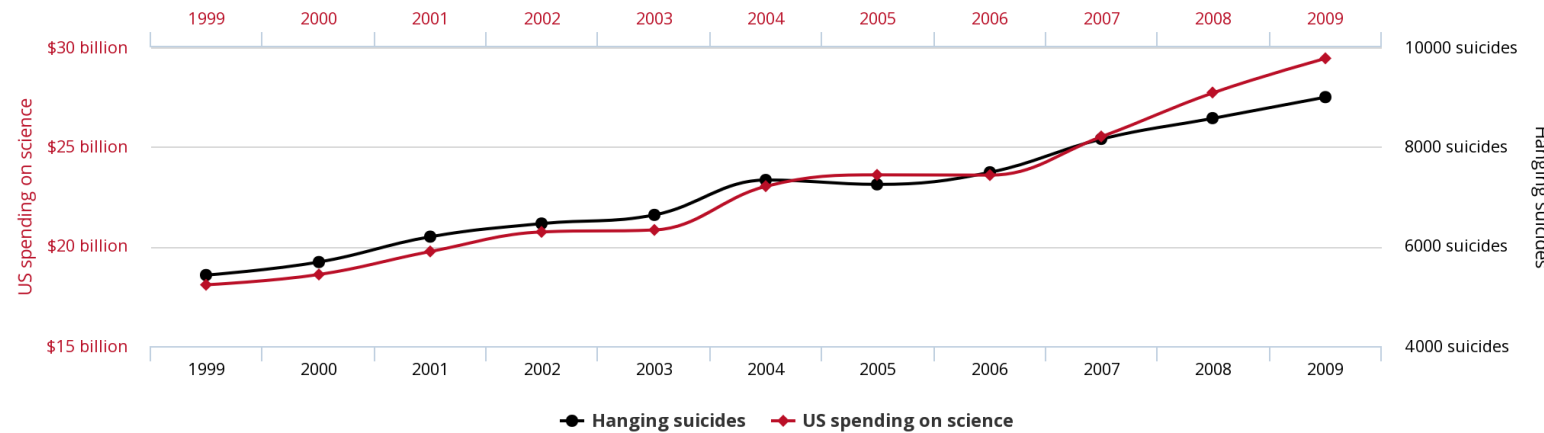
## Films Nicolas Cage appeared in



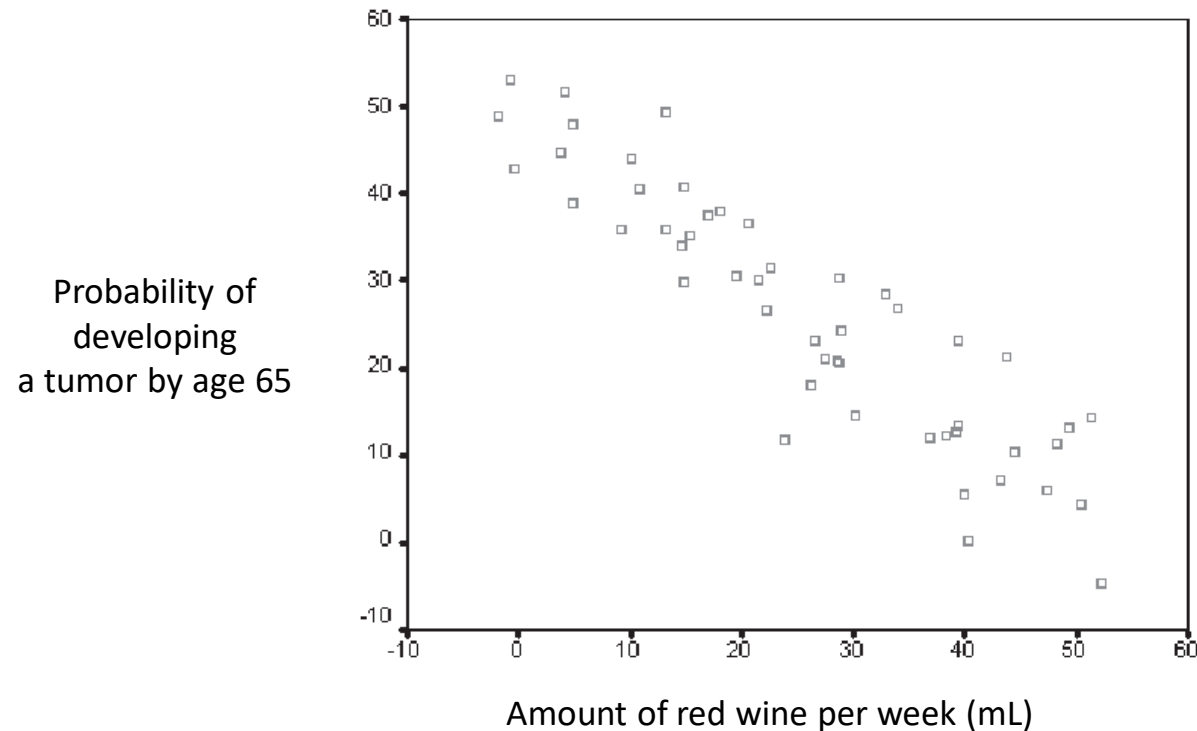
## US spending on science, space, and technology

correlates with

## Suicides by hanging, strangulation and suffocation



# A less trivial example



- Question: does red wine lower tumor risk?
- **NOT NECESSARILY**. Maybe people who drink red wine make better lifestyle choices, maybe they smoke less, maybe they are more active. The list is infinite!

# Hold the media accountable!



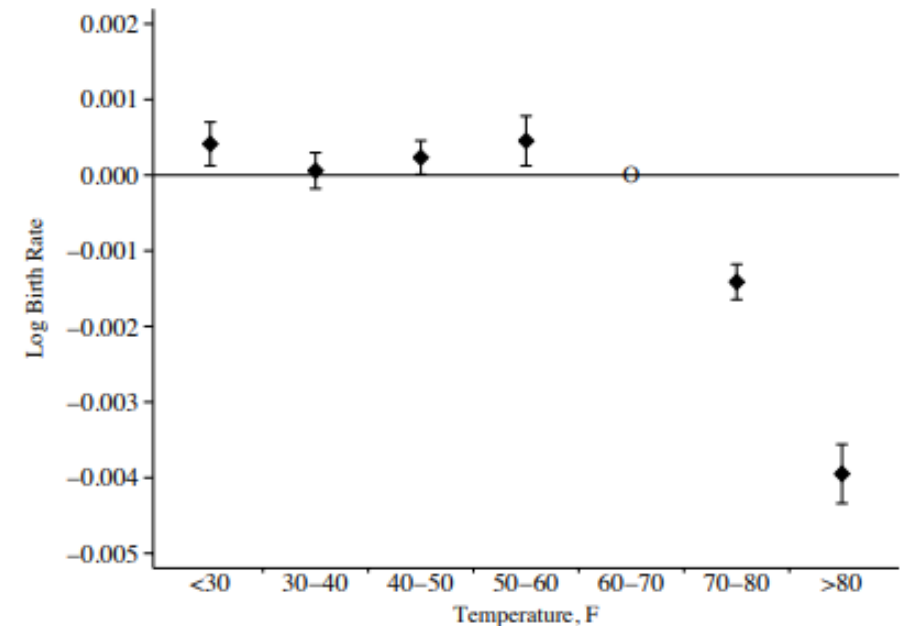
- No causation was ever mentioned in the study
  - Hotter days don't cause people to stop having sex (India, Africa, southern China)
  - American birthrate could be falling because of any number of factors (e.g., socioeconomic ones)

MAYBE NEXT MONTH? TEMPERATURE SHOCKS, CLIMATE CHANGE, AND  
DYNAMIC ADJUSTMENTS IN BIRTH RATES

Alan Barreca  
Olivier Deschenes  
Melanie Guldi

Working Paper 21681  
<http://www.nber.org/papers/w21681>

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
October 2015








# Size matters! Lessons on sample size

- Sample size: the number of subjects (e.g. people) you test in your study
- Lower sample size = less confidence in your results. It's just statistics!


## Oral splint ameliorates tic symptoms in patients with **tourette syndrome**

Jumpei Murakami DDS, PhD , Yoshihisa Tachibana DDS, PhD , Shigehisa Akiyama DDS, PhD, Takafumi Kato DDS, PhD, Aya Taniguchi DDS, Yoshiaki Nakajima DDS, Mao Shimoda DDS ... [See all authors](#) 

The present study aimed to investigate whether an oral splint (Fig. [1A](#)), commonly used for dental treatments of temporomandibular joint disorders, clenching, and bruxism, might be therapeutically effective to ameliorate TS-related tics. To this end, we examined tic scores in **22 TS patients** (Supporting Information) using the Tic Symptom Self-Report, which consists of motor and phonic tic scores (0–60; higher scores indicating severer states).[3](#) Mean age at TS onset was 5.9 years, and mean age at the first hospital visit was 17.2 years. Mean motor and

## Clinical research into Qufeng Zhidong Recipe used to treat 31 children with tic disorder

Min Wu <sup>1</sup>, Guang-Hua Xiao, Jian-Ming Zhang, Xin Zhang, Bo Ma, Shu-Xia Wang, Ya-Bing Zhou, Jing-Yan Zhang

Affiliations  expand

PMID: 21053620 DOI: [10.1016/s0254-6272\(10\)60034-9](https://doi.org/10.1016/s0254-6272(10)60034-9)

**Methods:** The enrolled patients were randomized into a **TCM group (31 cases)** treated with Qufeng Zhidong Recipe and a Western medicine group (30 cases) treated with haloperidol and trihexyphenidyl. Two courses of treatment were observed with 12 weeks as one course. The therapeutic effect and adverse reaction were assessed with Yale Global Tic Severity Scale (YGTSS), Tic Symptom Score Scale (TSSS), TCM Syndrome Score Scale (TCMSSS), Treatment Emergent Symptom Scale (TESS) and laboratory examinations.

# Complex does not imply smart!



Prof. Feynman  
@ProfFeynman

If you cannot explain something in simple terms, you don't understand it.

- Overusing neuroscience terms – we don't know that much about the brain yet!
- What are the author's credentials? Is he/she an expert on this topic?

## Consequences of Erudite Vernacular Utilized Irrespective of Necessity: Problems with Using Long Words Needlessly

DANIEL M. OPPENHEIMER\*

*Princeton University, USA*

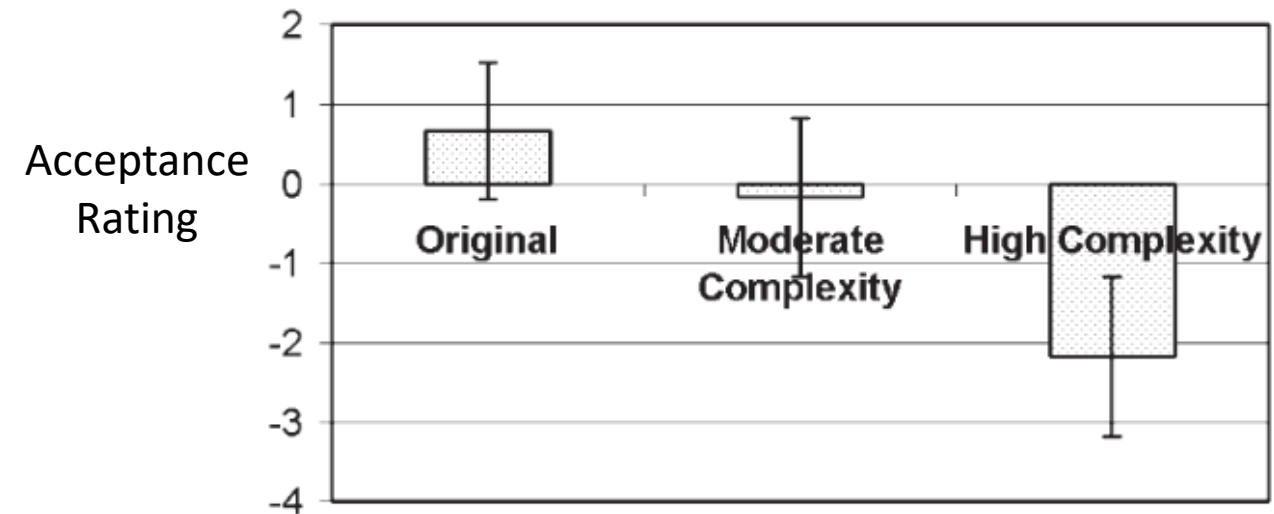


Figure 1. Acceptance ratings (on a -7 to 7 scale) for each level of complexity

# Summary: scientific literacy

1. Correlation and causation are very different things. Just because two variables correlate does not mean one causes the other.
2. A low sample size can greatly decrease the amount of confidence you (and other people) have in your results.
3. Beware of nonstop complexification: when people who are not experts in the field use complex terms and claim to have knowledge they really don't.

# New research on Tourette

## **Learning objective:**

- Identify the major innovative therapies being developed for Tourette

## **Topics of interest:**

1. Median nerve stimulation (MNS)
2. Noninvasive brain stimulation (TMS, TI)
3. Ecopipam (D1 receptor antagonist)

# Median nerve stimulation (MNS)

## Entraining Movement-Related Brain Oscillations to Suppress Tics in Tourette Syndrome

Barbara Morera Maiquez • Hilmar P. Sigurdsson • Katherine Dyke • ... Anupriya Rajendran • Georgina M. Jackson • Stephen R. Jackson  <sup>4</sup>  • [Show all authors](#) • [Show footnotes](#)

- **Keynote** at Tourette Conference Research Symposium 2022
  - Kevin Black, MD, Washington University SOM
- **Big idea:** rhythmic stimulation of median nerve reduces tics & related urges
  - Brain activity can be synchronized with these electrical pulses
  - Sample size = 19 volunteers with TS
  - Tic frequency and severity decreased by ~30%
- **Questions:**
  1. How long can improvement last?
  2. How long does the device have to be on? Does it need to be on all the time?
  3. Who specifically benefits from MNS? (comorbidities)



Using TENS device: <https://tics.wustl.edu/participate/median-nerve-stimulation-study/setting-up-tens-device/>

Clinical trial (pilot): <https://clinicaltrials.gov/ct2/show/NCT04731714>

# But wait, that looks familiar!

- Search “nausea stimulator” on Amazon



EmeTerm Relieve Nausea  
Electrode Stimulator Morning  
Sickness Motion Travel Sicknes...

1 Count (Pack of 1)

★★★★☆ ~111

\$129<sup>99</sup> (\$129.99/Count)

✓prime FREE One-Day  
Get it Tomorrow, May 22

More features



One click, to start! And...so easy to control!

Perfectly achieved with a button:

Formal warning: I am not a medical doctor and I am not endorsing buying these products. This is simply an observation I found interesting.





# Transcranial magnetic stimulation (TMS)

- **Big idea:** noninvasive brain stimulation using magnetic fields to manipulate neural activity
- Shown some efficacy when targeting supplementary motor area (SMA), but not deep enough to reach basal ganglia
- Shown to be effective for depression, but efficacy in Tourette is still TBD

[Brain Sci.](#) 2018 Jul; 8(7): 129.

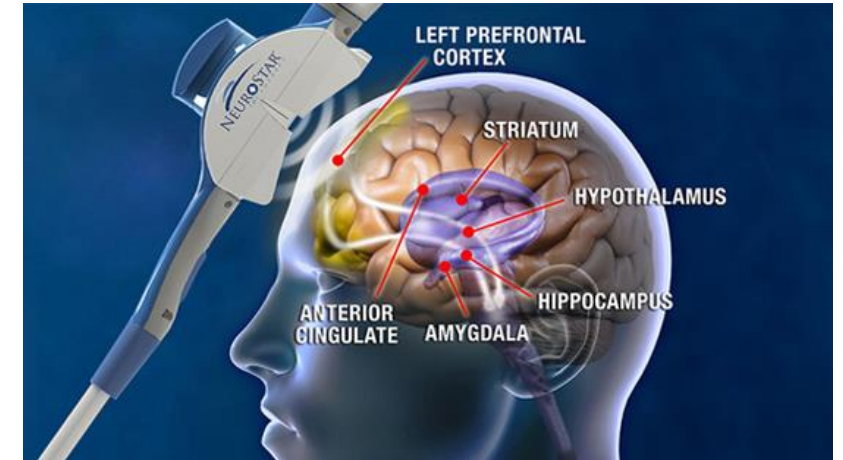
Published online 2018 Jul 6. doi: [10.3390/brainsci8070129](https://doi.org/10.3390/brainsci8070129)

PMCID: PMC6071080

PMID: [29986411](https://pubmed.ncbi.nlm.nih.gov/29986411/)

Transcranial Magnetic Stimulation in Tourette Syndrome: A Historical Perspective, Its Current Use and the Influence of Comorbidities in Treatment Response

[Marco Grados](#),<sup>1,\*</sup> [Rachel Huselid](#),<sup>2</sup> and [Laura Duque-Serrano](#)<sup>3</sup>



# Temporal interference (TI)

- **Big idea:** noninvasive deep brain stimulation using temporally interfering electric fields
- This idea came out in 2017 and is still being refined in the laboratory
- This is research-only – for now!

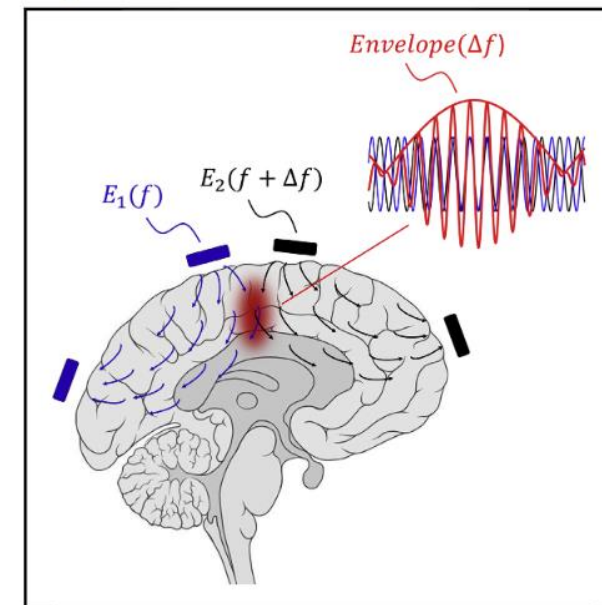
<https://doi.org/10.1016/j.cell.2017.05.024>

**Cell**

Article

## Noninvasive Deep Brain Stimulation via Temporally Interfering Electric Fields

Graphical Abstract



Authors

Nir Grossman, David Bono, Nina Dedic, ..., Li-Huei Tsai, Alvaro Pascual-Leone, Edward S. Boyden

Correspondence

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In Brief

A noninvasive method for deep-brain stimulation may be a new approach for the treatment of neuropsychiatric diseases.

ARTICLE | VOLUME 169, ISSUE 6, P1029-1041.E16, JUNE 01, 2017

Download Full Issue

## Noninvasive Deep Brain Stimulation via Temporally Interfering Electric Fields

Nir Grossman • David Bono • Nina Dedic <sup>16</sup> • ... Li-Huei Tsai • Alvaro Pascual-Leone • Edward S. Boyden <sup>17</sup> • [Show all authors](#) • [Show footnotes](#)

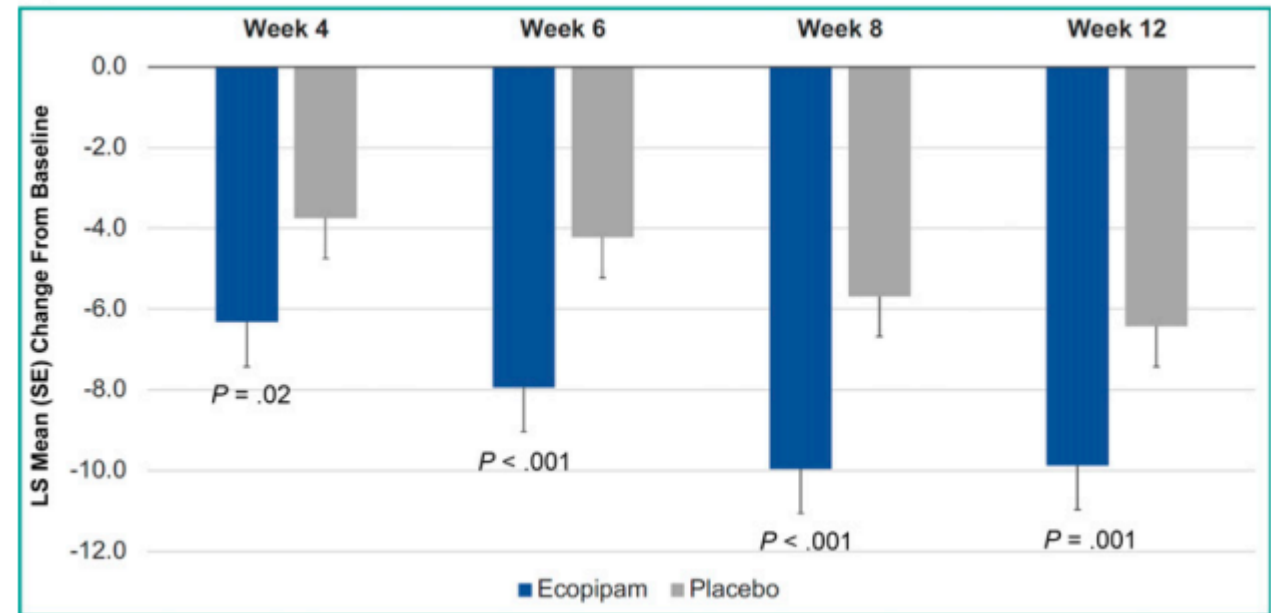
Open Access • DOI: <https://doi.org/10.1016/j.cell.2017.05.024> •

Check for updates

# Ecopipam (D1 antagonist)

- Dopamine is the primary neurotransmitter input to the basal ganglia
  - Generally promotes movement
- Many kinds of different dopamine receptors
  - Most antipsychotics today are D2 receptor blockers (“antagonists”)
  - Problem: unpleasant side effects!
- Ecopipam is a D1 receptor blocker
- Now on Phase 3 clinical trial!  
<https://clinicaltrials.gov/study/NCT05615220>

Phase 2 Clinical Trial results



<https://doi.org/10.1542/peds.2022-059574>

# Summary: new research

1. **Median nerve stimulation (MNS)** – rhythmic 12 Hz stimulation delivered to median nerve of wrist supposedly reduces tics and urges but leaves many unanswered questions.
2. **Transcranial magnetic stimulation (TMS)** – noninvasive cortical stimulation can be useful in certain disorders, although efficacy for Tourette is unclear. New methods are being developed, like temporal interference, to go deeper into the brain.
3. **Ecopipam (D1 receptor antagonist)** – failed weight loss drug shows promise in treating unwanted Tourette Syndrome tics.

# Personal stories and challenges

## **Learning objectives:**

1. Understand and validate the many struggles faced by people with Tourette
2. Appreciate the complexity of ethical and moral issues when dealing with coprolalia

# My Symptoms – Tourettic OCD

- Tics
  - Vocal: “ha”/”how” sounds, high-pitched noises
  - Motor: hitting desks/tables/etc., neck jerking, back arching
  - Coprolalia, copropraxia
- OCD
  - “What’s the worst thing I could say/do right now?”
  - “What’s the furthest thing from my values?”
  - “What’s going to stimulate my body in just the right way?”
- Social anxiety



# Personal Challenges

Frequency of tics	up to 6-10 per minute
Time spent having tics	35,000 hours (>4 years)
Number of tics I've had so far	64,000,000
Kicked out of Uber/Lyft	>25 times
Medical schools that rejected me	28
Graduate schools that rejected me	14
Jobs that rejected me	>57
Injuries from tics	1-2 per day
Time spent in treatment	700 hours
Money spent on treatment	> \$25,000
Shame and guilt	a lot

# Medications I've Tried

Clonidine

Guanfacine

Pimozide

Risperidone

Perphenazine

Topiramate

Olanzapine

Fluoxetine

Botulinum toxin

Haloperidol

Levetiracetam

Methylphenidate

Tetrabenazine

Dextroamphetamine

Fluvoxamine

Propranolol

Quetiapine

Cariprazine

Aripiprazole

Guanfacine ER

Fluphenazine

Deutetrabenazine

Valbenazine

Sertraline

Ziprasidone

Clonazepam

# A letter from Emory

This letter is to update you on your status in the Laney Graduate School (LGS). As explained to you in a letter dated June 4, 2018, following a conduct code hearing on March 30, 2019 the Hearing Committee determined that you violated the Laney Graduate School Conduct Code and Emory University's Equal Opportunity and Discriminatory Harassment Policy. As a result, you were suspended from campus through Spring 2019. Subsequent to that you took a voluntary leave of absence starting Summer 2019. You are now seeking readmission for Spring 2020, which you are eligible to request.

In accordance with these policies, inappropriate touching of another person and verbal tics that are personally targeted racial, sexual or ethnic slurs are strictly prohibited. It is your responsibility to manage your tics, verbal and motor, with the techniques and skills recommended by your care providers.

# Lessons and Advice

- Resilience, compassion, advocacy
- Let your challenges motivate you, not define you
- “If someone tells you ‘you can’t,’ they’re showing you their limits, not yours.” –unknown
- “Remember the guy who gave up? Neither does anyone else.” –unknown

## **Still I Rise**

BY MAYA ANGELOU

You may shoot me with your words,  
You may cut me with your eyes,  
You may kill me with your hatefulness,  
But still, like air, I'll rise.

# Advice for parents

- Love and support unconditionally.
- Children want to be good.
- Let go of the person you “always wanted” your child to become.

*Thank you!*



Download the slides: [www.ronnieli.com/tourette](http://www.ronnieli.com/tourette)

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