The Watertight Diet: Exposing the ignored secret to successful weight loss and health

PART III

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PART III: Dealing with difficulties

In this final part of the "diet" I want to explain why you will possibly still believe some of the things in Part I, even though I have told you that **Part I was complete bullshit** that deliberately manipulated information to sell you a false idea. This is an important lesson though because the points raised in this section are probably the reason why bullshit never dies. Next time you hold on to a belief, or you immediately dismiss someone's point of view, think back to the lessons outlined herein. Before going forward a lesson from one of my karate instructors, Barry, comes to mind: "drop your ego". In martial arts this is, in a very literal sense, saving face. No matter how talented and well-trained you are, a complete novice can always get a lucky shot in and KO you. So be confident but not cocky, and appreciate that everyone can teach you something.

When it comes to "knowing" things though, we (collectively) appear to struggle with dropping our **ego**. I am very much speculating, but I imagine that at least in part, this might be because we often equate "not knowing something" with "stupidity". Now you have read Part II, I am hoping you can see this is a **false equivalence**. I have studied hydration and health for about 8 years at the time of writing this book. That gives me some confidence that I know more than most people about this topic. But, if I am on your team at a pub quiz, I can guarantee I will be of basically zero help. Does this make me stupid? I don't think so; it means I have specialist knowledge, as does everyone.

Below I will go through some key cognitive biases, particularly the ones I attempted to tap into in The Watertight Diet; in order to get the most out of this part of the book, I strongly recommend heeding the advice above. The research surrounding these biases is fascinating and I recommend you have a look. I have avoided citing too many studies though, because firstly, I could easily be misrepresenting the evidence (again); and secondly, after this journey I think it is more important for you to know if you can relate to these biases rather than knowing about what research says other people feel. Certainly what I outline below resonates with my feelings and experiences when I believed in ample conspiracy theories. Please think back to your feelings throughout reading The Watertight Diet, or another time when you (think you) believed bullshit. Hopefully, after reading, you will be able to identify a time when you have been a victim of some of these biases, and going forward you will be able to recognise them *before* you believe what could be bullshit.

Beyond the biases I tapped into, this chapter will also give you tips on identifying and addressing your own biases, doing your own research, give some actual diet advice, and give some information on tricks your body plays on you that makes keeping lost weight off difficult, and some tips to help you maintain your weight loss (if that is your goal). Hopefully, if you read The Watertight Diet for diet advice, you won't be left completely empty handed!

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3.1 Water on the brain

Throughout Part I, I attempted to create some divisions: the dietary guidelines are bad, scientists are biased, this information has been hidden/ignored *versus* I am a good, credible scientist, you can trust me, I am on your side, I am a victim of the same system you are a victim of. This framing plays into **affinity biases** and **implicit biases**, which are the tendency to favour people who are more like ourselves. I mixed these **affinity** and **implicit biases** with plenty of **priming**. **Priming bias** occurs when you have been initially exposed to something, and that exposure influences how you respond to something related. For example, most people believe vitamin C will help with colds. They have often heard this before they have heard what the evidence for this claim actually says (last time I checked, it didn't show much). Showing people studies that demonstrate the lack of efficacy gets received poorly possibly in part because it has gone against their **prime**.

Once I have gotten you on my side (**affinity**) and given you some erroneous ideas (**priming**), the foundation is laid for other biases to grow. The **primacy effect** is our tendency to remember the first thing we hear. Of course, in the context of this diet, this will not be your first exposure to most things discussed (diets, water, health). However, the combination of tricks I used "reset" your thinking so essentially the information I have laid out becomes your first go-to. This is (in my experience) compounded by the bullshit agreeing with some personal opinions/views (i.e. biases). For example, if you have failed to lose unwanted weight on a "conventional" diet, you are primed to agree with sentiments that the dietary guidelines are wrong. Therefore, my stance becomes more appealing. If you've never read much about hydration before though, much of this (especially more technical) information will be your new prime go-to.

Admittedly, this is a complex web, so describing things in an exactly linear fashion is a bit difficult; it becomes a web of biases, with each bias enforcing the other. Part of this is that the information I provided in Part I is in some places quite outrageous (regardless of whether it is true). That is much more interesting to draw on than regular "conventional" thinking. Once this information is planted, an **anchoring effect** takes over; this is really important because we see this with seemingly every fad diet and conspiracy theory out there. **Anchoring** is when individuals use their original information to make judgements on or interpret new information. This effect is powerful because it prevents new (counter) information from being taken on board.

So far then, I have gained your trust (**affinity**) by "exposing" a **conspiracy** which appeals to you (the dietary guidelines are wrong). This has "reset" you to believe me that water is unhealthy (**primacy effect**) and/or **confirmed your own biases** that the guidelines are wrong, and then that information has stuck (**anchored**). Again, going back to the vitamin C example, your initial belief that vitamin C helps with colds probably feels quite ingrained; this is **anchoring** in action.

For readers who are particularly 'susceptible' to the tricks laid out in Part I, there might still be something inside you wanting to avoid drinking water with food because the data I initially showed you in Part I (and provided additional counter evidence for in Part II) said that drinking with food is bad for your blood sugar. It is ok to feel like this; it is a common experience in fact, called **cognitive dissonance**.

Cognitive dissonance is the discomfort you feel when presented with information that runs contrary to your beliefs. This may get compounded by the **backfire effect**. It is worth noting that the evidence is mixed on whether this is a legitimate effect or an artefact of another

effect (which I will discuss below). However, experientially, I have seen and experienced the **backfire effect** myself, so it is worth mentioning just in case you can also relate. This effect suggests that being presented with information that is contrary to your own beliefs strengthens your own (established) beliefs.

In other words, trying to educate someone against their beliefs pushes them further away from seeing alternative explanations. As such, the evidence I presented in Part II, which at the very least challenged the information in Part I, might have made you feel uncomfortable, but additionally might have also made you frown and instinctively ignore or mentally start to defend the information I **primed** you with in Part I. Going back to the vitamin C example, you may have initially screwed your face up, and maybe even justified that what I wrote was wrong ("but when I took it my cold got better straight away!"). (Note: I am not going to provide evidence for the vitamin C example; hopefully by the end of this book you will have the skills to assess the claim yourself. Maybe even, by the time I publish this, there will be strong evidence that vitamin C is helpful for colds!)

I mentioned above that the **backfire effect** is not fully established yet; this is because other research has proposed that the **backfire effect** is an artefact of reducing **cognitive effort**. In other words, reconsidering your own position requires some level of reflection regarding your beliefs. Reflexivity (fancy word for reflecting) is a high cognitive demand, and most people (probably subconsciously) do not want to use their time and/or energy on such a task. This leaves dismissing new information as the easy option. Either way, the consequence is broadly the same: new counter information is dismissed. Hopefully being aware of this can help you reflect on your own response to new evidence. I will add here that I indeed notice myself doing this quite frequently. Each time, I stop, un-scrunch my face, and re-read the information knowing that deep down I am holding some resistance and potential bias to the new information. This helps me to actually consider (and research) the new information.

To top all these off is **confirmation bias**, which is where we naturally find information to support our beliefs, and disregard or discredit information that contradicts our beliefs. In essence, Part I of this diet—which is a microcosm of basically any fad diet and conspiracy theory out there—creates the conditions for these biases to develop, and then when in the real world someone challenges you, **cognitive dissonance**, the **backfire effect** (maybe), and **confirmation bias** all kick in and defend your notion of truth. You may notice some **contradiction** here too. The Watertight Diet is predicated on an idea (to stop drinking fluids) that actively *gives* you **cognitive dissonance**, yet I am also saying it gives you **confirmation bias**. How so?

In the diet industry, and more broadly conspiracy theories, the **confirmation** appeals to your desire for the consensus to be wrong; thus the **cognitive dissonance** from learning that "water is bad" (or insert any other conspiracy theory/diet) is overridden by the sense of accomplishment that you were right and/or the scientific consensus was wrong (this links to the previously discussed **illusory superiority effect**). So how such claims appeal to you are determined by lots of things, including your own natural biases. I want to emphasise here that no one is bias-free; having bias is not the problem *per se*. Rather, not being able to recognise your own bias, nor address these biases according to new evidence, is where problems occur.

Collectively, this all results in **belief perseverance** (Savion, 2009). That is, even when faced with absolute evidence that you are wrong, your belief is incredibly hard to shake, particularly if it is a strongly held belief. Importantly for general life, some beliefs are not

based on evidence to start with, and are brought about by **sense-making** (discussed further below). Beyond diet books, humans are prone to creating explanations for things, and once we have generated this explanation, this in itself becomes reason to not let go of the belief regardless of new evidence (Schultz *et al.*, 2001).

Once all of this occurs, we see any new evidence in our own light. We find reasons to discredit conflicting information, and explain why our supporting evidence is true. This process in itself can further cement our initial beliefs (Lord *et al.*, 1979). This form of **confirmation bias** has been dubbed **myside bias**, whereby we are particularly good at picking out faults of other people's positions, whilst essentially being blinded to the weaknesses in our own beliefs. **Myside bias** seems to have no relation to measures of intelligence; in other words, none of us are immune (Stanovich *et al.*, 2013). I have read some ideas regarding the potential evolutionary advantage of this, but I think that is far beyond anything I could comment on. **Myside bias** seems closely related to **motivational reasoning**, whereby we decide what evidence to accept based on the conclusion we like most. As you can see, that is not a very evidence-based approach.

A risk at this stage is something called **identity fusion**. **Identity fusion** occurs when groups "fuse" themselves to a leader, and thereafter whatever that leader says is deemed "true". This may help reduce the cognitive effort required to assess claims, because you can just automatically agree with whatever your chosen leader says. I think this is very evident in the nutrition world.

But this is really what we have to remember: **truth is only as believable as the story that tells it**. In Part I, I created a ridiculous diet but I made this ridiculous diet *sound* believable. When I tell you the truth about weight loss later in this section (briefly: any method that means you burn more calories then you consume), that is boring, there is no story, no wow-factor, no **ego**-boost because you know a secret your friends, or even all these stupid biased nutrition scientists, do not know.

This leads nicely to the infamous **Dunning-Kruger effect**, related to **illusory superiority** and **overconfidence**, as previously discussed. To recap: this dictates that we all have roughly the same level of *perceived* ability, regardless of our *actual* ability; as the original paper writes:

> *"the miscalibration* [of abilities] *of the incompetent stems from an error about the self, whereas the miscalibration of the highly competent stems from an error about others"*
> *(Kruger & Dunning, 1999, p. 1127)*

As you can imagine, this can create all sorts of problems and be driven by and exacerbate the above biases. In my experience as a scientist in the dynamic field of nutrition, I have had (unqualified) people tell me my research is wrong (one time based on a *book* from the 1980s… Hopefully you can see now why that is not a particularly good source!), other people tell me I am an "uneducated moron", "stupid", "closed-minded", that I do not know my arse from my elbow, and that I am "irrelevant", among many other things.

I highly doubt any of these people are mean or nasty people, rather I challenged their notion of truth. This may manifest cognitively as perceiving there to be a **threat to the ego**; people do not like not knowing things so when someone is in any way "better" than them (perceived or objectively), defence mechanisms take over to defend their own "honour". You might have seen this more recently with those who claim they have been to the "University of Life" whenever someone highlights that they are actually educated in the topic at hand. Ironically,

these people often have never been to university so have no understanding of what is taught and how it is taught.

Because they cannot refute evidence, ***ad hominem* attacks** and insults come out (note: ***ad hominem* attacks** are using insults in order to discredit someone; insults are just being mean with no further purpose). This eases their **cognitive dissonance**; if I am a closed-minded moron, then of course their opinion *is* right, and there is no need to expend any **cognitive effort** reconsidering their stance. Based off my own interactions, I am not convinced this is a conscious process. What I have seen happening is that they will make a claim, I will provide evidence, they will provide evidence or **move the goalposts**, I will explain why their evidence is weaker/less appropriate/etc, they will call me names, I will be sarcastic back, we both get frustrated, and we *both* feel like the other person has **cognitive dissonance** (etc). In our own eyes, we are *always* right. And that makes determining the truth *incredibly* difficult. **How do we ever know if we are the ones suffering with a bias?**

You may have noticed above too, that I used a trick from Part I; I painted myself as a **victim** by describing the things members of the public have called me. Did I do that manipulatively? Well, not intentionally. I felt they were appropriate examples to make my point, but in some ways that kind of stuff may always be subtly manipulative regardless of intention. As I have also said previously, sometimes the truth is shrouded in a trickery-based narratives, other times bullshit is perfectly well framed. In my experience, most credible debaters generally more-or-less shrug off these comments and try and get back on track; conversely, I typically see bullshitters use their hurt feelings from (perceptions of) being attacked to leverage support for their argument; though I will add that I quite frequently see bullshitters claim they are being attacked in response to very reasonable requests for evidence.

To clarify, I am not painting scientists/experts/etc as angels who never sling *ad hominem* attacks or insults. But most of the time, at least in my experience, you can tell who is bullshitting by the response to any (perceived) attacked. Scientists often will comment that it is an *ad hominem* attack (possibly adding a snarky remark, and sometimes write about their experiences separately/outwith the debate at hand), and then get back on track with the debate. Bullshitters often drag this out and keep referring back to the (perceived) insult. Remember also, that sometimes perceptions are not inaccurate. For example, I have had cases of me showing evidence (i.e. a research paper) and people internet-shouting back saying how heartless I am to not believe them. Essentially, they have created an insult I have said, then insulted me by calling me heartless. You then get distracted from the actual debate and end up trying to defend that you are not actually heartless. It is very strange to watch and be part of.

Within this is **tone policing**; this is where people divert the debate towards your tone. Most scientists have a very direct writing style (it is kind of part of the job!), but this gets perceived as aggressive, cold, and heartless. The tone essentially **appeals to emotion**. I agree scientists should perhaps work on this, but really it should not matter. What should matter is the content of what is said, not how it is said. If you feel someone is getting aggressive, it is better to respond with “I feel this conversation is getting a bit heated, so can I just clarify that what you mean by XXX is YYY?”. This redirects the tone, ensures you have not misunderstood, and hopefully helps the other person refocus their energy on the point they are trying to make. Of course, as with anything, sometimes people will just sound aggressive; all you can do is debate their points and not their tone, and do your best to stay calm (I am somewhat hypocritical in saying this, but each encounter is a new learning experience).

I want to address the **ego** briefly too. I feel like this is a rather taboo topic to talk about, and being accused of defending your ego might come across as offensive in some way. As I said previously, we all have an ego, and we all enjoy it getting stroked at times. The problems that I see arise when the ego manifests as arrogance—arrogance that you know best without any reflection on why; arrogance that you know better than pretty much every legitimate expert in the world; arrogance that you have this unique knowledge that you need to shout at other people about. We all have an ego, we should look after and appreciate our ego, but we should also consciously check our ego every now and then, and make sure it knows its place.

The reason I have focused so heavily on the **ego** is because I think it helps explain much of this behaviour. Again, I want to reiterate that this is my own interpretation how things work; whilst the evidence I have read seems to support this interpretation, I do not want to claim this as fact. This all actually maps pretty closely to my own experience of believing ample bullshit in my time (of course, we have just learned the dangers of believing **anecdote**, so I only share for the sake of relatability rather than evidence).

The crux of all this is that we inherently want some control. I described this briefly earlier. People who are most susceptible to bullshit often have traits related to their **ego** needing a boost, like low self-esteem (e.g. Cichocka *et al*., 2015). Other traits do also correlate, but my (non-expert) impression is that these are perhaps less applicable to those who have a propensity towards diet bullshit compared to say flat earth or reptilian overlord type bullshit. Along with this, in my experience people turn to health bullshit because the system has in some way failed them; whether that be a struggle with weight loss following the guidelines, or medical professionals ignoring health complaints. This combination may in itself be a **prime** to believe any notion of hope. With that hope, comes control, and with control comes better self-esteem. Thus your ego can actualise. I think Aditya Shukla sums up this idea of control very nicely in Cognition Today (2020): “Do not make countering pseudoscience a threat to one’s core psyche. People tend to defend their psyche no matter what. Forcing a change reinforces the original psyche” (though I recommend reading the full post; the link is in the reference list or click here).

This is a lot to take in, so I have attempted to put it in a figure for you (Figure 3)…

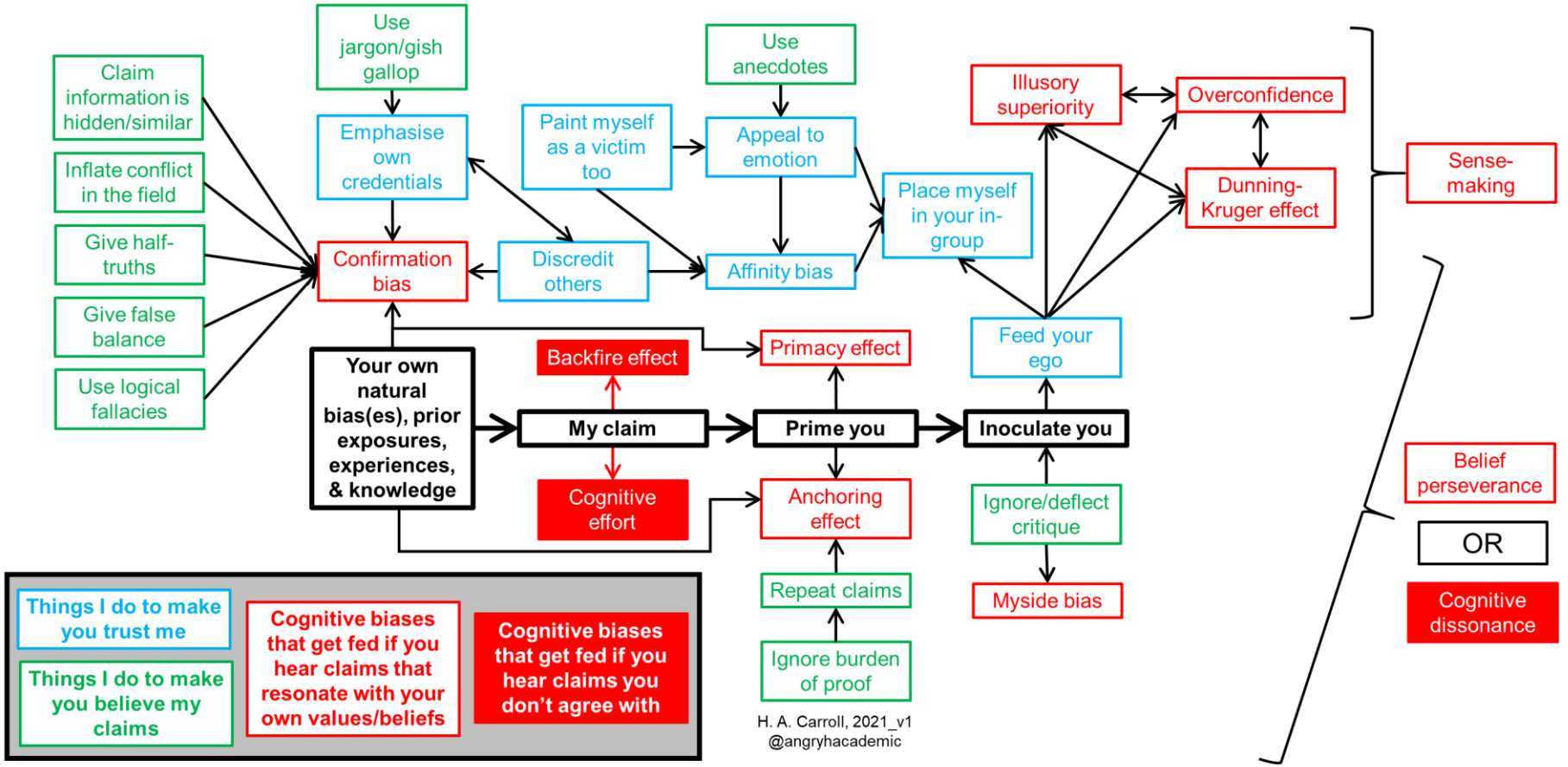

Figure 3. Web of biases: How people make you trust them in order to lure you into believing their claims, and how these tricks of language play into your own natural biases to make you believe or disbelieve them. Grey box describes the meaning of the colours in the main image. This should be viewed as lots of interacting factors that can occur, rather than in any specific direction or order.

3.2 Making sense of non-science

In my opinion, much of this is potentially avoidable if we were not in a culture whereby low self-esteem is normalised or ignored. I feel this is a societal failure. But considering those preconditions, the stage is set for a narrative that fits our own experience. So when I bash the dietary guidelines in Part I, if you have ever thought they are crap, you can hammer my narrative into your narrative and voila, you now have evidence that fits your experience. Finding things that fit your own interpretation is known as **sense-making**, and this can be driven by a strong emotional attachment to the experience you want to make sense of. In the case of diet books, I imagine many people turn to these at a point of desperation or fed-up-ness. No doubt curiosity also plays a role too.

You will have noticed throughout Part II that **illusory truth** and **proof by assertion** were frequently cited; I repeated claims because I did not have any solid evidence for (or I did not present the overwhelming counter-evidence). **Illusory truth** is an important tactic to make people believe claims. Reading the same claim over and over again makes it familiar; once something is familiar, it is far less likely to be questioned, and perhaps more likely to be **anchored**. A common example of the **illusory truth effect** is the idea that insulin (which increases after eating carbohydrates) increases hunger. This narrative is repeated so frequently, I have seen academic papers say this without a citing a source. If they looked for a source to cite, they would notice that insulin is actually a hormone that helps make you feel full (Austin & Marks, 2009). The idea that we cannot live for more than a few days without water is also a **proof by assertion** which has caused an **illusory truth effect**! It is also worth noting that politicians use this trick too, think: "MAGA", "strong and stable", "£350 million to the NHS" (I am sure any right wing readers can pick out some left wing examples too!).

Getting past our biases is incredibly difficult. We often see ourselves as infallible to bias compared to others, even after being given information about how we might have been affected by biases (Pronin *et al.*, 2002). This is perhaps one reason why addressing bullshit head on does not mitigate bullshit-based beliefs. The good news is that there does seem to be some things that might help tackle these biases, but this is not easy and does require some honest reflection regarding the true (lack of) depths of our own knowledge. Firstly, in science communication, we are often taught to try and understand the "why" of people's beliefs. You can do this yourself; for example, was The Watertight Diet appealing (and therefore believable) because you have tried other diets and they had not been successful? Or do you naturally not drink very much water and you're fed up of everyone saying you should drink more? Once you have understood your own reason(s) as to the appeal of the diet, you have some insight into where your biases may lay.

Secondly, we need to understand our own understanding. There is a phenomenon called the **illusion of explanatory understanding**. This is where we think we know how something works but we do not actually know (importantly, but only tangentially related to this diet, this phenomenon is common with political beliefs and correlates to other conspiracy traits; Vitriol & Marsh, 2018). To get around this, go through what you think happens. This is easier with mechanical things; for example, one study asked volunteers if they knew how toilets, cylinder locks and other things worked (Rozenblit & Keil, 2002). Participants rated their knowledge highly. Researchers then asked a diagnostic or mechanical question, such as step-by-step instructions on how to pick a lock. After this, participants lowered their knowledge rating. Subsequently, participants were shown "how-to" instructions, and re-rated their initial assessment, showing they now knew their initial assessment of their knowledge was too high. (Knowledge ratings after reading the expert how-to knowledge did increase,

which may present some additional problems, such as a **beginner's bubble of overconfidence** depending on the superficiality of the expert evidence; remember experts condense their huge knowledge into easy-to-understand information, discussed further below).

In terms of nutrition and diets, this can be much trickier, but you can still try this assessment and speak to experts if you are not sure; admittedly in the nutrition field there are many experts, some with legitimate qualifications, who spread bullshit, but if they use the tricks outlined above, hopefully you will be able to spot them a bit easier. With The Watertight Diet, you could ask things like:

- Can I explain how our body regulates water?
- Can I explain how blood sugar is controlled?
- Can I explain how appetite is regulated?

If you answered yes to any of these, go ahead and explain them in as much detail as possible. If you are honest, you will realise it is a lot harder than it seems. For example, did you explain: how water is absorbed; what hormones are affected; how these hormones are affected; what effect they have on what parts of the body; how they exert these effects; how water is filtered in the kidney; how sugar is detected in the blood; how insulin is secreted; how insulin gets sugar out of the blood to cells; how other (non-insulin) factors get sugar out of the blood; how sugar is stored across the body; how taste affects blood sugar and appetite; which gut hormones alter appetite; how these hormones alter appetite; how other (non-hormonal) factors alter appetite; the interactions between the hunger-fullness and desire-motivation areas of the brain, etc? I could go on—some people spend their entire careers understanding just one aspect of this list, like how a specific receptor on a cell is implicated in how effective insulin is at reducing blood sugar.

For me, I know I can explain these things, but only in the context of my own research. Other researchers will have different perspectives based on their own specialism. When we put all these knowledges together, we get what is known as **consilience of inductions**. When forms of different, unrelated, evidence come together to form the same conclusion, we can be much more confident we are right (known as **consilience of inductions**, which was briefly mentioned earlier). So someone studying insulin signalling in cells might show saturated fats increase insulin resistance; someone else might knock out genes in a mice related to saturated fat metabolism and find concordant results, someone else might feed human volunteers a high saturated fat diet and show their blood sugar response gets worse, whilst others look at the population and note that those eating high saturated fat diets have higher type 2 diabetes risk. All the evidence points to the same answer by looking at the problem through very different lenses. So the chances you know about all these levels is pretty low, but it can be a good test of the limits of your understanding. **There is nothing wrong with knowing you do not know; problems arise when we think we know it all.**

Thirdly, when assessing evidence, it is good practice to ask "would I agree/disagree if the results said the opposite?". One way to do this if possible is to read the study methods before reading the results. You can then evaluate the methodology (tips explained later—read on!), and make your own assessment as to whether you think the study is strong or weak, and in what context you think the results should apply. After this has been assessed, then look at the results, put them in the context you have already defined, and base your belief off that. Remember here that one study is not enough to have a complete conclusion, hence my previous advice (also discussed further below) to look at systematic reviews and meta-analyses for a fuller understanding of the evidence base.

To complete this process, once you are confident in your belief, ask "what evidence would change my mind?". Seek that evidence. If you find some evidence (using the same checks as above, and described more fully below), but this is inconclusive, then adjust your confidence. In other words, rather than "I believe X", you can say "I believe X but under these conditions" or "I err towards believing X but appreciate there are strong counter arguments". Being uncertain is scary, but this is what science is predicated on. Our entire knowledge-base is probabilities; how likely this explanation X wrong? Is it less likely to be wrong than explanation Y? This is why scientists rarely talk in certainties. We know our established facts, like natural selection in evolution *could* be overturned with sufficiently strong and convincing evidence. But so far, it explains our observations with little error.

You are of course welcome to disagree with any or all of that for you personally. That is your prerogative. However, I would remind you that all the above biases act subconsciously. So even if you think you are resistant, you probably are not; hence my recommendation to drop your **ego** to let these ideas sink in. Regardless though, the following section will go through some hopefully simple tips to help you do your own research. Following that I will give some legitimate diet advice, though considering the above, I would advise you check out for yourself what I say!

3.2 Top tips and pro-tricks

To sum up the key points above:

(i) Anything can be manipulated to sound convincing and evidence-based
(ii) Once we learn information that in some way resonates with us; it is nearly impossible to think objectively about that stance (whether or not that information was based on evidence is irrelevant)
(iii) The above two process (manipulation and affirmation) occur subconsciously so they are difficult to recognise let alone address

This puts us in a difficult place. So here I will outline three things I think can help at least some people some of the time in deciphering bullshit: 1. Appreciate expertise; 2. Finding and evaluating evidence for yourself; 3. Things to look out for.

3.2.1 Appreciating expertise

I am fully aware that expertise often gets perceived as arrogance, and even the very nature of this book may come across as having a "I know something you don't know" tone. Whilst not my intention, I can understand why some people may feel that way. The reason experts come across as arrogant is that it is incredibly frustrating to be told that you are wrong about things you literally spend your life understanding, and in some cases even being told the thing(s) you discovered is wrong. Of course, I should qualify this with acknowledging that, as with all walks of life, some people, including some scientists, are arrogant, but that is a separate issue!

To put this in perspective, imagine if I told you that you were doing your job wrong. Imagine if my thoughts on why you did your job wrong and my opinions on your job were based on me doing many hours of "research" reading blogs, watching YouTube, and sharing posts on social media by other non-experts, or by people who everyone in your job knows is a rogue. Imagine if, after you explain why my opinion is ill-informed and my sources are unreliable, I told you that you are "stupid" and "closed-minded", and that you "don't know your arse from your elbow". I can imagine you would get rather frustrated? I do not think this is arrogance.

As a nutrition scientist, I would be equally out of place telling a shop assistant that they are using the tills wrong as I would telling an astronaut they are flying their spaceship (rocket?) wrong. Yet everyone has an opinion on nutrition and health sciences, and everyone views their opinion as equally valid. Quite frankly, it is absurd! Beyond anything, if scientists were closed-minded and dogmatically driven, we would have zero progress.

I think this in part comes down to trust. It sounds counterintuitive, but scientists have to use trust for everything they do. I put my trust in the biochemists who designed the kits that allow me to measure hormones; they trust the physicists whose theories allow us to quantify what we measure in the biochemistry kits; we all trust the engineers who design and build the technology to allow us to do all this. If you think about it, your trust goes into a lot of people every day. Implicitly, you trust the farmers who grow your food, train and car manufacturers who build your transport, pilots who fly your planes, the builders who built our homes, the water company to provide us with clean and safe water and dispose of our rather disgusting waste, the internet wizards who bring us wifi… You get the gist. Underpinning all those things you trust, somewhere along the line is some form of science going on. **You already trust experts!**

Also consider the types of expertise the public criticise. It is not the jobs that we could easily verify whether the bullshitter knows or not. No one (that I have seen) tells brain surgeons about this *other* brain surgery technique they saw on the internet, or tells a plumber their method of plumbing is a farce, or an accountant that they do not understand taxes and audits. Why? Well, I am sure there are many reasons, but one major reason I think is likely due to these being absolutely verifiable with regards to their accuracy; they are rather black and white topics and/or carry quite high and immediately verifiable risks. Secondarily, I get the impression that there is an intrinsic desire for control over one's own body, thus others saying you are wrong about your own body is disempowering. This is secondary though, because this does not explain certain conspiracy theories outwith our own sense of being, such as flat earth.

Particularly in health sciences we have a few factors that are hard to understand unless you are invested in the field (properly). Firstly, there are legitimate debates; we do not know everything (as with every field of science!). The field is often dynamic and exciting. Unlike other sciences though, health science is living. So, for example, in physics, if a new particle is not yet discovered, it fundamentally does not change or make a difference to our everyday lives (I think Dr Ben Goldacre said something along these lines on The Infinite Monkey Cage podcast, so credit to him for that). However, if we find some early evidence (often in the form of anecdote or a small pilot study) that a new drug or diet is healthful in some way, as scientists we cannot get excited about that until further testing. Conversely, the media jump on this new finding and exaggerate the implications.

This gives the impression we, as scientists, are suppressing information, hiding the truth, and/or deliberately withholding health from people. Really though, we are awaiting more evidence of high quality. It is a slow and boring process. We have recently seen this process pan out with hydroxychloroquine treatment for COVID-19. Everyone got excited by the early evidence, and by the time strong evidence came out showing it had no effect and perhaps was harmful (for example, this meta-analysis: Fiolet *et al.*, 2020), there were entire "subcultures" claiming someone was withholding something (this entire debacle was doubly confusing to me since the people arguing for hydroxychloroquine in my experience were the same anti-BigPharma crowd, so I am unsure why they supported this drug so much, other than to be contrarian). Despite now (at the time of writing) there being meta-analytic

evidence against its use, many still claim hydroxychloroquine should be used. Think back to what you have just learnt about cognitive biases, and it might make some sense (the primacy effect, anchoring, cognitive dissonance, appealing to the ego, appealing to own biases, etc).

Which brings me to our next challenge: the media. The ultimate aim for most media sources is profit. An unfortunate consequence of this is contrarian/rogue scientists or overhyped findings are much more sellable than the science that actually keeps us ticking over. The media say what they want with no repercussions. I always find it baffling that in order to run an online survey asking academics what they thought about different research publication methods, I needed to get approval from an ethics committee, yet certain newspapers can undeniably misrepresent the state of the evidence, make causal claims, or give confusing messages (like one newspaper in particular which seems to claim that everything simultaneously causes and cures cancer).

You may argue that newspapers may report badly, but they are reporting the studies which are contradictory, so in a way, there is nothing wrong with that. I can understand this argument, however, in science, we have a method to get over this difficulty called a meta-analysis. As I explained earlier, meta-analyses collate all the findings of all relevant studies and see what the overall effect looks like. An example of how this can work is if you have 10 studies looking at the effect of diet X on weight loss; five show the diet works, three show the diet does nothing, and 2 show the diet makes people gain weight. When we pool these results together, we would probably find overall, this diet does nothing on average. For the record, a proper meta-analysis is a bit more complicated than that, taking into account things like number of participants and methodological differences, but that is broadly the gist. In my opinion, the media should for many things await meta-analyses before reporting. One study typically shows nothing we can get too excited about; if the finding gets confirmed, then we might be onto something (again, sorry, this is an oversimplification).

Sometimes, as with water intake guidelines, there is not much evidence regarding health outcomes, yet we still put a guideline out. I can understand why this might appear unscientific; it is by no means gold standard after all. Occasionally this is warranted though. These are usually based on the precautionary principle (“better safe than sorry”) and will apply our best current ideas and evidence (accepting that it may not be gold standard) to determine a guideline that is *most likely* conducive to health and *most likely* to prevent harm. In the case of water, it did seem odd that we did not include any guidelines for the nutrient we consume the most of day-to-day. With the rise of the bottled water industry, people also became more aware of drinking water, so I would speculate that guidelines were somewhat responding to greater public awareness of drinking needs, as well as to encourage water intake rather than high calorie drinks.

Considering all this, and more, I think when people are angry at scientists, they are actually angry at the media, and (depending on the context) politicians; both of whom frequently distort and abuse evidence. This abuse of the evidence fuels mistrust in scientists, it makes us look like we do not know what we are doing, or that we are shills for some kind of cover-up. Bar the odd exceptions, this is not the case!

3.2.1.1 Glass half full…of scepticism

I think it is worth discussing scepticism here too. A lot of people identify themselves as “sceptics”. This is a rather unnecessary term for a legitimate scientist; by our very nature, we are sceptical. Self-identified sceptics are often hiding under the label of scepticism to sound

objective and evidence-based, when really they are often ideology-led. There is a way to be sceptical in science, and outright denying the current status quo by default is not it. The status quo is the status quo because of often decades and perhaps even centuries of data. So anyone who makes contrarian claims must have quite extraordinary evidence to back up their claims.

To give an example, I have put out two papers which aimed to question the status quo in my field (Carroll, 2020a; Carroll & James, 2019). I put out the ideas, I suggested ways to test the ideas, I highlighted what the ideas do and do not explain, and I discussed the ideas with many others. Although I think I am right, I do not think others are wrong. Why? Because we still have not tested my contrarian ideas. My belief is largely based on my own hypothesising, along with my own interpretation of the available data. The consensus remains. And if new data prove me wrong, I will accept that and don my thinking hat again. That is true scientific scepticism. Compare that to those who claim they are sceptics: they will often have an idea, and incessantly hold on to it regardless of any evidence presented. That is dogma, not scepticism.

To add to this, we are all aware of the odd famous scientists who did literally flip our understanding on its head; people like Galileo, Darwin, and Einstein come to mind (I would also like to shout out to Rachel Carson, less well-known but an absolute science hero in my opinion). So-called sceptics often flaunt these examples to demonstrate that bold contrarian ideas can be right; the fallacy they use is thinking contrarian ideas *must* be right simply because they are contrarian. This is a form of **survivorship bias** because we simply do not hear of all the status quo-flipping ideas that flopped.

Rather tangential, but we often do not hear of the entire group who developed the status-quo flipping ideas either, we just know the face of the idea which gives the impression that lone geniuses randomly change the world. Typically our knowledge and understanding changes gradually and often unnoticeably; much like you cannot see children grow day-to-day but if you did not see your friends' child for a year they would be notably taller than when you last saw them. Equally, Darwin did not publish his theory, and then the next day a new consensus came out; it took years.

3.2.1.2 Credibly wrong

As touched on above, it is important to acknowledge that it can be difficult to identify who to trust. This can be very challenging: people with PhDs or medical doctors can be grade A bullshitters, whilst equally some people with an undergraduate degree seem to understand things better than most. I have two tips to identify these people and one of these will be discussed further later on. Firstly, if they use logical fallacies, dismiss counter evidence (for no good reason), use anecdotes, or appeal to other biases, they are probably not worth listening to. Secondly, ask what evidence would change their mind, and if you can, present them with that evidence (or search to see if others have) and see how they react. If they are legitimate they might critique the study, put it in context, or agree that it adds uncertainty. If they are not legitimate, they might also critique the study (usually poorly, but it is hard to discern that if you do not know how to critique research), or they might dismiss it in some way. Outright dismissal is often a sure-fire way to tell they are bullshitters. For the record, some very big "nutrition gurus" have made statements that no evidence would change their mind. I was quite shocked at their brazenness, but shows they are dogma, not data, driven.

I would avoid trusting well-qualified people *solely* because they are well qualified (**appeal to authority**); rather, ask them what evidence has led them to their conclusion, and what the

limitations are with the evidence. I say this because there are ample bullshitters in the nutrition field with legitimate qualifications, which really rather worries me. Dig to find out their level of confidence; anyone worth listening to will be able to explain where their diet (or whatever their claim is) has limitations or unknowns. Ask why that evidence convinces them more than other evidence. For diets, I also notice legitimate experts are usually rather happy if you were successful on a diet (unless it is outright ridiculous, like those who eat putrid meat); conversely, bullshitters I see quite literally shout people down for their own success if it was not on the diet they promote. Legitimate experts shout people down when they start preaching falsities about why a particular diet worked for them *and therefore* will work for everyone else.

You can also see what qualifications a person holds; often people who are qualified in unrelated subjects (frequently engineering for some reason) seem to think they know about nutrition; I am sure they would not be happy if I explained their subject to them! This is known as **epistemic trespassing**, where you falsely apply your expertise in one field to another field (where they lack the competence and understanding to critically evaluate their stance). The point of seeking this information helps you to assess where that person's strengths are; if they have a PhD in psychology, they are likely more trustworthy in terms of the behavioural side, for example. But apply this within the guidance above, i.e. do not trust someone *solely* because they have a PhD/credentials, but use these credentials to identify their true expertise, along with asking them for evidence (if a PhD in psychology sends you a cell signalling information, you might be more inclined to question whether they truly understand that research).

Lastly, in terms of credibility, people often say if someone has a book/product/service to sell then they will be focused on that rather than evidence. On the whole, this does generally seem to be true, but I would avoid using this as a rule. Conflicts of interest are a form of ***ad hominem* fallacy**; just because something *looks* like a conflict does not mean it is. For example, I have received funding for my research from industry, government, universities, and philanthropists. None have ever told me how to design my study, how to analyse my data, or what to publish. Despite me finding things that might be perceived to go against their 'agenda'. But if you see who has funded me, you might wrongly assume there is a conflict.

3.2.1.3 Credibly correct

Why should you trust experts though? Well, simply, we dedicate our lives to understanding something in more detail than anyone else on the planet. We then combine that understanding with everyone else's ridiculously in-depth understanding. Have you ever tried to (critically) read everything that has ever been written on a topic before? That is literally what scientists do…cram their head with all the current information to work out what we are missing. Beyond that, we do not really spend time learning facts, which I think many people think we do. Rather, scientists *create* facts (knowledge); they conduct research so we can understand something about nature that we did not understand before. This is incredible complicated to do, and requires innovation and in-depth understanding to do well.

To demonstrate, I will talk you through a bit of my research journey. The intention is to show you how much work goes into absolutely everything. Multiply my story up to everything we know in the world and you can see how amazing this can be.

At the time of writing this, I had spent seven or eight years, across two Masters degrees, a PhD, an honorary postdoctoral position, and many hours of my own time focusing much of my research into understanding whether or not AVP (remember: this hormone increases

when you are dehydrated) increases blood sugar. I think a couple of other groups in the world were also focusing their research on this too (hard to define groups, as we all mingle a bit!). We still do not have a clear answer; rather we have more data in different contexts so our answer of "it depends" is now much more nuanced than it was a decade ago. In total, my research into this has cost about £90,000, whilst others have spent substantially more. I still find research papers I did not know existed which add a new layer to my understanding. Imagine spending nearly a decade answering one simple question and during that time the answers you get just raise new questions.

I can imagine it is difficult to comprehend how it has taken so long for a "we still do not have an answer". To get to this stage, we had some theory about AVP and blood sugar. Someone then infused AVP directly into peoples blood, and their blood sugar increased (Spruce *et al.*, 1985). More recent research has infused salty water (hypertonic saline) which should cause AVP to increase; they also found blood sugar to increase (Jansen *et al.*, 2019). Surely that is the answer then, no? Well not really—how often do you have AVP or saline infused into you before eating? Probably never. Other groups stopped people with diabetes from taking their medicine and made them not drink any fluid for a few days; their blood sugar went up too (Burge *et al.*, 2001; Johnson *et al.*, 2017). So far, dehydration seems to be harmful (contrary to the narrative I spun in Part I)!

Some more studies came out using lots of different techniques, broadly agreeing that dehydration is not good for blood sugar regulation (reviewed in Carroll & James, 2019), but then one of the studies I ran showed dehydration did *not* affect blood sugar, even though we increased AVP by about five-fold (Carroll *et al.*, 2019a). From this, I proposed AVP was not the reason for the blood sugar increase in those with diabetes (rather it was another mechanism from the medication withdrawal), and I claimed that other studies did not represent what happens in real life. You can see this has been quite the (geeky) rollercoaster. But each study added something new in its own context, and we need to understand those contexts in order to accurately give guidelines on this. In keeping with the context of the book, remember this story is vastly oversimplified, a taster into how the evidence-base is created for a relatively simple question. Yet I see diet gurus, conspiracy theorists, and bullshitters make wild claims based on YouTube videos and random Facebook posts without any care or appreciation for the amount of work that goes on to actually produce knowledge and understand the world. **Ultimately, this is insulting for the people who believe them because it demonstrates how little the bullshitter cares for the victims of their bullshit.**

I lastly want to demonstrate the beauty of idle curiosity with a scientific mind. Maths done in the 1700s by Euler is now part of the maths used to make quantum computers work. That to me is magical. But we can also consider how different the world would be if Tesla did not manage to get his alternating current idea to take hold, or if we never found natural gas to power our electrics and create the plastics used for many of them, or if wars did not occur which gave us huge insight into things like nuclear reactions and atoms. All of these ideas in some ways are unrelated, but collectively have created the world we know today. And they are all predicated on people's curiosity to know as much as possible about one particular thing.

Overall, I can understand the difficulty of trusting experts, especially in health sciences. Most of the public understand health sciences through the media and perhaps politicians, but mostly through their own lived experience. This gives an incredibly inaccurate interpretation of what the science says. For most part (nutrition) scientists have strong consensus based

on **consilience of inductions**, and if there is doubt, we follow the precautionary principle based on our best current evidence and theory. Unlike dogma though, evidence changes, so sometimes consensus changes; the frequency of this is subject- and context-specific. We have seen with the coronavirus pandemic that evidence for measures like mask wearing changed rapidly (over the course of months); the fact guidance changed demonstrates that the scientific process is working. This level of uncertainty plays into our feelings of lack of control, so it is understandable that the public lost trust in scientists when it seemed like scientists were making things up on the fly. Scientists are used to this and usually consensus change takes time; this situation all happened in real-time during COVID-19 and the public saw what usually goes on behind the scenes. We see this behind-the-scenes action in the public a lot more with things like nutrition science though as it is often of immediate public interest (albeit, not necessarily public need).

3.2.2 Finding and evaluating evidence for yourself

Whilst I put my trust in scientists for knowing things about their field, I fully appreciate that sometimes you want to see the evidence for yourself. Finding and evaluating evidence effectively is no simple task; if it was, there would be no need for teachers, researchers, and degrees! Because it is not simple, I really do recommend listening to those who research the field first and foremost, looking out for any tricks above they may be using as a start in order to help identify if there are red flags with the person you are listening to. To give this some perspective, when a physicist claims that particles of light can act as both particles and waves (the infamous double slit experiment), I imagine you trust that. Further, I imagine when they explain it, you appreciate the explanation is simplified, and if you read the papers about it you would not tell the physicists they are wrong, because you would appreciate that any understanding you have is comparatively superficial. Hence I advise to apply that principle here, even if you think health sciences is easier (it is not, it is just difficult in different ways!).

Often though, it is more empowering to see things for yourself. The problem here is that we are all full of biases, and only a handful of people are properly trained to evaluate the evidence. So below are a few tricks to help you actually do your own research, properly. **I do however, want to emphasise that this is a simple guide and is not a replacement for decades of work undertaken by legitimate researchers.**

I say that because (as mentioned above) there is a tendency when evaluating evidence to transfer one's skills (**epistemic trespassing**). The field of nutrition for some reason attracts engineers. I have heard engineers claim that they are well qualified in nutrition because: they are trained in science/the scientific method; they understand systems thinking; and they know how to evaluate evidence. All of this is true, but *only in the context of engineering*. It would be absurd if I claimed to know how to build a bridge based on my nutrition PhD, because, after all, I understand science, systems thinking, and evidence evaluation. Different sciences require difference skillsets, are based on different philosophies, and combine evidence differently to determine strong and causal relations. So unfortunately, your engineering, maths, clinical psychology, geology, physics, politics, etc degree is unlikely to be particularly useful *in this context*, just as my nutrition PhD is worthless if I was to teach a maths class, help a patient with mental illness, analyse rock formations, use an electron microscope, or review political white papers.

The reason I highlight this is because nutrition research is uniquely complex, as with any science. In nutrition, it is very difficult to isolate factors. For example, if you want to understand the effect of carbohydrates on cholesterol, you need to consider how changing

carbohydrates affects other relevant factors. If you increase carbohydrates, then you also increase calories, and more calories in a diet causes weight gain and weight gain increases cholesterol…so perhaps you need to keep calories the same. The next option then is to change the amount of other nutrients (fat or protein). Let us say you decide to keep protein the same, but you reduce fat, so now calories are the same and carbohydrates are higher, *but* fat is *also* lower. So any effect you find might be because of (a) higher carbohydrate intake; (b) lower fat intake; (c) a combination of both higher carbohydrate *and* lower fat intake; (d) something else, like the other nutrients that also get consumed with higher carbohydrates/lower fat, e.g. more fibre or phytochemicals. So whichever study design you choose, you will be answering a slightly different question. The complexities of this are endless by the way, the above was a very simple example.

A slight tangent before continuing: I see a lot of bullshitters say to people "evaluate the evidence for yourself". I take some issue with this phrase. The way I have most often seen this used is the bullshitter has set up a **false premise** and **primed** the "victim" to believe their particular narrative. It is sometimes accompanied with evidence (perhaps even **gish gallop**) which has been **cherry-picked**, so if the reader does "evaluate the evidence", they are more likely to evaluate a biased sample of the evidence. This acts to **confirm the bias** that has been **primed**.

My issue also arises because the reader is obviously not an expert. In the case of diet books, nutrition experts do not (or at least, should not) read these to inform their opinion on a topic. So you are usually reading a diet book because you have acknowledged in some way that you do not have expertise in the subject. In other words, you buy a book exactly because it is not within your skillset to interpret studies and synthesise vast swathes of information accurately. As such, "evaluate the evidence for yourself" (or similar) is a nothing phrase, but helps you feel confident in what the bullshitter is saying ("I have nothing to hide because everything I say you can verify"). In any debate, the **burden of proof** is on the one making the claim (**onus probandi**); I have claimed water is bad for you, it is not <u>your</u> job to confirm that. If my stance was valid, I would not need to use a whole host of fallacies and tricks to present my perspective. Therefore, I often feel "evaluate the evidence for yourself" and "do your own research" type remarks in themselves are a trick used to get you to believe the bullshitter ("they must be confident in their knowledge because otherwise they would not want me to evaluate this myself"). Bullshitters in this case are playing to ignorance. This to me is often a red flag for bullshit; after all, have you ever actually gone and checked the evidence for yourself, or did you feel reassured what you heard was true solely because someone said you could look up their claims for yourself?

Ideally, you should start with a completely open mind which can be shaped by quality evidence. By "open mind", I mean one that is open to new information, yet still appropriately critical for all claims. However, particularly in health sciences, we already have a wide array of opinions, often shaped by the media, friends, or even our own experiences. So starting with a blank slate is somewhat an impossibility. As such, as I described previously, my first tip is to ask "what evidence would change my mind?". If your answer in any way alludes to "nothing" then the first step for you is to acknowledge your bias. If you cannot get passed this sentiment, then you will follow an ideology that suits you regardless of the evidence. Inherently, there is nothing wrong with that if you are content in following an ideology and do not profess your ideology as a one-size-fits-all absolute truth. As such, it will not matter if you do any research because your mind is made up. If you answer the question with an idea on what kind of evidence would change your mind, then that is a much better place to start.

Once you have an idea in mind, we then need to look for this evidence. The information I will give you should help you find the best available evidence. The starting point here is understanding what information you want. This is known as formulating a research question and is incredibly important to help you identify information. For examples sake, let us use an example from this diet: you read somewhere that drinking water is unhealthy and you want to find out if that is true. It is important to recognise here that research studies are very specific, so our initial task is to dig down to understand exactly what you are interested in.

Accordingly, when formulating a proper research question, you need to be specific; terms like "health" (or "unhealthy") are very vague, no one really does a study to find out if a diet, nutrient, intervention, or drug affects "health". So rather than "health", you need to identify what outcome you are actually interested in. Health means different things to different people, so maybe this means blood sugar, cholesterol, inflammation, appetite, weight loss, mood, mental illness, skin tone/wrinkles, bone health, kidney health, cancer risk, diabetes risk, stroke risk, etc. You may wish to specify a time frame (acute/short-term or chronic/longitudinal/long-term) and add "human" in your search to help prevent animal research coming up. All the terms in your search should be specific. So rather than searching "is water healthy", we can narrow down our term to specific key words: "plain water type 2 diabetes humans"; "dehydration blood sugar humans"; "water intake glycemia humans". You might have to try a few different searches!

Note that we only include key words and we do not need punctuation. We also want to avoid any leading words, like "lower" as this might bias our search towards finding what we want to see. You may also need to investigate other words for what you are looking for. For example, in the water and diabetes literature, scientists have studied "diabetes risk", "HbA1c", "hyperglycaemia", and "gluco-regulation". If you are not sure on alternative words, try https://www.powerthesaurus.org/ (I am not sponsored by them!). Finally, you may need to specify the population you are interested in, for example "healthy" "children" "lean" "obese" (note: "healthy" works *in this context* because if researchers often screen for diseases that they want to exclude and call the resultant sample "healthy"); specifying this helps ensure the results are relevant to you. I would add these in if your initial searches are coming up with research in people who are not like you (for example, if all the research is in young male students, and you are a postmenopausal woman, the results may not apply very well to you).

But where will you type this? As with any other question, we can use a search engine. There are some special search engines specifically designed for research (e.g. PubMed), but for most people, Google Scholar (https://scholar.google.co.uk/) is simple and familiar enough to use (I am not sponsored by Google in any way either by the way!), though feel free to use other *academic* search engines too. There are several functions you can use on these search engines for advanced searches which you can look up if you need, but for basic searching this will largely be unnecessary.

Type into your academic search engine of choice your key words/phrases. Before hitting search, my first port of call is to add the phrase "cochrane review" to the search (if nothing comes up, I replace "cochrane review" with "meta-analysis" and failing that, I also try "systematic review", or just "review"). So my first four searches might be:

1. Plain water type 2 diabetes risk Cochrane review
2. Plain water type 2 diabetes risk meta-analysis
3. Plain water type 2 diabetes risk systematic review
4. Plain water type 2 diabetes risk review

Cochrane reviews are typically regarded as the top-level evidence we have in health sciences. They systematically review all known literature on a topic and tell us what our current best evidence states. These are often what medical guidelines are based on. Meta-analyses and systematic reviews are of similar quality evidence, though one benefit of Cochrane reviews (which are systematic) is that they have and easy-to-read summary so you do not need to be an expert to understand the *key* findings (remember: you may still not fully understand the details/nuances!). Reviews are also excellent sources but can have some bias. This bias stems from them not being systematic. "Systematic" means the way research included in the review has been found in order to be included in the review is (theoretically) unbiased, and (theoretically) every *relevant* piece of evidence should have been included.

If you find a Cochrane review, systematic review, or meta-analysis then you will more likely than not have found your answer. If there are multiple papers you find, *probably* the most recent one is the best one to look at as this should include the most up-to-date research (on Google Scholar there is an option to select the year so you just get the most recent papers). If you want to get more technical, you can look at the search terms each review uses (found in the methods section) to find out if one of the reviews is more relevant to what you are interested in. For example, if they only looked at studies of less than 2 weeks duration, maybe you want to see if another review has looked at longer-term effects. Hurrah though! You have most likely found your answer! Just remain mindful that this answer may change as new evidence comes in; that is science in action, but is also a lesson in keeping an open-mind ready to adapt if needed.

If you find a review that is not systematic, then this will be a good starting point but bear in mind the authors might be portraying an expert opinion. Scientific opinions are often good to build new research and foster new ideas, so this is not the same as someone on social media's opinion. These are often interesting and can include some very innovative thinking, but try and avoid thinking it is a definitive unbiased answer to your question!

If you cannot find any of the above, then it is most likely that there is simply not enough evidence to make any (relatively) definitive statements. As such, anyone making definitive statements is likely filling in gaps with their own opinions. Of course you can continue looking for answers, but I would avoid thinking that any one study gives you an answer; rather each individual study adds another piece to the puzzle. Also bear in mind, that unless you have proper training/experience in searching the literature or doing systematic reviews, the individual studies you find may not be representative of the overall literature. In other words, you may be finding the papers that say one answer but accidentally miss papers that say another answer.

The following advice may be useful if you want to carry on searching for individual studies or to understand any reviews you find better: You may have seen or heard of the hierarchy of evidence. This basically states that opinions and anecdote are the least trustworthy evidence, and systematic reviews are the strongest. Broadly speaking this is true, though I think when you study in-depth, you learn the importance of all types of data and how they all fit together to build the puzzle.

At the stage of just wanting to know what the answer to your question is though, for simplicity, I would recommend focusing on human studies. In other words, try not to focus on anecdotes on the internet, animal research, or cell (*in vitro*) studies. Anecdotes of course are biased and only represent one persons uncontrolled experience (we do not know what they

actually did or other changes that occurred in their life). Animal and cell work is mechanistic. This helps us identify what pathways different interventions may be working along. These are incredibly important and helpful studies, but will not help you to answer your question because they are a tiny bit of a huge puzzle. You want to know what happens on a big scale, when every mechanism is being simultaneously challenged, i.e. in a human like you.

Based on that, you are likely to come across two types of studies: observational and controlled studies. I have described these in Part I and with a bit more perspective in Part II. There are many different aspects to understand about interpreting both study designs; there are whole textbooks about just this topic. I initially wrote some tips for interpreting these studies but I very much struggled because this is incredibly nuanced and complicated and realised I was writing textbook in itself. Instead, below, I have a checklist of key points that you can consider when you encounter a study (Table 1).

I will end this subsection with a cautionary tale. I cannot emphasise enough that this is a *very* basic guide. My aim was to show you some simple things to help you be led by the evidence and evaluate bullshit claims. In short, if you can find a systematic review/meta-analysis, then that is most likely currently our best-evidence answer. If you cannot find a systematic review, then we probably do not have enough evidence to give a confident answer yet so proceed with caution!

Moreover, it is important to be aware that often people can “rote” learn the hierarchy of evidence, and then if we do not have a gold-standard randomised controlled trial, people take it as evidence that we must be wrong. However, some things we cannot run randomised trials for; there are ethical implications, as well as logistical, financial, adherence (etc) problems. It is hard to comprehend these without experience. Further, as described previously, gold standard evidence, including randomised controlled trials and meta-analyses can be conducted poorly, and it takes knowledge and experience to understand those nuances. To make things more complex, sometimes scientists might opt for a non-gold standard methodology because for their particular question, that gold standard is not optimal (e.g. see “blinding” in **Table 1**).

I frequently see those inexperienced in research saying “those researchers should have done X”. This may be a valid idea, but scientists (usually) spend a long time designing and justifying studies to answer specific questions. For example, I spent many months deciding (among other things!) whether in a study I wanted to feed participants two porridge-based breakfasts with the same calories but one breakfast would have fewer oats and 30 % sugar, or whether I wanted the sugar to be added to the porridge. Two interesting study designs, but fundamentally different applications and rationales. Designing that study and another study also required me to define breakfast, which sounds really simple. But somewhere I have something like a six page justification for my chosen definition. More thought than most people realise go into tiny details; hence why I think experience in research for most people is needed in order to be competent at critiquing evidence. Hopefully the tips above will help you more accurately assess evidence, but keep an open but critical mind and ask for help if you are unsure.

Table 1. Key terms that may be in human health/nutrition research papers (note: there are many more specialist terms, but hopefully this helps with the basics)

Term	Definition	Interpretation, comments
OBSERVATIONAL STUDY	Collecting data from people naturally, without interfering in their life	Non-causal. Good to understand behaviours, and often necessary when controlled studies would be unethical or otherwise infeasible
Cross-sectional study	All measures taken at a single time-point	Cannot determine cause and effect (did eating X food actually happen before the health outcome occurred?)
Longitudinal study	Measures taken over several time points	Helps identify cause and effect, because we can see that eating X food happened, and then a disease occurred afterwards
Confounder	A variable that affects both the predictor and the outcome variable	This term is often used to mean any variable that might affect the relationship between the two variables (X food, and Y disease) we are interested in. in papers, these will be "adjusted" for, and this essentially "removes" the effect of these confounding variables so we can see the independent effect of the food we are interested in on the disease/outcome
INTERVENTION STUDY	When we interfere with people's normal lives by telling them to do something differently (e.g. drink a litre of water extra per day)	These are usually classed as causal studies (though not always, depending on other study design factors). In an excellently designed intervention study, in theory, participants should start the study with the same risk of whatever outcome we are interested in, then the only difference becomes the food (or whatever) we tell them to change. If one group ends with lower risk or better outcomes, we can be more confident that it was because of the food/intervention. These are typically more reliable than observational studies, but may lack real world applicability, depending on how the study was run
Randomised controlled trial	Randomly allocate participants to an intervention or a control/comparison group.	This helps ensure we would (by the law of averages) end up with two groups who had roughly the same risk of getting the outcome we are interested in by choosing at random which participant goes into the intervention group and the control group.
Blinding	When the participants (single-blinded), participants and researchers (double-blinded), or participants, researchers, and statisticians (triple blinded) do not know who has been allocated to the intervention	This is generally a good thing as it helps prevent any subconscious bias kicking in; if you think a drug is going to work, then it more likely will. In blinded studies though, you will not know if you get the drug or not. However, in many nutrition studies, blinding is impossible, or may even be inappropriate. Knowing you are doing an intervention may naturally change behaviours which may skew the results (e.g. common ideas that eating breakfast is healthy might subconsciously change participants' behaviour if they are in a study and have been told to eat

		breakfast). This skew might be interesting and relevant to your question, or it might interfere with your findings.
Crossover	A type of randomised controlled trial, but here the participants do both the interventional *and* the control trials. If it is a *randomised* crossover study, whether each of the participants does the intervention trial first is decided at random	Improves our causal inference in many cases, as now we can compare what happens to each participant compared to themselves, rather than compared to another group. In some areas though, these designs can be weaker than running a randomised controlled trial, for example, assessing some aspects of appetite.
Power calculation	How the number of participants required for the study is determined	Typically we look for equal to or higher than 80 % power (also written as $\beta = 0.8$), and significance at equal to or smaller than 5 % (also written $\alpha \leq 0.05$, or $p \leq 0.05$)
Intention-to-treat	Where the researchers include the data of *everyone* who started the study, regardless of how well they stuck to the protocol	This is good if you want to know what happens in the real world, because in the real world people may not stick exactly to the protocol researchers tell them
Per-protocol analysis	Where the researchers *only* include the participants who completed the study *exactly as the protocol stated* in their data analysis	This helps you understand "if I stick exactly to this diet, what is the most likely response?". However, this does not tell you the overall outcome if people do not manage to stick exactly to what the researchers did.
Control group	A group that does not receive the intervention, so is used as a comparison	This gives us a comparison, so for example, we can see if our intervention causes higher or lower diabetes diagnoses than the control group. Control groups might be doing nothing; getting a placebo (pretend) intervention (e.g. a fake supplement); an attention control (where both groups might get group nutrition counselling, but the intervention group *also* gets the intervention like a personalised diet plan or something); or best practice (this is usually in drug trials, where researcher pit the current gold standard drug against the new drug to see if it does a better job with fewer side effects). In nutrition, you might compare against another diet, like the standard American diet or the dietary guidelines. Other times you might manipulate behaviour, like breakfast eating (intervention) *versus* breakfast skipping (control). Control groups are very important to understand the context in which the intervention makes sense. As such, there is no absolute best control group as it depends on the study design and aims

3.2.3 Helping yourself

The above is quite technical, and sifting through evidence is a hard task most people do not have time for (which is why it is some people's jobs!). Often we simply hear about new diets and want to try them, and I think there is generally speaking no problem with that (of course, check with a health professional first). So here I want to give you some information about how diets and weight loss work to help you identify what is best for you. Please note, once again, this is not extensive. I just feel it is only fair to give you something tangible to take away to help with your weight loss and health journey.

In Part I, I outlined the idea of energy balance. Fundamentally that is the crux of weight loss. You need to burn more calories than you consume. This is known as calories in-calories out, or CICO. When calories in is less than calories out, you are in negative energy balance. Thermodynamics dictate this, so if you disagree, bring it up with physicists! The problem I often see occur is that CICO is misinterpreted, so when nutrition scientists say CICO, bullshitters say that CICO does not work for them. This rebuttal makes zero sense—it is like saying gravity does not work for them because they fell up the stairs. When you get deep into these conversations, you realise that what people seem to mean is that counting calories did not work for them, and instead they found a diet where they naturally ate an amount that aided weight loss, without feeling hungry.

That is of course the ultimate goal; importantly though, this does not violate CICO. And unfortunately that leaves us in the rather boring and unsexy place of saying any diet in which you eat fewer calories than you burn will result in weight loss. I will explain below a few reasons why this does not always *seem* to be the case. But if you burn 2000 calories a day, whether you eat 1500 calories of chocolate, onions, or pasta, you will lose weight.

There are many diets that can achieve this negative energy balance. I have outlined some of the more popular ones in Table 2. Beyond weight loss, we also (usually) want to consider our general health too. As such, I think there is an element of common sense involved. If a diet is overly restrictive, does not supply you with adequate nutrients (particularly if you do not want to supplement), or obviously goes against what we know about health, then probably avoid that diet. Of course, personal ethics, availability, costs, and time considerations need to be factored in to help you make the right choice that is sustainable for you.

Some diets sound convincing and full of science, like the alkaline diet. But if you use the search tips I gave above, you will see that there is no good evidence that these do anything beyond what would be expected (and that has nothing to do with "balancing your pH"). If you read about a diet that says the diet works in any other way than reducing your appetite and creating a negative energy balance, that information is probably bullshit. The diet may still work, but not for the reasons you read about. It always comes down to CICO.

Rather paradoxically, some bullshitters openly acknowledge the lack of evidence, yet claim their diet is effective. For example, at the time of writing, to my knowledge, there are no long term (more than six month) randomised controlled trials of high fat low carbohydrate (less than 50 grams per day) diets compared to low fat high carbohydrate diets with matched protein between the groups on weight or other health markers. At the lack of this level of evidence, how can anyone claim superiority of the high fat low carbohydrate diet long-term with such absolute confidence? Hopefully lessons learnt in Part II will be helpful in sifting through such claims.

This is often the case for most diets to be fair. That does not mean the diet has no utility, it simply means that we do not know without bias what the unique risks and benefits are. This also does not mean that people have not been successful on an unproven diet either. Again, it means we have far less confidence that the benefits they saw were because of the specific diet (would they get the same results on another diet?), nor do we know other factors or their level of adherence to make generalisable claims about their experience. Of course, if you are on a specific diet, and it works for you, that is great! But that does not mean the diet is unique, that it will work for everyone, or that it has no risks.

There are lots of arguments between nutrition scientists/professionals and nutrition bullshitters. This really gives the impression that the evidence is not clear on what makes a good diet in terms of health and weight. Between the legitimate professionals though, there is a strong consensus; assuming the same amount of calorie reduction compared to calorie burning, any diet will have roughly the same effect on weight loss. There are some nuances, for example, weight loss during low carbohydrate diets is initially quicker than high carb diets because much more water is lost (carbohydrates are stored with water in the body). Equally, fasting may mean you lose a bit more muscle and less fat. High protein diets burn more calories getting the energy from the food compared to high fat or carbohydrate diets. The differences in weight loss between diets are nuances and will not define your weight loss success or failure *per se,* particularly long-term.

Table 2. Things to consider when deciding a diet

Diet	Premise	Pros	Cons
Continuous energy restriction	The classic weight loss strategy: eat fewer calories every day	Helps preserve lean (muscle) mass so nearly all weight lost is fat Flexibility to eat whatever and whenever you like	Some people find this hard to stick to Required to estimate calories (nearly) every day
Fasting	Skipping meals, eating within a specified time window, or eating very little/no food a few days per week	Some people find complete avoidance of food much easier to manage We do not usually fully compensate for lost calories when we do eat Flexibility to eat freely on non-fasting days	Potentially unsociable Evidence suggesting this maybe increases the rate of muscle loss compared to continuous energy restriction (so you lose more muscle during weight loss)
Low carb/keto	Consume very few carbohydrates (figures vary, but usually less than 10 % energy from carbohydrates), moderate protein, and high fat	Seems to cause a spontaneous reduction in hunger and appetite More rapid initial weight loss (from water losses, not fat losses though)	Potentially unsociable “keto flu” (short term feeling of unwell) Often animal product heavy (ethical/environmental concerns, though you can do low carb plant-based) Very restrictive Cost? May increase LDL cholesterol (associated with higher risk of cardiovascular diseases), especially if high in saturated fats
Meal replacements	Shakes that contain all essential nutrients, consumed in place of meals	Convenient Easy to follow	Unsociable Restrictive
Plant-based	Completely or partially avoid animal products	Many established health benefits of plant-based diets More widely accepted so less unsociable? Ethical/environmentally less damaging than other diets	Potentially unsociable Restrictive Cost?
Weight loss groups	Group-based support (e.g. Weight Watchers) often with their own programme for weight loss	Support network Often designed to be easy to follow/not unsociable	Cost Time commitment

If you need to lose weight though, most differences between (relatively sensible) diets are overall negligible and the weight loss will bring health benefits most likely counteracting any health detriments. The caveat here is assuming the diet you have chosen meets your nutrient needs; of course if you only eat 200 calories of crisps per day and nothing else, I would anticipate long-term health problems (mainly from nutrient deficiencies), despite the weight loss.

In terms of overall health, there is a general consensus that a mostly plant-based diet, with occasional meat and fish (a couple of times a week) and limited highly processed/junk food seems to be optimal. But I think it is important you find a sensible diet that suits you. For example, some people can easily skip breakfast, others cannot function without breakfast. If the latter is you, then any diet whereby you are skipping breakfast will be unsustainable.

Ultimately, your aim here is to find a way to consume fewer calories comfortably and sustainably. This can be from various methods which are more effective for some people than others:

- Skipping a meal/meals (e.g. fasting)
- Reducing particular macronutrients (e.g. low carbohydrate diets)
- Reducing food choice (e.g. vegan diets)
- Focussing on filling foods, typically higher in fibre and/or protein (e.g. whole-food plant-based diets)
- Making any other arbitrary rule that makes eating a conscious decision (e.g. “if I eat a snack, I must also eat a fruit”—this acts to make you think about whether you *really* need that snack, whether you are *really* hungry or not) or streamlines your decision making (e.g. no snacking)

Some people find keeping a diet diary and frequently weighing themselves helpful, for others this is demotivating, and in others this may trigger unhealthy relationships with food. Some people need to allow themselves a sweet treat, others find avoidance the easier option. Some people like to gradually make changes to their diet, others like to start all-in. Some people like restriction and cheat days, others find more balance every day is better. You know yourself better than anyone else, so find out what you do and do not like, what you think you can and would struggle to do, try it, evaluate, and adapt as needed. If you find a diet that is sustainable, and where your weight is going down as you would like and/or your health markers are improving, then congratulations: it seems like you have found a great diet for you!

3.2.4 Things to look out for

In saying all that, weight loss is not easy, and maintaining that weight loss brings extra challenges (hence why finding a sustainable diet is important). So here I want to help you identify tricks you may come across, either when looking for diets that you want to try, or during dieting/maintenance.

When looking through diet ideas, bear in mind **survivorship bias**, and that weight loss itself often causes improvements in health, and not necessarily due to the particulars of the diet (**incorrect attribution**). We discussed **survivorship bias** above, but as a recap, this is when you only hear the success stories which gives the impression the diet works all (or most of) the time relatively trouble-free. With **incorrect attribution**, what happens is that people lose weight on a particular diet and their health markers also improve. The person then wrongly attributes all the successes (weight loss *and* improved health) to their particular

diet. This is why we need studies; well designed studies help us understand the unique effect of different diets. In this case, how do we know whether that person would have had the same, worse, or even better results on a different diet? How do we know if those health improvements would have happened on the same diet without weight loss?

A nice example of this is the "Twinkie Diet"; a nutrition professor put himself on a low-calorie diet consisting mainly of Twinkies (plus some meat and a multivitamin each day). By the end of the diet, he had lost weight because he ate fewer calories, *and* most of his health markers also improved. You might be thinking this is absurd—how can a Twinkie diet be healthy? Well you are correct of course, it is not healthy. But weight loss, particularly in those with overweight or obesity, *does* improve health. And CICO *does* work! I am hoping you spotted this is another well-controlled **anecdote**, but imagine if you read this on a website, and instead of Twinkies, it was called the raw food diet, the alkaline diet, the low carb diet, or any other fad diet. **How convincing would that have been?**

A third factor which may need to be considered is called **regression to the mean**. I think this is most relevant when people peddle things like supplements. Regression to the mean is simply that in everyday life, we fluctuate around our "average"; if we take a measure that is an outlier, a future measurement of this will likely be back to average again (i.e. it regressed back to the mean or average value). With supplements we can kind of see this: if I have a cold, and I take vitamin C, then a few days later my cold has gone, some people will think this is evidence that vitamin C helps get rid of colds. But we can see our cold as an outlier, which means over time, we will regress back to average (healthy). As with **incorrect attribution**, how do we know the cold went away *because of* the vitamin C, or because it would have gone away naturally anyway? In this case, colds usually go away in a few days naturally…this is why we need controlled studies!

The next thing to bear in mind is we are generally pretty terrible at estimating our energy needs. People often underestimate how many calories they eat, and overestimate how many calories they burn through exercise, and then wonder why they cannot lose weight. Whether or not you decide estimating calories is the best way for you, you should still keep this point in mind. If you are not losing weight as expected, then your CICO is not negatively balanced, so you need to reconsider your eating and exercise plan; either your appetite is not being suppressed enough, or you are inaccurately tracking calories in and out. Don't worry, everyone struggles with this!

To help with weight loss, Dr Kevin Hall and his team from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) in the US, have done some amazing work to understand what happens metabolically when humans lose weight. From their work, they have created a body weight planner which can be found here: https://www.niddk.nih.gov/bwp

This can help you estimate how many calories you burn each day, and how many calories you should eat per day in order to reach your weight loss goal in the time frame you set and also how many calories you should eat to maintain that weight loss. The trick here is that as you lose more weight, the less energy you need to just exist, so your energy needs go down; Hall's body weight planner understands this and factors it in.

I have mentioned weight maintenance there, and this is worth discussing. Most people can indeed achieve their weight loss, but after around 6-12 months (usually), weight loss slows and weight regain can start to occur. This can make people feel like the diet is failing, or they should give up. Be reassured to know that this is simply physiology, so do not despair! To

mitigate this, you may want to reassess your calorie intake to ensure this has not started to creep up again (this is common), and/or check that you are eating the right amount for your new (lower, yay!) weight. You should also congratulate yourself for getting this far—far enough that you need to reduce your calorie intake to account for having a lower body weight (assuming a lower body weight was your goal)!

To further help avoid this problem is exercise (if you are able to of course!). Exercise has consistently been shown to aid with successful *maintenance* of weight loss. There are also health benefits, like helping to maintain your muscle mass. If you are on a weight loss *and* health journey, I would emphasise that if you can, get into as many good exercise habits as possible. Really hammer in these behaviours so they do become habitual. As with diet though, find something you enjoy and can maintain!

If you cannot exercise for any reason (or it is simply something you are not motivated to do), then do not despair either. Any physical activity is helpful. Unlike exercise which is structured and planned in some way, physical activity is simply any activity you do, from scratching your nose to full on exercise. Particularly when humans stop eating (i.e. fasting), their physical activity lowers compared to when they do eat. To give an example, in one study where lean participants either skipped breakfast (no food until after midday) or ate breakfast (700 calories before 11am), light physical activity burnt about 400 calories per day *less* in participants who skipped breakfast (Betts *et al.*, 2014). This activity was specifically during the fasting period (before midday) so is likely caused by the lack of food.

So when reducing your calorie intake, you should be generally mindful of your physical activity. This means taking note of the smaller actions if you can: take the stairs, park further away from the shops, get off the bus a stop or two earlier, stand up frequently if you have a desk-based/sedentary job, generally fidget or and any of the small activities you did before you started dieting. All these little activities can add up to help keep the weight off and improve your health, but a lot of them occur subconsciously. Hopefully being aware that these activities really add up will help you keep small do-able activities in your mind where possible.

On top of all this, I think a bit of planning can also help people. This includes planning the diet, but also planning for difficulties. We all have bad days, and these bad days in many people can trigger a downward spiral that undoes all the previous weeks or even months of work. So maybe plan what you will do if you have a day that does not follow your diet as planned: will you write the day off and start again the next day, will you skip your next meal to make up the calories, or something else? Think about how you will feel about each of these options, and what approach would be most conducive to your long-term success (the odd off-day should not make or break your long-term success—though bear in mind that one weekend splurge can undo a whole weeks worth of calorie deficits, so don't deliberately go too over the top too often!). Will you have friends or family you can call on to hold you accountable, or support you through this?

In short, I think it is important you find a way to achieve negative energy balance in a way that works for you, that within this you plan to be flexible as your desires and body changes, and that you plan in advance for when things go a bit wrong.

I will finish this section with a note about the crossover between nutrition science and bullshit/conspiracy theories. Many of the diet fads have quite avid followers who refuse any

form of evidence. Honestly, some of these conversations are conspiratorial. So I think it is worth addressing this here.

Claims I frequently see/hear, and why they are not true, include:

- "No one is researching this [diet secret]": This is possibly true for some ridiculous diets, but if the public show an interest in a diet, researchers will follow suit. Vast sums of time, money and effort go into things like fasting, low carbohydrate/ketogenic diets, macronutrient manipulation, meal timing, etc. These projects range from the behavioural side, to the health response, to the cellular level looking at gene expression. Hopefully, using the research skills outlined above, you will be able to assess whether claims like this are true or not
- "[Diet secret] is being hidden": This is odd because this often follows the previous bullet point. Much research now is registered before it starts on clinicaltrials.gov (or another trial registration website). You can therefore look up studies to see what studies are about to be conducted, or are currently being conducted. If studies have been registered as completed but the results are not available, then perhaps there is reason to ask why they have not been published (usually it is time/resource related, and/or they might be in the process of publishing the study so avoid jumping to conclusions immediately!)
- "We were right all along about [diet secret]!": This often rears its head when a new study comes out that can be interpreted to support their diet "secret". In science, before you have data, you have a hypothesis (an idea). When you have a hypothesis, you cannot claim to know anything extra than anyone else, because you have no data to support your ideas. So, if these bullshitters *knew* they were right, either they were hiding data (unlikely), or what they mean is "our *hypothesis* now has some extra support". The level of certainty in bullshitters is a big red flag, but claiming to know something before we have data is a whole new level of arrogance and ignorance

3.3 Final comments

If you have gotten this far, I think you will agree this diet has been quite the journey. If all has gone to plan and you did not know what this diet was about, what I am hoping happened is the following journey: you believed in some capacity the contents of Part I; you then got a bit angry in Part II and maybe even tried to justify why some bits of Part I are still true (to be fair, some of it was true), this all made you quite uncomfortable; and then Part III probably added to that anger and discomfort but hopefully helped you reflect. Ideally, this would have helped you reflect on lots of beliefs, but realistically I imagine this might have more of an impact with new information you come across in the future (not just about diets).

I imagine there is also some disappointment that I have not offered an actual diet *per se*. I am sorry for that, and for misleading you. As I stated in Part II, it was important to make you believe some bullshit first. The reason is that if I critique someone else's bullshit, you can claim I am being nit-picky, biased, closed-minded, and/or a range of other things to discredit my critique. Since I have critiqued my own bullshit, hopefully you can see how easy it is to spin a narrative and make literally anything sound convincing (including that drinking water actively dehydrates you!). Additionally, if I critique others bullshit, or simply explain cognitive biases to you, you can always deny that you would have believed that bullshit, or claim that you would be immune to experiencing these biases. Thus, again, I felt it was important for you to actively experience the biases for yourself.

From all this though, I hope I have saved you time and energy getting sucked into a diet for bullshit reasons. Hopefully you can see that any successful diet will be due to achieving negative energy balance, and hopefully you now have some skills to identify which diet might be most effective *for you*.

Considering this journey has been a bit cruel, I do want to offer my expert opinion The Watertight Diet. I apologise this will be wholly unexciting. I do not think we have enough evidence to dictate how much we should drink for *optimal* metabolic health and to reduce appetite. Bar a few pathologies, overall I do not see evidence of harm from drinking a bit extra water and avoiding thirst. Whilst I did show you some research that demonstrated high post-meal blood sugar when drinking water, it is unlikely that this will cause long-term harm; particularly considering the evidence that people who drink more water are generally a bit healthier than those who do not (this could be for a multitude of reasons, but if drinking water was powerfully harmful, we would likely see hints of it in these data).

Evidence of harm from not drinking enough is also weak but there are some suggestions drinking less could be harmful for your kidneys/urinary tract, and perhaps some other hormonal changes that occur. We need to await further research before being confident in these ideas though. In terms of appetite, despite the animal research of dehydration-induced anorexia, human evidence does not seem to support this (though personally, I think it might be true in cases of proper dehydration—that is very much opinion, not evidence-based though!). Hydration status appears to play little if any role in human appetite. Drinking water before meals seems to reduce energy intake particularly in older adults; considering this group often suffer malnutrition, under-eating would be undesirable in this instance. As such, I support the guidelines, but do not think they are based on strong quantifiable evidence of benefit; rather they are based on our best ideas on reducing harm. This is my expert opinion though, and will change if new evidence comes out; equally, as evidence is sparce, I know some hydration researchers disagree with my position and that is absolutely okay!

I do want to be really clear though. I am not convinced that many, perhaps most, diet gurus and other bullshitters do any of this deliberately. If they did, they would more likely be liars, not bullshitters. I am sure some do know exactly what they are doing, but I doubt that is the majority. Unfortunately, I doubt that is a statement that could ever be backed up by evidence (who would admit they are selling a lie?), which makes things so much more difficult, because the bullshitters truly believe their bullshit. Their narrative is strong and in many cases part of their identity; biases kick in and critiques cannot be handled maturely.

Unlike bullshit which can be subtle, simple to understand, and intuitive, unfortunately, the scientific method seems cold, detailed, and often goes against common sense and intuition. It is important to recognise that science is not a list of facts; during your research training you are taught how to be critical so you can evaluate your own studies. You are not really taught any facts *per se*. **Science is a process of systematically testing an idea whilst removing as many sources of bias as possible. Why anyone would object to that will forever baffle me**. But this inherently makes it unattractive.

With more evidence, our understanding of bias improves, so we adapt our methods to test a different perspective, we refine our consensus, we change our minds. It is inherently uncertain. Bullshitters use this uncertainty against scientists (**inflation of conflict fallacy**), particularly if new evidence comes out to support the bullshitters' claim. This is another one of the many **contradictions** bullshitters peddle: their ideas are infallible and certain, yet

often lack strong evidence. Scientific consensus is built on lots of evidence, yet is often portrayed (rightfully) with a level of uncertainty.

As such, I hope I have given you some awareness of how these tricks work, and some understanding on how to assess claims. Whilst you might hate me for all the tricks I have played on you to demonstrate how others trick you, I hope this information will help prevent you from being led astray in the future. If I have achieved that, then I think that is success. And if you do read a diet book, and decide to follow their plan, I hope you can do this based purely on "I think this could work for me", rather than thinking that particular diet has something unique to offer (remember, all diet books claim to offer the same unique thing: weight loss and/or better health).

Ultimately, the truth does not change. What changes is how people tell the truth. If you tell your version of the truth compellingly enough, people will accept it as *the* truth. And that is what makes all this so difficult. Someone could be portraying the truth exactly, but they might convey it using logical fallacies, appealing to cognitive biases, and any other tricks. The use of any of the tricks alone does not mean the information is wrong; it means the rationale to getting to the conclusion is not sound. Equally, someone could convey information without using any tricks and still reach an incorrect conclusion; thus the lack of tricks, fallacies, and biases does not necessarily mean the truth is being portrayed correctly. It is a very tough game to play. There is also a fallacy for this, called the **fallacy fallacy**, whereby it is wrongly believed that just because an argument is poorly formulated, the conclusion must be incorrect. However, **if someone is portraying a truth, based on best current evidence, they should not need to resort to tricks; if they do, they probably do not understand their conclusion particularly well so possibly are not a particularly credible source (even if their conclusion is correct)**.

Overall, I hope you can take from this book a few things:

- ✓ How easy it is to make bullshit sound evidence-based and convincing;
- ✓ What tricks and fallacies you can look out for;
- ✓ How to notice and address your own biases;
- ✓ To trust legitimate experts, especially when the majority are saying the same thing;
- ✓ How to do basic searches yourself;
- ✓ The complexity of even very simple sounding things;
- ✓ And to not think one person's success automatically equates to a good or healthy diet for you or others

Science embraces uncertainty, hence why credible scientists tend to speak in uncertainties, with ample caveats. They know their certainty can cause harm if misplaced. Bullshitters do not care for this. **I hope you can embrace the uncertainty too, and always think "what if I am wrong".**

I realise this is a lot to take in and in some ways it may seem like a lot of **contradictions** in terms of red flags for bullshit. For example, if someone provides no evidence, they are being fallacious (**ipse dixit**), if they provide some evidence, they *may* be being fallacious (**cherry-picking**), and if they provide too much information, they are being fallacious (**gish gallop**). It is not easy! But if people are inconsistent in their detail, and use a lot of fallacies or appeal to biases, they are most likely an unreliable source. If you are not sure, use the principle of **Occam's razor**: what is the explanation that uses the least amount of assumptions (and still backed by evidence of course) to explain what you are trying to understand? Along with that, if what you are reading seems rather contrary, ask yourself whether it is more likely that all

the scientists in the world are unaware of what the contrarian is talking about, *versus* the likelihood of there being a global cover-up, *versus* the likelihood the ideas of the contrarian may be a spun narrative and why these opinions can only be expressed on the internet rather than reputable places like scientific journals.

On that note, I hope you find a diet that suits you: something that means you can comfortably eat less without feeling hungry; that does not make you feel groggy; that you can sustain; and that does improve the key health markers you want or need to improve. Moreover, I hope you share both your successes and failures, but more importantly do not proclaim that your successes or failures mean others will definitely succeed or fail on a particular diet just because you did. I also think it is worth acknowledging that sometimes what works for an individual may not be what the evidence says because evidence is about what happens on average. Your success/failure does not disprove the evidence though. Stay alert, and stay humble.

Wishing you all the best on your journey!