



Misinformation – Understanding its Effect on Cognition and Optimising Corrections

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Australian Government
Australian Research Council



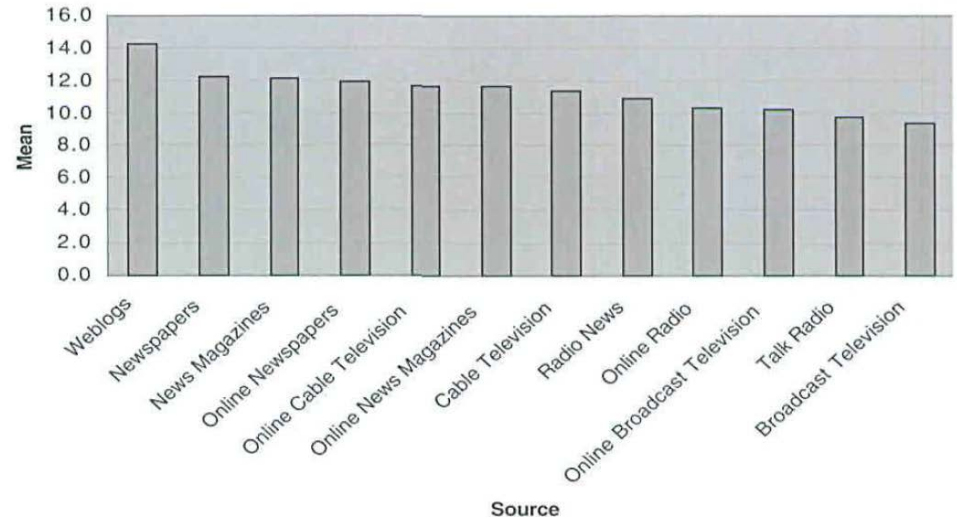
Can you trust social media for health advice?

The online 'wellness' industry is booming, but after the revelation that blogger Belle Gibson faked her own cancer story, you might want to think again about where your nutritional advice is coming from.



Johnson & Kaye (2004): Internet users trust blogs most

Credibility of Traditionally Delivered Information Sources vs. Online Counterparts





The Continued Influence of Misinformation

- Misinformation (initially plausible/believed) will continue to influence memory, reasoning and decision making **after corrections**
- Even when people believe and remember the correction

Misinformation on the web

milk thistle



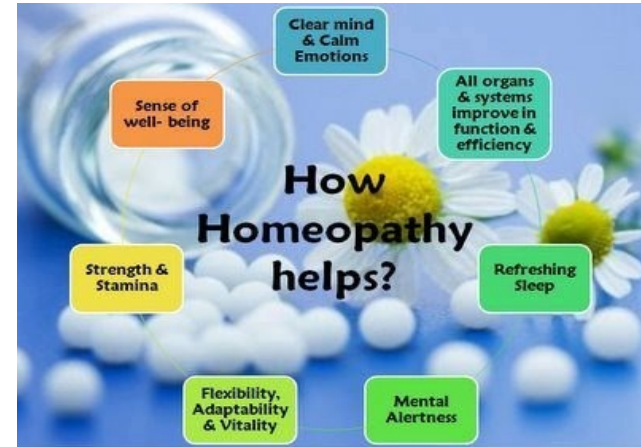
CLEANS LIVER IN POWERFUL WAYS,
EFFECTIVE AGAINST HEPATITIS C,
O.C.D., SKIN CANCER, & COLON CANCER



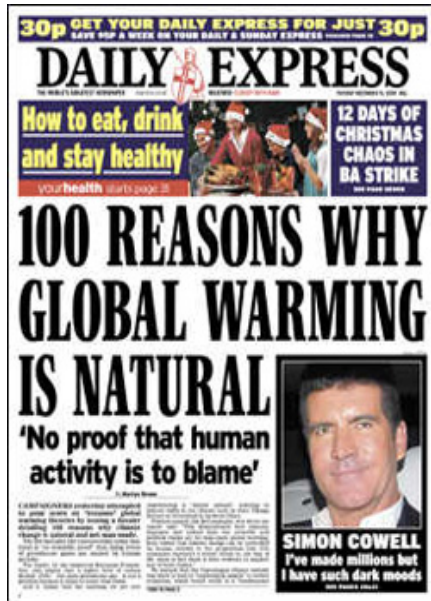
**THERE IS
POISON
IN THE
TAP
WATER.**



Copyrighted Material
**Healing Power of
Natural Whole Foods**



Misinformation in the media



IPCC must accept temperature rises are small and benign

MATT RIDLEY The Wall Street Journal December 20, 2012 12:00AM



Peter Ferrara, Contributor

I cover public policy, particularly concerning economics.

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Forbes

OP/ED | 5/26/2013 @ 9:44AM | 281,034 views

To The Horror Of Global Warming Alarmists, Global Cooling Is Here

Chronic Ear Infections
ADD
Allergies
Asthma
Autism
Death
Diabetes
Meningitis
Polio
Seizures
SBS

and SIDS are caused by adverse reactions to vaccine poisons.



by BEEZY MARSH, Daily Mail

New evidence suggesting a link between the MMR vaccine and autism emerged yesterday.

Scientists reported finding a strong association between the vaccine and an immune system reaction which is thought to play a role in autism.

Findings Onset of behavioural symptoms was associated, by the parents, with measles, mumps, and rubella vaccination in eight of the 12 children. Infection with one, two, or three of these viruses in children had intestinal abnormalities (angioma, lymphoid nodular hyperplasia to colon). Histology showed patchy chronic inflammation in the colon in all three children. In the two children with measles, but not granulomas. Behavioural disorders (autism, autism), disintegrative (one), and possible postviral or vaccinal encephalitis (one) were not observed in any of the children. All children were normal. Abnormal laboratory results were apparently raised urinary methoxy acid and acid compound with age-matched controls (0.03–0.09) and haemoglobin in four children (1.0–1.5 g/dl).

Interpretation While the association between gastrointestinal disease and development of regression in a group of previously normal children is generally associated in time with environmental triggers,

Lancet 1998; **352**: 37-41

Inflammatory Bowel Disease Study Group, University Departments of Medicine and Pathology (A J Wakefield, S E Davis, J Lennell, S H Murphy, D M Casson, M Malik, M A Thomson, P H Walker-Smith), Child and Adolescent Psychiatry (M Berelowitz), Neurology (P Harvey), and Radiology (A Valentine), Royal Free Hospital and School of Medicine, London NW3 2QG, UK

Correspondence to: Dr A. J. Wakefield

THE LANCET • Vol 351 • February 28, 1998

EARLY REPORT

Early report

**Ileal-lymphoid-nodular hyperplasia, non-specific colitis and
pervasive developmental disorder in children**

If you give us a safe vaccine, we'll use it. It shouldn't be polio versus autism.

(Jenny McCarthy)



Donald J. Trump 



Follow

Healthy young child goes to doctor, gets pumped with massive shot of many vaccines, doesn't feel good and changes - AUTISM. Many such cases!

Laboratory investigations

Thyroid function, serum long-chain fatty acids, and cerebrospinal-fluid lactate were measured to exclude known causes of childhood neurodegenerative disease. Urinary methylmalonic acid was measured in random urine samples from eight of the 12 children and 14 age-matched sex-matched normal controls, by a modification of a technique described previously.¹¹ Chromatograms were scanned digitally on a computer, to analyse the methylmalonic acid zones from cases and controls. Urinary methylmalonic acid concentrations in patients and controls were compared by a two-sample *t* test. Urinary creatinine was estimated by routine spectrophotometry.

Children were screened for antiendomysial antibodies and boys were screened for fragile-X if this had not been done





Misinformation effects: The climate change consensus gap

THE PUBLIC THINK...



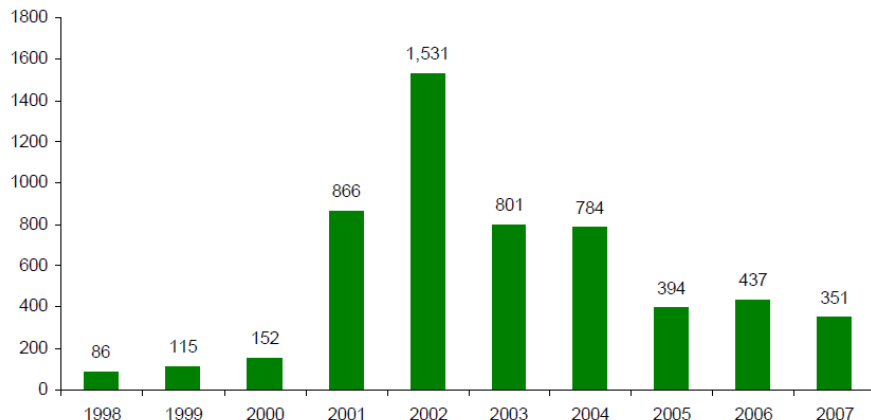
IN REALITY...



Cook et al., 2013
Doran & Zimmerman, 2009
Anderegg et al., 2010

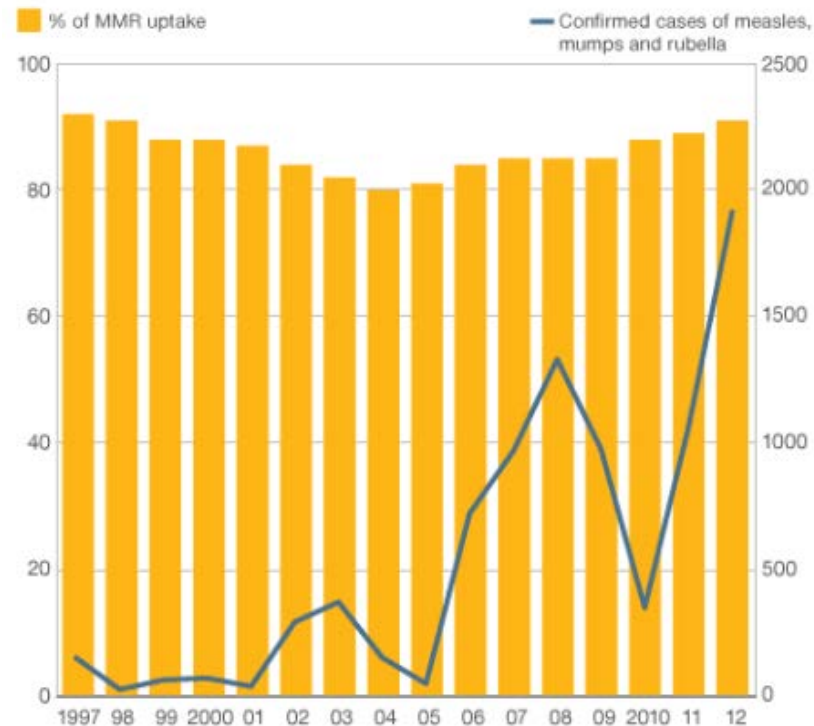
Misinformation effects: Autism scare and MMR uptake

Chart 6: Articles mentioning MMR in UK national press, 1998-2007



Source: Factiva full article searches of 'MMR' in UK national papers for each year specified

MMR and measles in England



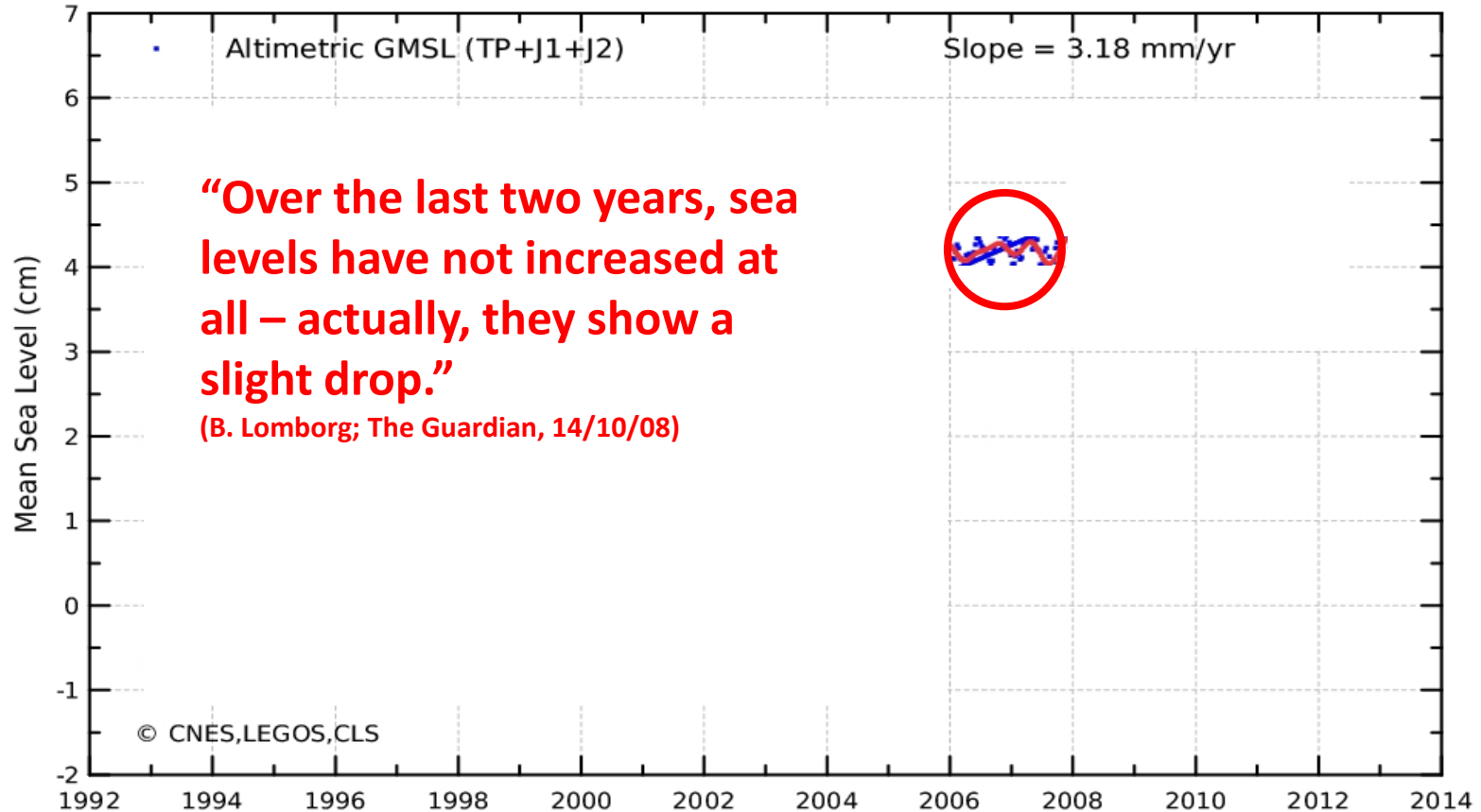
Source: NHS IC



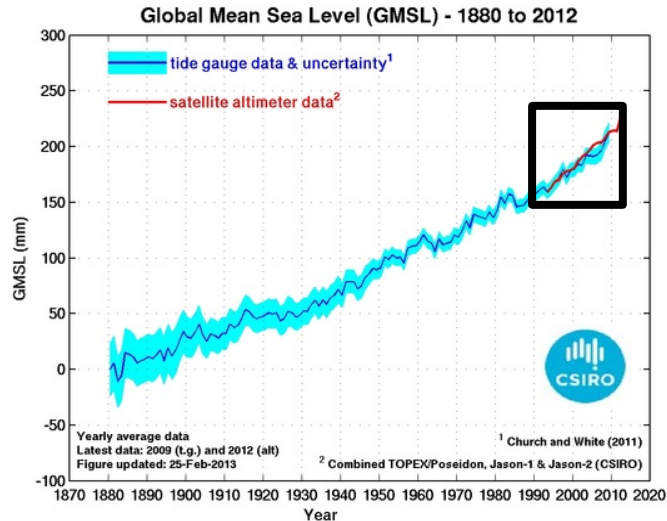
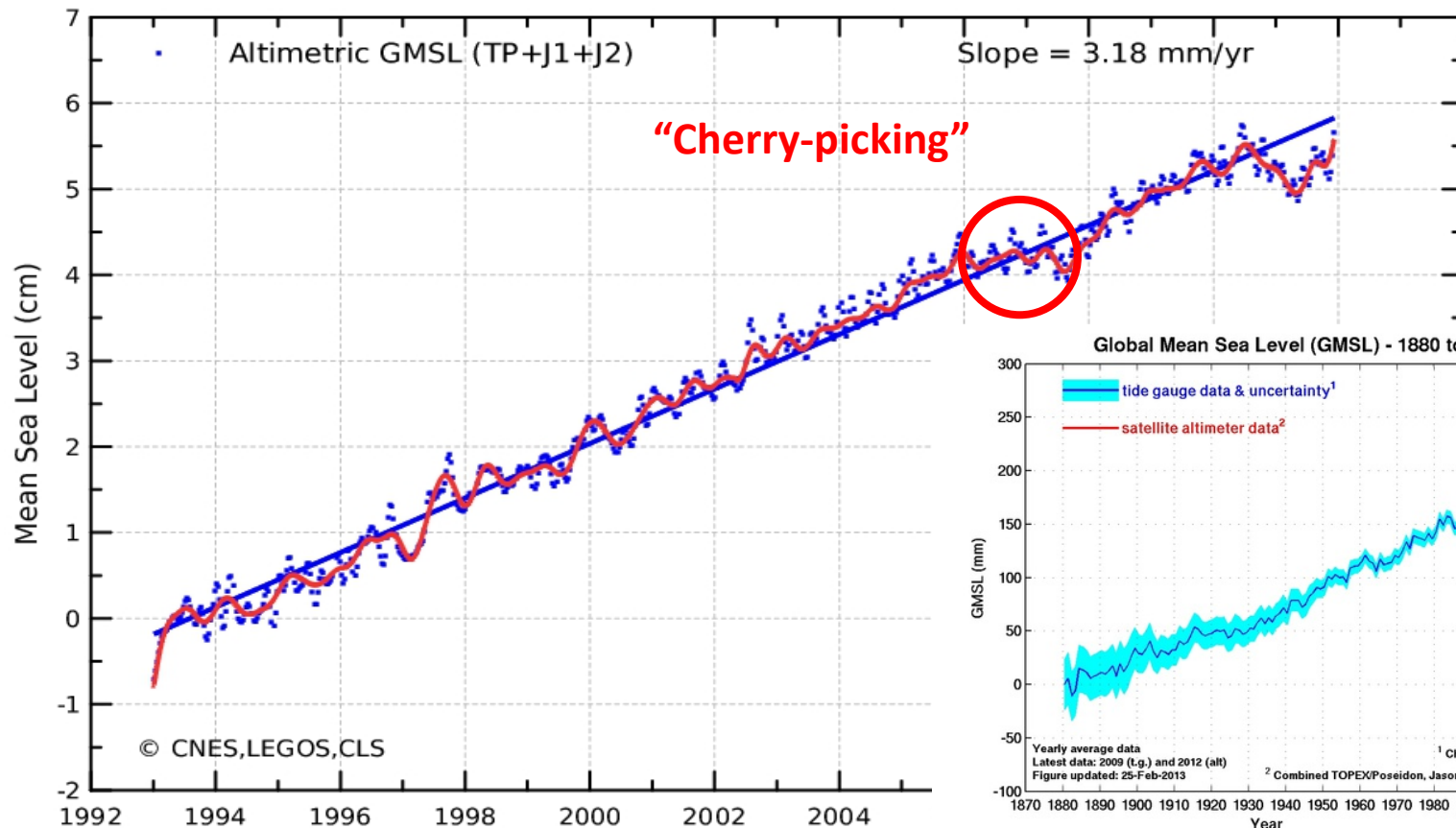
Misinformation is often blatant...

...but can also be more subtle.

Global mean sea level 1993-2011 based on satellite altimetry



Global mean sea level 1993-2011 based on satellite altimetry

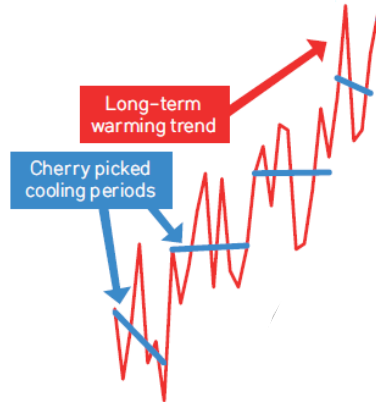


Effective Debunking I

Foster skepticism and
critical thinking



Expose disinformation
strategies and logical
fallacies



HOW MYTH DISTORTS FACT

**Cherry
picking:**
ignoring the
full body of evidence
telling us the planet
continues to build up
heat.



Misinformation: How is it spread?

- Inadvertently (*in dubio pro reo*)
 - Media
 - Pressures associated with competition and 24/7 news cycle (less fact-checking)
 - Obsession with “balanced” coverage even in the absence of balanced evidence
 - Social media
 - No fact-checking
 - Information spread to recipient (not by choice)
 - From fiction and entertainment
 - Crichton’s ‘State of Fear’
- On purpose

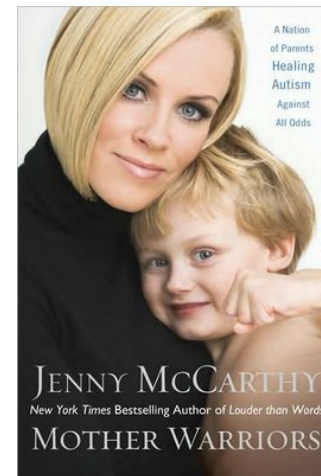


emotional reaction in the

interview

Misinformation – Why believe it?

- People want to understand causalities, in particular in case of
 - Unusual events
 - Negative events
- Helps avoid re-occurrence
- But: Absence of good explanation opens door for misinformation
- In other words: People build mental models of the world and they prefer **complete** models



Misinformation – Why believe it?

- Deluge of information
- Limited resources
 - Time
 - Access to
 - Cognitive
 - Motivation
- → Impossible
- Heuristics
 - How does
 - How does
 - What do other people think about this?
 - Trusted sources (blogs, FB friends, twitter followees, etc.)
 - Experts (?)

Twitter users			Followers
1		KATY PERRY @katyperry	60,469,849
2		Justin Bieber @justinbieber	57,134,956
3		Barack Obama @BarackObama	50,223,008
4		Taylor Swift @taylorswift13	47,306,432

e.g., **confirmation bias**: people selectively look for / interpret information in a way that supports their beliefs

...a problem if what you and others believe is wrong.



Simple solution?

- Simple solution? Tell people it's wrong... “Information Deficit Model”
- Simple retractions of misinformation are **ineffective**
 - Once communicated and processed by the individual, **it is no longer possible to just “take it back”** by saying the information given was incorrect (Mud sticks).



The Continued Influence of Misinformation

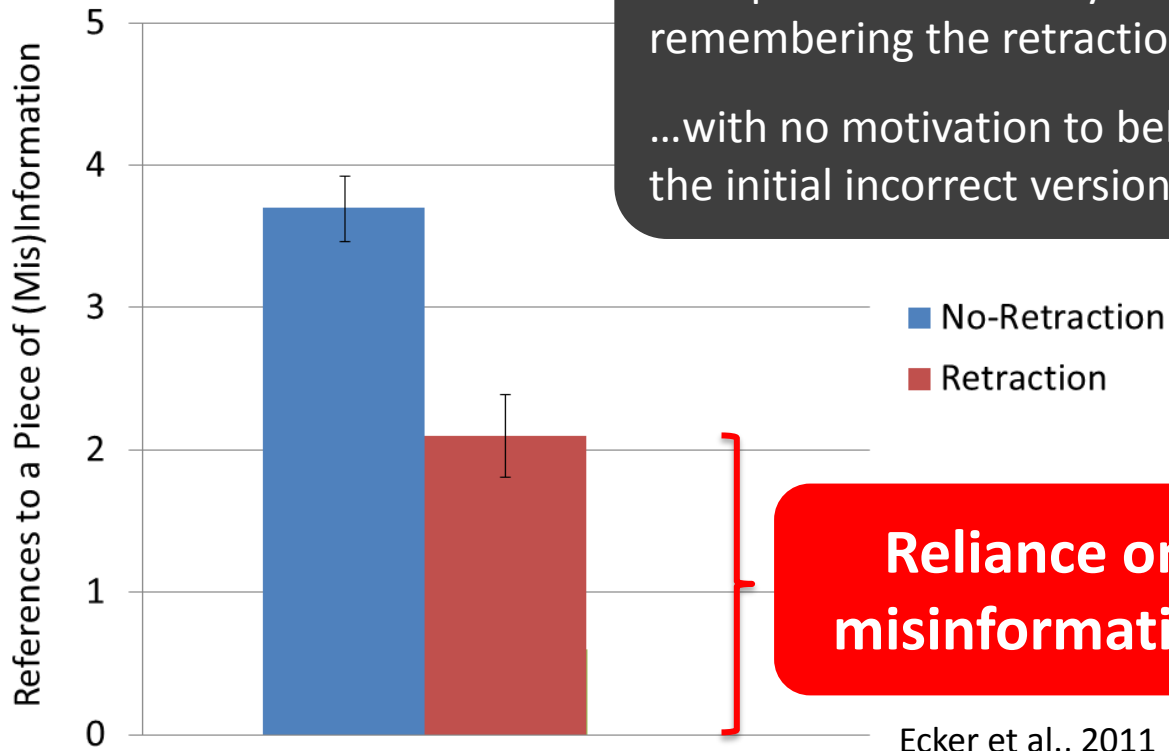
- Misinformation (initially plausible/believed) will continue to influence memory, reasoning and decision making after corrections
- Even when people believe and remember the correction



Example lab study

- **Critical information:** “Spike in seizures caused by new compound vaccine.”
- **Retraction:** “Review finds no relation between the new vaccine and the seizures.” (**vs. No-Retracton Control**)
- **Measure:**
 - Memory
 - Inferential reasoning
 - Behavioural intentions

Post-retraction reliance on misinformation



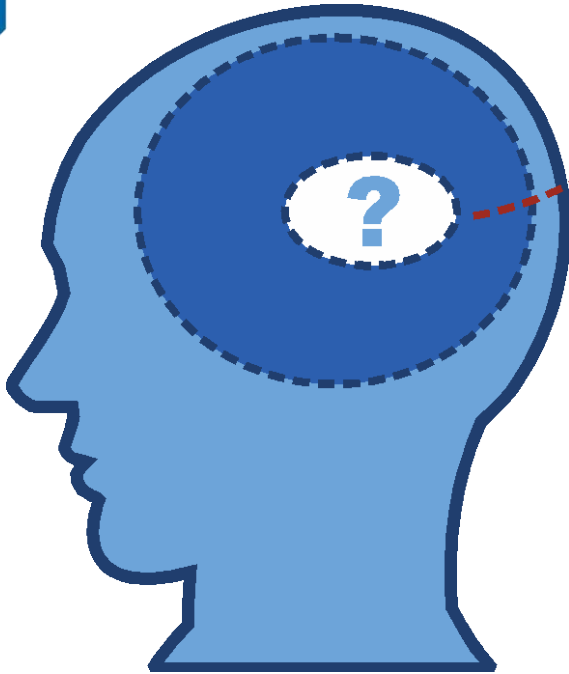
...despite demonstrably remembering the retraction

...with no motivation to believe the initial incorrect version

Reliance on misinformation

Ecker et al., 2011

Retractions create gaps



MYTH

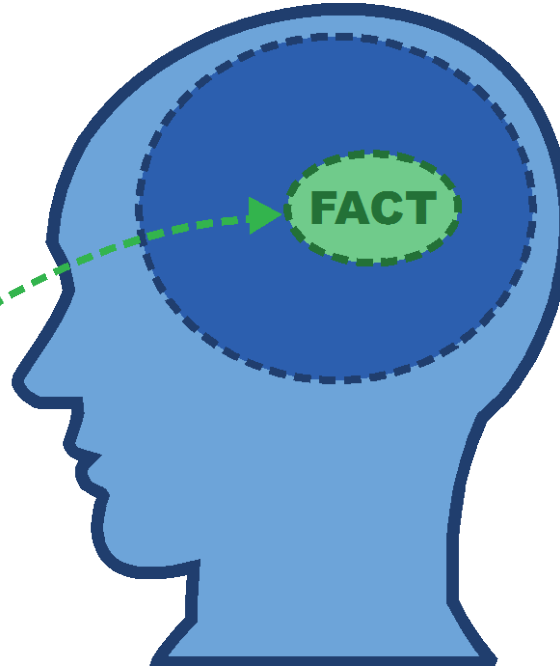
**Removing
a myth leaves
a gap**

People hate gaps!

“Removed” misinformation is
actually still in memory, and people
use it even when they know it is
wrong!

Fill the gap

**Replace
with alternative
narrative**



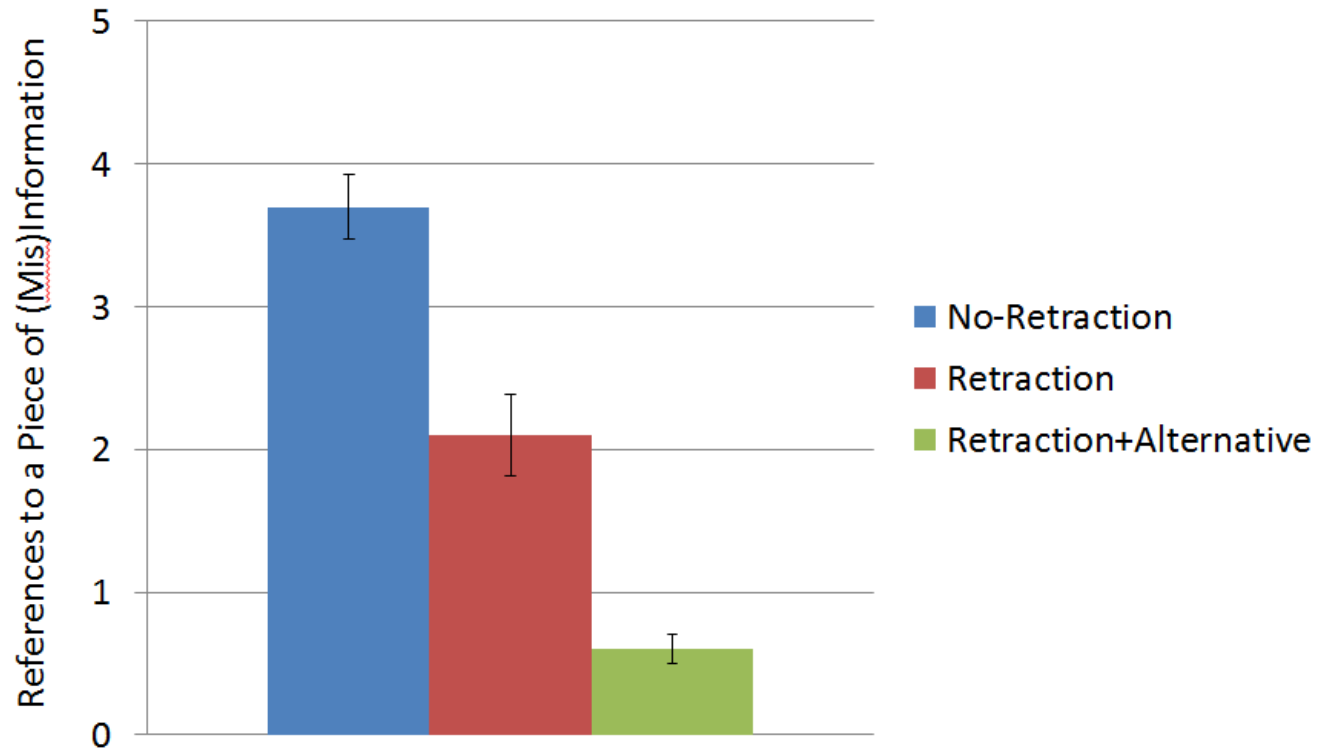
...Unless...
The gap can be filled with
plausible alternative
information



Example

- **Critical information:** “Spike in seizures caused by new compound vaccine.”
- **Retraction:** “Review finds no relation between the new vaccine and the seizures. **Seizures were caused by a virus.**”

Post-retraction reliance on misinformation





Effective Debunking II

Create a gap with a
retraction



Fill the gap with a
factual alternative

Problem when

- no alternative explanation is available (MH370)
- when the alternative explanation is complex and/or unsatisfactory (autism)

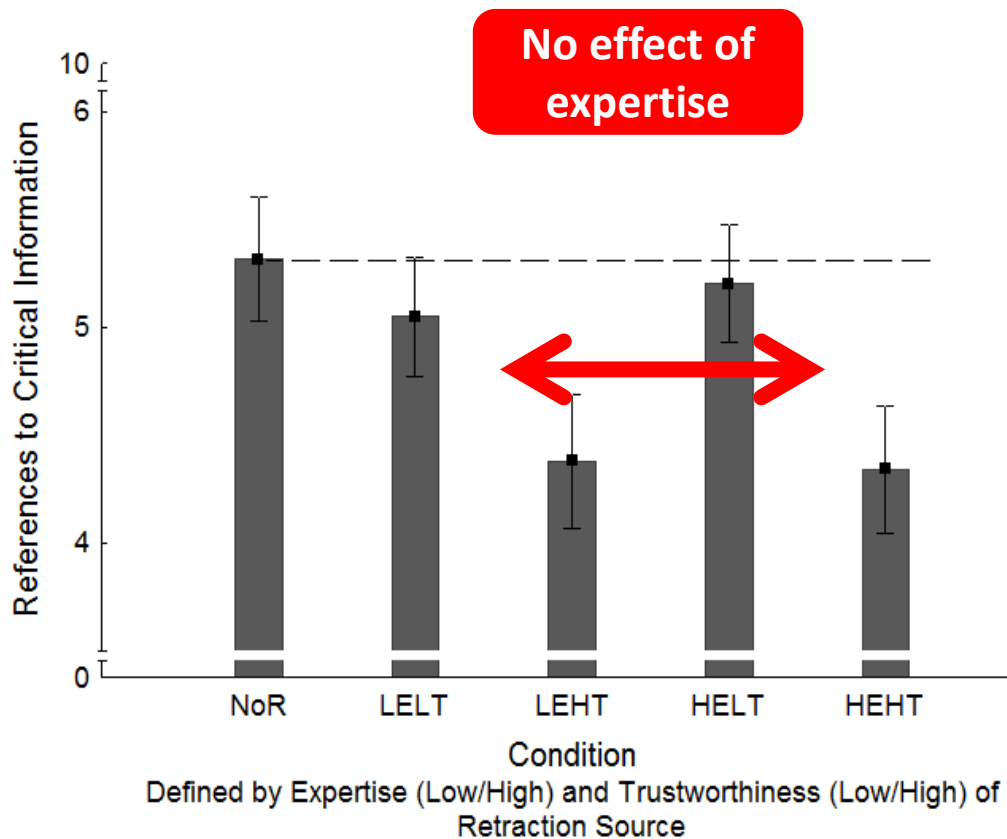


Effectiveness of Retraction: Trust and Expertise

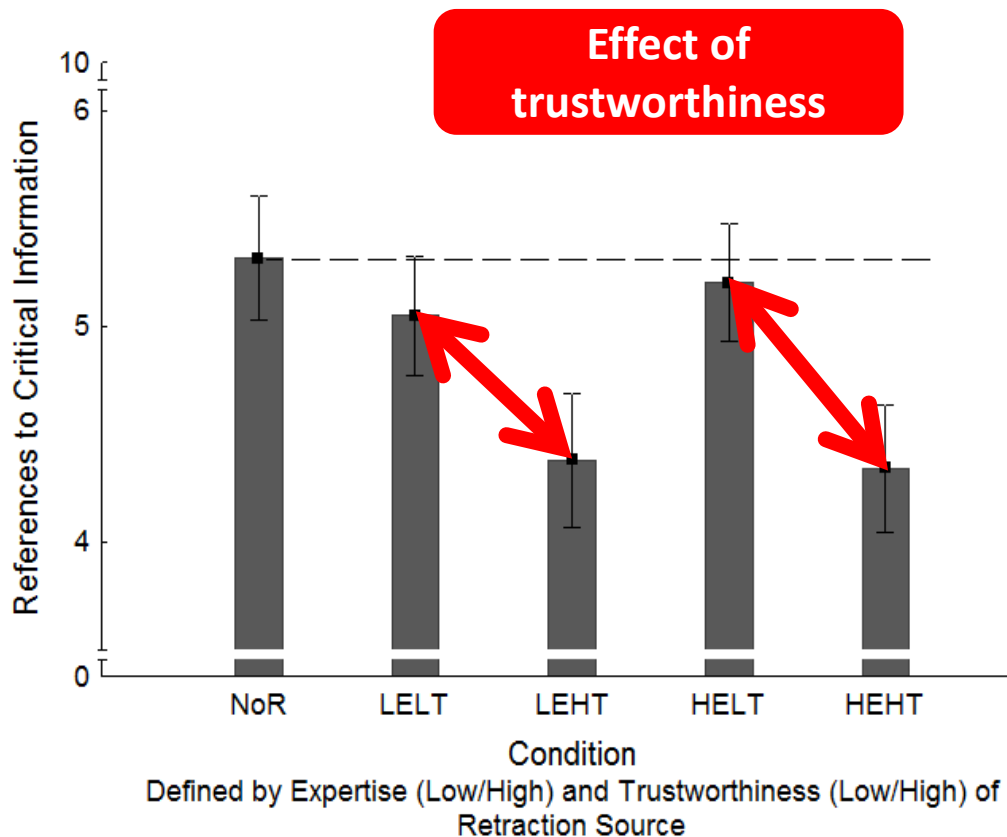
- Study manipulating the retraction source's perceived
 - Trustworthiness
 - Expertise
- Example: Retraction of “Safety concerns regarding drug X”

Retraction Source	Low Expertise	High Expertise
Low Trust	Pharma industry lobbyist	Director of pharma company selling X
High Trust	Local nurse	Professor of pharmacology

Trustworthiness and Expertise



Trustworthiness and Expertise



Preliminary data; Ecker et al. (2014)

Trustworthiness and Expertise

- Retractions are more effective when they come from a source that is perceived as trustworthy
- The perceived expertise of the source plays no role (see also Guillory & Geraci, 2013)





Effective Debunking III

Don't rely just
on expertise



Build trust & use
trustworthy source
for corrections



Retractions can backfire

- The last thing you want is to make things worse!
- A few principles should guide retractions to avoid
 - The familiarity backfire effect
 - The worldview backfire effect



Flu Vaccine

Facts & Myths



Department of Health
and Human Services
Centers for Disease Control
and Prevention

"People can die from the flu."

TRUE

Influenza (flu) is a highly infectious disease of the lungs, and it can lead to pneumonia. Each year about 114,000 people in the U.S. are hospitalized and about 36,000 people die because of the flu. Most who die are 65 years and older. But small children less than 2 years old are as likely as those over 65 to have to go to the hospital because of the flu.

"Even if I get flu vaccine, I can still get a mild case of the flu."

TRUE

The vaccine usually protects most people from the flu. Sometimes a person who receives flu vaccine can get the flu but will be far less sick than without the vaccine. Flu vaccine will not protect you from other viruses that sometimes feel like the flu.

"The side effects are worse than the flu."

FALSE

The worst side effect you're likely to get with injectable vaccine is a sore arm. The nasal mist flu vaccine might cause nasal congestion, runny nose, sore throat and cough. The risk of a rare allergic reaction is far less than the risk of severe complications from influenza.

"Not everyone can take flu vaccine."

TRUE

You might not be able to get this protection if you are allergic to eggs (used in making the vaccine), are very ill with a high fever, or have had a severe reaction to the flu vaccine in the past.

"Only older people need flu vaccine."

FALSE

Adults and children with conditions like asthma, diabetes, heart disease, and kidney disease need to get flu vaccine. People who are active and healthy can benefit from the protection the flu vaccine offers.

"You must get a flu vaccine before December."

FALSE

Flu vaccine can be given before or during the flu season. While the best time to get flu vaccine is October or November, getting immunized in December or later can still protect you against the flu.



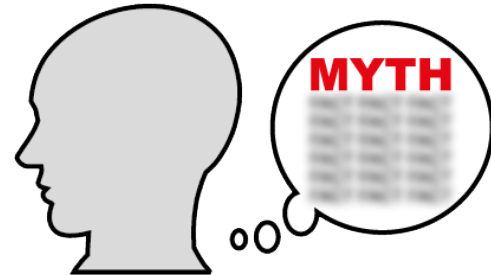
For more information, ask your health care provider or call the CDC IMMUNIZATION HOTLINE
English 800-232-2522 Español 800-232-0233 Website www.cdc.gov/nip/flu

The Familiarity Backfire Effect

Debunking a myth can
reinforce the myth in
people's minds
(Schwarz et al., 2007)

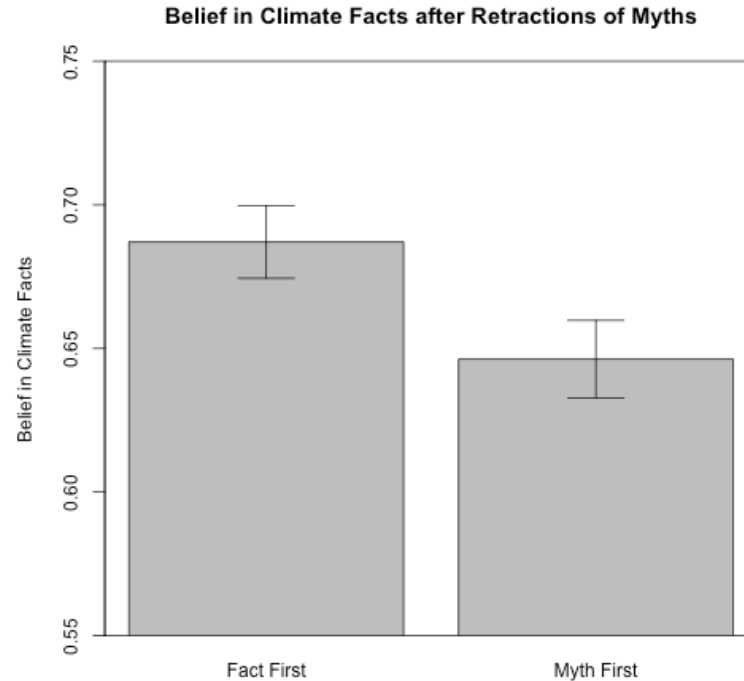
The Familiarity Backfire Effect

- When people read
 - *“The side effects of the flu vaccine are worse than the flu.”*
- Followed by
 - *“FALSE. The worst side effect would be a sore arm.”*
- What they may remember after a while is:
 - *“The flu vaccine has side effects.”*
- This is because repeating the myth when retracting it makes it more familiar.
- People remember and believe familiar things.





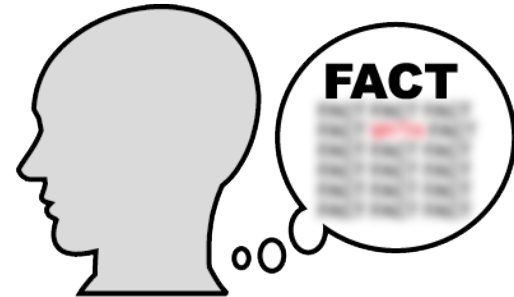
If you correct myths, start with the facts





The Familiarity Backfire Effect

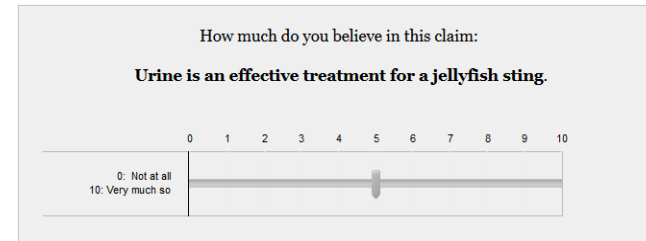
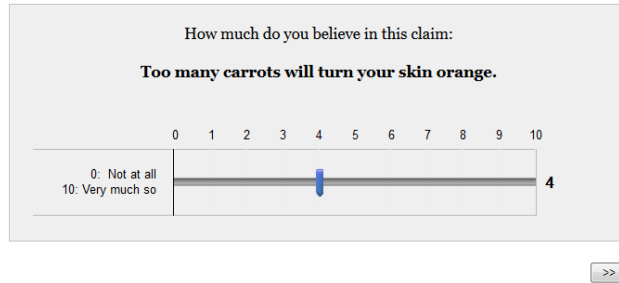
- Start with the facts...
 - *“The vaccine is safe! The worst side effect would be a sore arm.”*
- ...then address the myth, clarifying immediately that misinformation will follow (puts people ‘on guard’).
 - *“There are myths that the side effects are worse than the flu, but they are just that: myths.”*



Fact affirmations, Myth retractions

(Swire et al., 2015)

- Claims—veracity unclear to participants



- Belief rating 1



Fact affirmations, Myth retractions

(Swire et al., 2015)

- Affirmation/Refutation, with or without detailed explanation

Too many carrots will turn your skin orange.

FACT

Too many carrots will turn your skin orange.

>>

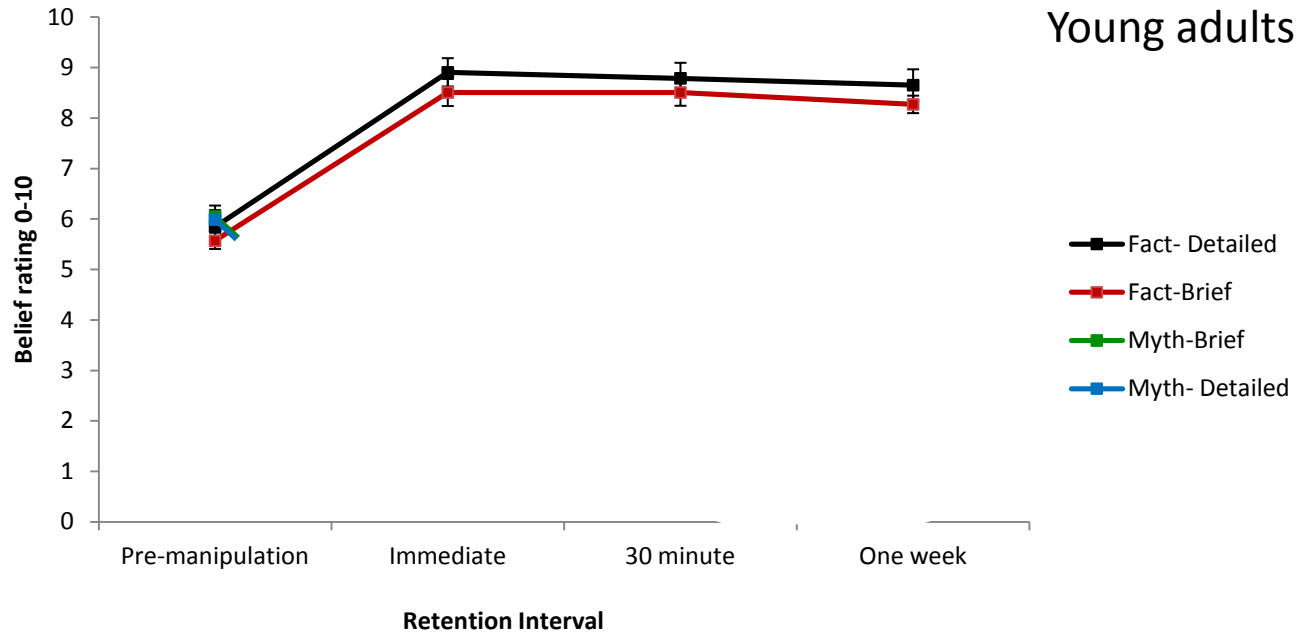
Urine is an effective treatment for a jellyfish sting.

MYTH

This myth originated from the television show 'Friends'. When one of the characters is stung by a jellyfish, the other characters recall a useful fact that they saw on the discovery channel - that urine will remove the pain. Although this worked for the character in the show, in reality there is no scientific evidence to support this remedy. Urinating on the affected area may only aggravate the sting, not to mention making your day even worse than it already is.

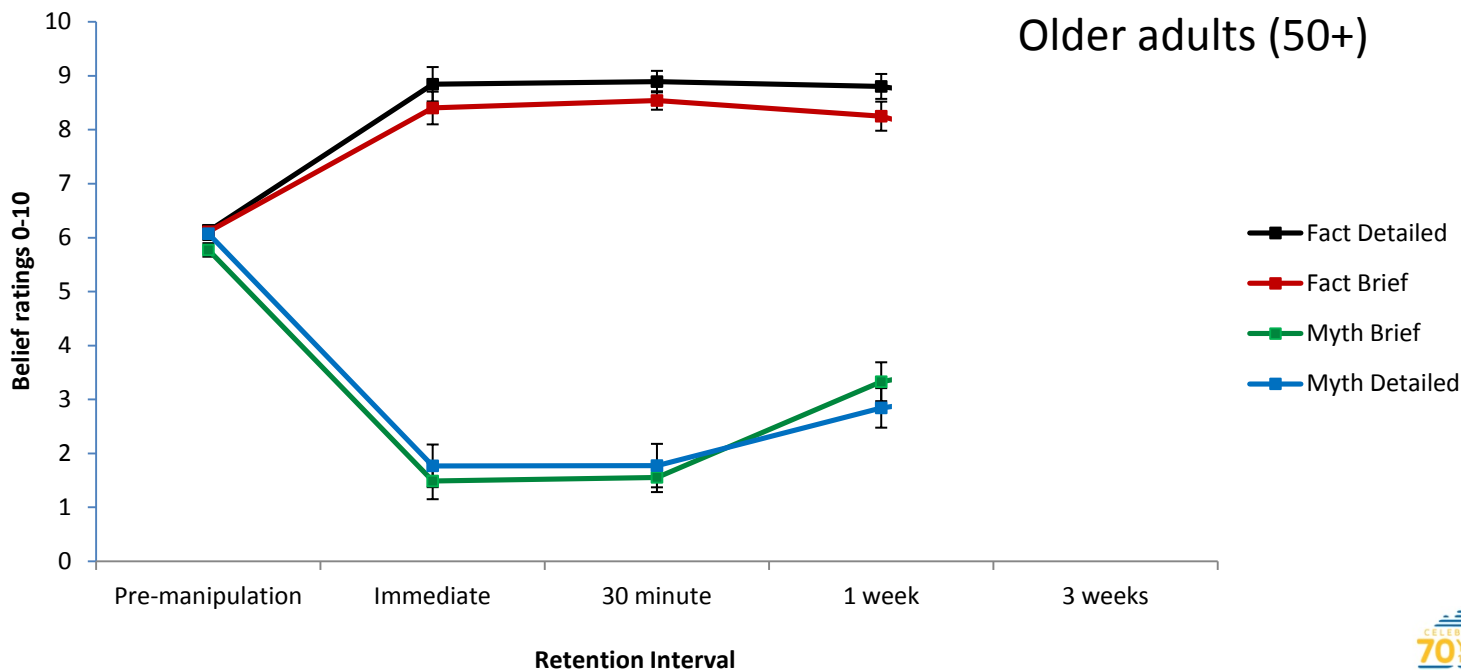
- Belief rating 2 after various retention intervals

Myth retractions may have only temporary effects



Swire et al. (2015)

Myth retractions may have only temporary effects



Swire et al. (2015)



Effective Debunking IV

Avoid the
Familiarity
Backfire Effect



Don't (unnecessarily)
repeat myths;
give the facts (first)



Effective Debunking V

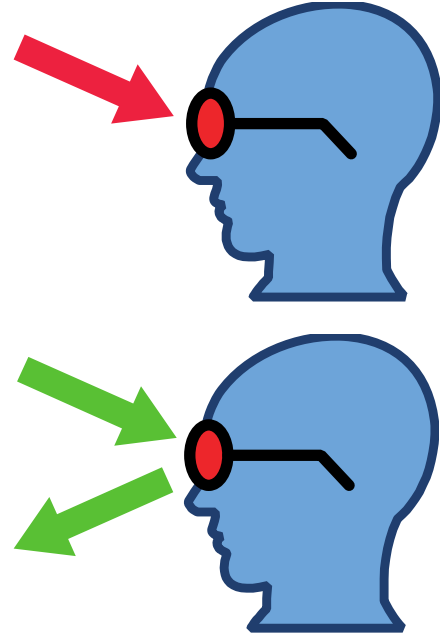
Avoid the
Familiarity
Backfire Effect



Repeat myth
retractions
occasionally

The Worldview Backfire Effect

- If people have strong attitudes and beliefs
 - They will accept attitude-congruent misinformation
 - They will defend their beliefs
 - They will counter-argue “inconvenient” retractions (Prasad et al., 2009)
 - Retractions can cause ***stronger*** misbelief



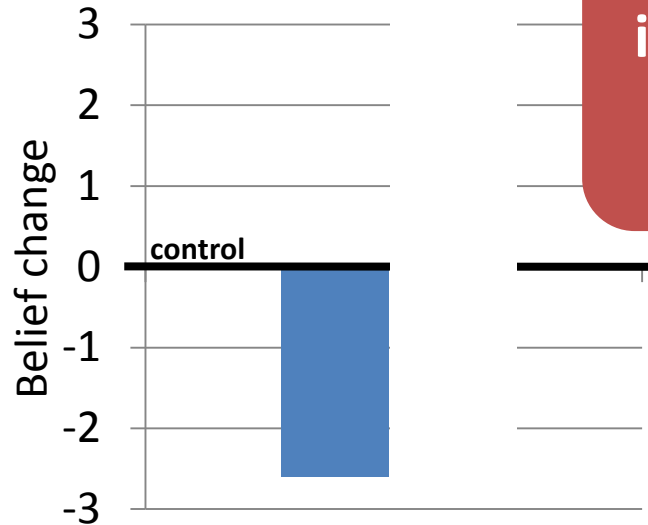
The Worldview Backfire Effect

Retraction attitude-congruent

e.g. You support party X.

You hear about misconduct in X.

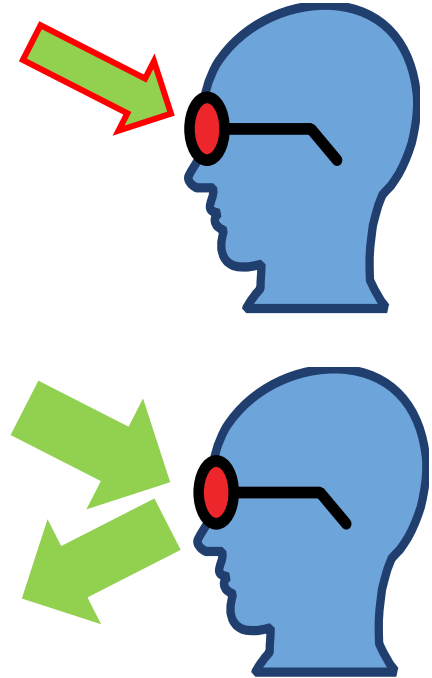
This is retracted: Belief in the misconduct is *reduced*.



**The attitude-
incongruent
retraction
backfires**

The Worldview Backfire Effect

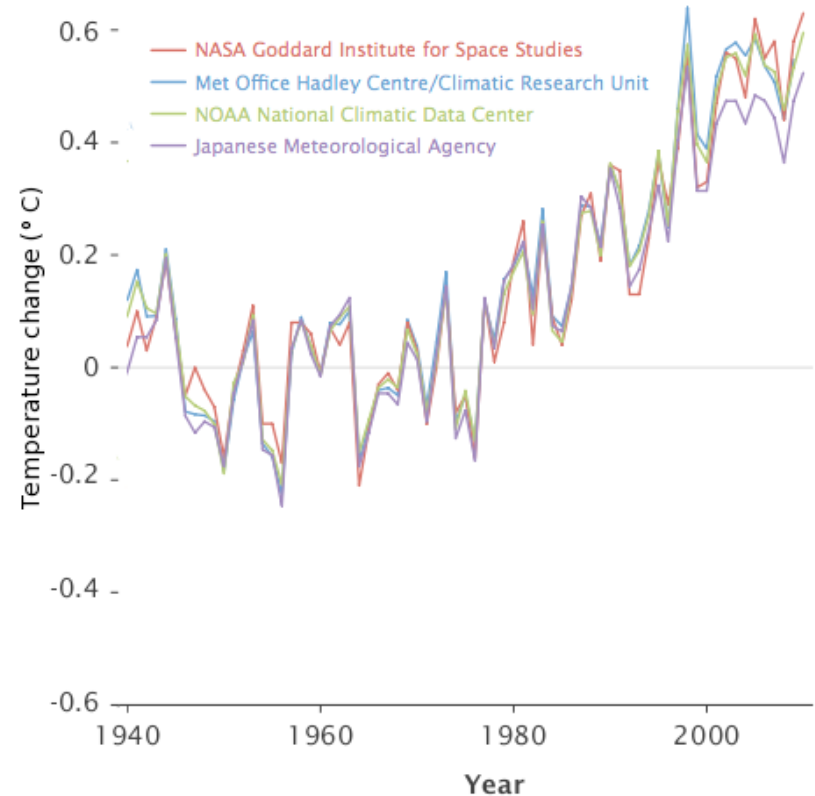
- Messages can be framed to affirm worldview
 - Conservatives are more likely to accept climate science when policy changes are framed as business opportunities (cf. Kahan, 2010)
- Strong believers are difficult to persuade even with hard evidence
 - Efforts are best targeted towards undecided majority
 - ...although covert belief change might occur



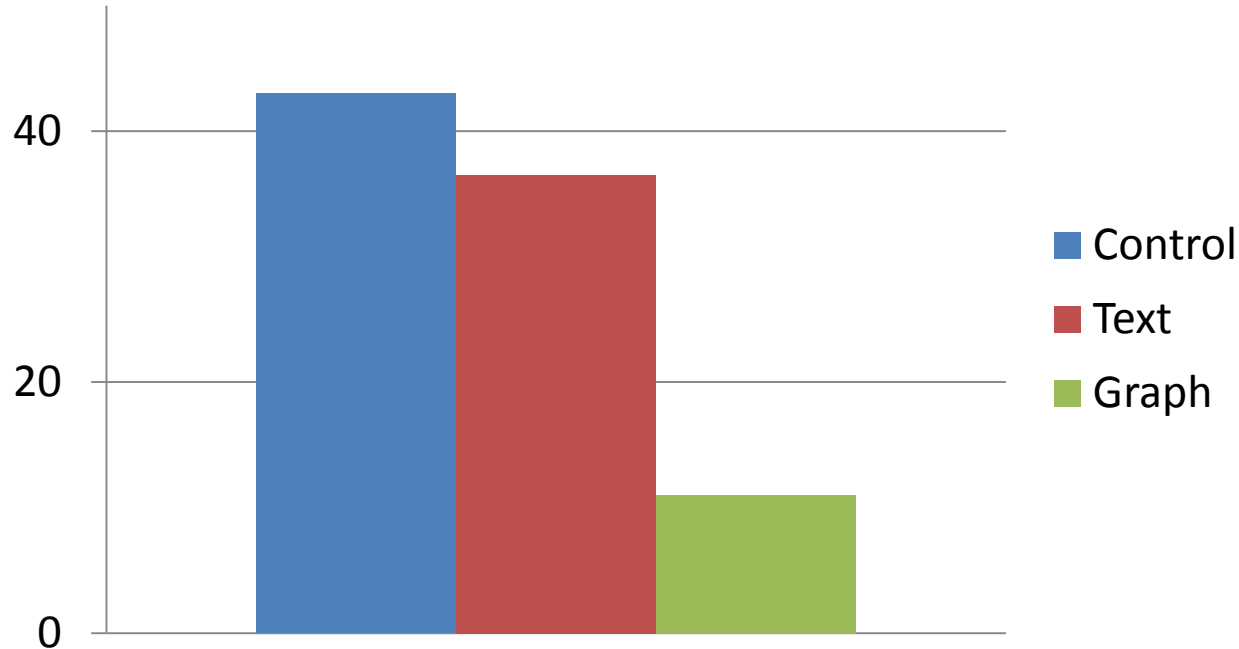
The Use of Graphs

(Nyhan & Reifler, 2011)

Groups of scientists from several major institutions — NASA's Goddard Institute for Space Studies, the National Oceanic and Atmospheric Administration's National Climatic Data Center, the Japanese Meteorological Agency and the Met Office Hadley Centre in the United Kingdom — tally data collected by temperature monitoring stations spread around the world. All four records show peaks and valleys that vary in virtual sync with each other. They each show an increase in average global surface temperatures of approximately 0.5 degrees Celsius over the last three decades. Data from each source also indicate that the last decade is the warmest since 1940.



% Agreement with Global Cooling (in Republicans; Nyhan & Reifler, 2011)



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Effective Debunking VI

Avoid the
Worldview
Backfire Effect



Target majority;
align correction
to recipient



Effective Debunking VII

Avoid
communication
barriers



Use graphs
(and simple language)



Summary of Recommendations

- Expose disinformation strategies and logical fallacies
- Provide alternative explanation when retracting a myth
- Focus on facts and give concise but detailed refutations
- Use simple language
- If myth repetition is necessary, start with facts and preface misinformation with an 'Attention: Myth follows!' warning
- Understand what myths are prevalent and repeat important retractions regularly
- Use informative, well-designed graphs
- Take recipients' worldview into account
- Target non-radical majority

Thank you!

For a review, see Lewandowsky et al. (2012) article in *Psychological Science in the Public Interest*, available at:
<http://psi.sagepub.com/content/13/3.toc>

For a brief summary, see Cook & Lewandowsky's (2011) *Debunking Handbook*, available at:
<http://sks.to/debunk>

For more literature & enquiries,
please visit
www.cogsciwa.com

