WN *Hot stuff*

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Ethics

The 'eat chocolate, get slim' sting

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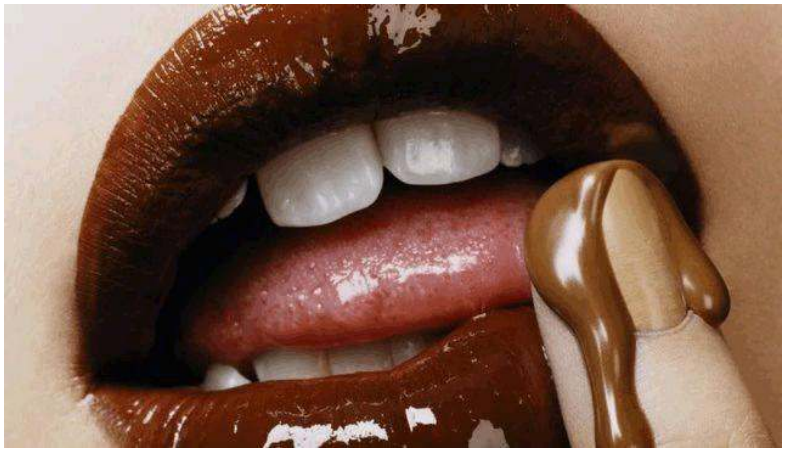
Editor's note

Can nutrition science as conducted and published be trusted? This disturbing commentary exposes what seems to be currently a rotten situation. It implicates scientific journals, the media that report the findings of research as published in journals, typical methods used by researchers to get significant results, and potentially researchers themselves, whose funding and careers depend on publishing impressive results.

John Bohannon, the author, a self-styled 'gonzo' journalist with academic credentials in biological science, has perpetrated a sting. He finds that many journals will publish studies whose methods and results should be obviously spurious, and that after publication and promotion, many on-line, broadcast and print media will accept and project the claimed results of such studies. He has done this first, by inventing a study supposed to show that a species of lichen could prevent cancer. This was eagerly accepted by many journals, *as reported in the journal Science in 2013*, *As told in the on-line blog io9* and *as interviewed* and now here, he then with colleagues concocted another study. This purports to show that dark chocolate eaten daily boosts weight loss. Despite obvious basic flaws *it was published* without review, and then magnified without significant checking by media all over the world at the end of March this year. This sting has many implications, all of which are disturbing.

Big news



Everybody who desires or craves chocolate would love to believe that it is good for health. This March, international media amplified the results of a study published in the scientific literature concluding that dark chocolate accelerates weight reduction. But the study was a hoax, a sting designed to show that journals and the media are eager to publish and promote attractive 'science'

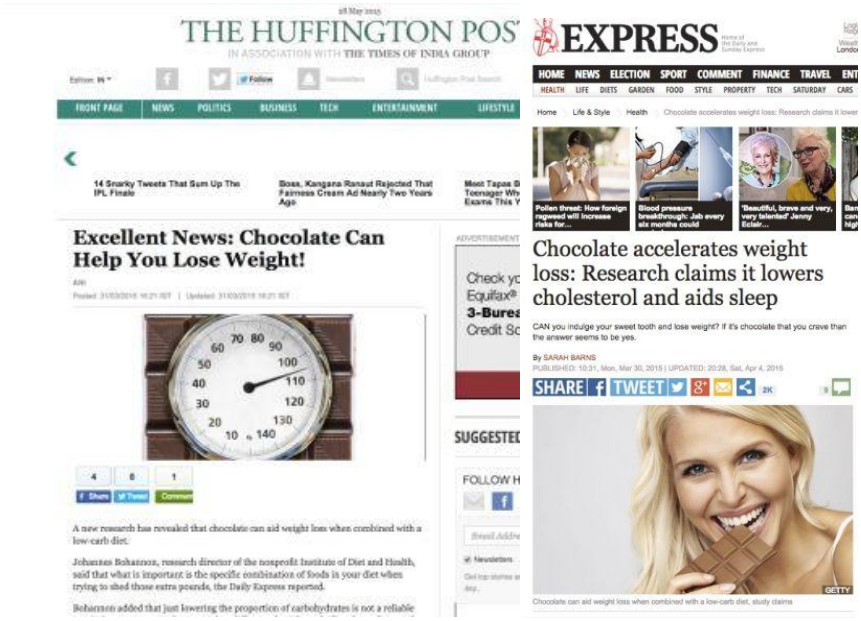
'Slim by Chocolate!' the headlines blared. A team of German researchers had found that people on a low-carbohydrate diet lost weight 10 per cent faster if they ate a chocolate bar every day. The story made the front page of *Bild*, Europe's largest daily newspaper, just beneath their update about the Germanwings crash. From there, it ricocheted around the internet and beyond, making news in more than 20 countries and half a dozen languages. It was discussed on television news shows. It appeared in glossy print, most recently in the June issue of *Shape* magazine ('Why You Must Eat Chocolate Daily').

Not only does chocolate accelerate weight loss, the study found, but it leads to healthier cholesterol levels and overall increased well-being. The *Bild* story quotes the study's lead author, Johannes Bohannon PhD, research director of the Institute of Diet and Health: 'The best part is you can buy chocolate everywhere.'

I am Johannes Bohannon PhD. Well, actually my name is John, and I'm a journalist. I do have a PhD, but it's in the molecular biology of bacteria, not of humans. The Institute of Diet and Health? That's nothing more than a website.

Other than those fibs, the study was 100 per cent authentic. My colleagues and I recruited actual human subjects in Germany. We ran an actual clinical trial, with subjects randomly assigned to different diet regimes. And the statistically significant benefits of chocolate that we reported are based on the actual data. It was, in fact, a fairly typical study for the field of diet research. Which is to say, it was terrible science. The results are meaningless, and the health claims that the media blasted out to millions of people around the world are utterly unfounded.

The sting



The sting paper was published without review, and magnified in the media without significant checking. Here are two results: lead stories in the Huffington Post, and in the UK daily newspaper The Express

Here's how we did it.

I got a call in December last year from a German television reporter named Peter Onneken. He and his collaborator Diana Löbl were working on a documentary film about the junk-science diet industry. They wanted me to help demonstrate just how easy it is to turn bad science into the big headlines behind diet fads. And Onneken wanted to do it 'gonzo' style, which is to say, to reveal the corruption of the diet research-media complex by taking part in it.

The call wasn't a complete surprise. The year before, I had run a sting operation *for the journal Science* on fee-charging open access journals, a fast-growing and lucrative new sector of the academic publishing business. To find out how many of those publishers are keeping their promise of doing rigorous peer review, I submitted ridiculously flawed papers and counted how many rejected them. (Answer: fewer than half.)

Peter Onneken and Diana Löbl had everything lined up: a few thousand Euros to recruit research subjects, a German doctor to run the study, and a statistician friend to massage the data. Onneken heard about my journal sting, and figured that I would know how to pull it all together and get it published. The only problem was time. The film was scheduled to be aired on German and French television in the late spring, so we really only had a couple of months to pull this off.

Could we get something published? Probably. But beyond that? I thought it was sure to fizzle. We science journalists like to think of ourselves as more clever than the average hack. After all, we have to understand arcane scientific research well enough to explain it. And for reporters who don't have science expertise, as soon as they tapped outside sources for their stories – really anyone with a science degree, let alone an actual nutrition scientist – they would discover that the study was laughably flimsy. Not to mention that a Google search yielded no trace of Johannes Bohannon or his alleged institute. Reporters on the health science beat were going to smell this a mile away. But I didn't want to sound pessimistic. 'Let's see how far we can take this,' I said.

The con

Onneken and Löbl wasted no time. They used Facebook to recruit subjects around Frankfurt, offering 150 Euros to anyone willing to go on a diet for three weeks. They made it clear that this was part of a documentary film about dieting, but they didn't give more detail. On a cold January morning, 5 men and 11 women showed up, aged 19 to 67.

Gunter Frank, a general practitioner in on the prank, ran the clinical trial. Onneken had pulled him in after reading a popular book Frank has written railing against dietary pseudoscience. Testing bitter chocolate as a dietary supplement was his idea. I asked him why this choice. He said it was a favourite of the 'whole food' fanatics. 'Bitter chocolate tastes bad, therefore it must be good for you,' he said. 'It's like a religion.'

After a round of questionnaires and blood tests to ensure that no one had eating disorders, diabetes, or other illnesses that might endanger them, Frank randomly assigned the subjects to one of three diet groups. One group followed a low-carbohydrate diet. Another followed the same low-carb diet plus a daily 1.5 ounce (42 gram) bar of dark chocolate. And the rest, a control group, were instructed to make no changes to their current diet. They weighed themselves each morning for 21 days, and the study finished with a final round of questionnaires and blood tests.

Onneken then turned to his friend Alex Droste-Haars, a financial analyst, to crunch the numbers. One beer-fueled weekend later and... jackpot! Both of the treatment groups lost about 5 pounds over the course of the study, while the control group's average body weight fluctuated up and down around zero. But the people on the low-carb diet plus chocolate? They lost weight 10 per cent faster. Not only was that difference statistically significant, but the chocolate group had better cholesterol readings and higher scores on the well-being survey.

The hook

Pass the Easter Egg! New study reveals that eating chocolate doesn't affect your Body Mass Index ... and can even help you LOSE weight!

- New research from Roy Morgan reveals there's no proof that chocolate consumption affects BMI
- Currently two thirds of Australians eat chocolate at least once a month
- A study from German researchers has also found there's a connection between cocoa diets and increased weight loss
- Chocolate also found to benefit brain, heart and stress levels

By SAM BAILEY FOR DAILY MAIL AUSTRALIA

PUBLISHED: 01:22 EST, 31 March 2015 | UPDATED: 16:14 EST, 31 March 2015

Share 1k shares 55 Votes comments

From the endless chocolate blocks passed around the office, to the glaring supermarket aisles and the family relatives who miraculously appear with baskets of eggs, Easter can be a minefield to navigate if you're trying to watch your waistline.

But according to new research, there's no need to go easy on the eggs this week, with a Roy Morgan study revealing there is no direct connection between chocolate consumption and an increasing Body Mass Index (BMI).

This should come as sweet relief for chocoholics when according to Roy Morgan, two thirds of Australians admit to munching on chocolate at least once a month.

Scroll down for video

Eggsellent news: A chocolate a day is found to not affect your Body Mass Index

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Has the world gone coco? Eating chocolate can help you LOSE weight

GOOD news slimmers! New research claims that eating chocolate can actually help you beat the bulge.

Facebook 215 Twee 12 Shar 1 Share 228

By Laura Mitchell / Published 30th March 2015

CHOCOHOLIC: New research reveals that eating chocolate can actually help you lose weight [GETTY]

It's the diet that everyone has been waiting for.

A German study has found that eating chocolate can reduce your waistline, lower your cholesterol and help you sleep.

Two more of the results, in the UK's Daily Mail and Daily Star. Our media release invited interviews with 'The Institute of Diet and Health', but enquiries were perfunctory or non-existent

I know what you're thinking. The study *did* show accelerated weight loss in the chocolate group, so shouldn't we trust it? Isn't that how science works?

Here's a dirty little science secret. If you measure a large number of things about a small number of people, you are almost guaranteed to get a 'statistically significant' result. Our study included 18 different measurements – weight, cholesterol, sodium, blood protein levels, sleep quality, well-being, and so on, from 15 people. (One subject was dropped.) That study design is a recipe for false positives.

Think of the measurements as lottery tickets. Each one has a small chance of paying off in the form of a 'significant' result that we can spin a story around and sell to the media. The more tickets you buy, the more likely you are to win. We didn't know exactly what would pan out. The headline could have been that chocolate improves sleep or lowers blood pressure. But we knew our chances of getting at least one 'statistically significant' result were pretty good.

Whenever you hear that phrase, it means that some result has a small *p* value. The letter *p* seems to have totemic power, but it's just a way to gauge the signal-to-noise ratio in the data. The conventional cutoff for being 'significant' is 0.05, which means that there is just a 5 per cent chance that your result is a random fluctuation. The

more lottery tickets, the better your chances of getting a false positive. So how many tickets do you need to buy?

$P\ (winning) = 1 - (1 - p)^n$

With our 18 measurements, we had a 60 per cent chance of getting some 'significant' result with $p < 0.05$. (The measurements weren't independent, so it could be even higher.) The game was stacked in our favour.

It's called p-hacking – fiddling with your experimental design and data to push p under 0.05 – and it's a big problem. Most scientists are honest and do it unconsciously. They get negative results, convince themselves they goofed, and repeat the experiment until it 'works.' Or they drop 'outlier' data points.

But even if we had been careful to avoid p-hacking, our study was doomed by the tiny number of subjects, which amplifies the effects of uncontrolled factors. Just to take one example: A woman's weight can fluctuate as much as 5 pounds over the course of her menstrual cycle, far greater than the weight difference between our chocolate and low-carb groups. This is why you need to use a large number of people, and balance age and gender across treatment groups. (We didn't bother.)

You might as well read tea-leaves as try to interpret our results. Chocolate may be a weight loss accelerator, or it could be the opposite. You can't even trust the weight loss that our non-chocolate low-carb group experienced versus control. Who knows what the handful of people in the control group were eating? We didn't even ask them.

Luckily, scientists are getting wise to these problems. Some journals are trying to phase out p value significance testing altogether to nudge scientists into better habits. And almost no one takes studies with fewer than 30 subjects seriously anymore. Editors of reputable journals reject them out of hand before sending them to peer reviewers. But there are plenty of journals that care more about money than reputation.

The inside man

It was time to share our scientific breakthrough with the world. We needed to get our study published pronto, but since it was such bad science, we needed to skip peer review altogether. Conveniently, there are lists of fake journal publishers. Since time was tight, I simultaneously submitted our paper, with the title 'Chocolate with high cocoa content as a weight-loss accelerator', to 20 journals. Then we crossed our fingers and waited.

Our paper was accepted for publication by multiple journals within 24 hours. Needless to say, we faced no peer review at all. The eager suitor we ultimately chose was the the *International Archives of Medicine*. It used to be run by the giant publisher BioMedCentral, but recently changed hands. The new publisher's chief executive office, Carlos Vasquez, emailed Johannes to let him know that we had produced an 'outstanding manuscript.' and that for just 600 Euros it 'could be accepted directly in our premier journal.'

Although the *Archives* editor claims that 'all articles submitted to the journal are reviewed in a rigorous way,' our paper was published less than two weeks after Onneken's credit card was charged. Not a single word was changed.

The marks

With the paper out, it was time to make some noise. I called a friend of a friend who works in scientific public relations. She walked me through some of the dirty tricks for grabbing headlines. It was eerie to hear the other side of something I experience every day.

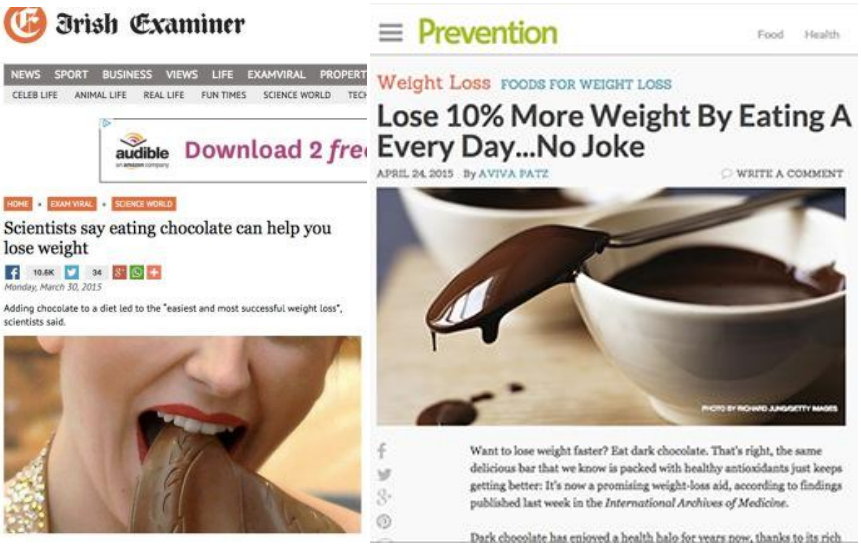
The key is to exploit journalists' incredible laziness. If you lay out the information just right, you can shape the story that emerges in the media almost like you were writing those stories yourself. In fact, that's literally what you're doing, since many reporters just copied and pasted our text.

Take a look at *the press release I cooked up.* It has everything. In reporter lingo: a sexy 'lede' (introduction), a clear 'nut graf' (telling readers why the story matters to them), some punchy quotes, and a kicker (alluring sub-headline). And there's no need to read the scientific paper, because the key details are already boiled down. I took care to keep it accurate. Rather than tricking journalists, the goal was to lure them with a completely typical press release about a research paper. (Of course, what's missing is the number of subjects and the minuscule weight differences between the groups.)

But a good press release isn't enough. Reporters are also hungry for 'art,' something pretty to show their readers. So Onneken and Löbl shot some promotional video clips and commissioned freelance artists to write an acoustic ballad and even a rap about chocolate and weight reduction (You can hire people on the internet to do nearly anything.) Onneken wrote a German press release for German media outlets. The promise of an 'exclusive' story is very tempting, even if it's fake. Then he blasted the German press release out on a wire service based in Austria, and the English one went out on *NewsWire*. There was no quality control. That was left to the reporters.

I felt a queasy mixture of pride and disgust as our lure zinged out into the world.

The score



More results, here in an Irish newspaper and a US magazine. The hoax study 'news' was alluring, a type that researchers want to discover, journals want to publish, and journalists want to magnify

We landed big fish before we even knew they were biting. *Bild* rushed their 'Those who eat chocolate stay slim!' story out without contacting me at all. Soon we were in the *Daily Star*, the *Irish Examiner*, *Cosmopolitan*'s German website, the *Times of India*, both the German and Indian site of the *Huffington Post*, and even television news in Texas and an Australian morning talk show.

When reporters contacted me at all, they asked perfunctory questions like 'Why do you think chocolate accelerates weight loss?' or 'Do you have any advice for our readers?' Almost no one asked how many subjects we tested, and no one reported that number. Not a single reporter seems to have contacted an outside researcher, for none is quoted.

These publications, though many command large audiences, are not exactly paragons of journalistic virtue. So it's not surprising that they would simply grab a bit of digital chum (bait) for the headline, harvest the page-views, and move on. But even the supposedly rigorous outlets that picked the study up failed to spot the holes.

Shape magazine's reporting on our study employed the services of a fact-checker, but it was just as lackadaisical. All the checker did was run a couple of sentences by me for accuracy and check the spelling of my name. The coverage went so far as to specify the appropriate cocoa content for weight-loss-inducing chocolate (81 percent) and even mentioned two specific brands ('available in grocery stores and at amazon.com').

Some dodged the bullet. A reporter from *Men's Health* interviewed me by email, asking the same sort of non-probing questions. She said that the story was slated for their September issue, so we'll never know.

No one dipped into our buffet of chocolate music videos. Instead, they used vaguely pornographic images of women eating chocolate. Perhaps this music will take on a life of its own now that the truth is out.

So what?

So why should you care? People who are desperate for reliable information face a bewildering array of diet guidance – salt is bad, salt is good, protein is good, protein is bad, fat is bad, fat is good – that changes like the weather. But science will figure it out, right? Now that we're calling obesity an epidemic, funding will flow to the best scientists and all of this noise will die down, leaving us with clear answers to the causes and treatments.

Or maybe not. Even the well-funded, serious research into weight-loss science is confusing and inconclusive, says Peter Attia, a surgeon who has co-founded a non-profit called the Nutrition Science Initiative or NuSI for short. For example, the *Women's Health Initiative,* one of the largest of its kind, yielded few clear insights about diet and health. 'The results were just confusing,' says Attia. 'They spent $US 500 million and couldn't even prove that a low-fat diet is better or worse'. Attia's non-profit is trying to raise $US 190 million to answer these fundamental questions. But it's hard to focus attention on the science of obesity, he says. 'There's just so much noise.'

You can thank people like me for that. We journalists have to feed the daily news beast, and food, nutrition, diet and dieting science is our horn of plenty. Readers just can't get enough stories about the benefits of red wine or the dangers of fructose. Not only is it universally relevant, because it pertains to decisions we all make at least three times a day, but it's science! We don't even have to leave home to do any reporting. We just dip our cups into the daily stream of scientific press releases flowing through our inboxes. Tack on a snappy stock photo often of an alluring woman, alluring food, or both, as seen above in the media examples shown, and you're done.

The only problem with the food-nutrition-diet-dieting science beat is that it's *science*. You have to know how to read a scientific paper, and actually bother to do it. For far too long, the people who cover this beat have treated it like gossip, echoing whatever they find in press releases. Hopefully our little experiment will make reporters and readers alike more sceptical.

If a study doesn't even list how many people took part in it, or makes a bold diet claim that's 'statistically significant' but doesn't say how big the effect size is, you should wonder why. But for the most part, this is not done. Which is a pity, because journalists are becoming the de facto peer review system. And when we fail, the world is awash in junk science.

There was one glint of hope in this tragic-comedy. While the reporters just regurgitated our 'findings,' many readers were thoughtful and sceptical. In online comments, some posed questions that the reporters should have asked.

'Why are calories not counted on any of the individuals?', asked a reader on a bodybuilding forum. 'The domain [for the Institute of Diet and Health web site] was registered at the beginning of March, and dozens of blogs and news magazines (see Google) spread this study without knowing what or who stands behind it', said a reader beneath the story in *Focus*, one of Germany's leading online magazines. Or as one prescient reader responding to the 4 April story in the *Daily Express* put it, referring to the custom whereby 1 April is the day of pranks, 'Every day is April Fool's Day in nutrition.'

Status

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