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GREAT EXPECTATIONS: THE EVOLUTIONARY PSYCHOLOGY OF FAITH-HEALING AND THE PLACEBO EFFECT¹

I said that the cure itself is a certain leaf, but in addition to the drug there is a certain charm, which if someone chants when he makes use of it, the medicine altogether restores him to health, but without the charm there is no profit from the leaf.

Plato (Charmides, 155-6).

I too have a story about leaves and charms. My little daughter, Ada, did not encounter stinging nettles until we returned to England from America when she was nearly four years old. We were in the fields near Cambridge. I pointed out a nettle to her, and warned her not to touch. But, to reassure her, I told her about dock leaves: “If you get stung,” I said, “then we’ll rub the bad place with a dock leaf and it will very soon be better.”

Ten minutes later Ada had taken her shoes and socks off and had walked into a nettle patch. “Daddy, daddy, it hurts. Dad do something..” “It’s all right, we’ll find a dock leaf.” I made a show of looking for a dock leaf. But then – in the interests of science – I played a trick.

“Oh dear, I can’t see a dock leaf anywhere. But here’s a dandelion leaf,” I said, picking a dock leaf. “I wonder if that will work. I’m afraid it probably won’t. Dandelion’s aren’t the same as dock leaves. They just aren’t so magic.”

Ada’s foot had come up with a nasty rash. I rubbed it with the dock leaf which Ada thought to be a dandelion. “Ow, Daddy, it’s no better, it still hurts. It’s getting worse.” And the rash certainly looked as bad as ever.

“Let’s see if we can’t find a proper dock leaf.” And we looked some more. “Ah, here’s just what we need,” I said, picking a dandelion leaf. “This should work.”

I rubbed Ada’s foot again with the dandelion leaf which she now believed to be a dock. “How’s it feel now?” “Well, a little bit better.” “But look the rash is going away” – as indeed it was. “It does feel better”. And within a couple of minutes there was nothing left to show.

So, dock leaf magic clearly works. And yet dock leaf magic is *placebo* magic. Dock leaves, as such, have no pharmacologically relevant properties (any more than do dandelion leaves). Their power to heal depends on nothing other than the reputation they have acquired over the centuries – a reputation based, so far as I can gather, simply on the grounds that their old English name, *docce*, sounds like the Latin *doctor*, hence *doctor leaf*, and also that they happen providentially to grow alongside nettles.

But father magic clearly works too. Ada, after all, simply took my word for it that what was needed was a dock leaf. And very likely if I had merely blown her foot a kiss or said a spell it would have worked just as well. Maybe father magic is also a placebo.

We should have a definition. Despite this talk of magic, there's every reason to believe that, when a patient gets better under the influence of a placebo, normal physiological processes of bodily healing are involved. But what's remarkable and what distinguishes placebos from conventional medical treatments is that with placebos the process of healing must be entirely self-generated. In fact with placebos no external help is being provided to the patient's body except by way of ideas being planted in her mind.

Let's say, then, that a placebo is a treatment which, while not being effective through its direct action on the body, works when and because:

- the patient is *aware* that the treatment is being given
- the patient has a certain *belief* in the treatment, based, for example, on prior experience or on the treatment's reputation
- the patient's belief leads her to *expect* that, following this treatment, she is likely to get better
- the *expectation* influences her capacity for self-cure, so as to hasten the very result that she expects.

How common are placebo effects, so defined? The surprising truth seems to be that they are everywhere. Stories of the kind I've just recounted about Ada are not, of course, to be relied on to make a scientific case. But the scientific evidence has been accumulating, both from experimental studies within mainstream medicine and from the burgeoning research on

alternative medicine and faith healing. And it shows beyond doubt that these effects are genuine, powerful and remarkably widespread.²

Andrew Weil, one of the best known advocates of alternative medicine, now argues that “the art of medicine” in general “is in the selection of treatments and their presentation to patients in ways that increase their effectiveness through the activation of placebo responses.”³ And he describes in his book, *Spontaneous Healing*, the range of things that he has found from his own experience can do the trick. “Over the years . . . patients have sung the praises of an astonishing variety of therapies: herbs (familiar and unfamiliar), particular foods and dietary regimens, vitamins and supplements, drugs (prescription, over-the-counter, and illegal), acupuncture, yoga, biofeedback, homeopathy, chiropractic, prayer, massage, psychotherapy, love, marriage, divorce, exercise, sunlight, fasting, and on and on. . . In its totality and range and abundance this material makes one powerful point: *People can get better.*”⁴

What’s more, as Weil goes on, “people can get better from all sorts of conditions of disease, even very severe ones of long duration.” Indeed experimental studies have shown that placebos, as well as being particularly effective for the relief of pain and inflammation, can for example speed wound healing, boost immune responses to infection, cure angina, prevent asthma, lift depression, and even help fight cancer. Robert Buckman, a clinical oncologist and professor of medicine, concludes that “Placebos are extraordinary drugs. They seem to have some effect on almost every symptom known to mankind, and work in at least a third of patients and sometimes in up to 60%. They have no serious side-effects and cannot be given in overdose. In short they hold the prize for the most adaptable, protean, effective, safe and cheap drugs in the world’s pharmacopoeia.”⁵ Likewise, another medical authority, quoted in a recent review in the *British Medical Journal*, dubs placebos “the most effective medication known to science, subjected to more clinical trials than any other medicament yet nearly always doing better than anticipated. The range of susceptible conditions appears to be limitless.”⁶

“Limitless” may be an exaggeration. Nonetheless, it’s fair to say that just about wherever placebos *might* work, they *do*. In other words, wherever a capacity for self-cure exists as a *latent possibility* in principle, placebos will be found to activate this capacity in practice. It’s true that the effects may not always be consistent or entirely successful. But they certainly occur with sufficient regularity and on a sufficient scale to ensure that they can and do make a highly significant contribution to human health.

And there’s the puzzle: the puzzle that I’ll try to address in this paper from the perspective of evolutionary biology. If placebos *can* make such a contribution to human health, then *what are*

we waiting for? Why should it be that we so often need what amounts to *outside permission* before taking charge of healing our own bodies?

I can illustrate the paradox with one of Weil's case histories. He describes the case of a woman with a metastatic cancer in her abdomen who refused chemotherapy and relied instead on dieting, exercise and a regime of "positive thinking" including "regular meditation incorporating visualization of tumour shrinkage" – following which, to the physicians' astonishment, the tumour completely disappeared.

Weil asks: "What happened in this woman's abdomen that eliminated widely disseminated cancer and restored her internal organs to good health? Her healing system, probably making use of immune mechanisms, was surely responsible; but *why did it not act before?*"⁷

Precisely. Why? Why should her bodily immune system be prepared, apparently, to let her die unless and until her mind decided otherwise?

Weil asks the question as a doctor, and his "why?" is the why of physiological mechanism: "what happened?". But I myself, as I said, want to take the perspective of an evolutionist, and my "why?" is the why of biological function: "why are we designed this way?".

There are two reasons for thinking that evolutionary theory may in fact have something important to say here. One reason is that the human capacity to respond to placebos must in the past have had a major impact on people's chances of survival and reproduction (as indeed it does today), which means that it must have been subject to strong pressure from natural selection. The other reason is that this capacity apparently involves dedicated pathways linking the brain and the healing systems, which certainly look as if they have been *designed* to play this very role.⁸

I'd say therefore it is altogether likely that we are dealing with a trait that in one way or another has been shaped up as a *Darwinian adaptation* – an evolved solution to a problem that faced our ancestors.

In which case, the questions are: what was the problem? and what is the solution?

I am not the first to ask these questions. Others have suggested that the key to understanding the placebo response lies in understanding its evolutionary history. George Zajicek wrote in *The Cancer Journal* a few years ago: "Like any other response in the organism, the placebo effect was selected in Darwinian fashion, and today's organisms are equipped with the best placebo effects."⁹ And Arthur and Elaine Shapiro wrote in a book, *The Placebo Effect*: "Does the ubiquity of the placebo effect throughout history suggest the possibility . . . that positive

placebo effects are an inherited adaptive characteristic, conferring evolutionary advantages, and that this allowed more people with the placebo trait to survive than those without it?”¹⁰

But, as these quotations illustrate only too well, the thinking in this area has tended to be question-begging and unrevealing. I hope we can do better.

So, let me tell you the conclusion I myself have come to. And then I shall explain how I have come to it, and where it leads.

My view is this. The human capacity for responding to placebos is in fact not necessarily adaptive in its own right (indeed it can sometimes even be maladaptive). Instead, this capacity is an emergent property of something else that *is* genuinely adaptive: namely, a specially designed procedure for “economic resource management” that is, I believe, one of the key features of the “natural health-care service” which has evolved in ourselves and other animals to help us deal throughout our lives with repeated bouts of sickness, injury, and other threats to our well-being.

Now, if you wonder about this choice of managerial terminology for talking about biological healing systems, I should say that it is quite deliberate (and so is the pun on NHS.) With the phrase “natural health-care service” I do intend to evoke, at a biological level, all the economic connotations that are so much a part of modern health-care in society. “Managed health-care” as it’s practised these days is of course not just to do with health – sometimes it isn’t even *primarily* to do with health – it is to do with balancing budgets, cutting costs, deciding resource allocation, operating a triage system and so on. I am suggesting that the same applies in crucial ways to nature’s own bodily healing systems.

And the point is that, if that’s right, we can take a new theoretical approach. Suppose we adopt the point of view not of the doctors or the nurses in a hospital, but of the hospital administrator whose concern as much as anything is to husband resources, spend less on drugs, free up beds, discharge patients earlier and so on. Then, if we take this view of the natural health-care service, instead of asking about the adaptiveness of bodily healing as such, we can turn the question round and ask about the adaptiveness of features that *limit* healing or *delay* it. What we’ll be doing is a kind of figure-ground reversal, looking at the *gaps between* the healing.

So let’s try it. And, in taking this approach, let’s go about it logically. That’s to say, let’s start with the bare facts and then try to deduce what else has to be going on behind the scenes to explain these facts, on the assumption that we are indeed dealing with a health-care system that has been designed to increase people’s overall chances of survival. Then, once we know

what *has to be* the case, we shall surely be well placed to take a closer look at what actually *is* the case!

I am setting this out somewhat formally, and each proposition should be taken slowly. Here are some basic facts to start with:

1. *Other things being equal, well-being is to be preferred to sickness.*

I assume this is uncontroversial.

2. *People's bodies and minds have a considerable capacity for curing themselves.*

This is what all the evidence of spontaneous recovery shows.

3. *Sometimes this capacity for self-cure is not expressed spontaneously, but can be triggered by the influence of a third party.*

This is the basic placebo phenomenon.

Then, it follows from 1 and 2, presumably, that:

4. *In such cases, self-cure is being inhibited until the third-party influence releases it.*

And from the assumption that this pattern is non-accidental that:

5. *When self-cure is inhibited there must be good reason for this under the existing circumstances; and when inhibition is lifted there must be good reason for this under the new circumstances.*

Put this together with the starting assumption that people want to be as well as they can be, and we have:

6. *The good reason for inhibiting self-cure must be that the subject is likely to be better off, for the time being, not being cured.*

In which case:

7. *Either there must be benefits to remaining sick, or there must be costs to the process of self-cure.*

Likewise:

8. *The good reason for lifting the inhibition must be that the subject is now likely to be better off if self-cure goes ahead.*

In which case:

9. *Either the benefits of remaining sick must now be less, or the costs of the process of self-cure must now be less.*

I'd say all the above does follow deductively. Given the premises, something like these conclusions *must* be true. In which case, our next step ought to be to turn to the real world and to find out how and in what sense these rather surprising conclusions *could* be true.

The following are the most obvious matters which want unwrapping and substantiating:

Is it indeed sometimes the case that there are benefits to remaining sick and, correspondingly, costs to premature cure??

Is it, as we might guess, more usually the case that there are benefits to getting better and, correspondingly, costs to delayed cure??

In either case, are there really costs associated with the process of cure as such??

Is it possible to predict how these costs and benefits will change according to external circumstances, so that the subject might in fact be able to take control of her own health budget??

Let me take these questions in turn.

- *Benefits of remaining sick / Costs of premature cure*

It depends how we define sickness. If sickness means a *pathological* condition of the body or mind that is unconditionally harmful, then there cannot of course ever be benefits to

remaining sick. However if sickness is taken more broadly to mean any abnormal condition of body or mind that you, the patient, find distressing and from which you seek relief, then it may be quite another matter.

It has been one of the major contributions of evolutionary theory to medicine to remind us that many of those conditions from which people seek relief are not in fact defects in themselves but rather self-generated *defences* against another more real defect or threat.¹¹

Pain is the most obvious example. Pain is not itself a case of bodily damage or malfunction – it is an adaptive response to it. The main function of your feeling pain is to deter you from incurring further injury, and to encourage you to hole up and rest. Unpleasant as it may be, pain is nonetheless generally *a good thing* – not so much a problem as a part of the solution.

It's a similar story with many other nasty symptoms. For example, fever associated with infection is a way of helping you to fight off the invading bacteria or viruses. Vomiting serves to rid your body of toxins. And the same for certain psychological symptoms too. Phobias serve to limit your exposure to potential dangers. Depression can help bring about a change in your life style. Crying and tears signal your need for love or care. And so on.

Now, just to the extent that these evolved defences are indeed *defences against something worse*, it stands to reason that there *will* be benefits to keeping them in place and costs to premature cure. If you don't feel pain you're much more likely to exacerbate an injury; if you have your bout of influenza controlled by aspirin you may take considerably longer to recover; if you take Prozac to avoid facing social reality you may end up repeating the same mistakes, and so on. The moral is: *sometimes it really is good to keep on feeling bad*.¹²

So, in that case, how about the other side?

- *Benefits of getting better / Costs of delayed cure*

There *is* of course another side. Even when an ailment is one of these evolved defences, this does not necessarily mean there is nothing legitimately to complain of. For the fact is that, while the defences are there to do you good, they may still in themselves be quite a burden – not just because you do not like them, but because they can actually threaten your fitness directly, sometimes severely so.

Take the case of pain again. Yes, it helps protect you. Nevertheless, it is by no means without cost. When pain makes it hard to move your limbs you may become more vulnerable to other dangers, such as predators. When the horribleness of pain takes all your attention you may no longer be capable of thinking clearly. When pain causes psychological stress it may make you bad-tempered or incapable or hopeless. It may even take away your will to live. In

cancer wards it's said that patients in greatest pain are likely to die soonest and that treating the pain with morphine can actually prolong life.

Or take some of the other defences I listed above. Fever helps fight infection, but it also drains your energy and can have damaging side effects such as febrile convulsions. Vomiting helps get rid of toxins, but it also throws away nourishment. Depression helps disconnect from maladaptive situations, but it also leads to social withdrawal and loss of initiative. Crying helps bring rescue from friends, but it also reveals your situation to potential enemies.

So *now* it stands to reason that there will after all be benefits to getting better and costs to delaying cure. The moral is: *sometimes it really is bad not to return to feeling good as soon as possible.*

And I have been discussing here only examples of self-generated defences. In cases where the sickness in question is a genuine defect or malfunction – a broken leg, say, or a snake bite or a cancerous growth – the balance of advantage must be clearer still. Surely in these cases there could be no advantage at all in withholding cure.

Or couldn't there be?

- *Costs of the process of cure as such*

When the sickness is self-generated, so that cure can be achieved simply by switching off whatever internal process is responsible for generating the symptoms in the first place, then, it's true, the cure comes cheap – and there should indeed be little reason to hold back just on cost grounds.

With pain, for example, you may well be able to achieve relief, when and if desirable, simply by sending a barrage of nerve signals down your own spinal cord or by releasing a small amount of endogenous opiate molecules. Similarly, with depression, you may be able to lift your mood simply by producing some extra serotonin. The production costs of the neurotransmitters, the endorphins or serotonin, are hardly likely to be a serious limitation.

However, it may be a very different story when the sickness involves genuine pathology and the cure requires extensive repair work or a drawn-out battle against foreign invaders – as with healing a wound or fighting an infection or cancer. For in this case the process of cure may turn out to be far from cheap.

In particular, if and when the cure involves the activity of the immune system, the costs can mount rapidly¹³. For a start the production of immune agents (antibodies, etc.) uses up a surprisingly large amount of metabolic energy (so much so, that early in life when a child's immune system is being built up, it actually takes as much energy as does the brain; and it's been found in animals that when the immune system is artificially stimulated into extra activity

the animals lose weight unless they're given extra food.¹⁴ But besides the calories, the production of immune agents also requires a continual supply of quite rare nutrients in the diet, such as carotenoids.¹⁵ Ideally you should be able to build up reserves when times are good. But, even so, once a major immune response is under way, even the best reserves may get used up – so that every time you go on the attack against today's threat you are compromising your ability to respond to a *new* threat further down the road.

And then, as if this weren't enough, there is the added problem that mounting an immune response can pose quite a danger to your own body, because the immune agents, unless they are controlled, may turn on your own tissues and cause autoimmune disease. This is a particular danger when the body is already under stress, for example as a result of strenuous exercise.¹⁶ It means that even when the resources for overcoming an invader are potentially available, it will not always be possible to deploy them safely to maximum effect.

The overall costs of the immune system are in fact so very great that most people most of the time simply cannot afford to keep their system in tip-top order. At any rate this is true for animals living in the wild. And the ramifications of this go beyond health issues as such, to affect courtship and reproduction. In several animal species, and maybe humans too, differential ability to maintain the costly immune system has become the basis for sexual selection.¹⁷ So that when a male or female is looking for a mate they pay close attention to indicators of *immunocompetence* – as shown for example by the colours of a bird's feathers, or the symmetry of the body or quality of skin.

All in all, we are beginning to see just how complex the accounting has to be. We have found that with self-generated defences the sickness itself is designed to bring benefits, but it also has costs, although the process of self-cure is cheap. With sickness arising from outside, the sickness has costs with no benefits, but the process of self-cure can be costly.

Imagine, now, you are one of those hospital managers, in charge of this natural health service. It would be the height of irresponsibility if you were to allow all the different departments to operate autonomously, with defences and cures being switched on or off regardless. Instead you should surely be trying to plan ahead, so that you are in a position to decide on your *present priorities* in the light of *future needs*. You would want to ask what weight to attach to this cost or that benefit *in the particular circumstances that you're now in*.

- *Reckoning how the costs and benefits change according to circumstances*
Let's think about some particular examples.

Pain. You've sprained your ankle. Question: Is this the defence you really need right now, or on this occasion will it actually do more harm than good? Suppose you are chasing a

gazelle and the pain has made you stop – then, fair enough, it’s going to save your ankle from further damage even if it means your losing the gazelle. But suppose you yourself are being chased by a lion – then if you stop it will likely be the end of you.

Nausea. You feel sick when you taste strange food. Question: How serious a risk would you be taking in your present state of health if you did not feel sick? Suppose you are a pregnant woman, and it’s essential to protect your baby from toxins – then, yes, you really don’t want to take any risks with what you eat. But suppose you are starving and this is the only food there is – then you and the baby will suffer still more if you don’t take the chance.

Crying. You are upset by a letter telling you you’ve been betrayed. Question: Are the benefits of sending out this signal of distress actually on offer in present company? Suppose you are among friends who can be expected to sympathise with you – then, well and good. But suppose you are among strangers – they may merely find your display embarrassing.

Immune response. You have a head cold. Question: Is this the right time to mount a full scale immune response, or should you be saving your reserves in case of something more serious? Suppose you are safe at home with your family and there’s going to be time enough to convalesce – then, sure, you can afford to throw everything you’ve got against the virus. But suppose you are abroad, facing unknown dangers, under physical stress – then, paradoxically, since you might think you’d want to get better as fast as possible, on balance you might do better to keep your response to the level of a holding operation.

As we see, especially with this last example, the crucial question will very often be: *what is going to happen next?*

The fact is that many of the health-care measures we’ve been discussing are *precautionary* measures designed to protect from dangers that lie ahead *in an uncertain future*. Pain is a way of making sure you give your body rest just in case you need it. Rationing the use of the immune system is a way of making sure you have the resources to cope with renewed attacks just in case they happen. Your healing systems are basically tending to be cautious, and sometimes over-cautious, as if working on the principle of better safe than sorry.

Now, this principle is clearly a sensible one, if and when you really cannot tell what is in store for you. It’s the same principle that advises you to carry an umbrella when you don’t know whether it’s going to rain, or to keep your running pace down to a trot when you don’t know how far you may have to run.

But suppose you *were* to know.

Continuing the analogy, suppose you could tell for sure that the weather would stay dry – then you could leave the umbrella behind. Or suppose you had definite information that the race was just one hundred metres long – then you could sprint all the way.

And the same with health care. Suppose you were to be able to tell in advance that an injury was non-serious, food was non-toxic, an infection was not going to lead to complications, no further threats were in the offing, rescue was just around the corner, tender loving care about to be supplied – then, on a variety of levels, you could let down your guard.

It will now be clear, I hope, where this is going. I have been saying “you” should ask these questions about costs and benefits, as if it were a matter of each individual acting as his or her own health-care manager at a rational, conscious level. But of course what I am really leading up to is the suggestion that Nature has already asked the same questions up ahead and supplied a set of adaptive answers – so that humans now have efficient management strategies built into their constitution.

I would expect this to have occurred on two levels.

To start with, given that there are certain universals in how people fare in different situations, there are presumably *general rules* to be found linking *global* features of the physical and psychological environment to changes in the costs and benefits of health-care – features such as where you live, what the weather is like, the season of the year, what you can see out the window, how much you feel at home here, and, especially important, what social support you’ve got.

Generally speaking any such features that make you feel happy and secure – success, good company, sunshine, regular meals, comforting rituals – are going to be associated with lower benefits to having the symptoms of illness (e.g. feeling pain) and lower costs to self-cure (e.g. mounting a full scale immune response). By the same token any of them that make you feel worried and alone – failure, winter darkness, losing a job, moving house – are going to be associated with higher benefits to continuing to show the symptoms and higher costs to self-cure.

Now, appreciating these cost/benefit changes, and switching health-care strategy accordingly, would bring clear advantages in the competition for biological survival. So it’s a fair bet that natural selection will have discovered these general rules and that humans will now be genetically designed to make good use of them – with the appropriate environmentally-activated switches being wired into the brain. And indeed there is lots of evidence that this is actually the case. People’s health does respond quite predictably to global environmental factors of the sort just listed. Much of the science of “health psychology” is now concerned with charting just how important these global effects are.¹⁸

However, let's come to the second level. Knowing the general rules as they apply to everybody is all very well. But it should surely be possible to do still better. If only you were to have a more precise understanding of *local* conditions and the rules as they apply in your own individual case, then in principle you should be able to come up with predictions at the level of *personal expectancies*. These then could be used to fine-tune your health-care management policy to even greater advantage. In which case natural selection – in an ideal world, anyway – should have discovered this as well.

But, in reality, this might not be straightforward. The problem is likely to be that specific personal expectancies must involve high-level cognitive processing, taking account of learned associations, reasons and beliefs that are peculiar to each individual. And it would surely be asking too much to suppose that human beings could have been genetically designed so that every one-off prediction generated by an individual brain will have just the right effect directly on the healing systems.

If this were asking too much, however, then presumably the answer would have been for natural selection to go for a bit less. And, in any case, I'd suggest that such a degree of direct one-to-one linkage would actually have been something of an extravagance. For the fact is that most of the benefits of personal prediction ought to be achievable in practice by the much simpler expedient of linking expectancy to healing by way of an *emotional variable*: for which there exists a ready-made candidate, in the form of "hope" and its antithesis "despair".

Thus, what we might expect to have evolved – and it would do the job quite well – would be an arrangement on the following lines. Each individual's beliefs and information create specific expectancies as to how things will turn out for them. These expectancies generate specific hopes – or, as it may be, despairs. And these hopes and despairs, being generic human feelings, act directly on the healing system, in ways shared by all human beings. Hope and despair will have become a crucial feature of the *internal environment* to which human individuals have been designed to respond with appropriate budgetary measures.

I am suggesting natural selection could and should have arranged things this way. It would make sense. Yet it remains to be seen whether it is actually the case. Do we have evidence that hope can and does play this crucial role in health care?

Well, yes, of course we do have evidence. It's the very evidence we started with. Ada and the stinging nettles. The lady with the vanishing cancer. Placebos themselves provide as good evidence as we could ask for. Because what placebo treatments do is precisely to give people reason to hope, albeit that the reason may in fact be specious. No matter, it works! People do change their priorities, let down their guard, throw caution to the winds. That's the placebo effect!

I shall say more about placebos in a moment. But let me first bring in some research on the effects of hope that might have been tailor-made for the purpose of testing these ideas (although in fact it was done quite independently). This is the research of my colleague at the New School, Shlomo Breznitz.

Breznitz begins a recent paper on “The effect of hope on pain tolerance”¹⁹ with a discussion of what has come to be called the “tour of duty phenomenon”. In World War II American bomber crews who flew nightly missions over Germany suffered terrible casualties, with planes and crews being lost each night. Morale was inevitably low, and low morale brought with it a variety of stress-related illnesses. Psychologists were called in to help. They surmised that a main cause of the problem was uncertainty as to when the ordeal would come to an end. Their advice was to give the crews specific information about when their tour of duty would be over.

Forty missions had been the unofficial average. But now the airmen were told it would be forty missions and no more. The effects were dramatic: once the airmen knew that they only had to hold out *just so long*, they became able to cope as never before.

Breznitz in his own research set out to study this phenomenon experimentally. He undertook a series of studies in which human subjects were made to suffer pain or anxiety or fatigue, and he manipulated their expectations about how long it might last. His question was whether hope for a relatively early end would indeed allow subjects to manage better, while dread that the ordeal might go on and on would do the opposite.

In one study, for example, he required subjects to keep one of their hands in ice-cold water until they could no longer stand the pain and had to remove it. Subjects in one group were *told* that the test would be over in four minutes, while those in another group were not told anything. In fact the test lasted a maximum of four minutes in both cases. The result was that 60% of those who knew when the test would end were able to endure the full four minutes, whereas only 30% of those who were kept in the dark were.

Breznitz does not report whether the subjects who were in the know actually felt less pain than the others (this was a study done for the Israeli army, and no doubt the sponsors were more interested in objective behaviour than subjective feeling). But I strongly suspect that, if the question had been asked, it would have been found that, yes, when the subject had reason to believe that the external cause of the pain was shortly to be removed, it actually *hurt less*.

You’ll see, I trust, how nicely this could fit with the health-care management story that I have been proposing. My explanation would be that when it’s known that the threat posed by the cause of the pain is soon to be lifted, there’s much less need to feel the pain as a precautionary defence. Likewise with the tour of duty phenomenon, my explanation would be

that when it's known that safety and rest are coming relatively soon, there's much less need to employ defences such as anxiety, and furthermore healing systems such as the immune response can be thrown into high gear.

I should stress this is *my* take on things not Breznitz's. But I am glad to say he himself concludes the review of his research with words that might have been my own: "it is quite conceivable that people are capable of fine-tuning the distribution of their resources according to the anticipated duration ahead of them."²⁰

So I'll turn to how placebos fit with and extend the story. But first one more twist – relating to the question of how hopes get generated.

Breznitz's experimental situations are, of course, somewhat contrived. If people in the real world are fine-tuning their health-care budgets on the basis of their specific hopes, we need to consider how they come to have these hopes. Or, because this is what it will often come down to in the cases that interest us, how they come to have the *beliefs* that underpin these hopes – especially the belief in the power of a particular treatment to bring recovery.

Well, we have just seen one way in which you can come to believe something: someone you suppose to be trustworthy *tells* you so. "You have my word for it, I promise it will be over in four minutes". But this is presumably not the only way or indeed the usual way.

In general there are going to be three different ways by which you are likely to acquire a new belief (discussed at greater length in my book, *Leaps of Faith*²¹, Humphrey, 1995). These are: (a) *Personal Experience* – observing something with your own eyes, (b) *Rational Argument* – being able to reason your way to the belief by logical argument, and (c) *External Authority* – coming under the sway of a respected external figure.

Now, if these are indeed the ways you can come to believe that *a specific treatment is good for you*, we should find each of these factors affecting your hopes for your future well-being – and so, presumably, having significant effects on health management strategies.

Do we? Again, I trust it will have been obvious where the argument is going. But now I want to bring *placebos* front stage – not just as corroborative evidence but as very proof of these ideas about hope and health management.

Suppose we were designing a scientific test of the predicted hope effects. We would want to show that treatments that generate hope in each of the ways just described are capable of calling up the healing process. But, to show it's really *hope* that's doing it, we would want to be able to separate the "pure hope" component of the treatment from any other component that might be having direct effects on healing. So ideally we would want to use "hope only" treatments. Which is, of course, precisely what pure placebos are.

Let's see, then. How do these three hope-generating factors play?

- *Personal experience.*

Someone believes she is going to recover after a treatment because it has worked for her before. “This pink pill, labelled ‘aspirin’, cured my headache last time. I’ll soon be fine when I take it again.” Or “When Nurse Jones looked after me before, I found I was in completely safe hands. I’ll be safe enough this time too.”

Past associations of this kind are indeed a fairly reliable basis for hopes about the future. There ought then to be a major *learned* component to placebos. And there is. In fact the learning that recovery from sickness has in the past been associated with particular colours, tastes, labels, faces and so on is the commonest way by which placebo properties get to be conferred on an otherwise ineffective treatment.

- *Rational argument.*

Someone believes in a treatment because she reckons she understands something about the causal basis. “I know that if a medical treatment is to work it must be *strong medicine*, the kind that tastes nasty, or hurts or is very expensive. This rhinoceros horn extract has all the right properties.” Or “I realise I can’t expect to get better unless I myself take positive action and *do something*. That’s why I am taking a flight to Lourdes.”

Such arguments do make reasonable sense, and provide rational grounds for hope. So there ought to be a major *rationalised* component to placebos. Again there is. In fact so-called “active placebos” – for example those with unpleasant side-effects or those that involve pseudo-medical procedures such as injection or surgery – are found to work especially well. As, equally, do those that require effort and involvement by the patient. Patrick Wall, the leading pain researcher, has concluded that the process of *doing something about the pain* is indeed all there is to placebo analgesia.²²

- *External Authority.*

Someone believes in a treatment because she trusts the word of someone else. “Everyone I know swears by homeopathy. Presumably it will work for me as well.” “The doctor has a degree from Harvard. Obviously he’ll give me the best treatment going.”

In general taking the word of others with some claim to authority is a sensible strategy, and people would be foolish not to let their hopes be swayed this way. So there ought to be a major *faith* component to placebos. And once again, of course, there *is*. In fact the evidence ranging from faith healing to hypnosis shows that this is potentially the most effective way of all by which otherwise bland treatments and procedures can achieve marvellous powers.

Enough. And it's time to take stock. Let me run back over how the argument has gone so far.

We began by asking what the existence of placebos tells us about the nature of our healing systems. We showed, deductively, that placebos imply that there has to be some kind of health care management policy in place. And we discovered that, when we look into the biology and natural history, the existence of such a policy would make sense as an evolved adaptation. We speculated about how natural selection would have designed it. We came up with some ideas about the cognitive factors that might well be used to fine tune the allocation of resources. We predicted what would follow – and asked for evidence. And I think it's fair to say we've found it. The circle is closed. The facts about placebos are evidence for the very analysis that placebos started.

Yet there is some unfinished business here – rather serious and interesting business. And it will become clear just what the issue is as soon as we try, as we probably should have done already, to straighten out a potential confusion about terminology.

The term “placebo”, as we defined it at the outset, was supposed to apply only to those treatments that do nothing *directly* to help with healing but rather exert their influence on bodily processes *indirectly*, through what we've been calling the “placebo effect” or “placebo response”. By contrast, if the treatment does have a direct effect on healing, we should consider it to be a “genuine treatment” and not a “placebo”.

However it hardly needs saying, at this stage of this paper, that genuine treatments with direct effects can of course *also* influence healing indirectly. In fact genuine treatments – for obvious reasons, to do with how easy it is for the subject to believe in them – are even more likely than are placebos to bring about the kind of hope-based changes in health-care strategy that we've been considering. Thus, odd though this may sound, we should want to say that genuine treatments often have placebo effects.

Now, to avoid having to talk this way, I can see we might do better to introduce an entirely new term for these effects: perhaps something like “hope-for-relief effects”, as the generic name for the hope-based components of *any* kind of treatment. Except that this is clumsy and also arguably too theory-ridden. And in any case the reality is that in the placebo literature the term “placebo effect” has already become to some degree established in this wider role. So let's keep to it, provided we realise what we are doing.

However in that case there is surely a further distinction that we should want to draw: namely between what we may call “justified” and “unjustified placebo effects”, based on *valid* and *invalid* hopes.

Suppose, for example, a doctor gives someone who is suffering an infection a pill that she *rightly* believes to contain an antibiotic: because her hopes will be raised she will no doubt make appropriate adjustments to her health-management strategy – lowering her precautionary defences and turning up her immune system in anticipation of the sickness not lasting long. But now suppose instead he gives her a pill that she *wrongly* believes to contain an antibiotic: because her hopes will be raised in the same way she will no doubt again make adjustments – in fact the very same ones. In the first case it would be a justified placebo response, in the second an unjustified placebo response.

I said we should want to draw this distinction, but actually why should we? For it might be argued that, as we have just seen, it will not be a distinction of any consequence. From the point of view of the subject, all hopes are on a par – all hopes have *subjectively* to be valid or else they would not count as hopes. So, provided the patient truly believes that when the doctor gives her the pill she can expect a quick recovery, it is not going to make any difference to her response whether it's the real thing or the fake.

However, to argue this would be to have missed the main point of this paper. For it ought to be clear that, on another level, the distinction may be crucial: the reason being that only when the patient's hope is valid will her anticipatory adjustments to her healing system be likely to be *biologically adaptive*. In fact when her hope is invalid the same adjustments may actually be *maladaptive* – because she may be risking lowering her fever too soon or using up her precious resources when she cannot afford to.

Thus, from the point of view of natural selection all hopes are by no means on a par. Unjustified placebo responses, triggered by invalid hopes, must be counted a *biological mistake*.

Why then haven't humans evolved *not* to make such mistakes?

The answer, most likely, is that this has never really been an option. The possibility of making mistakes comes with the territory. If you have evolved to be open to true information about the future – coming from Experience, Reason or Authority – you are bound to be vulnerable to the false disinformation that sometimes comes by the same routes. You cannot reap the advantages without running the risks.

Still, the chance of encountering fakes in the natural world in which human beings evolved was presumably relatively small – relative, at any rate, to the world we now are in. So placebos were probably hardly an issue for most of human prehistory.

This is not to say that in the past the risk did not exist at all. Superstition has always existed. Indeed it is a pre-human trait. And when I hear of chimpanzees, for example, making great efforts to seek out some supposed herbal or mineral cure, I have to say I wonder. Have

these superstitious chimps *duped* themselves into relying on a placebo, just as we humans might have done?

Nevertheless it's probably only with modern medical opportunities and new forms of propaganda that the possibility of people being snared by placebos has become a more serious danger: the danger being that they will indeed indulge in *premature cure* and the *unwise allocation of resources*. And it's fortunate perhaps that this danger has increased only at the same time as, today, people's increased security and affluence, along with modern regimens of care, have made it actually less important than it was in the past that they let natural defences, such as pain, run their course or that they husband resources for the lean times that might lie ahead.

All the same, the risk is there, and here is another reason to take it seriously.

It's obviously of some significance that placebo effects are generally *rewarding* to the subject. To coin a phrase, *placebos are pleasing!* People prefer to feel good – prefer not to have a headache or fever or to remain sick – even in those relatively rare but crucial cases *when continuing to feel bad would be the safer option*.

Hence we should hardly be surprised to find that people continually go looking for placebo treatments, seeking to discover new forms of placebo – even when they might, as it happens, be better off staying as they are.

But to discover a new placebo, all you need do is to *invent* it, and to invent it all you need do is *change your beliefs*. So it seems the way might well be open for everyone to take *voluntary* and *possibly irresponsible* control of their own health.

Yet, the truth is that – fortunately, perhaps – it's not that easy. When it comes to it, how *do* you change your own beliefs to suit yourself?

No one can simply bootstrap themselves into believing what they choose. Many philosophers, from Pascal through Nietzsche to Orwell have made this point. But the physicist Stephen Weinberg puts it as nicely as anyone at the end of his book *Dreams of a Final Theory*: “The decision to believe or not believe is not entirely in our hands. I might be happier and have better manners if I thought I were descended from the emperors of China, but no effort of will on my part can make me believe it, any more than I can will my heart to stop beating.”²³

So what ways – if any – are actually open for the person who longs to believe? Suppose you would desperately like it to be true that, for example, snake-oil will relieve your back pain. Which of the belief-creation processes we looked at earlier might you turn to?

Personal experience? Other things being equal, there's little likelihood that snake oil will have worked for you in the past.

Rational argument? There's not going to be much you can do to make a reasoned case for it.

External authority? Ah. Maybe here is the potential weak-spot. For surely there will always be somebody out there in the wide world, somebody you find plausible, who will be only too ready to *tell* you that snake oil is the perfect remedy for your bad back.

In the end then it's not so surprising that, as we noted at the start of this discussion, people have come to require *outside permission* to get on with the process of self-cure. They may, for sure, have to go looking for it. But who doubts that, in the kind of rich and willing culture we live in, there will be someone, somewhere, to supply them. And around the world and across the ages people have indeed gone looking – seeking the shaman, therapist, guru or other charismatic healer who can be counted on to tell them the lies they need to believe to make themselves feel good.

However, even as we count the blessings that flow from this tradition of self-deception and delusion, I think that as evolutionary biologists we should keep a critical perspective on it. The fact is it may sometimes be imprudent and improvident to feel this good. Your back pain gets better with the snake oil. But your back pain was designed by natural selection to protect you. And the danger is that while your pain gets better your back gets worse.

Don't tell this to my daughter Ada, or she'll never trust her Dad again.

Postscript

Now, friends have told me this isn't the right note to end on. So downbeat. Arguing that placebos are a evolutionary mistake. What about that woman with her metastatic cancer, for example. It seems she owed her life to the snake oil – or rather, in her case, to the guided visualisation. Isn't there a case to be made for the *real health benefits* of submitting to at least some of these illusions?

Yes, happily, there is. And I can and will turn the argument around before I end.

Very well. As I've just said, it may sometimes be imprudent for you to show a placebo response when it is unjustified by the reality of your condition. To do so must be counted a biological mistake. But of course you don't want to err in the other direction either. For it could be equally imprudent, or worse, if you were *not* to show a placebo response when it *is* justified by the reality of your condition.

I suspect that just such a situation can arise. And in fact a particularly serious case of it can arise for a surprising reason: which is that your evolved health-care management system may sometimes make *egregious errors* in the allocation of resources – errors which you can only undo by *overriding* the system with a placebo response based on *invalid hope*.

Let me explain. I think we should look more closely at that woman with her cancer. I'd be the last to pretend we really know what was happening in such an extraordinary case. Nonetheless, in the spirit of this paper, I can now make a suggestion. The fact is, or at any rate this the simplest reading of it, that, while the cancer was developing, instead of mounting a full scale immune response, she continued to withhold some of her immune resources. Earlier in this paper I called this paradoxical: "Why did she not act before?" But now we have the makings of an explanation: namely that, strange to say, this was quite likely *a calculated piece of health-care budgeting*. Lacking hope for a speedy recovery, the woman was following the rule that says: when in doubt play safe and keep something in reserve.

Yet, obviously, for her to follow this rule, given the reality of her situation, was to invite potential disaster. To adopt this safety-first policy with regard to future needs, was to make it certain there would be no future needs. To withhold her own immune resources as if she might need them in six months time, was to ensure she would be dead within weeks. And, so it would have proved, if in fact she had not rebelled in time.

Now, I presume we should not conclude that, because this rule was working out so badly for this woman in this one case, that natural selection must have gone wrong in selecting it. Rather, we should recognise that natural selection, in designing human beings to follow these general rules, has had to judge things statistically, on the basis of actuarial data. From natural selection's point of view, this woman would have been a single statistic, whose death as a result of her overcautious health policy would have been more than compensated by the longer life of her kin, for whom the same policy in somewhat different situations did pay off.

Still, no one could expect the woman herself to have seen things this way. She of course would have wanted to judge things not statistically but individually. And if she could better the built-in general rules, by going her own way, using a more up-to-date and relevant model of her personal prospects, such was clearly what she ought to do. Indeed this ties directly to the argument we've already made about the advantage of fine-tuning the health care budget on the basis of personal expectancies. It's the very reason why the placebo effect, based on personal hopes, exists. Or, at any rate, why *justified* placebo responses exist.

But in this woman's case could any placebo response have possibly been *justified*? She certainly had few if any valid grounds for hope. And there is no denying the force of the calculation that she would be taking a big risk with her future health if she were to use up her entire immune resources in one all-or-none onslaught on her cancer, leaving her dangerously vulnerable to further threats down the road.

"Certainly" and "no denying" – except for one simple fact that changes everything: it's never too early to act when otherwise it's the last act you'll ever have the chance to make. When the alternative is oblivion, hope is always justified. Which is, I think we can say, what

she herself proved in real life – when she took matters into her own hands, found her own invented reasons for hoping for a better outcome, released her immune system, beat the cancer, survived the aftermath, and lived on.

Now this is, of course, a special and extreme case. But, in conclusion, I think the reason to be more generally positive about placebos is that several of the same considerations will apply in other less dramatic situations. Your evolved health care system will have over-erred on the side of caution, and as a result you'll be in unnecessary trouble. It will be appropriate to rebel. And yet having no conventional valid grounds for hope, you too will need to go looking for those rent-a-placebo cures.

Actually, now I come to think about it, the pain of a nettle rash is just such a case of an over-reaction to a rather unthreatening sting.

You can tell this to my daughter Ada, and she'll see that after all her father does know best.

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