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GUMPTIONADE℠

The Booster for Your Self-Improvement Plan

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Chapter 8

TRANSLATE UNCERTAINTY INTO RISK

Should I stay or should I go?

The Clash

IT IS LIKELY THAT THE MERCHANT SHIP *Wigan Thistle* will get to Stockholm to deliver its load of British goods. It is likely that the ship will then return to London with Swedish timber, hemp, and bar iron. But its owner Francis McKnight is worried—if it does not, he will be ruined.

This is the early 18th century. Bad weather, French privateers, or poor navigation could result in a total loss and debtors' prison for McKnight. The *Wigan Thistle* is his livelihood. He has to put his ship to sea, but he can't bear the risk of losing it.

Deciding how best to proceed under conditions of uncertainty is a fundamental problem of living. The solution is to transform uncertainty into risk when you can. Risk is a thing

that can be measured. Sometimes you can pay other people to take risk from you—you can insure against it.

Francis McKnight goes to Lloyd's Coffee House on Lombard Street to buy some courage. Others are there, ready to sell it. In return for a payment now, they promise to make good on the loss McKnight might sustain from the *Wigan Thistle*'s upcoming voyage.

Ben Watson takes on part of McKnight's risk. So do nine other investors present at Lloyd's that day. McKnight can now send his ship out on the North Sea. He has courage.

There is a tool for transforming uncertainty into risk. It's called statistics.

Like the other underwriters, Watson has access to tables that list voyages attempted and completed, and ships lost at sea. Watson has access to statistics. He knows his risk of coughing up one-tenth of the value of the *Wigan Thistle* and its cargo.

He will not be ruined if the ship goes down. And if it completes its voyage, as is statistically likely, his one-tenth of McKnight's risk premium is pure profit. Statistics give Watson the courage to risk a moderate loss in return for a more likely small gain.

Good business on both sides. Uncertainty was turned into risk, which could be bought and sold. This is a way to be courageous.

Let's look at another example of purchasing risk reduction—and use statistics to decide whether it's good business too.

Overweight twenty-first-century American Joe Hart reads that men with high cholesterol are fifty percent more likely to have a heart attack in the next ten years than other men their age. This news makes Joe uncertain. He has high cholesterol.

Joe attempts to lower his risk. He gets a prescription for a drug to decrease the cholesterol in his blood. It comes with side effects—headaches, muscle weakness, and a one-thousand-dollar per year out of pocket cost. The discomfort seems worthwhile. After all, he *is* cutting his risk of heart attack a lot.

Would Joe change his mind if he looked at the facts behind that apparently large risk reduction? Here are the statistics:

- Four out of one hundred men his age *without* elevated cholesterol are expected to have a heart attack in the next ten years.
- The number is six out of one hundred for men his age *with* elevated cholesterol.

That alarming fifty percent increase in heart attack risk is a matter of two more heart attacks per one hundred men. Over ten years. Even if they *don't* take that drug, ninety-four out of one hundred men *with* elevated cholesterol will *not* have a heart attack in the next ten years.

The fifty percent figure is a measure of *relative frequency*. Figures that cite numbers—e.g., from four to six heart attacks per one hundred men—are measures of *actual frequency*. Insist upon actual frequency when you weigh risk.

Joe may decide that the difference between four and six does not merit the side effects of the drug. Trying to eliminate every risk from life is neither courageous nor possible. Translating his uncertainty into his risk of a coronary gives Joe the courage to do what needs to be done about his heart. He may choose wrong, but he will not be guessing.

There is much uncertainty among twenty-first-century Americans about breast cancer, prostate cancer, and cardiovascular disease, to name a few threats to our health. Some risks are exaggerated; others are ignored. Most of us aren't doing what needs to be done about our health.

Similarly, there is great uncertainty about risk in the stock market, as we learned during the crash of 2008. Most of us aren't doing what needs to be done about our money.

We pay too little attention to what is actually dangerous, and too much to what is actually not.

> *Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write.*
>
> H. G. Wells

You live in an uncertain world. You may have a fine day tomorrow, or you may get a pie in the face. A lot of clowns out there. You just don't know.

You have to make decisions, regardless. You have to make decisions under conditions of uncertainty:

- Is he the one for me?
- What is the best car in my price range?
- Should we launch in this weather?

- Is it time to sell?
- Should I have that operation?
- Can this wait?
- How high can I put my deductible?

It is important to translate uncertainty into risk. It is just as important to translate *certainty* into risk. This reduces your chance of acting on optimism, such as: "I will change him." Or "this will only take a week." Or "safe as houses."

By measuring risk, statistics defend you against your own recklessness and the recklessness of others. Go Fever is not courageous. Neither is avoiding all risk.

Because risk can be weighed, it can be priced. There are markets for buying and selling risk, such as the coffee shop that became Lloyd's of London. There are times you want to buy down your risk, like Francis McKnight. There are times you may not, as Joe Hart saw.

What are *you* risking? Don't guess. Know.

Go Fever won't get you through Day Four. It takes courage to become more than you are now. Effective risk evaluation builds courage. Unfortunately, it *requires two things that are in short supply among most humans:*

1. the ability to monitor the effect of emotions on judgment, and
2. the ability to use statistics as a tool.

The human brain is millions of years older than statistics. Statistical thinking was not a deciding factor in how Your Hairy Ancestor made her prehistoric living on the African savannah. It was not passed down to you by natural selection or provided by an intelligent design. Neither was statistical thinking gifted to you by your other ancestor, The Child You Were. In the earliest years in your personal evolution, you weren't ready for 2 + 2.

You are almost certainly now, as I was before I wrote this chapter, innumerate when it comes to the math needed to effectively evaluate risk. Few modern humans, including few doctors, professors, and CEOs, have the required grasp of basic statistics.

Do you judge tornadoes to be more risky than asthma? You are about twenty times more likely to be killed by asthma. People believe otherwise because tornadoes are more vivid.

If you've ever seen them in person, you know how terrifying tornadoes are. They even make a dramatic impression on video. Asthma? Not so much.

Speaking of asthma: A friend of mine accepts the risk of smoking, which costs women an average of 4.6 years of life. She will not, however, accept the risk of living near a nuclear power plant, less dangerous than riding a bicycle. But stories about nuclear power plant disasters are easy to remember.

People are afraid of the wrong things. They judge they are more likely to die in an accident than by disease. They think they are more likely to be murdered than to commit suicide. Statistics show that disease causes about sixteen times as many deaths as accidents, and suicide occurs twice as frequently as murder. Accidents and murders are simply more interesting and more widely reported.

Buy a gun if it makes you feel safer, but know that—statistically—you are more likely to shoot yourself than someone trying to do you harm.

People believe otherwise because we tend to assess risk based on emotion—how much we fear something—rather than how dangerous it really is. People judge risk by the ease with which examples come to mind and how vivid those examples are.

One reason lottery tickets sell so well to innumerate people is that they make great wealth quite easy to imagine. You are about one hundred times more likely to be killed by lightning than you are to win a million-dollar lottery prize. Perhaps you still want to buy that ticket. At least you are not guessing. You have statistics.

The weakness in human risk evaluation is the stock-in-trade of terrorists. They do flashy, horrible things to a minuscule subset of the population and thereby attempt to intimidate the rest. It is not courageous to respond by crying for more government protection, surrendering our civil rights, or lashing out. Effective risk evaluation is key to responding effectively—courageously—to terrorists. Simple. Not easy.

Experts are not immune to misjudging risk. Many American physicians unknowingly overstate the risk of prostate and breast cancer while also understating the risk of treatment.

Former chairman of the Federal Reserve Alan Greenspan was shocked when the housing bubble burst, causing a worldwide economic recession. He says now that he "made a mistake in presuming" that the giant financial firms would regulate themselves.That was naive, but it was not Greenspan's worst mistake. His worst mistake was ignoring the existential risk to the U.S. economy if the giant financial firms did *not* regulate themselves, regardless of his presumptions. *Optimism is not courage.*

Levee failures caused 80 percent of New Orleans to flood during Hurricane Katrina. 1,833 people died. The American Society of Civil Engineers noted afterward that Louisiana officials did not account for "…the probability of failure combined with the consequences to human health and safety if that failure were to occur." Like Greenspan, Louisiana officials presumed that low risk of a catastrophic event meant they did not need to prepare for it. *Voluntary myopia is not courage.*

Perhaps the most damning finding of the investigation into the *Challenger* space shuttle disaster concerned the misstating of risk. NASA management put forward a 1 in 100,000 chance of catastrophic failure. Their own engineers felt the chances were closer to 1 in 200. NASA management embraced the illusion of certainty. *Go Fever is not courage.*

Consider other examples of how we misjudge risk:

1. The rate of deaths from skydiving accidents remains stable despite great advances in equipment safety. Emboldened skydivers try riskier dives.
2. Helmets are the main reason there are so many head injuries in football.
3. Otherwise sane adults make phone calls while driving.

Tom is a turkey. He lives on a farm. Farmer brings him delicious corn to eat and fresh, cool water to drink every day.

The pattern repeats faithfully for 1,000 days. Using inductive reasoning — deriving a general principle from specific observations — Tom becomes certain that Farmer is a benevolent creature that exists to meet his needs.

Tom does wonder, sometimes: "Farmer takes milk from the cow and apples from the tree. Why would he give me everything I need and expect nothing in return?" Or "what became of that older turkey that disappeared last year? Or the one before that?"

When the gate is left open, Tom does not muster the courage to escape into the woods. Why would he? The woods seem uncomfortable. The farm is comfortable.

Perhaps it will remain so. Or perhaps Tom is a Magoo.

On day 1,001, Tom's fate manifests itself, ax in hand. Perhaps Tom should have translated his uncertainty into his risk of becoming Thanksgiving dinner.

How to Avoid Guessing about Risk

Most of us are vulnerable to the dangerous illusion called the false positive. To demonstrate, please allow me to make you sick.

You have been feeling tired for a long while and your skin is becoming painfully dry. Your doctor suspects you have Finding's Pneumonia (named for Sir Basil Finding; called FindingPneumo for short). She orders a test. It can only be given once. You test positive.

Your doctor informs you that without treatment, FindingPneumo will shortly cause your skin to turn bright orange and scaly for about three years.

There is a cure. She recommends you take it. It has side effects, however: severe flulike symptoms for two months. It costs $28,000 and is not covered by your insurance.

You are uncertain. Should you buy the cure? What is your risk? You ask for more facts. Your doctor gives you these:

1. Three percent of the population has FindingPneumo, whether or not they have symptoms yet. She unnecessarily points out—you are not an idiot—that 97 percent of the population does *not* have FindingPneumo.

2. The test for FindingPneumo is not perfectly accurate. There is a 10 percent chance of a false positive. That is to say, one out of ten people who do *not* have FindingPneumo will nonetheless get a test result that says they do.

3. There is also a 67 percent chance that a person who actually *has* FindingPneumo will test positive for it. That leaves a 33 percent chance of a false negative.

You seek a second opinion. That doctor tells you exactly the same thing, as does Wikipedia.

Now you must decide. Should you spend $28,000 and feel horrible for sixty days to ensure that you do not look like a clown fish for three years?

Yes, you did test positive, but what is the chance it was a false positive? Do you really have FindingPneumo? The test is only 67 percent accurate, after all.

So you have a 67 percent chance of having the disease, right? Wrong.

An estimate of 57 percent, however, neatly subtracts the 10 percent false positive number from 67 percent. Also wrong.

Channel your inner Gene Kranz. Be a good flight director. Don't guess. Know. Assess your risk with

statistics. Just how strong a piece of evidence is the fact that you tested positive for FindingPneumo?

Imagine that Flight Director Kranz gives you this big hint: "Base rates." Imagine you ask him to elaborate and he says: "Ninety-seven percent of the population is a lot of people."

The thought then occurs to you that a large number of people must get false positives. Indeed the 10 percent false positive rate multiplied by the 97 percent of the population who don't have FindingPneumo means that 9.7 percent of the population will get a false positive if tested.

You see that the false positive group would be more than three times larger than the 3 percent of all people who actually *have* FindingPneumo. Feeling a bit better, you proceed to turn your uncertainty into risk. You get out pen and paper and proceed to draw the diagram opposite this page.

Now you know your risk. You have a less than one in five chance of becoming bright orange and scaly. Maybe you will keep your $28,000 and skip the side effects of the medicine. Maybe you won't. You certainly won't be guessing.

Regardless of your choice—or the result—you have done what needs to be done by someone who tests positive for FindingPneumo. That's excellent.

Does a Positive Test Mean I Have FindingPneumo?

For every **1,000** People Tested:

Group H
30 People Have FindingPneumo
(3% of 1,000)

- **20** Will Test Positive (67% of 30)
- **10** Will Test Negative (33% of 30)

Group D
970 People Don't Have FindingPneumo
(97% of 1,000)

- **97** Will Test Positive (10% of 970)
- **873** Will Test Negative (90% of 970)

Since I tested positive, I need to know the probability of **anyone** testing positive actually having the disease. To start, I will add the number of people who test positive from both groups:

20 from Group H + 97 from Group D = 117 total people who tested positive

I will turn uncertainty into risk by seeing what percentage of that 117 people who tested positive are the 20 people who test positive and actually do <u>have</u> the disease:

20 ÷ 117 = 0.17

Because I tested positive, my probability of having FindingPneumo is **17%.**

In *The Black Swan*, Nassim Taleb uses the turkey problem to point out that recent history is not conclusive. Safety is in effective risk assessment. Unlikely-but-catastrophic scenarios must be addressed. Tomorrow is one day closer to day 1,001.

Courage is in more and better facts. Courage is in statistics.

Here are a few statistics everyone should know:

1. Smoking increases the risk of coronary heart disease and stroke by two to four hundred percent and lung cancer by over two thousand percent.
2. Approximately five percent of the general adult population has a sex addiction.
3. Women who identified their work as highly stressful were forty percent more likely to suffer from heart disease than female colleagues reporting lower work-related stress.
4. Individual investors who trade actively reduce their returns by about four percent annually versus investors who buy and hold low-cost mutual funds.
5. Obesity increases the risk of:
   - diabetes by seven hundred percent,
   - heart disease by eighty-one percent,
   - stroke by sixty-four percent,
   - depression by fifty-five percent,

- asthma by fifty percent,
- Alzheimer's by forty-two percent, and
- getting ten types of cancer.

6. Twenty-five percent of women who have more than seven alcoholic drinks per week are considered to be dependent on alcohol.

People with gumption look for facts and options. They also know the difference between paying attention and useless worrying. They don't gamble more than they can afford to lose, but they do accept the risks inherent in living a purposeful, adult life. That requires courage — and statistics.

Some of your certainty about who you are and what you can do is no better than a guess. You can do more. Start with your understanding of risk and probabilities. You accept too much risk in some areas (e.g., your bad habits) and too little in others. You take advice from people who are themselves just guessing.

It's a good thing to be literate: You can read food labels, you can read Shakespeare, and you can read the funnies. But if you want to be courageous — neither cowardly nor rash — it pays to be numerate. Look at the statistics. Measure real risk. There be dragons. There be courage. There be gumption.

Fundamentals *of* Translating Uncertainty *into* Risk

1. Do not confuse what is frightening with what is dangerous.
2. Do not confuse what you want to happen with what is likely to happen.
3. Use available statistics to measure your uncertainty before making big decisions.
4. Use actual frequency not relative frequency (that fifty percent increase may only be from four to six out of one hundred).
5. Accept the risks inherent in living a purposeful, adult life.
6. Insure yourself against potentially ruinous losses.
7. Don't insure your microwave oven.
8. Certainty is an illusion: beware the false positive.
9. Things often seem more orderly than they are—one-hundred-year floods can happen twice in two years.
10. Most smart people are not smart about statistics.

GUMPTIONWORK

Look, Ma — Watch Me Measure Uncertainty!

You can do this better online:
www.gumptionade.com/measure-uncertainty

I now place two dice on a table in front of you. They appear identical, but one is fixed to land only on three or six. I then offer to bet you ten dollars that you can't guess which of the dice is fixed, after rolling just one.

You take the bet. Hey, it's just ten bucks. You pick one up and roll it. It lands on six. This is almost certainly the fixed dice. That was easy.

Before you can say anything, though, I offer to up the bet to one thousand dollars.

You are pretty sure that would be a good bet for you, but…a grand? You are uncertain. At this point you cannot afford to guess. Before you make the big bet, you need to weigh your risk of losing one thousand dollars.

Can you can use logic to translate your uncertainty into risk? If you hated FindingPneumo, think of this exercise as preparation for Chapter 9: "Suffer Better." Please proceed:

Since it came up six, the probability I rolled the fixed dice is as follows:

_____

You aren't sure? Look at it this way:

GUMPTIONWORK

Bayesian Probability Analysis

	FIXED DICE	FAIR DICE
Probability you chose each dice	1 in 2 (=½)	1 in 2 (=½)
Probability of rolling a "6" with it	1 in 2 (=½)	1 in 6 (=⅙)
Combining the probabilities	½ x ½ (= **¼**)	½ x ⅙ (=**1/12**)

One-quarter is three times larger than one-twelfth. Because you rolled a six, you are three times more likely to have picked the fixed dice than the fair dice. This is the same as saying there is a seventy-five percent chance you picked the fixed dice.

You are no longer uncertain. If you bet that the dice you rolled is the fixed one, your risk of losing is twenty-five percent. Take the bet if you can afford to buy a seventy-five percent chance of winning one thousand dollars, accompanied by a twenty-five percent chance of losing that much.

Extra credit: Show yourself why this $1,000 bet is worth $500:

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