SQUAT EVERY DAY

Thoughts on **Overtraining** and **Recovery** in **Strength Training**

MATT PERRYMAN

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by Matt Perryman

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Preface

This book started as an experiment I did on myself. Long-time readers of my blog at Myosynthesis.com will know that I started tinkering with daily squatting back in early 2010. I hadn't intended to do anything but try it out for awhile, just to see what would happen. I honestly expected a crash-and-burn inside a few weeks.

But it never came. In fact, it started to feel like the exact opposite. The squat numbers kept going up as long as I kept turning up. I expected more injuries, but those never materialized either. Instead, my long-aching joints and sore spots, some of which I'd thought were career-enders, started to feel better.

I started taking notes, sifting through research papers, and trying to figure out why this was happening. Based on everything I thought I knew at the time, my body should have been stressed to the breaking point — and it just wasn't. I blogged about what was going on, and I was content to leave it at that.

I didn't have any intention of writing a book about it. After all, it's one thing for a top-caliber athlete to train every day, multiple times at that. They have the skill, the bodies, and the incentive. It didn't seem like there would be any appeal for programming that specialized, requiring that much of a time commitment and dedication, for the recreational lifters and bodybuilders that I write for. I'm far from a top-tier athlete, and while I like to tinker with strategies that I'd never "officially" recommend, it didn't occur to me that there'd be anything of real interest here, beyond the novelty of it.

The more I thought about it, though, the more I realized that what I'd stumbled upon wasn't just about squatting to a max every day. There was more here, potentially much more, hidden away in the assumptions we all make about our bodies, about our training, and how it all hangs together behind the scenes. At the time, I'd been following John Broz's lifters, reading his thoughts on the "Bulgarian" system he used, and watching the progress videos on YouTube. I was following Jamie Lewis's Chaos & Pain blog, reading his exploits in the land of extreme training. There was a pattern at play here — a pattern that transcended the usual excuses of genetics and steroids — and I wanted to figure out what it was.

It was about a year later when I was convinced to write a book about the topic. By that point I'd put in my own time with the system, come up with some good reasons to support it, and frankly I was sold. Not as a program or even a "workout system", but as a different way of looking at fitness, at strength-building, and the process of recovery.

So here we are.

Those of you familiar with my older work will notice that I have made a sharp departure from my usual "scientific" approach. In the last few years, my views on science, especially science's role in establishing "truth" in fitness and nutrition, have changed so much that it qualifies as a complete break.

The internet has developed whole communities who believe that fitness and strength can be reduced to numbers and captured in micro-level facts about biochemicals and cellular

biology. The conclusions drawn are Truth given by the authority of Science. The more oblique references listed, the more scientific. Let's call this "Pubmed Science".

It sounds good, but this style of truth-seeking is as mythical as the gym-rumors it aims to counter. Combing abstracts for biochemical information or the hormonal responses of athletes or some such trivia removes you from the realities of actually lifting a weight. It strips away all the context and creates mock-quote "facts" in a vacuum. In the absence of any grounding, it's easy to construct a whole reality out of those "facts", one which has little to do with the world we live in.

Pubmed Science is more like telling a story, crafting a beautiful narrative out of scientific factoids. It gives you that story we all need to tell ourselves, that we know what is going on and, more to the point, that we have control over it. I'm all for the safety blankets of illusions, but not when the illusion is held up as a superior, objective, non-biased account of reality.

My strategy here is not so novel, and will probably seem like common sense to many of you. What I'm doing here is shifting the priority away from the abstract theoreticals and instead grounding my ideas in the practical.

Any practitioner, whether we're talking the line technician who keeps the phone lines working or the MD who keeps you healthy, has more knowledge than is immediately evident from their educational background and formal training. There is an unspoken — and unspeakable — element in the Doing. The term for this is *tacit knowledge*.

Dealing with the contingencies and uncertainties of Reality means that we just can't write down every last detail, or even a formal list of rules and good ideas. Some things are going to remain fuzzy, and you'll have to make judgment calls based on necessarily incomplete information.

Pubmed Scientists see this as a problem, expecting that all questions about living bodies will have distinct, objective, "true" answers. I don't believe that either is the case. Biological systems largely won't have concrete answers of the sort you'd find in physics or chemistry — but, well, so what? I believe it's wrong-headed to expect those answers in the first place, and on the other hand, the fuzziness works in our favor because we don't need concrete answers at all. Our judgment about "what next?" is oftentimes better than any "scientific" reply.

In this book, I start with the assumption that Doing takes precedence over the abstract theorizing of Pubmed Science. In strength training, it is getting in the gym, paying attention to your body, and keeping records that forms our starting point. I start with the premise that not having a precise answer is no problem at all. The idea is to use that knowledge you amass while Doing and learn how to deal with uncertainty.

With that grounding of personal knowledge to start with, then — and only then — we look to the research to give that knowledge context. Formal research is wonderful for explaining why some observations might be happening, and that is the methodology I have used. The science here is in the service of what I saw happening in the gym, not the other way around.

While this is, officially, a book on strength training and fitness, these themes of tacit

knowledge, acceptance of uncertainty, and rejection of reductionist Pubmed Science lie beneath everything you're about to read, and I would suggest that you read it with that in mind.

Finally, besides the usual disclaimers about getting medical clearance before beginning any such program and such, I would add that nothing written herein is intended as the last word on any subject. This is a record of an experiment I conducted on myself and with the input of acquaintances who decided to throw in and see what would happen.

Consider this the starting point of a dialogue rather than the an authoritative final word on the matter.

Doing It All Wrong

"Whenever you find yourself on the side of the majority, it is time to pause and reflect."

—Mark Twain

"It is impossible to begin to learn that which one thinks one already knows."

—Epictetus

It was on March 5th, 1949 when a wiry farmer stunned the crowd in Johnson City, Tennessee with a deadlift of 725 and one-half pounds. An impressive number in its own right, this feat was all the more amazing for the size of the man hoisting the barbell. Our farmer weighed all of 180 pounds, and that 725 pound deadlift set a record which stood for over 20 years.

Bob Peoples was one of the most gifted lifters of the 20th century and one of the strongest men to ever touch a barbell. No stranger to hard work, Peoples spent his days in the local textile mill and on his farm, sometimes training as late as 2am after a long day, sometimes missing months of training due to work and other obligations.

What might surprise you even more than a 700-plus pound deadlift by an 180 pound man — with a double overhand grip, no less — is how he arrived at that kind of strength.

In a 1952 article written for Peary Rader's *Iron Man* magazine, Peoples summarized the nuts and bolts of his training. His methods were simple, if diverse, and he always came back to the old standby which had served him best: "that is, daily training with a few exercises and working up to limit poundages and 3 to 5 reps."[1]

Although it's clear from his writings that he tried many different systems and methods over his career, Peoples always came back to heavy, low-rep training done every day of the week. Work schedule or not, when Bob Peoples trained, he trained. Deadlifts in excess of 600 lbs and squats over 400 lbs for sets of 3-5 reps — each and every day — are the rule rather than the exception in his recorded workouts. And this, despite a grueling work schedule and a busy life in the community.

Bob Peoples trained as heavy as he could and as often as he could make it happen. Not for the sake of any training-dogma. In the 1940s there were no internet forums and barely a hint of the mass-media circus that would become the public face of strength and fitness. He trained daily because, through trial and error, he found that this was the most productive way to get stronger. For his efforts he was able to pull over 700 and squat over 500 while weighing well shy of 200 pounds.

It's hard to imagine that kind of workout schedule these days. Current thinking in the strength and fitness world doesn't allow for it. Everyone knows that training every day is reckless, counterproductive, dangerous. Unsustainable without drugs. Only good for genetic freaks. Working with a modern-day personal trainer or coach, Peoples would be advised to

cut back on his workouts in order to hit the gym fresh and avoid overtraining himself.

Bob Peoples lived and trained in a time and a place where steroid use would have been unthinkable. John Ziegler wouldn't synthesize methandrostenolone — Dianabol — and kick off the steroid era for another decade. Peoples lived a busy life full of manual labor, with no research, no blogs and only a handful of fitness magazines to tell him he was training sub-optimally and likely overtraining.

And yet he still trained every day he could and deadlifted weights that most people will never see in real life.

If doing everything wrong works better than doing it by the book, is it really wrong?

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At the 1988 Olympics, Turkey brought home its first gold medal thanks to weightlifter Naim Suleymanoglu's spectacular 342.5 kilogram total, hitting a 152.5 snatch and 190 clean & jerk. Numbers of that caliber would grab the attention of many national teams for a 200 pound man. Suleymanoglu stood a scant 4'9 (1.47m) tall as he competed in the 60 kilo featherweight class, proportions earning him the nickname "The Pocket Hercules" as well as a Sinclair score of 505 — a score that establishes Suleymanoglu as the all-time best lifter by bodyweight.

Before defecting to Turkey in 1988, Suleymanoglu trained in his native Bulgaria under coach Ivan Abadjiev. Abadjiev, from a background as a humble basket-weaver, surely didn't strike anyone as an innovator when he first began his weightlifting career in the 1960s. The man who would go on to coach Bulgaria's national team to multiple gold medals in the 1970s and 80s started out as a weightlifter himself before several embarrassing displays that left him disgruntled and at odds with the administration.

As the story goes, it was Abadjiev's disgust with Bulgaria's sporting system, and the belief that he could do better, that led him to take over the top coaching slot. Inspired by practices of American weightlifters of the previous generation, Abadjiev's solution was at once simple and intimidating: his lifters would clean, jerk, snatch, and squat. Every day. For eight hours a day.

The Bulgarian method, as this would become known, emphasizes specificity. You want to get good at the snatch and the clean & jerk? Then train them, train them hard, and train them often. Bulgarian lifters would train in half-hour sessions focused on one lift, followed by down time for mental as well as physical relaxation.

While Abadjiev's method isn't without criticisms — some justified, others less so — and represents an extreme case, the underlying logic is sound. Take the lifts you want to improve and, perhaps, a bare minimum of assistance work, and hammer it as often as you can. That probably won't require 50 hours a week of Olympic weightlifting, but then again, nothing says you need that level of dedication and sacrifice to make frequent lifting work.

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Anthony Ditillo wrote for Peary Rader's *Iron Man* magazine for over 20 years between the late 1960s and the 1980s. An eclectic and impressive lifter in his own right, Ditillo was

always open to experimentation. Over his career, he ranged from a body weight of over 300 pounds at 5‘7, his trademark “bulk and power” build, to a shredded sub-200 pound bodybuilder’s physique. Although he tried many diverse methods of training, like Bob Peoples he always came back to heavy basics, working in the range of 3-5 reps and training on a regular basis.[2]

One of Ditillo’s articles recounts his training in the summer of 1974, when he trained with a good friend and “accomplished Olympic weightlifter” who he named as “Dezi”. As he went on to describe, he was training “for the most part five days a week on the following movements: Bench Presses, High Pulls, Shrugs, and possibly sometimes Power Snatches. I also include whenever I feel like it, full, bar high on the neck, back completely straight, Olympic Squats.”[3]

Ditillo, always a fan of sets of three or five reps, stayed with that scheme while working up to maximum weights for the day. He noted that, despite the workload, “the need to psych up for a workout or limit lift is no longer necessary” as your body begins “slowly adapting to the workload you are putting on it and it gets to the point where you can recuperate overnight”.

Like Bob Peoples, he found it better “to condition the body to accept workouts on a DAILY basis than to use the two or three times a week method of operation”.

Ditillo’s training partner “Dezi” was the weightlifter Dezso Ban, no slouch himself. Ditillo reported that Ban, weighing all of 190 pounds, clean & jerked 380, power cleaned and pressed 285 for sets of five, shrug pulled 500 and stiff-legged 605 for doubles, and front squatted 455 for five among other feats.

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Weightlifting coach Bud Charniga has translated a range of former-Soviet materials on strength training and athletic development, some of which is published on his Sportivny Press website. Among his articles are an interview with Russian superheavy lifter Leonid Taranenko, who would still hold the all-time record in the clean & jerk had the weight classes not been restructured. In an interview with Charniga in the late 80s, Taranenko said that he trained six days a week: three times a day, up to six hours per day, for three days, and twice a day up to four hours on the remainder. This netted Taranenko a 380kg (837 lb) back squat, with a two-second pause at the bottom.[4]

Among strength athletes, it’s the weightlifters who treat their training like a skill. All you have to do is one rep with a snatch or clean & jerk to understand why. These lifts are hard. Not only in the sense that they’re skill-intensive, requiring immense concentration, but rep for rep the quick lifts are more physically challenging than just about any other lift. Accomplished Olympic lifters must not only be strong and fast; they must also be proficient at the lifts, and fit enough (in aerobic terms) to tolerate the workouts. It’s a sport that fits well with regular practice and demands a conditioned body.

This sets the weightlifter apart from powerlifters and strongmen, who traditionally gravitate towards more conservative strength programs and the style of training that treats strength as a simple brute-force equation.

While developing a brutally-strong squat doesn't guarantee equally brutal performances with the clean and snatch (as many strong squatters with weak showings on the platform attest), there's an unexpected lesson for those of us after plain old gym-strength.

The squat is an accessory exercise for Olympic weightlifters, used as a developmental movement for the hips and legs. A degree of squatting strength is necessary, but certainly not sufficient, for stellar performances on the platform.

What does it say about training for a goal when weightlifters have such impressive numbers for a lift that they don't even take seriously? Pound for pound, top weightlifters have squats that rival — if not exceed — those of top powerlifters. And these squats are all the more impressive for the technique used, the high-bar, full-depth "Olympic" style with little or no supportive equipment.

This is a trend among top weightlifters — lots of pulling and squatting, then more pulling and squatting, leads to a strong squat. Taranenko wasn't a weak squatter just because he didn't train the "right" way. If you get stronger, you're stronger.

When you succeed by doing everything wrong, are you really doing it wrong?

Once upon a time, strength training looked a lot more like the programs of Bob Peoples, Anthony Ditillo and Ivan Abadjiev. Squatting, picking up, and putting weights overhead as often as possible, lifting as heavy as possible.

Naim was setting world records as a teenager, and won that first gold at age 21 before going on to medal again at the 1992 and 1996 Olympic games. There's little doubt that Peoples was an extraordinary lifter, given his equally extraordinary tolerance for punishment. These men, regardless of their dimensions, were all outliers among strength athletes. That kind of strength doesn't happen without being wired right for it.

Yet these smaller powerhouses nevertheless point us toward an important truth: strength isn't always built through raw muscle bulk. Strength sports aren't bodybuilding. Strength means lifting things. Powerlifters, Olympic weightlifters and strongmen all need to pick things up and move them around. The exercises are different, but the better you are at moving heavy things, the better you perform. What better way to get better than to spend time practicing your sport?

Fast-forward to the modern day. Decades of bodybuilding and mass-marketed aerobics and circuits and shaping and toning have ingrained the idea that muscle bulk and low body fat are synonymous with strength and health. Bodybuilding methods and training schedules, with split workouts and a focus on pumping, bombing and blasting individual muscles, have become synonymous with weight training.

There's nothing wrong with bodybuilding or training for the sake of looking better, but that focus on bodybuilding as the one and only way to lift weights gives the wrong idea.

The bigger the engine, the more horsepower you have to work with, and it's no coincidence that the best numbers, in absolute terms, are put up by the biggest lifters. Yet

there's an uncomfortable relationship between training for muscle bulk and aesthetics, on the one hand, and strength for the sake of strength. Like any close siblings, they have a great deal in common and just as much to argue about.

Beginners hear nothing to challenge this, of course. The beginner, typically a chronically underweight male (and increasingly, female) finding it difficult to add muscle mass and get stronger, hears the cardinal rule: Eat. Lift Heavy. Sleep.

In fairness, for most would-be strength athletes, this is the solution. Your typical "hardgainer" is chronically underweight and a chronic undereater. Force-feeding yourself to a healthy body mass works, and it works well.

For awhile.

Fired up by the calorie-fueled pace of beginner's gains, however, you might expect the party to last forever. It's easy to lose perspective in the moment, even though you will hit a point of diminishing returns sooner than later. At that point, when you can no longer rely on eating yourself 10 pounds fatter for an extra 10 pounds on your squat, is when the test begins.

With the low-hanging fruit picked, it's time for a new strategy. Gains will be slow and hard-won. You'll hit the same plateaus and butt heads against the same maxed-out lifts. You repeat the same programs, the same weights, the same rhythms and timing. You try to out-eat the problem, piling on 20 pounds of fat for every five pounds on your squat.

And you don't improve.

When all the things you *should* do stop working, what's left? You can settle into a rut and get comfortable with mediocrity. You can complain about genetic potential and steroids and being a hardgainer. Some will choose pharmaceutical enhancement, switching back on the growth potential with anabolic steroids and briefly extending the power of Eating to Gain.

Strangely enough, during all that, the training never changes. Of all the things to question and tinker with, all the places to squeeze out a little extra, it's never the training.

I wrote this book to explore these questions. Genetic wonders they may be, there's also another set of common factors. Their training wasn't anything exceptional. They focused on the basics. They trained heavy and hard, using lots of low-rep sets and occasional rep-outs. They trained with little more than the core lifts, squatting, pulling, and pressing weights.

And they trained every day. Each of these men trained according to an apparently unique philosophy, each was impressively strong, and — above all else — each of them completely ignored everything you've ever been told about overtraining and recovery.

A central theme of this book is that there's more than one way to get strong. Not everyone has the potential to eat themselves to a svelte and muscular fighting weight. Not everyone wants to be 30% body fat for a 10 kilo bump in their squat. The "bulk and power" method, effective as it can be, is not for everyone, and probably has little place outside brief and occasional growth spurts.

Strength can happen in other ways. You can be sleek, streamlined, and still lift impressive amounts of weight. Strength can be more like *practice*. We need to think more

like Bob Peoples and Ivan Abadjiev.

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Tell one of your in-the-know gym-friends that you plan on squatting to a max six days a week and the response can be scripted almost to the last word. You'll hurt yourself. You'll overtrain. You can't do that without drugs. No way you can do legs that much, you need at least a week to recover after leg day.

One place you won't hear it is Average Broz's Gym in Las Vegas. Until recently, this hole in the wall of a gym was little more than that: a few platforms and jerk boxes, a set of upright squat stands, and stacks of bumper plates piled into office space in a commercial strip mall.

In late 2009, then teenage Pat Mendes became an overnight sensation thanks to his unbelievable squat strength, handling 350 kilos with an almost casual effort. Mendes's coach, John Broz, revealed that this was no one-off event. Handling ridiculous weights with casual effort was routine in the training at his gym.

Broz, himself an accomplished record-holder, is a former student of Antonio Krastev, best known for his all-time record snatch of 216 kilos. It was from Krastev that Broz developed his own variant on the Bulgarian methodology, using a daily max approach to the quick lifts as well as the front and back squat. Lifters train up to a technically-solid maximum for the day, make a few attempts with it, and then plan work sets (back-off sets) from that.

Broz has a knack for turning out impressively strong squatters. It seems like every other week he has a new lifter turn up and squat close to triple body weight. It was reading through Broz's rationale for his training, and seeing his results, that first prompted me to try the method for myself.

This was a point in my life when I'd taken the orthodox powerlifting approach to heart, and in fairness it did net me some decent gains over the years. But there was a problem. I'd leveled out, and much of that plateau was due to an impressive range of injuries. One torn adductor and one torn quad meant that doing things the old way, squatting once or twice a week with a powerlifter's wide stance, just wasn't in the cards anymore.

I gave it an honest try, though, even knowing that maxing out on squats five or six days a week was probably not going to cooperate with two busted legs. I didn't have anything to lose, so why not?

Imagine my surprise when the numbers on the daily max just kept climbing, week after week. I felt beat up, maybe more irritable than normal, had a constant low-grade soreness going on — pretty much what you'd expect from squatting heavy every single day (or starting a new job heavy on manual labor).

Not only were the numbers going up, but I noticed that all the physical symptoms — symptoms I'd have classified as "overtraining" in years past — didn't really *do anything*. They were there, certainly, and I didn't always feel great, but most days at the gym it just made no difference. Even days where I came in sluggish, I'd do a few sets to grease the groove and I'd feel the power come on. Hitting max weights, double body weight or more,

became as casual as getting out of bed.

I ignored all the "overtraining" and *nothing happened*. The textbook says one thing, and yet when the cards were down in the gym, it just didn't matter. I didn't make it a big deal and it wasn't a big deal.

As for my injuries, something even more bizarre happened. I'd expected to become progressively achier, maybe aggravating the old scar tissue and risking a new tear if I wasn't careful. Imagine how surprised I was when the pain got better the more I squatted.

You read that right. The more I squatted, the less warmup I needed and the more cooperation I got from the old injuries. From somebody who seriously thought he'd never squat heavy again to be squatting double body weight — for casual singles on a daily basis — inside six weeks, that's big progress. I noticed a similar effect on my shoulders, which have both suffered partial rotator-cuff tears, while bench pressing. The frequency felt like it was greasing the wheels and making everything feel better.

That experience, more than anything else, sold me on the idea.

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I started writing this book as a defense of frequent lifting after my own experiences with daily squatting. I wanted to explain just why alleged "freaks" like Bob Peoples and Naim Suleymanoglu and Deszo Ban could get so strong by doing everything wrong, at least by the standards of accepted mainstream knowledge. I wanted to know, first and foremost, why I hadn't exploded as I expected I would.

Ask this question to your average fitness know-it-all and you'll get a response, of course: genetics and drugs. While there's an element of truth in those charges, they lack any real explanatory power, and can be easily challenged by counter-examples. Why accuse one athlete of drugs, and not another? Why assume that one kind of excess is good — say squatting to your limit once a week, or less — and another unsustainable? There's an incredible double standard within the orthodox viewpoint.

What about a genetic *untermensch* like myself? I've got a small bone structure, have never been particularly impressive at muscle-building, and even the lifts I'm good at aren't particularly good when measured against a high bar. I still made it work, and for my trouble I got about as strong as I've ever been while at a much lighter body weight.

The fitness mainstream, such as it is, is dominated by people who have no idea what "too much" is because they can't rate exercise by any metric beyond immediate discomfort; or else by those who, in a bizarre twist, cut out anything resembling hard work so as not to risk "overtraining". It would be most charitable to say that these points of view aren't exactly wrong, but neither are they right-enough to be useful.

Paraphrasing Vladimir Zatsiorsky, the idea is to train as heavy as possible and as often as possible while staying as fresh as possible. We want to find a balance point between all three of those variables and, as Ditillo wrote, to encourage the body's adaptability. As I researched, I came across a lot of information on what recovery might be and how it relates to both positions, and ultimately that's what I'm trying to get across to you.

The “every day” wording is a bit of an exaggeration. You don’t have to be in the gym literally every day of the week. It might be better to call this frequent training, or regular training, or high-frequency lifting. Whatever you like. I’m not terribly concerned about the label; just know that I’m talking about doing enough strength training to aggravate people on the internet.

As I’m defining it here, high frequency means training an exercise or muscle group with three or more sessions in a seven-day week. This definition covers everything from the daily workouts of Peoples and Ditillo to, at the extremes, the almost non-stop training attributed to the Bulgarian and Chinese weightlifting teams. High-frequency includes more modest programs, which could mean training as little as three times a week, though this would be a bare-bones starting point.

What I have in mind falls above that bare minimum, but still shy of an eight hour day of squats, five or six days a week. Think five or six workouts, 50 minutes to an hour each, with a squat and a press, or a press and a pull, and some conditioning work thrown in. Whatever you want to call it, the idea is to get as much exposure to heavy weights as you can stand. If that means lifting seven days a week, so be it. If that means only three or four, that’s fine too.

If you want more than modest results — if doing it all “right” hasn’t worked out for you — then you should be open to new kinds of training instead of resigning yourself to being a genetic reject. Genetics matter, but, as I will argue, so do other factors that lie beyond the scope of simple inheritance — and our reluctance to try these “crazy” workout options may, itself, hold us back more than anything about our biology.

The traditional strength-building approach works, and I’d be lying to say it doesn’t. Powerlifters use it, strongmen use it, lots of strong people train that way. Even I started off training with those basic methods, and they earned me a lot of progress over the years.

I have no desire to pull a hatchet-job on meat-and-potatoes strength training. At the same time, I also think there’s a lot of folks out there who won’t respond well to it as a career-building perspective on training. Common wisdom is common because it works for somebody, but that doesn’t mean it works for you. There’s a whole space of training options out there that most of us won’t ever explore, and we never try them out because we’re convinced we know better.

If nothing else, this is an approach to have in your tool-kit for times when you might make use of it.

At a deeper level, I think there’s an inherent kind of uncertainty built in to the human body. This will perhaps make more sense as you read, but I believe that we’re misguided in trying to treat physical training as an activity that can be quantified and neatly categorized — the way most “science-based” programming methodologies treat the problem.

This helps make sense out of my observations on “overtraining” and the fact that my injuries improved with more lifting, which only makes sense if we throw out much of the established understanding in regards to recovery and adaptation.

I will elaborate more in coming chapters. For now, you need only know that I have more fundamental reasons for being skeptical of orthodoxy, and the reasons relate to what

biological organisms *really are* (as well as fundamental limits in our ability to understand that nature).

It may turn out that you'll see better results by doing everything wrong.

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Instead of taking a purely research-driven approach, I'm coming at this problem from the assumption that lifters, by and large, have figured out What Works through an accumulated process of trial and error. The formal apparatus of science then supports and validates those conclusions, or suggests a better explanation, or else does its own kind of myth-busting. What it doesn't do is tell us *what to do*. It can't, and with a literal handful of exceptions, that's not the intent of published research.

You could argue that training science has refined the art since the days of Peoples and Ditillo, and that the practices of modern-day lifters reflect these advances. There may be some truth to that. It's easier these days to confirm what doesn't work, or what may be worth investigating. We've certainly got a much better idea of what biology's doing in the broadest scope, and that's useful in its own way.

As far as improved training practices explaining for the steady increase of records in strength events, I can't get on board with that. That weight training has grown from an obscure activity reserved for social outcasts and become a core part of athletic programs and a popular mainstream hobby — thus drawing from a much wider talent pool — could explain the improvement by itself. We'd also have to take a serious and honest look at what supportive gear and performance-enhancing drugs have added in order to make any meaningful comparison.

While we're on the subject of drugs, that stigma largely comes from several high-profile drug-testing failures by Bulgarian weightlifting team in the 1980s and 90s. As I'll explain later, I think that the drug argument is a red herring. Drugs are equally common at the top levels of sport, regardless of how the athletes choose to train. It makes little sense to stigmatize lifters who train often while ignoring drug use in those who only squat once a week.

If anything, the infrequent lifters benefit more from pharmaceutical enhancement for reasons which I'll explain.

The chronic overtrainers of yore could train every day while drug-free and living active lives. If they could, there's no reason — no physical reason at least — why you couldn't. Nothing's changed between you and them, and I think the lifestyle is a greater determinant than anything else. Daily training methods can and do work for anyone, genetics and drugs aside, provided you follow a few basic guidelines and realize what you're getting into.

For any training philosophy to work, it has to agree with you, your beliefs, and your life circumstances. Look at who you're copying. Not just what they can lift, but look at what they do. Do they squat like you? Do they train in gear? Do you have similar builds? Look at who they are — how do they live their lives? What beliefs and goals drive them? Who are their five biggest influences? How do they train with? What's their gym like?

Circumstances matter. The people around you, the people in your gym, the atmosphere

of your gym, what you read about training, who you talk to about training, what you believe about training — this all matters, and I believe it is key to making any type of training effective.

What you're going to find in this book is affirmation of the basics: squatting, picking up, and pressing heavy weights on the regular. Time-tested exercises and strength-building methods that never stop working, the same stuff that Olympic weightlifters like Bob Bednarski were doing back in the 1950s, what Bob Peoples did when he trained himself to a 725 pound deadlift in a dingy basement gym, and what earned Leonid Taranenko the all-time world record in the clean & jerk while squatting six days a week.

I'm assuming you already know how to squat, deadlift, bench, press, and can generally exhibit competence with a barbell. As much as I'd love to pad out the page-count with pictures of the starting and ending positions of basic exercises, there are around 10 million fitness books that do that.

I'm assuming you've got a few years of consistent strength-building behind you, and some of the discussion might not make sense if you don't. If you're still new to the game, keep reading. There's plenty to think about, particularly in your ideas of productive training and recovery, but you may want to reconsider some of the high-frequency training suggestions if you don't have at least a few years of real, serious, hard training behind you. Then again, maybe not.

As you read the coming chapters, keep simplicity in mind. Strength training is Not That Complicated. The hardest part is showing up and putting in the effort. If you can do that, just about anything will work. But we want to overcomplicate it, overthink it, and wear it out. I've been just as guilty of that as anyone. Learning to cut out the fluff, all the useless, unhelpful and unnecessary baggage, is key to any successful exercise program.

The first two chapters in Part One are meant to explain just why we're supposed to train less, and why the old rubrics may not be as true as we thought. Overtraining, we're told, is always looming, ready to cut us down with a career-ending injury or months of recovery if we don't get enough rest. There are limits, to be sure, but our ideas on recovery might not be as on target as we believe.

Chapters 3, 4 and 5 expand on this in Part Two, describing how differences in biology and psychology influence our training, suggesting that not all programs are created equally. The prevailing belief in "genetics" has been upset by current thinking in biology, and studies of talent development suggest that there may be more to success than the genes we inherit. Your mindset and your emotional coping style and your social networks all influence you in subtle, but powerful, ways that can't be explained through pure biology, and there may be advantages to training on a regular basis irrespective of your genes.

Chapters 6 through 10 suggest guidelines for training, building on these ideas and putting them into practice along with basic workout templates in Part Three. Training frequently requires quality over quantity, treating strength as a matter of practice and repetition, and we can encourage quality by moving away from highly-structured workouts.

Chapter 10 closes out with a look at the ineffable qualities of mindset, psychological tools to keep your head focused, and some of my less-proven, more out-there ideas which might still be of interest.

If you don't care much about the rest of the book and just want to get on with it, start at Chapter 6.

If, at the end of the book, you don't find yourself compelled to squat to a max every day of the week, that's okay. I don't expect to build an army of converts. If you think I'm full of it, that's okay too. All I ask is that you read what's here and give it an honest, thoughtful consideration.

What's important to me, whether you agree with my conclusions or not, is that you stop and ask yourself "what if there's something to this?" If I make you stop and think about how you're lifting, or just give you a few ideas to help you along, then mission accomplished.

PART ONE

Disturbing the Status Quo

1

The Case For More

"Only those who will risk going too far can possibly find out how far they can go."

— T.S. Eliot

Do More, Get More

Milo of Croton lived in southern Italy around 2500 years ago, at the height of ancient Greece's power. Renowned for his skill as a wrestler, Milo cleaned up with six Olympic victories and numerous wins in the lesser-known games of the Greeks. His physical prowess made him as much of a household name as you could be circa 520 BC, the classical era's equivalent of a sporting icon.

The ancient Greeks had a thing about puffing up their heroes, surrounding them with a halo of larger-than-life feats which are undoubtedly embellished. Writing in the 2nd century AD, historian Athenaeus cites Theodorus of Hierapolis, who claimed that Milo "used to eat 20 pounds of meat and as many of bread, and he drank three pitchers of wine. And at Olympia he put a four-year-old bull on his shoulders and carried it around the stadium; after which, he cut it up and ate it all alone in a single day."

It's the ill-fated bull that brings Milo to our attention. According to legend and every exercise physiology textbook, Milo began lifting the bull when it was a tiny calf, carrying it on his shoulders every day. As the calf grew, Milo kept lifting it — and lifting that tiny extra amount of weight every day — until one day he was picking up a full-grown bull.

Today, Milo's bull-carrying feats handily demonstrate *progressive overload* to bright-eyed exercise science undergrads. Seek to lift gradually heavier weights and over weeks and months and years those tiny increments eventually add up to a respectable number. This is the fundamental principle of exercise: to stimulate physical fitness, we must present our bodies with ever-increasing challenges.

Yet, foundational as progressive overload may be, Milo's story leads to unsightly implications. Why couldn't he keep on lifting heavier bulls, maybe graduating to boulders and mountains as Greek legends were prone to do, and keep getting stronger?

If getting strong were about showing up every day and picking up a marginally heavier weight, we could all be world champions. Anybody can pick up one more pound a day, right?

The math seems unavoidable, though. After a year, one pound has become 365, a rate of strength gain that might, generously, be in the cards for a fresh beginner. But after two years, you'll have added 730 pounds, and at three, 1095. Assuming we're talking about a

simple deadlift from the floor, you'll be handling weights well above the all-time world record after a scant three years of training.

Developing superhuman strength with simple progressive overload, as Milo did, is not so easy for those of us without the biographers of legendary Greek heroes.

Milo's oft-cited example demonstrates that strength gains don't happen *linearly* over long spans of time. There will come along occasional outliers and freaks who keep piling weight on their deadlifts and bench presses week after week until they reach numbers that rival mythical Greek athletes, but these people are exceptional (in more ways than you might realize).

For most of us, progress doesn't happen in a straight line. It can seem like it when you first start to train, and maybe for brief spells later in your career when everything comes together just right, but if you were to map out your gains in strength over time, you'd find a line full of peaks and valleys and probably more than a few plateaus.

Progress fluctuates. Progress is *nonlinear*.

Coaches and sports scientists alike have spent considerable time and effort trying to work around this problem. Mapping out and, perhaps, even deliberately planning these peaks and valleys has been the goal of *periodization*, a word taken from the former Soviet Union which is fancy way of saying "plan and organize your training". Sometimes you train light and take it easy, sometimes you train heavy and push out the efforts.

Periodized workouts cycle the intensity from lighter and easier weights on up to heavier and maximum attempts. The less-than-maximum weights develop a foundation for the heavier attempts later on, while the variety keeps you from getting too comfortable and stalling out into one of those plateaus.

Cycling is the time-tested basis of strength-building. To get strong, we must lift heavy weights, but we must also respect that our bodies can☒ft support endless progress. The peaks must be matched with valleys.

How Strength Happens

Most of us have an intuition for what strength is — objects being picked up and carried around, and the heavier the better. Like pornography, we know strength when we see it, even if a strict definition is hard to come by.

Almost anyone would acknowledge the strength of the person who squats 800 pounds, or deadlifts over three times body weight, or clean & jerks 180 kilos.

Strength comes in different forms. The bodybuilder who squats 400 pounds for 20 reps would qualify, as should the strongman who presses that same 400 pounds over his head. Milo with his wrestling and bull-shouldering feats would certainly count as strong even though he never touched a barbell.

Pick up the neighbor's couch on moving day? You might be strong to somebody.

We know strength when we see it because we understand, on some level, that we're talking about the ability to move things around, picking up a heavy object and doing things with it.

In *Supertraining*, Mel Siff defined strength as "the ability of a given muscle or group of muscles to generate muscular force under specific conditions".[5] Strength happens in powerlifting and Olympic lifting and strongman contests. Strength happens in real life, whether that's helping friends move, working out in the yard for some casual landscaping, or moving your body to play a sport.

Getting stronger, then, means lifting heavier things, or carrying them for longer distance, or even changing the specific conditions — the exercises — in which you can develop force.

Back in 1993, Fred "Dr. Squat" Hatfield and quadzilla Tom Platz decided to see who was really stronger: powerlifters or bodybuilders.

The gym rat's analysis says that powerlifters are stronger than bodybuilders, but bodybuilders have more muscle than powerlifters. The bodybuilder needs finely-developed muscles and low body fat, which isn't great for lifting the most weight. The powerlifter trains to move the most weight, which isn't always great for taking your shirt off at the beach.

The Great Squat-Off in Fibo, Germany put this belief to the test. Hatfield, a powerlifter and one of the first men to squat over 1000 pounds, faced Platz, the bodybuilder renowned for his otherworldly leg development, in a challenge to see who could lift the most weight and knock out the most reps with 500 pounds.

Hatfield out-squatted Platz at 855 to Platz's 765. But when the weight came off for maximum reps, Platz took home the trophy with an amazing 23 reps at 500 pounds, while Dr. Squat only managed thirteen.

Who's stronger? Hatfield with his 855 max or Platz with his 500x23? The strict view says that Hatfield takes it, in that he lifted more weight. Then again, "weak" isn't a word I'd use to describe Platz — and that 500x23 could be seen as more impressive, dare I say stronger than, a one-off maximum lift.

Picking sides in the "who's stronger?" debate defies any simple answers.

Ever since the 1960s, strength and fitness circles have centered on muscles. Muscles generate force, so bigger muscles mean more strength. Unsurprisingly, the strongest people have always been the biggest. Debates over size and strength aside, the person with more muscle will always lift more than the person with less *if all else is equal*.

The thing is, the else is rarely equal.

Top bodybuilders aren't weak by any stretch of imagination, as evidenced by Tom Platz's performance in the squat-off. But if bodybuilders, with their advantage in muscular development (if not in pure bulk), don't match the top-end strength of powerlifters, what does this tell us about strength? If strength were a simple matter of muscle mass and development, Platz should have won.

While big muscles clearly correlate with the lifting heavy weights, as any strong bodybuilder demonstrates, bodybuilders have more of a "low gear" to their strength, being better equipped to handle high reps and train through muscular fatigue. The strongest powerlifters are hardly small men, but at the same time — with bodyfat percentages aside — they don't always demonstrate the development or refinement of physique displayed by top bodybuilders. The powerlifter has fine-tuned himself to lift in one big effort.

Strength events, whether a squat, a stone lift, or a clean & jerk, rely on muscle mass and supporting tissues like tendons and ligaments. Muscle mass will always determine the upper limits of strength, but only in terms of *potential* strength. The more muscle available to contract, the more potential for generating force and torque around joints.

Lifters like Bob Peoples and Naim Suleymanoglu demonstrated incredible strength with physiques which, while muscular, were lightly-built. Strength increases with muscle mass in some proportion, but the ratio is not one to one.

Unfortunately, the upper bounds of muscle mass — not to mention other anatomical traits like leverages, bone size and joint robustness — are outside our power to alter (the future may offer a variety of alternatives, but speaking of practical present-day solutions, our hands are tied). Your success with the "big is strong" approach will likely come down to luck of the genetic draw and your willingness to use chemical solutions (and how you respond to the chemical solutions).

Think of muscles as the engine in your car. A supercharged V8 is going to have a whole lot more horsepower than a one-liter economy car thanks to how it's built. This is a *structural* difference. The bigger engine has more power because it's bigger, in much the same way as a hypertrophied muscle becomes stronger.

You could take that tiny engine and soup it up, add a new power train, suspension, and a turbocharger, and wind up with a more even contest. The improvement in performance is *functional*, changing the way the system works. Training for function realizes the potential of your muscles.

One engine is powerful because of its size, the other because it's tweaked to squeeze out every last bit of power. Strength comes from *what you do* as much as *how you're built*. This explains why lighter powerlifters and weightlifters, bound to a weight class, can "lift more" than a bodybuilder of greater mass. Smaller lifters learn to squeeze all the

horsepower out of their engines.

Training for strength doesn't have to be about exhausting yourself like a bodybuilder or endurance athlete. The bodybuilding approach of strength-through-muscle is one way to succeed, but it requires either biological proclivities or chemicals (or both).

What we need is a different thought process, and we can base that on one simple rule: You become what you do.

The Power of Nerve

Dr. Ramachandran watches as his patient stares at a rubber arm. The man, an amputee, sits at a partition with the fake appendage in front of him. With only a little imagination, you could see that arm as a part of your body. Out of place, but there all the same.

To the patient, this is exactly what happens. He feels the rubber arm graft itself on, briefly replacing his missing limb.

This sounds fantastical, but many of V.S. Ramachandran's amputee patients experience this exact effect. The rubber limb sitting on the table, in plain sight, manages to graft itself on to the patient's body. He *knows* it's not there, not really, but for brief moments it feels authentic. Touch it, scratch an itch on the fake arm, and he will experience it.

The phantom limb syndrome is surprisingly common in amputees. Ramachandran has studied the phenomenon since the 1980s, and is famous for his stories of men and women who have experienced bizarre neurological events.

The origins of the phantom limb syndrome lie deep in the brain, and their discovery added a new dimension to the relationship between mind and body.

In our brains, a thin strip of tissue called the *somatosensory cortex* contains a full map of our bodies. That neurological map represents our internal "body image". Not how you feel in a bikini, but all the information brought in by your senses and integrated into a sense of existing and perceiving the world. [6]

Literally every part of your body has a corresponding piece of neural real estate. When someone touches your arm, nerve impulses travel into the brain and light up the corresponding region on the brain map, which is where you register the feeling of touch.

In amputees, Ramachandran discovered that the part of the body map for the missing arm would go dead. With no information streaming in from the now-missing limb, those neurons were listening to dead air.

The brain doesn't like to leave resources unused. Nerves from nearby regions, which happen to control the face, grew into the abandoned space and took it over. When phantom limb patients feel a touch on their face, the nerves that used to handle the arm are stimulated at the same time. This phenomenon, where still-functioning brain regions repurpose unused areas, has been confirmed time and again in amputees, in stroke victims, and in other cases of traumatic brain injury.

It wasn't that long ago that the brain didn't change, at least not according to any neuroscience textbook. Thanks to contributions from Ramachandran and others in the field, we've had to admit that, yes, nerves can and do grow in adult human brains, and the centuries-old belief in the unchanging brain finds itself on shaky ground.

Not only do nerves form new connections (called *synapses*) with other nerves, creating the feeling of arms in faces, but we can actually see the growth of brand new neurons in some parts of the brain. The brain, even in adults, is far more malleable than we'd ever

thought thanks to the process of reshaping and rewiring known as *neural plasticity*.

In 1949, neurologist Donald Hebb wrote:

> *When an axon of cell A is near enough to excite cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as one of the cells firing B, is increased.*[7]

Hebb's rule, as this came to be, says that "cells which fire together wire together". Nerves learn through repetition. Nerve A might fire a little more often, nerve B might start listening a little more closely. During this early stage, changes are all signal, happening in quickly and laying down the beginnings of a new connection. If A keeps signaling B, then the nerves start literally growing stronger links, as happens in the phantom limb patients.

This process of reinforcement and growth, known as *long-term potentiation*, is fundamental to all learning, whether picking up a language or learning how to squat. Changes in nerve *activity* precede changes in nerve *structure*.

The more you practice a skill, the better you become at that skill. Practice enough and the skill hardwires itself into your brain.

Following on this exact idea in his book *Power to the People!,* Pavel Tsatsouline writes that most strength-training programs are all bodybuilding in disguise, focused on building muscle bulk rather than more productive strength-building methods.[8]

That's fine if bodybuilding is the goal. But Pavel says most people wind up chasing bigger muscles when they really want to lift more weight. Instead of training with that in mind, they train badly and, when the bodybuilding stops being so effective, the next step is to hop on a steroid cycle.

As Mel Siff and Yuri Verkhoshansky wrote, it would be better to use "specialized training regimes to enhance nervous system conditioning" if the goal is strength. Train the nervous system, not the muscles.

It's easy to think of strength as a crude quality, just hoisting a weight from point A to point B. In the middle of a heavy set of squats, the word "skill" doesn't immediately spring to mind. But that's exactly what it is.

When you decide to move, a stream of nerve impulses flows out of your brain, through the spinal cord, and into relevant muscles, causing them to contract. That sounds simple enough, but *motor control* — control over voluntary movement — is one of the more complicated feats performed by the mammal brain.

The motor cortex sits right next door to the sensory cortex, acting as the outbox and sending those movement signals out to your muscles. When the motor cortex sends out the signal to move, another structure down by the bottom of the brain, the cerebellum, gets a copy. The cerebellum also responds to sensory feedback from your body — how your limbs are moving, where they are in space relative to everyone else — and works to fine-tune the signals coming out of the motor cortex.

This feedback loop is the basis of any movement. Even actions we take for granted,

standing up or grabbing a cup of coffee, require an enormous amount of on the fly fine-tuning, involving vision and kinesthetic (body-awareness) senses.

You have to know where the object is, and where you are in relation to it, in order to grab it and move it around.

Every move you make is a complex balance between the signals to move — called *central motor drive* — and your sensory awareness of what's actually happening.

It's easy to think of skill as being the gross movement through space — swinging a bat, shooting a three-pointer, kicking a soccer ball — and little more. A skill is just a movement. Once you learn it, you've learned it.

Mel Siff noted that motor learning doesn't quite work that way. Learning isn't just a matter of picking up a movement one time, in the way you learned to ride a bike as a kid. According to Siff, skill development is an on-going process which "continues as the intensity and complexity of loading increases, as skill under demanding conditions is significantly different from skill under less onerous conditions".[9]

Even to the trained eye, a batter's swing will always look like a swing no matter how heavy the bat. As far as your brain is concerned, the superficial movement pattern is just the beginning. Different parts of your motor-control system light up in different ways when a movement is done quickly compared to slowly, or heavy compared to light. Speed, resistance, and range of motion are all part of that skill.[10]

A squat with 60% is literally a different movement from a squat at 95% of your best lift. Squatting 90 kilos in your first year of training is different from 140 in your second year and still different from 220 after eight years. You can see this for yourself. Load up a bar with 60% and do a few reps with it. Now load the bar up to 95%. The weights *feel* different, almost like different movements. As far as your brain knows, they are.[11]

Technical mastery, even in "dumb" strength movements, is continual process of learning. Each gain in strength, every extra kilo on your squat, presents a new challenge to your brain. You learn the movement-through-space, and you learn how to handle it with heavy weights.

Pavel's groove-greasing philosophy exploits this circuit between brain and muscle, treating strength as a skill to develop through practice and repetition. As you learned to swim and ride a bike, practicing heavy lifts — squats, bench presses, and deadlifts included — teaches the motor-control loop how to lift heavy.

"Neural" training explains why you never forget how to ride a bike, or walk, or any motor skill that you take for granted. New, complex, and challenging movements stimulate new connections, literally wiring the new skill into your brain.[12]

In principle, the more practice you get with an exercise — not just the gross movement, but the weight and technical conditions of that weight — the better you get at it. You wouldn't practice the violin once a week, or try to learn German with two one-hour practices. The best violinists play for hours each week. Language learning correlates with time spent speaking it.

To get good at lifting heavy things, you must practice lifting heavy things.

Widen the Base

In his book *Secrets of Soviet Sports Training*, Dr. Michael Yessis relates a story of how he once happened upon the Russian weightlifting team. This in itself is not so unusual, as it happened at an international competition, but what they were doing caught his eye.[13]

Yessis watched the Russian national team playing a pickup game of soccer the day before going on the platform. Soccer can be a demanding game, and yet, despite playing hard, the lifters were, well, making a game of it, having fun and enjoying themselves without a hint of strain.

Why would weightlifters be playing a vigorous game of soccer right before an important competition? Shouldn't they be resting? And for that matter, why were weightlifters in shape to casually play an aerobically-inclined sport as soccer?

Russian coaches were big on *general physical preparation* (GPP). GPP training doesn't don't directly improve the sport, but does improve work capacity and break up the monotony of lifting heavy year-round. General development was especially important for young athletes, who needed a large base of conditioning to tolerate later specialization. Being "fit" in a well-rounded sense — in good enough condition for leisurely games of soccer before a major weightlifting contest — was essential to Russian strength-building practice.

The term "GPP" has come to mean "hard cardio" nowadays, with powerlifters dragging sleds and doing strongman medleys alongside more traditional strength workouts. The idea reached the mainstream in the West thanks to Louie Simmons, who's long advocated the idea of being "in shape to train". GPP methods encourage recuperation in mind and body, as well as building that crucial work capacity.

It's hard to draw a line between too much training and just being out of shape for what you're doing. We need to be in shape if we want to perform at a high level, and that takes more than two or three strength workouts in between force-feedings.

By "in shape", I don't mean extreme aerobic conditioning for any 10-minute romp or 10-mile run, but that's certainly got something to do with it. This isn't about that ever-elusive quality of "hardcore" with cute motivating slogans meant to show the world what an uncrackable nut you are. You can surround yourself with all the trendy mass-marketed fad-driven totems in the world and never once get close to the inner power necessary for a nosebleed deadlift, or overhead axle for maximum reps, or a triathlon.

When I say "in shape", ignore whatever preconceived notions you have about endurance athletes. In shape means that you're fit for every aspect of your goal. In strength training, that means being able to lift the weight, yes, but it also means developing all the other parts of your body (and mind) that give you the physical ability to be strong.

"Establishing a solid foundation of consistent, hard training and slowly expanding it is the only way to achieve a higher level of strength," wrote strength coach Bill Starr. "It's much like building the base of a pyramid. Once that base is sufficiently wide, you can elevate the top."[14]

Starr was writing about the need to gradually increase the training volume in your

strength workouts, necessary to build “strength conditioning”. The volume isn’t the end in itself, but rather the means of getting in shape in order to get stronger. A high work capacity allows you to handle the volume you need to improve.

Widening the base is about *being in shape to lift*. Being athletic and capable of handling whatever comes at you. Getting through your workouts without tanking 20 minutes in. It’s that old-school kind of toughness where you just get it done. No worrying about overtraining, no worrying about whether your conditioning work will kill your strength. You just go do the thing, and you’re confident that it’s no big deal because you’re doing it *smart*.

The more quality work you do in training, the more your whole body — muscles, nerves, organs, everything — experiences a demand to adapt. These adaptations lay the base for future peaks in strength. You can tolerate harder training, even as the training itself builds strength.

Volume is part of the answer but not, by itself, the goal.

A lifter training with 50,000 pounds each week can split it over two workouts for 25,000 pounds each day — sustainable, but each of those monster sessions leaves him a wreck for several days. There’s a limit to how much you can do in a single workout, and even if you have time for two to three hours of training, long and volume-heavy workouts aren’t always ideal.

But divide that over five workouts and now he’s only handling 10,000 lbs each session. Much shorter sessions, much easier on recovery from day to day.

Training frequently lets you break up those long sessions into manageable bites, and the volume becomes a consequence of regular practice. With months and years of gradual improvements, this lifter will be handling far higher net volume — tonnage per week — than he ever could in one or two sessions.

More workouts mean more opportunities to practice under weights without the boredom and exhaustion of three-hour workouts. You get in shape through sheer repetition and consistency.

Strength is about skill, teaching your brain how to handle both a movement and a maximum weight, but it’s also about building your body’s capacities.

Nobody Strong Trains This Way

Right about now, the astute reader will have posed an obvious question: "Why do I need to do all this when so many of the strongest people in the world don't train that often?" Why wouldn't you want to do the least amount of work that you can get away with? Despite all the anecdotal evidence of lifters surviving and thriving on frequency, this is a good question.

I can give you two good answers.

We've already covered the first. Progressive overload and neurological adaptation tell us that, at least in principle, the more you do, the stronger you can become. Each workout promotes growth and stimulates adaptation, so the more often you can train, the more you experience those cycles of growth and adaptation stress. *In principle*, more frequent training should add up to more progress.

This answer won't satisfy many people, not the least of which because there are so many examples of people getting amazingly strong without all the trouble. And, as Milo's story demonstrates, strength doesn't just "add together" from training every day. There has to be more to it.

You also don't have to look far to find top strength athletes who train 2-4 days a week. Squatting and benching once a week is common, and leaving the deadlift to languish every second week or once a month or even less has become a staple.

Doesn't this disprove the idea that you need to train more to get stronger? If so many of lifters at the top get there by Doing Less, doesn't that mean you should follow their lead? Isn't it likely that more training would lead to diminishing returns by dipping into your recovery? Isn't it true that more isn't always better, precisely because the human body can only handle so much before training beats you into paste?

To be honest about my intentions up front, the answer is no. When it comes to recovery, there are myths and unconsidered half-truths that play like a broken record in the domains of fitness and human performance, and I think most of them are next to useless. What I have come to call 'folk recovery', in which your freshly-certified personal trainer speaks of 'recovery' as if it's some ghostly energy stored in a battery near your kidneys, is so off the mark that it's not even wrong.

Bad theory, of course, leads to bad advice. From folk recovery we get the belief that there is some ultimate limit to how much training you can do, and, in the opposite case, that you are best served by getting more rest so as to keep your recovery magic topped up like a fresh tank of gas.

Consider the popular statement "no one *needs* to do that much training". Really? How do you know what anyone *needs* with regards to any performance goal? It's not clear what anyone *needs* to do in any instance, and we're best staying out of arguments about necessity.

The more critical issue, implied by the question about the training of the world-class, is whether or not you benefit from the same type of strategy they do. Again, I believe the answer is no. I will make a more detailed case for this later on. For now let it suffice to say

that people are not identical and even if you share the goal of "lift more weight" you might find that there are better ways to make that happen. I realize that doesn't sound like much more than a weak "everybody's different" justification, but there is meat to this point.

Ivan Abadjiev gets credit for "the Bulgarian training system", but training daily with maximum weights is no Bulgarian innovation. Angel Spassov, one-time coach of the Bulgarian team, once stated that in developing their seemingly radical system they looked to the American weightlifters of previous decades.

We've already been introduced to Bob Peoples with his routine of daily heavy sets, but Peoples himself wasn't exceptional for his time. Lifters like Bob Bednarski and John Davis were training heavy and often, using multiple triples and single-rep sets back in the 1940s, lifting on five- and six-day schedules. The slightest research will turn up many more names from the early to middle 20th Century, and most all of them trained heavy and often.

You might point out that many (though not all) of these examples are Olympic weightlifters. The snatch and the clean & jerk, phenomenal tests of strength and athleticism that they are, have noticeable differences from your standard squats and deadlifts and bench presses.

For one thing, these lifts are fast — it's not for nothing that we call them the *quick* lifts. As the ruckus in your average weightlifting gym will inform you, these lifts are dropped from the top position. No messy eccentric overload and all the muscular damage it causes.

The quick lifts are a far cry from the tooth-gritting effort put into a bench press or a deadlift, let alone the muscle-blasting that bodybuilders swear by. There's a whole slew of psychological and physiological differences that must surely make a difference.

But hang on: Olympic lifters also squat. In the case of Abadjiev's lifters, they squat the same way they practice the lifts — heavy and unreasonably often. Leonid Taranenko, the Russian weightlifter who still holds the world record for the all-time best clean & jerk, squatted over 300kg and claimed to squat six days a week.

Ok, so that's no help. Well, what does Olympic weightlifting have to do with powerlifting or strongman anyway? They are two different goals.

Boris Sheiko, the coach of the Russian national powerlifting team, seems to think the answer to that last question is "quite a lot". Sheiko's programming is notorious for its focus on volume, rather than the traditional powerlifting focus on intensity. Gone are the sets of 10. Even sets of five, the bread and butter of American strength-building, don't get much play in Sheiko's methods.

Instead, Sheiko focuses on lots of volume — lots of practice — with moderate intensities and low reps. Sets of three or less are the rule here, and intensity only rarely climbs above 85% of the lifter's 1RM.[15]

As Sheiko's lifters progress in strength, they move through a ranking scheme that qualifies them from beginners to elites competing on the world stage. Depending on their classification, Sheiko's athletes squat anywhere from three to ten times a week. The internationally-competitive Master of Sport lifters train four to five days a week, sometimes with morning and evening sessions.

Sheiko's methodology developed from the study of strength-building methods used by the weightlifting teams. In the Russian view, strength is strength: a weightlifter's 300 kilo squat is no less impressive simply because it belongs to a weightlifter. Factoring in bodyweight, supportive gear, and squat style — the Olympic lifter's distinctive upright, close-stance, full-depth style — the weightlifters come out ahead more often than not.

Thanks to the Russian success on the world stage, Sheiko's frequency-centric and volume-heavy programs are currently all the rage among powerlifters competing under IPF regulations. As impressive as top powerlifters are, the image of lifters virtually mummified in supportive gear sets an expectation unreasonable — and undesirable — to many. The training has been adjusted to play to the equipment, rather than building an overall foundation of strength.

Do you squat in suits of triple-ply canvas with briefs under that and knee wraps as thick as your wrist?

Propaganda aside, the powerlifters that have traditionally done the best in minimal gear, at lighter body weights, and under strict judging have always had more in common with Olymplic lifters than the current popular image of powerlifters. Even in the US, it's not hard to find powerlifters who train more than orthodoxy wants to allow. Names like Brian Siders, Mike Bridges, and Wade Hooper — himself a recent Sheiko convert — immediately spring to mind.

Siders trains upwards of six days a week with an intimidating volume, and while his records leave little doubt that he's one of the genetically gifted, you can't help but wonder which came first — the volume or the "genes".

There's a benefit to training for that all-over toughness that characterized the ideal of "strong people". Jamie Lewis, angry person and author of the Chaos & Pain blog, bars no holds and pulls no punches in his training talk. Lewis, no slouch in strength, believes that overtraining is a crock and that most wheel-spinning gym-rats are wasting their time with tame programs and mediocre progressions. Besides squats, deadlifts, and overhead pressing there's little in his aptly-named Chaos & Pain philosophy to resemble traditional programs. Jamie's only hard rules are time-tested wisdom: stick to big compound exercises, anything that has you standing up with a bar in your hand or on your back, and keep it heavy. He suggests training with 85% of your best lifts at the minimum, for as many sets as you can handle with one, two, or three reps — as many as 30 reps in each workout, five to six days a week. Not one to be all bark and no bite, Jamie backs up his talk in powerlifting meets, having totaled elite, several times, in the 181 lb weight class.[16]

Getting strong is not what the cliques would have you think, but neither is it complicated.

Critics will say that my selections are biased and I'm only picking out those genetic freaks who succeed while ignoring all the poor folks who suffer crippling overtraining. Hysteria aside, I'm not aware of any support for this view. You'll hear all the horror stories, of course, which are always anecdotes about a friend's cousin's roommate's brother's uncle's dad's son's pharmacist's dog walker who tried to squat more than three days a week and then the devil claimed his soul. Posted to the internet, of course — you'll never meet any of

these people in person.

As far as actual verifiable data goes, there's just not much to draw on, for or against. Those worried over prevalence of injury or the "need" to train often will have a hard time finding any conclusive data to support that view. Intuitions on probability are routinely wrong; without statistical information, the human mind defaults to what it knows. If what you know is traditional strength training, or an example or two of people who "got hurt and overtrained" by trying to do too much, then that's what you'll tend to believe as universal truth.

Of course that doesn't exempt me, and my argument is subject to the same criticism. Naming off examples lends weight to the case but is not enough to draw any tight conclusions. In lieu of sketchy or absent evidence to the contrary, I'm going to rely on other sources.

Scientifically speaking, we're still probing around in the dark. There are no (or at least not very many) experiments published in well-regarded journals that can verify the usefulness of training regularly, and none which can categorically disprove it.

With one exception. In late 2009, the Norwegian powerlifting team along with the Norwegian School of Sports Sciences conducted an experiment on the distribution of training volume. The Frekvensprosjektet ("Frequency Project") took 27 powerlifters and split them into two groups over a three-month training phase. The first group trained with an orthodox program, lifting three days a week with high volume. The second group used the same weekly workload but split over six days.

In all measures taken, including strength in the three powerlifts and cross-section of the thighs, the six-day group showed the greatest improvements, results which were statistically significant (that is, likely due to the training rather than a chance outcome).

Researcher Truls Raastad and team coach Alexander Kierketeig suggest that these results were due to the more frequent bouts of stress and recovery. Although the amount work done each week was equal, the actual training stimulus — the stress on the body necessary to cause adaptation — was higher in the six-day high-frequency group, leading to almost double the strength gains in the same amount of time.

The Frequency Project remains unpublished at the time of this writing, but the preliminary results suggest that, given equal volume, spreading the workload over six days returns the better gains when compared to concentrating the same volume into three sessions.[17]

While there's not a large body of conclusive science to draw upon, it's hints like these that give me reason to question standard wisdom. I think that the rest-and-recovery notion is weaker than we're led to believe, both in scientific research and in real-life training practices.

Someone, somewhere, will assemble a collection of Pubmed abstracts which "prove" you can't get results by training often (ignoring that this is just a weaker brand of speculation), but that's not the kind of justification we should be after. There will be no definitive answers from research journals.

The lack of concrete research kicks the ball back to us, so we're left with the natural experiments of trial and error — showing up at the gym and giving it an honest try. In this I'm inclined to agree with Richard Feynman:

> *If it disagrees with experiment it is wrong. In that simple statement is the key to science. It does not make any difference how beautiful your guess is. It does not make any difference how smart you are, who made the guess, or what his name is – if it disagrees with experiment it is wrong. That is all there is to it.*[18]

From our perspective as people trying to get stronger, we need only one standard: if it works, it works. If training more often works better for you, then why wouldn't you do it? If all these people doing it wrong are out-lifting you and staying injury-free, then could it be that they're not so wrong?

We've got an idea of why frequent training can work, but that doesn't clarify everything. Why do some people get strong on simple meat-and-potatoes training? How can some people go nuts every day, while others remain insistent that you need drugs to make that work?

2

The Overtraining Myth

"For every subtle and complicated question, there is a perfectly simple and straightforward answer, which is wrong."

— H.L. Mencken

The Least Possible

Arthur Jones remains one of the most polarizing figures in bodybuilding. An entire sub-culture developed around Jones's unorthodox High Intensity Training methods, as did an equally vocal range of critics. When discussing HIT, there is no middle ground.

Jones's notoriety began in the 1970s, at a time when names like Joe Weider and Vince Gironda were synonymous with bodybuilding. Stars of the Muscle Beach era include Franco Columbu, Dave Draper, Lou Ferrigno, Larry Scott, and the man who would practically become bodybuilding, Arnold Swarzenegger.

This motley crew trained according to principles of blasting and bombing, working a muscle to exhaustion with set after excruciating set, splitting up their entire body into muscle groups to be trained in total across five or six weekly workouts.

Arthur Jones didn't agree. To Jones, spending six days in the gym, training two to three hours at a stretch, was too much time wasted on too many useless sets. It was intensity, not volume, that grew muscle.

Exercise science defines intensity as a physical measure: your output relative to your maximum capability. In strength training, intensity is given as a percentage of your one-rep maximum (1RM).

Jones used a more subjective value. In the HIT world, intensity is about effort, about pushing through pain and fatigue. The endless sets of bombing and blasting were a waste of time. There was no effort, no drive, no stimulus behind the pumping. What bodybuilders needed was focus, to dig in and maximize the stimulus placed on a muscle with the least possible amount of physical work.

Jones believed that he'd teased out the mythical Grow Button hidden away inside muscle tissue, that he'd learned how to push it with the most direct possible stimulus. What mattered was the so-called inroad, tapping the muscle's momentary maximum ability, which we'd know today as "training to failure". Volume was a distraction, unnecessary and even harmful as it depleted the energies needed to recover and grow.

The HIT school grew out of these two maxims: maximum effort put into minimal work

Endorsed by bodybuilders from Jones's protégé Mike Mentzer to six-time Mr. Olympia Dorian Yates, who used a variation of Mentzer's Heavy Duty system to bring home his Sandows, it seems there must be something to the minimalist approach.

As I'm using the term here, minimalism is the belief that workouts *must* be time-efficient, that one set is as good as or better than three or more sets, and that "recovery" — a vague term if there ever was one — can only be maximized with ample rest between workouts. Minimalism is the belief that less is *always* better than more.

Even Jones's most bitter opponents concede — if grudgingly — that the gruff curmudgeon raised points worthy of consideration. Jones's central point was that people didn't train hard enough. Going through the motions for two hour workouts, pumping away with set after set, probably isn't the most productive use of time. There has to be some kind of push behind your training.

Many of Arthur Jones's training recommendations aren't so bad, viewed in hindsight. Jones promoted training a muscle 2-3 times a week, and despite the "one set to failure" perception, muscle groups were trained with more than one exercise per session. Some of the early HIT workouts are almost volume-heavy (at least compared to what would come later). Jones's occasionally obsessive focus on machine training notwithstanding, these were not bad workouts.

As a core set of principles, "train hard and efficiently while focusing on lifting heavier weight" is a message hard to argue with. Unfortunately, those reasonable ideas weren't the end of the minimalist trend.

The Hardgainer philosophy which grew out of HIT took the "brief and intense" idea and ran with it. While even Jones allowed for a reasonable frequency of workouts, the minimalist notion that we must aspire for less eventually overtook the more sensible view.

A hardgainer is the prototypical skinny kid that can't gain weight. Hardgainers are at a genetic disadvantage, as they don't respond to training "normally", so they have to do *even less* work for any hope of a strong, well-muscled physique.

HIT's minimalist legacy remains with us today, responsible in part for the popular gym-belief that that less is always better. You train with brief, intense workouts, and follow up with lots of rest. That's just how it's done. Anything more is overtraining.

Whether we're talking HIT or blasting and bombing, we're still in the world of bodybuilding. We're still talking about the best way to train *muscles*, whether that's lots of volume and lots of workouts, or a handful of sets at nose-bleed intensity with plenty of rest time.

It's all about muscles, not strength.

Current biological knowledge is vastly improved over the understanding of the 1960s and 70s. We know more about muscle growth and about recovery and overtraining than we did when minimalism first took shape.

Yet strength training remains in a virtual dark age when it comes to understanding what happens and why.

We can do better than that.

Dealing With Stress

Every time we butt heads with the unfriendly world, we call it stress. In everyday language, "stress" means psychological pressure. Boss breathing down your neck. Endless traffic on your morning commute. To be stressed out is to be anxious, wound up, nervous. This definition isn't too far off the mark.

Stress has a specific meaning: the biological response to a threat encountered by a living being. Stress is your body's reaction to a threat.

The threat itself is a *stressor*. Stressors can be physical: a third-degree burn, a deep cut in your arm, a punch in the throat. Stressors can be psychological, as with the demanding boss or morning gridlock.

Before the early 20th century, it was assumed that living organisms responded to challenges with a variety of different responses. Heat would create a different reaction than cold, infection different from a hammer to the head.

In the 1930s, experiments performed by Hans Selye turned that idea on its head. Selye found that, regardless of the threat, rats demonstrated the exact same set of biological reactions. Hot or cold, flu or hammer-blow, the same set of neurological and hormonal signals — collectively called the *neuroendocrine stress-response* — were activated any time the rats faced a challenge.

A universal stress-response means that the stress symptoms aren't controlled locally. The entire organism responds to challenges as a whole.

We now know that the stress-response originates in the brain, in regions that we call the *sympathetic nervous system*. Whenever the rats faced a stress, whether a fright or a lack of food, the sympathetic nerves would activate and the same set of symptoms would appear.

Selye developed his General Adaptation Syndrome (GAS) model according to these findings. The organism would first become aware of a threat, causing a state of alarm and activation of the sympathetic nervous system. Now aware and alert, the organism works to cope and resist the stressor.

If things go well, the organism fights off whatever's ailing it and things go back to normal. If not, the organism enters the third stage, complete exhaustion. Having failed to cope with or get rid of the threat, the organism's energy reserves are depleted and it gets sick (or dies).

Selye's GAS model can be found in virtually all mainstream ideas on exercising. Workouts are stressful, damaging muscles and connective tissues, activating the heart and lungs and the organs of general housekeeping. Of course your body would treat physical activity as a threat.

Train hard, then rest and recover.

As Selye's model predicts, your entire body mobilizes to fend off the challenge. Sympathetic nerves drive up levels of stress hormones — catecholamines and glucocorticoids — leaving you prepared for the threat. With the threat removed, stress hormones and amped-up neural activity return to baseline while any mop-up operations —

repairs of damaged tissues, for example — go on about their business.

Exercise scientists adopted the GAS model, adding one key feature that remains with us. Repair processes cause an "over-adaptation" after a workout session, and it's this overshoot that makes us bigger and stronger and faster.

Better known as *supercompensation*, this recovery process is a matter of restoring all the biomolecules that we depleted during exercise. But your body is smart, so it adds a little bit on top to ensure that you're better prepared for the next time.

There's a catch, though. Train again too soon, and you dip back into the stores before they're fully replaced. Train too late and the surplus — your strength and size gains — will have been sold off to pay for the liver's new car.

Supercompensation is all about timing. Training every five days, or seven days, or no more than once every 10 days, all of those rules come from the principle of supercompensation. If you train too often, you'll eventually drain your "recovery supply" and exhaust yourself just like Selye's rats.

The supercompensation model dominates the way we think about exercise. Train hard, then take time off to recuperate. You grow outside the gym, not in it.

Supercompensation theory tries to summarize a range of complex processes — of which recovered muscles are only one variable — with one single indicator. Can you really reduce your body's "recoveredness" to a single question of whether you are or aren't recovered?

Selye thought that living organisms would deplete their reserves of stress hormones if the stress-response continued indefinitely. The organs producing catecholamines and glucocorticoids would "burn out", leaving the poor rats (or bodybuilders) defenseless.

As it turns out, Selye wasn't quite correct. To see why, we have to take a brief detour.

All The Little Pieces

Is diet 20% or 80% of your results? If you could only do one exercise, what would it be? You've almost certainly had these questions come up when talking shop. But what does it mean that diet is 80% of your results? How do you express that in real-world terms? What does it mean to say there's a "best" exercise? How would you begin to measure that?

In real terms, you can't. Those questions don't make sense. You'd think you would be able to give a simple answer to a simple question, but it isn't like that.

Your biology classes might give you the impression that living bodies are like a squishy version of Mr. Potato Head. Add a nervous system and a circulatory system and a skeletal system together and the result is a functioning human being. Just put the pieces and you get a living organism.

We expect the world to add up like an arithmetic equation. The tiniest parts add together like pieces in a jigsaw puzzle and always give you the same predetermined result. Finding the answer is simply a matter of understanding all the little pieces.

If you've ever lived in a hurricane zone during the warm months, you'll be familiar with the whirling vortex shape of a cyclone. Between June and November every year, the whole east coast of the United States keeps a nervous eye out toward the Atlantic.

Hurricanes begin as humble thunderstorms off the coast of Cape Verde in Africa. As they make their way across the warm oceans, something happens to the clouds. Fueled by the heat of warm seas, wind speeds pick up, pressure drops, and before you know it, you've got a spinning death-cloud in the familiar shape.

What is a hurricane exactly? You know it when you see it, to be sure, but what is it? The simple answer, which applies to any cloud, is "water". Zoom in down to the tiniest level and a hurricane isn't anything but ordinary water droplets, made up of ordinary H_2O molecules. It's the same stuff you drink and bathe in, yet I can't recall a time that a glass of water knocked over a city. There's something *different* about the hurricane.

Take a rug on your floor and look at it up close. Use a magnifying glass for extra effect. Rugs are woven out of hundreds and thousands of threads. Up close, you can see those strands criss-crossed into the repeating pattern that makes up the whole object we call "rug". How much does any one of those threads add to the "rug" object? 10%? 50%? Would it ever occur to you to ask that question in the first place?

Probably not. The rug forms out of all the threads woven into a pattern. You could take out one, or two, or ten threads and not affect the thing we call "rug". You wouldn't ask about the relationship between thread and rug just as you wouldn't think about a hurricane by asking about the water droplets.

Over the last few decades, science has slowly come around to the understanding that biology is more like a hurricane than Victorian clockwork. It doesn't make any sense to ask whether any water droplet is 10% or 60% of the whole storm. Reductionism, the point of view that says we can understand a thing by breaking it down into the tiniest pieces, is gradually being replaced by the science of complexity.

The hurricane is what we'd call an emergent property of the water droplets (or water

molecules, if you zoom in even further). The droplets are just plain old water droplets, no different from the condensation on a cold drink in the summer. It's only when kicked up into a specific *pattern* that we get the object we call "a hurricane".

The pattern is what matters. A hurricane persists despite the turnover of tremendous amounts of water, which it pulls in from warm seas and dumps out as rain. If you look at the hurricane as a lot of water droplets, you leave out something very important.

Individual droplets don't just add up to a cyclone the way gears and springs add up into a watch. It's the relationship between the water molecules, not just hundreds or thousands but millions upon millions, that matters. When they're arranged in the right way, you get a hurricane.

Think patterns, not pieces.

Your body can be considered in much the same sense. What's most important to live: the heart, the brain, or the kidneys? The correct answer is "all of them" (or, more confusingly, "none of them"). You can't live without any of those organs; none of them is "most" or "least" important.

Simple cause-and-effect thinking has no place in the study living beings. Causes and effects smear out over networks where each piece effects, and is effected by, tens, hundreds, or thousands of other pieces. The patterns that define our bodies are *complex*.

Complexity is a challenging concept, and even the scientific community is still coming to terms with it, so don't beat yourself up if bells aren't ringing right now. The important thing to remember is that individual pieces of complex systems aren't the big deal.

Think big picture. What matters is the pattern, not the little parts that make it up. Rugs will survive children pulling out some of their threads. A hurricane will absorb and drop many tons of water and we still identify it as the same storm.

Is your diet 80% of your results? Are squats better than deadlifts? Does cortisol eat up your hard-won muscle or lead to a flabby gut? The only correct response to questions like this is to unask them: forget this line of thinking, as it makes no sense.

Squats or deadlifts? Yes. Does the bench press train chest or shoulders? Yes. What's more important, diet or training? Yes.

Complex systems have some interesting properties. Their patterns are inherently unstable, intrinsically variable, having no easily identified chains of causes and effects as we would expect in a factory. Despite all this volatility and uncertainty, these patterns can remain stable over long periods of time and are resilient in the face of all kinds of perturbations.[19]

These are all features that have obvious implications for how we train, let alone how we eat and live our lives. Unfortunately recreational exercisers, bodybuilders, and let's face it, most strength & conditioning experts and athletes, love to get hung up on details. We still think of the body as a collection of linear systems that we can tug on and pry apart. Every time someone asks what's *most* important or worries about whether a hormone is optimally stimulated, you're seeing reductionist thinking in action.

Whenever that comes up, just remember: Biology Is Not Like That.

We have to get over the Mr. Potato Head biology. You can no longer consider muscles as dead pieces of meat that receive orders from the brain and have no other contact with the rest of your body. Muscles – like glands, heart, lungs, brain and everything else – are elements in an on-going storm of biochemical activity.

Points of Equilibrium

When a hurricane gets over land and loses the warmth of the sea, it fizzles out. With no energy, the once-organized pattern decays and pretty soon the dwindling vortex isn't much more than a front of rain clouds.

Living organisms have the advantage here: they will take steps to keep their patterns intact when the environment challenges them. The word for this is *homeostasis*. If you're not familiar with the term, here's Merriam-Webster's definition:

> *A relatively stable state of equilibrium or a tendency toward such a state between the different but interdependent elements or groups of elements of an organism, population, or group.*

All living things strive to reach an agreement with their surroundings, a tendency toward the equilibrium state as the dictionary says.

Since stability is a requirement for life, living organisms developed many ways of guaranteeing they stay that way. Mammals, including humans, come with seriously impressive equipment for this purpose. Nearly any value you can name, from your heart rate, blood pressure, breathing, eye-blinks, pupil dilation, digestion, and toe-nail growth, has some kind of oversight to keep it in line with the body's specifications.

All of these life processes have an ideal value, called a *set point*, and a whole mess of regulatory feedback loops work to keep bodily functions more or less at that ideal point. Like a thermostat, as soon as the number falls off the target, the feedback loop kicks in and nudges it back in place.

What is optimal for a biological function? Can we have a blood pressure, a heart rate, or toe-nail growth that is optimal regardless of the circumstances? Not likely. Set points are more like set *ranges*, with multiple ideal points depending on what's happening with everything else. Ideal while staring at your cubicle's wall is different from ideal while you're asleep or sprinting at top speed.

More and more research reveals that biological stability, which we're inclined to think of as specific, hard numbers, isn't really all that stable. Regulation of life-processes involves huge amounts of communication between organs and tissues. Your body is a vibrant ecosystem, a web of interlocking networks, where each biological function relies on the activity of everything else. Any single life process, from a single cell and on up the scale of organization, results from dozens, hundreds or even thousands of signals working to create the appearance of stability.

Bruce McEwen, endocrinologist and stress researcher at Rockefeller University, suggests that this chaotic system-wide process of equilibrium-seeking — called *allostasis* — describes living beings more accurately and completely than homeostasis.[20]

What if the hurricane, once over dry land and risking imminent decay into rain showers, could intervene by changing its wind speeds, conserving the energy it already has, and taking a dozen other steps to move back out to the ocean?

According to the allostatic model, biology is inherently noisy and fuzzy, and this instability is actually a feature of the system. Living bodies can react in ways that a dumb storm can't, and this considerable adaptability is possible precisely because complex systems aren't locked into orderly machine-like processes. Allostasis is *stability through change*, the flexibility that living organisms need to survive.

The brain is loosely in charge of this nightmarish bureaucracy, although it isn't exactly a pointy-haired micro-manager. The brain works like the guy on TV who spins the dinner plates on top of dowels. Once they're all spinning, it's all a matter of fine-tuning and adjusting to keep the act going.

Instead of spinning plates, your brain juggles heart rate, blood pressure, hormone levels, temperature, and about ten trillion other things at once. It's well-equipped for this job and does it beautifully (most of the time).

All of this means we need to have a hard look at our older ideas on stress. Hans Selye believed that chronically-stressed critters were pushed away from their "set point" of health when critical tissues and glands were exhausted. What Selye couldn't know at the time is that the stress-response involves more than a simple elevation of stress hormones.

When a car almost hits you on the way home, or you have to run from a lion, your whole system gets thrown out of balance and then works to bring you back into equilibrium. The nervous system sets off a cascade of changes, starting with a snap to attention, jittery nerves, and increased heart rate that we call the adrenaline rush.

"Adrenaline rush" is deceptive wording. Where Selye viewed the "alert" feeling as the product of sympathetic nerves and adrenal hormones, allostasis implies that your entire body shifts into a different mode. When a heckler throws a beer bottle at the stage, the guy balancing the spinning plates has to react if he doesn't want his act to end. He's got to concentrate and stay more alert, ready to move.

While in stress-mode, organs and tissues behave differently. For a brief period of time, long enough to dodge a bad driver or get away from a lion, this is fine. But you aren't meant to spend your life in that condition.

The allostatic model of stress suggests that stress-induced illness isn't a result of depleting or exhausting any particular glands or hormones or what have you, but rather the unintended consequence of an *overactive* coping strategy. Stress-mode is not a healthy place to be, thanks to all the physiological changes it involves, and spending too much time there accumulates wear and tear across your entire body, which we measure as *allostatic load*. Paraphrasing researcher Robert Sapolsky, your body's army doesn't run out of bullets; it spends so much on the defense budget that it doesn't have any cash left over for the more essential life processes.[21]

If the brief dip into stress-mode is adaptive — that is, if it solves the problem — then you're fine. You'll adjust and everything settles back to normal. It's when you stay in stress-mode all day every day, for weeks and months, that you develop real health issues.

Recovered or Ready?

The stability-via-change dance of allostasis leaves supercompensation theory in an awkward position. No depleted biomolecules to trigger the supercompensation effect. No exhaustion of stress hormones to leave you overtrained.

That also means a lot of things the textbooks tell us about recovery could stand a revision. Supercompensation isn't exactly wrong, but it's not quite right-enough either.

The question can be put simply: What is recovery, exactly? Are you recovered when your muscles have their energy stores replenished? When proteins have rebuilt themselves? When the muscle stops showing signs of tissue damage? When you don't feel so sore anymore?

What about the tendons and ligaments and other connective tissues? What about the immune system? The autonomic nervous system? Your mood and emotional state? Do all those systems supercompensate? Do they all peak and return to their set points on the same schedule?

Even the words we use for recovery take for granted a "hydraulic model", in which our bodies have some vital energy kept in a fuel tank somewhere. These recovery energies, which we draw upon to heal ourselves, aren't different from the vital force or the vitreous humours once thought to animate living organisms. When that reserve is topped up, by good food and sleep and relaxed mood, we're "recovered". When we drain that reserve, we're exhausted and sick.

We've got to toss all that out. Even if we grant that there's some value to the supercompensation model, there's a lot of pseudo-science quackery hiding in there. As a metaphor, the notion of "adaptive energies" works. As a reality, it fails.

Taking complexity on board, I don't think it makes sense to even talk about "recovery" (at least not in a biological sense). Muscles do have a recovery process which is important, but tempting as it is to focus on our muscles, they aren't our number one priority. Tissue repair processes carry on their normal business unless you're in an extreme state of starvation or trauma (trauma like massive burns or infection). Muscles heal, and they heal fast — especially if you've got a background of training.

If "recovery" is to be useful at all, there has to be more to it than waiting on your biceps to recover for seven days. No single measurement can describe you as "recovered" or "not-recovered".

We might, however, be able to pull a useful definition out of allostasis.

Later in his career, Selye wrote of stress as having both positive and negative qualities. Positive *eustress* promotes growth and vitality, while negative *distress* leads through the resistance and exhaustion stages. Exercise represents a disruption to our bodies, which can be good in moderate amounts or harmful if taken to excess.

This is an interesting and unintuitive property of complex systems, in that they actually thrive on a little disorder and volatility — an important point to which we will return later.

In the early 1980s, sports scientist Eric Banister developed a model accounting for these positive and negative after-effects of exercise. Banister's two-factor model treats workouts as having both fitness-building benefits and negative stress-induced effects (henceforth called fatigue).[22]

The key insight here is that the positive and negative factors operate *simultaneously*, with the tissue-repairing recovery things and the bad stress-response things going on *at the same time*. You can feel absolutely smashed the day after a hard session while still experiencing the positive muscle- and strength-building effects of training. The mind-game is that you don't always notice these fitness gains right away, not because you're "not recovered", but because the accumulated fatigue effects drown them out. How well you can realize your fitness level at any moment depends on the balance of positive and negative after-effects, otherwise known as *preparedness*.[23]

"Recoveredness" isn't about muscles or the CNS or any of the pieces. It's about the accumulated disorder across your whole body relative to your current fitness level.

While I enjoy some good navel-gazing over biology, we also have to ask if the shift from a focus on bodily exhaustion to a focus on the altered behavior of coping systems really makes any difference. If your body's so stressed out that it's not working right, and our mood and gym performance reflect that, does it really matter that we're not *technically* exhausted?

Diminishing Returns — Or Positive Feedback?

When I say supercompensation isn't entirely wrong, I mean that the notion of a limited pool of "recovery energy", that our capacity to recover from punishment has limits, is not entirely unfounded. Any extreme physical trauma or illness can readily demonstrate the limits of the human body, and it isn't terribly difficult for an athlete, recreational or otherwise, to find that point. Biology does have limits to what it can handle, and that isn't in question.

However, we also assume that our powers of recovery never change throughout our life. A lifter reaches some "normal" level, able to handle squatting twice or maybe three times a week, but no more. You're riding a fine line, and doing more is simply impossible. Don't even think about it.

We are of course back at the ideas of the HIT and Hardgainer schools, who believe that more training leads to diminishing returns. Physical exercise and recovery from it exist in an "either-or" dance of negative feedback. You can either do lots of training, or you can be well-rested. Never both.

You might find some progressive thinkers who grudgingly agree that training more does lead to larger *absolute* results, but these gains are only *marginal* when compared to the efficiency of fewer workouts. According to this thinking, the majority of your gains come from a baseline of two or three weekly workouts. This creates perhaps 80-90% of your possible gains. Further sessions might add to your progress, but only in proportionally smaller increments. A fourth session might only add 5%, a fifth only 2%, and so on. Instead of milking that 90% and calling it a day, you'd be adding two extra days for a piddling 7% on top of your gains. After a point it becomes so time-inefficient that you'd be a fool to bother.

There is research in favor of this view. Meta-analyses done independently by Matthew Rhea of Arizona State University and Mathias Wernbom of Sweden's Göteborg University analyzed the body of published strength-training studies and identified inverted-U "sweet spots" for both frequency and volume.[24] The inverted-U is like a camel's hump on a graph. Toward the zero-point, stimulus is low and the effect is low; you don't do much and you don't get much back. At the high end, stimulus is high and the effect is still low, suggesting that more isn't always better if you overwhelm yourself in the process. The effect is maximized near the middle, when a moderate stimulus generates the largest the effect.

Rhea and Wernbom independently reached similar conclusions on the effects of strength-training based on the findings of published research. Frequency maxes out around two or three sessions per week per exercise, and number of work sets starts at around four for a beginner and expands to around eight in more advanced athletes. This all fits with, if not a perspective of Doing Less, at least an eye towards moderation. That's a position I find reasonable — not aiming to do the *least possible* amount of training, but an ideal amount of training to net you the best-possible gains for the work that you do.

But there is a caveat. The papers used in these meta-analyses were largely limited to the untrained or lightly-trained subjects so often used in academic exercise science, with a

paucity of data on more advanced athletes. These numbers were only ever intended to illustrate what works as a theoretical starting point, and for that purpose they work wonderfully. Let's keep them there, as guidelines rather than the final answer.

The idea of a finite point, an ultimate limit, just makes no sense. Even the language of "moderation" depends on this, however, and it is not at all clear that this is accurate. Are we actually capable of assigning what percentage of our realized gains came from any single work set? Not likely.

What these papers do indicate clearly is a trend towards "more" as athletes become more trained over time. Workloads used in training expand and unfold as you improve, trending toward more sets and more workouts as strength improves over a career. Your body becomes more resistant to overload as you get stronger, and as a consequence of that resistance you need "more" in order to encourage adaptation.

That's an important hint, and I think it should lead us to question supercompensation. The scope of evidence drawn from outside exercise physiology suggests that our bodies just don't work like that, and there are good reasons to consider alternatives. Banister's fitness-fatigue model, as one conspicuous example, explains why you'd have the *appearance* of supercompensation in some situations, like a beginner just finding her legs in the gym, but it can also explain more things — like the unpacking of workloads in more advanced lifters, or the Frequency Project.

From all this, I believe that there is no fixed limit as such. Rather, we're dealing with a dynamic, unstable limit that can change depending on how much you train (or don't).

Stress has positive effects, after all, and the entire point of adaptation is to make your body more resistant to whatever it perceives as a threat. The limit changes every time you set foot in the gym.

Russian sports science, while still using the imagery of ☒gadaptive energy☒h, knew that improving robustness was a critical goal of physical training (and they knew that there were no real energies, but rather underlying biological processes that restored you to a state of normalcy). In *Supertraining* Mel Siff wrote that "the capacity of these [adaptive] reserves is not fixed, but alters in response to the demands placed on them by stresses such as training."[25] Recovery itself, in as much as the word has a meaning at all, can be trained with practice. The more you expose yourself to stressful events, within reason, the less stressful they become.

On one level this is obvious. A workout that absolutely floors a beginner can be a light day for an advanced lifter. You don't stop training in your first few months of lifting weights because you got really sore after those workouts. We take it for granted that we'll become more robust with experience, at least in that dimension.

Instead of diminishing returns, we can think start thinking about *positive feedback* — that doing more can, in turn, create more. Training and recovery are more of a "both-and" situation, rather than the "either-or" of supercompensation. Your body's condition, its ability to handle stress and to recover from it, depends at least in part on being exposed to stress in the first place.

With that in mind, I think we can start to look at training as a way of coaxing your body

into a more robust condition, such that you can not only *handle* more training, but *thrive on it*.

You can't do that with a fixed cap on your recuperative powers. But treating the body as a "growth system", one with limits but still far more adaptable than you might otherwise believe, gives us this option. We are less machines with limited resources and more ecosystems which can adapt and grow with the right encouragement.

You wouldn't run your garden like a factory, thinking in terms of efficiencies and maximum-minimum outputs. Gardeners tend rather than manage. Tending our bodies is a matter of exposing yourself to stress and gradually increasing that stress, but in such a way that it doesn't overwhelm you. Hanging out in stress-mode all the time is bad, but spending a lot of time cruising with occasional bursts of all-in effort is actually good for you. This pattern of under- and over-stimulation is crucial (more on this later).

What this all means is that you can train far more, and far harder, than you might otherwise believe. Want to train the same exercise five days in a row? Six? Seven? You can, and you can benefit from all of those workouts. You eventually have to pay down your fatigue debt, of course, and in order to see your gains realized — to see that new muscle growth, to lift a new PR weight — you may have to let the fatigue bleed off.

But this is not about recharging your hitpoints. Instead, we're letting the stress-response stabilize and settle down. It doesn't matter if you train "legs" or "arms" two or three or five days a week *as long as you allow for adaptation to occur at some point in time*.

Once you stop looking at recovery as hitpoints, a whole world of new possibilities opens up. Training is a continual process of biological growth and change which is balanced and checked by accumulated wear-and-tear. You're always walking on a knife's blade, at "the edge of chaos" so to speak, but as your fitness level grows, so does your ability to tolerate a thrashing. You can handle more intensity as weights get heavier, and more volume and more workouts as work capacity improves. The result is a system which grows to match what it's been trained to do.

It would be unfair to say that workouts based on supercompensation "can't work", because obviously they can and do. Minimalist-style workouts, ranging from straight-up HIT to meat-and-potatoes powerlifting workouts work, and work just fine. For some people.

I don☒ft think supercompensation is wrong as much as it is incomplete, and it☒fs in the incompleteness that we find possibilities.

Two Stages of Overtraining

Just on principle, there has to be some point beyond which *more training* becomes counterproductive. I don't deny this, nor will I say that overtraining doesn't exist. The phenomenon is well-studied and its effects are undeniable — at least in high-performing endurance athletes.

I'm more interested in how we define overtraining and "too much" training in the first place. The view held by most gym-rats and casual lifters is unsophisticated. Look at Arnold's workout, with six training days and three hours worth of sets each day. That's "overtraining".

Put another way, overtraining is an amount of work or volume that lies beyond some (incredibly vague) threshold of tolerance. Working within that threshold is fine, going beyond will wear you down and burn you out. To them, overtraining is something you *do*.

Sports science defines the Overtraining Syndrome (OTS) by a checklist of symptoms which include a loss of motivation to train, changes in biological stress-markers, and most importantly, reduced performance. This makes more sense, but full-blown OTS is rarely seen outside of athletes at the highest levels, and even then it's usually endurance athletes training with tremendous weekly workloads. These unfortunates can take months (or longer) to dig themselves out of their fatigue-hole.

Overtraining, in official sports-science terms, is not an amount of work but a condition or state of being: the stress-response gone haywire, the system-wide damage accumulated from months of excess.

Overtraining, by definition, reflects diminished performance. Coaches and athletes and gym lifters would never concern themselves with stress or overtraining if it had no impact on 100m times, on 1RM performance, on the 10K run. We care about overtraining precisely because it limits what we can do.

That means performance, irrespective of biological stress markers, is our number one indicator. Even if all the right signs are there, can you be overtrained when you're still you're hitting PR numbers?

Back in 2001, Dr. Michael Hartman and Glenn Pendlay put this idea to the test, coaching a team of weightlifters through a grueling training cycle designed to push them to their limits. Throughout the training, the lifters, all squatting and doing the Olympic lifts many times each week, were tested for levels of testosterone and cortisol.[26]

Hartman and Pendlay hypothesized that the ratio between these two hormones (the T/C ratio) would provide a marker of overtraining symptoms. As predicted, after several weeks of extreme training, lifters were coming in with crashed T/C ratios. But despite crashed-out hormones and fatigue so crippling that some of the lifters could barely make it up the stairs to the gym, something remarkable happened.

"We still had several lifters set all-time PRs at the end of a week in which we worked up to a max five times," says Hartman.[27]

While the T/C ratio rebounded after the training cycle, and the rebound correlated with

strength gains, their research also demonstrated that while any heavy-enough training will make hash of the hormonal profile, it's still possible to keep making PR lifts.

Are you really overtraining if you're still hitting PR numbers?

It might help to think of this whole "overtraining" phenomenon as a two-step process, with two related but different phenomena in play.

What gym-rats and casual lifters experience as "overtraining" is rarely so vicious as full-blown OTS. You trigger feelings of tiredness and lethargy. You feel sore and stiff. You may not feel like going to the gym. Blood work would likely show a depressed T/C ratio and other markers of stress. You're suffering the effects of fatigue and the stress-response, certainly.

But if you show up, it's possible to keep training near or at your best. Even floored by the dreaded Arnold workout, restoration will come about with a week or two out of the gym, sleep, and good food.

Researchers have wisely separated *overreaching* — which appears quickly and reverses easily — from genuine OTS for exactly this reason. No matter how bad you feel, indicators of physical stress don't always reflect decreased performance.

For some reason, people seem to have it in their heads that overreaching, being a short-term form of overtraining, means that OTS is both imminent and inevitable if you don't cut back on your workloads.

It's certainly true that many athletes, especially nationally- and internationally-ranked, often walk the edge between productive effort and overtraining. They also stick to grueling full-time schedules that aren't remotely indicative of your 4-10 hours a week in the gym.

Here's what I think: overreaching, what you might variously call the "squat flu" or the post-training blues, is a biological response much like that of the sore muscles you get after training. You've posed a challenge and the body responds with stress-mode's profile of neurological, hormonal, and immune-system signals meant to cope. In mild cases, it just means you've outdone your body's current ability to do work, be it intensity or duration or both. You lifted heavier, did more sets and reps, or some combination thereof, and now you're feeling the effects of that.

Of course it's still very possible to overdo it and experience extreme DOMS to such a degree that you can't even move your arms or legs the next day. The muscle is legitimately trashed and needs rest; you've done a degree of damage that won't regenerate inside that 24-72 hour window.

All this means is that there are degrees of trauma. That you can largely ignore mild DOMS is in no way suggestive that you can ignore the kind of DOMS that hospitalizes you with kidney trauma.[28]

The unsophisticated view argues that any post-training indicators of stress mean that we should rest. This position doesn't allow for the *motion of adaptation*. This blip of stress-markers might be transient and, ultimately, tolerable by your body. As evidenced by the findings of Hartman and Pendlay, the body reacts strongly to a large and unfamiliar stress —

and then it stabilizes.

As with DOMS, there's squat flu, and then there's *squat flu*. What the vast majority of gym-trainers experience is low-grade overreaching. You've stressed your body to be sure, and it will display all the symptoms we'd call "being stressed", but you'll adapt. Collapsing into a neuro-endocrine disaster area because you trained too hard is unlikely in the extreme.

Genuine overtraining, in strength athletes, has more to do with psychology than physiology, and in fact I'm hesitant to even call it overtraining. Overtraining Syndrome is identified by a profile of symptoms which are largely physical, with loss of performance and no immediate sign of recovery with rest being number one on the list.

I think that leads us in the wrong direction. Many an "overtrained" lifter will say "I feel fine" with confidence. They aren't lying. They really do feel just fine, and might even be lifting just fine. But they don't feel quite right about it, and probably notice motivation waning. Without any obvious physical symptoms, no muscle soreness or lethargy or anything obvious like that, they assume they're okay.

Overtraining for "high output" activities like lifting weights is first and foremost a problem of mental — or neurological — output. To understand why I say this, we have to move past our body-centric prejudices and realize that psychology is physiology (and vice-versa).

The Russians had an even better way of defining this phenomenon, using the term *staleness* to describe a burned-out athlete with flat-lined performance. In *Science and Practice of Strength Training*, Vladimir Zatsiorsky notes that staleness comes not from volume but from regularly lifting weights which are too heavy. "Because of the high motivational level needed to lift maximal weights, athletes using this method can easily become 'burned out'," he writes.[29]

"Burn out" or staleness in strength training is a consequence of training too heavy, with high emotional and psychological arousal, rather than the amount or volume of training. When you go stale, performance plateaus, weights feel too heavy, and motivation evaporates.

That sounds a lot closer to what gym-lifters and even serious strength athletes experience. Staleness is a problem of intensity: weights are too heavy and athletes are pushing too hard, emotionally, to lift them.

When gym-rats feel themselves "overtraining" with high-volume or high-frequency training, it's likely that they're coming in psyched up and throwing everything into their workouts. In strength athletes, "overtraining" — and its late-comer friend "CNS fatigue" — is more like a code-word for "I worked too hard and now I feel bad."

We fear the idea of daily training because we relate it to how we feel after a hard workout. You feel sore and stiff. You may feel warm and feverish. You feel like you got hit by a truck on the worst days. The idea of getting under the bar to grind out more sets is the last thing on your mind. Feeling bad doesn't say much about what you can do, if you actually make it to the gym, and in fact "feeling bad" might not imply what we've been taught.

PART TWO

Recovery Matters

3

How You Feel is a Lie

"Reject your sense of injury and the injury itself disappears."

—Marcus Aurelius

Of Two Minds

Whether you realize it or not, you probably think of your mind as a separate thing from your body. Even if you don't believe in a soul in the religious sense of the word, you've still grown up in a culture that treats the inner life as mystical, abstract, and even divine. Body is just crude flesh. Internal consciousness, thoughts, and feelings are the primary mode of existence.

Intuitively, that probably feels right to you.

Western philosophy of mind truly begins with Descartes and his famous *cogito ergo sum*. The mind is an ephemeral thing, out *there* somewhere, experiencing a nonphysical mode of existence. In the 18th and 19th centuries, philosophers furthered the view of mind as a rational entity distinct and removed from the body. The spirit, being unique to humankind, must grant us our powers of reason and rationality, separating us from the primitive instincts of animals.

This notion of mind-body dualism, rational mind removed from physical body, has dominated Western culture since the beginning, and most of you reading this will probably think along those lines even if you don't buy into any particular religious doctrine. We just take it for granted as true. Despite that, increasing piles of evidence suggest that we've got it all backwards.

Back in the 1960s and 1970s, there was an intense interest in artificial intelligence among computer scientists. They wanted to build brains, copying the rational powers of human beings in machines. These early efforts fizzled out, leading to the so-called AI Winter of the 1980s and 90s. Computer scientists and philosophers of mind, backed by a growing body of neuroscientific understanding, found that rational thinking and abstract reasoning — things like math and language — are immature, underdeveloped, and comparatively primitive when compared to the emotional and instinctive parts of our brains. In his book *Mind Children*, computer scientist Hans Moravec wrote:

> *Encoded in the large, highly evolved sensory and motor portions of the human brain is a billion years of experience about the nature of the world and how to survive in it. The deliberate process we call reasoning is, I believe, the thinnest veneer of human thought,*

effective only because it is supported by this much older and much powerful, though usually unconscious, sensorimotor knowledge. We are all prodigious olympians in perceptual and motor areas, so good that we make the difficult look easy. Abstract thought, though, is a new trick, perhaps less than 100 thousand years old. We have not yet mastered it. It is not all that intrinsically difficult; it just seems so when we do it.[30]

Reasoning is the easy problem. We can make computers handle all kinds of abstract number-crunching, and they do it effortlessly. Building a "smart computer" that can handle things like recognizing a picture or navigating through a crowd — abilities possessed by any toddler — continues to stump the bright minds working on the problem.

These miraculous powers of motor control and sensory processing that confuse programmers originate in the oldest and most refined (in evolutionary terms) parts of our brain. Evolution's processes of trial and error have had hundreds of millions of years to work out the bugs, which is why you can work out all the differential equations required to follow and catch a baseball without — consciously — knowing the first thing about arithmetic.

The rational brain doesn't have anything like that refinement, and instead draws heavily on its older siblings to do what it does. Psychologist Jonathan Haidt analogizes the rational brain to a rider atop an elephant. The unconscious brain lumbers along, responding to the tugs and prods of the rational mind as it pleases. To a bystander, the rider appears in control. He's got the reins, he makes great plans, and the elephant seems to obey orders.

Until a mouse runs across the trail. In the face of a panicky elephant, the rider's illusion of control vanishes. The elephant's going where it wants. A tiny rider just doesn't have the equipment to strong-arm a two-ton elephant.

This has led psychologists to propose *dual-process theories of thought*, which very roughly divide into fast but unconscious and slower but deliberative forms of thinking. As Daniel Kahneman writes, the elephant — which he labels System 1 — is a fast, intuitive thinker who works in metaphor and associations. System 1 is automatic and quick, but at the cost of accuracy. Our elephant is limited to connections which are immediate in space and time, giving it a considerable set of blind-spots. The rider, System 2, is more deliberative and capable of thinking beyond the here and now but, being newer and comparatively weaker, also slower to act. System 2 demands a cost in both time and energy, and as a result most of our thinking defaults to the lazier, faster options provided by System 1.[31]

As modern neuroscience continues to discover *neurological correlates of behavior*, underlying structures and functions of the brain that repeatedly show up with particular thoughts and behaviors, we find more support for the "two minds" view. Our abstract-thinking selves are evolutionary late-comers, a ramshackle network of circuits built around the far more stable and fine-tuned structures of the inner brain — structures shared with other mammals, birds, and reptiles.

❧

University of Iowa's Antonio Damasio spends a lot of time with defective brains. During his career, he's investigated the origins of consciousness and intelligent decision-making,

and has written several books on his findings.[32]

While it's long been known that damage to the brain's frontal lobes – the center of System 2's reasoning – often leads to behavioral problems, including a profound loss of self-censoring and inappropriate social behavior, Damasio's work has helped understand why this happens.

His research has included patients with damage to a specific part of the frontal lobes called the *ventromedial cortex* (VMF). In several studies, Damasio's team gave VMF-damaged subjects tasks designed to test decision making abilities. They've found that, time after time, these subjects simply can't make good choices. They're indecisive, and when they do choose, they're more likely to make bad decisions compared to control groups. This bad decision-making often leads to more high-risk "stupid" behavior, not to mention socially-inappropriate outbursts and violence.

You can't talk about frontal lobe damage and behavior changes without mentioning the oft-told tale of railroad worker Phineas Gage, who had a three-foot long, one and a quarter inch diameter iron rod rammed through his skull in a blasting accident. Gage, who survived and was even conscious and speaking within a few minutes of his injury, suffered a complete change of personality and temperament. So profound were the changes that Gage's physician Dr. John Harlow later wrote that "his mind was radically changed, so decidedly that his friends and acquaintances said he was 'no longer Gage.'"

Damasio's tests with VMF-damaged patients show that they've lost no intelligence. Compared to their lives before injury, IQ tests, factual knowledge, and language skills are all unchanged. On paper, these people are at least as *smart* as they were before their injury.

But something had changed. In an experiment testing responses to provocative images, two groups with normal and intact brains and the experimental group with damage to the VMF were tested for emotional reactions by skin conductivity. Skin conductivity tests, a measure of involuntary emotional arousal, are very difficult (if not impossible) to fool. Healthy control subjects responded as expected, with a detectable emotional reaction.

The patients with VMF damage? Nothing. While the intellect remained intact, the expression and experience of emotion had been compromised.

How can it be that people who pass all the intelligence tests, and showed none of these defects before their injury, are nevertheless unable to make good decisions or act right when they *know* better?

Remember that our brains carry around a body map that creates our internal feelings of "bodiness". Damasio proposes that our emotions are actually changes in that self-image, what he calls the *somatic state*, and further, these emotional changes guide our decision-making and problem-solving powers.

It happens that the VMF connects with several old-brain regions that handle our response to fear, the sensations of our inner body states, and the connection between the brain and the rest of the body. The network between these regions forms what Damasio calls the "body loop". It's the VMF's job to associate conscious information with our past emotional responses. Damage the VMF and your reasoning abilities are no longer "colored" by emotional intuitions.

It sounds strange that reasoning would be so tied in with emotional reactions, but emotion colors your thinking in profound ways. When you look at that slice of chocolate cake and you *know* you want it, that's an obvious emotional response influencing your choice. Or when you see a lion and think, "Holy crap, it's a lion. I better get out of here". The feelings are clear.

Have you ever looked at something, or maybe someone, and found what you saw disgusting but had no idea why? You decide you don't like a pair of shoes, or find yourself really attracted to a potential partner, but can't quite say why that is. You just *know*, even if the reasons aren't clear, and that kind of unconsciously biased thinking drives more of your behavior than you might realize.

Damasio calls this the *somatic marker hypothesis*. Emotion pares down our options and colors our choices to the point that we aren't effective decision-makers without those feelings.

Now where this gets interesting is in a second, related circuit which Damasio calls the "as if body" loop. In this circuit, the frontal cortex can avoid the actual sensory input and activate emotional memories "as if" we'd just experienced them. The "as if" feature is why we can imagine movements, or pain, or just about any other sensation and almost feel it happening. It also means that our thoughts and memories can trigger emotions and physical reactions.

Not only are we incredibly sensitive to our body's state of being, but we can also affect it with our thoughts.

CNS Voodoo

Nervous-system or "CNS" fatigue has become a modern-day buzzword right up there with overtraining. Don't train too hard or you'll burn out the nervous system. I'm at least partly to blame for spreading awareness of this phenomenon, and don't mistake me, it's a real thing, but the concept has mutated beyond recognition.

Sports science, on the other hand, has a clearer definition. Fatigue is just a fancy way of saying that you're tired and not operating at peak capacity. The question is, what's getting tired? Better, is anything tired at all?

Being a body-oriented profession, we naturally focus on the heart and lungs, in endurance athletes, or muscles in the case of more strength-dependent activities. We easily relate to tired muscles, legs made of jelly after a long run, or when you can't raise your arms after a hard shoulder workout. The muscles themselves have been worked into paste and can no longer sustain the activity. Or, in the case of endurance athletes, you've reached your VO2 max and can no longer keep up the pace because your lungs are burning.

When the tiredness happens in the working tissues, we call this peripheral fatigue.

But there's more. Sports scientists noticed something fishy while playing around with electro-stim devices, which apply an electric current to a muscle and cause it to contract involuntarily. When you do this to a fatigued muscle, the contraction isn't quite as hard as you'd expect in a fresh counterpart. This makes sense, since the muscle itself is tired and forcing it to contract won't change that.

Under some circumstances, though, you can apply current to a tired person and the muscle contracts just fine, like it's not tired at all. Yet when asked to contract the muscle voluntarily, the subjects can't do it. Researchers labeled this *central fatigue*, since there's no obvious cause of tiredness in the muscles. The loss of performance is due to central causes — that is, happening in the brain or spinal cord, better known as the central nervous system (CNS).

South African sports scientist Timothy Noakes suggested an explanation for this phenomenon, focusing on the brain and its damage-control features. According to Noakes, we experience fatigue as a specific sensation that alters our perception of effort as our bodies do work and grow tired during physical activity, and we can measure this conscious perception of difficulty with the rating of perceived exertion (RPE), a value that rates how hard you're going compared to your theoretical best-effort. We'll see a lot more about this later.

Noakes's *central governor hypothesis* says that the feeling of difficulty, measured by the RPE, gradually increases during a workout, and in response our neural output — central drive to the working muscles — drops off. We're often physically capable of doing much more work, at a higher effort, than we typically do, but from a survival standpoint, voluntarily working to a point of catastrophic failure isn't the best idea.[33]

Noakes suggests that the brain pulls back on the throttle as a protective measure. The sensation of "tiredness" is our psychological experience of this protective mechanism. Our limits, both in endurance and in maximum intensity, are in part physical and in part

psychological (although in reality there is no distinction between the two, as I've suggested).

The governor isn't a particular cluster of neurons or any part of the brain that we can point to and say "fatigue happens here". Like many brain functions, the governor is intended as a shorthand for the behavior of many (many) networks spread throughout the brain acting together. Whatever the governor really is, if Noakes is right it acts like one of Antonio Damasio's somatic markers, taking feedback from the body — from muscle tissue and the cardiovascular system in this case — and integrating it into a bodily sensation.

Fatigue can be triggered by a stunning range of signals, as everything from ammonia and oxygen content in your blood to the availability of neurochemicals in your brain and the feedback from receptors in your muscles and joints works into the calculation of just how tired you are.

This is the kind of fatigue that you can overcome by reaching down and digging in your heels. You can make that last quarter mile; you can grind out that 10kg squat PR if you grit your teeth and keep it moving. Since nothing is actually "tired" in the way we tend to think, you can grunt your way through it with an executive override. It won't be pleasant, however, because you're working against the survival instincts built into your brain.

Intriguingly, mental fatigue by itself can trigger the fatigue effect without any need for you to actually do anything. A 2009 paper from Samuele Marcora's team at Bangor University in Wales tested the effects of mental fatigue on high-intensity cycling. Subjects given a complicated mental task before the cycling test couldn't keep up the pace compared to the control group.[34]

Marcora's team suggests that mentally-demanding tasks fatigue the *anterior cingulate cortex* (ACC), another part of the brain important for its role as a junction between your body-sense and your conscious perception of effort. During exercise, the autonomic nerves fire on all cylinders to keep heart rate and blood pressure and everything else working in "exercise mode". The ACC plugs that information in to our conscious minds and we experience it as "hard work".

When you go exercise after spending half the day studying differential equations, you've worn out your ACC and the exercise feels much harder than it should. Marcora argues that the perceived difficulty itself may cause you to cut off a workout before any genuine physical fatigue sets in.[35]

There's no "handbrake" in the brain as in Noakes suggests. Instead, as we exercise and gradually tire out, neural output from the brain has to increase to keep up the pace. That increased output translates into feelings of difficulty. Fatigue happens when the feeling out-does your motivation to keep going and to ignore the pain.[36]

We don't have to worry over the nuances of the scientific back-and-forth. The competing models differ in detail but agree on the key point: the brain is receptive to physical signs of fatigue as well as being the site of mental fatigue. The two fatigue processes seem to share many of the same circuits, and both involve changes in brain activity that we experience, subjectively, as feelings of difficulty and a loss of performance. Likewise, those same fatigue-induced changes lead directly to "coping behavior".

Or, more simply: As exercise feels harder, whether from mental or physical tiredness, you're more likely to stop doing it and it's more likely to make you feel bad afterwards.

Calling fatigue an altered brain state or an illusion of the senses isn't meant to discount the feeling. The sensation itself may be "just a feeling", but the change in brain state, and the reduction of neural output, most assuredly is not. Fatigue markers can impair performance just as sure as any injury.[37]

Confirming this, Romain Meeusen of Belgium's Vrije Universiteit has shown that the feeling of fatigue happens as a consequence of altered neurological activity, specifically the behavior of two important neurotransmitters.[38]

Back in 1987, Eric Newsholme proposed that transmission of serotonin in the brain increases during exercise, leading to feelings of lethargy and contentment as well as a perception of fatigue. Newsholme called this the *serotonin hypothesis of fatigue*.

Meeusen's research found that elevated serotonin is only half of the central fatigue equation. Dopamine, another neurotransmitter involved in motivation and motor control, also increases during intense exercise. But Meeusen found that, at the point of exhaustion, dopamine levels drop off sharply. We experience central fatigue after that dopamine crash, while serotonin is still high, and it⊠fs this ratio between dopamine and serotonin that matters in our perception of tiredness.[39]

Meeusen warns that there is no one pathway that completely governs fatigue. Serotonin and dopamine, while likely an important piece of the puzzle, are only two players in a complex game of arousal and inhibition. He points to the brain's store of glycogen fuel, which is a paltry 1.5 grams when maxed out, as another factor worth consideration. The brain⊠fs energy usage is so high that even small changes in glycogen make a big difference in our perceived energy levels. Intense focus and concentration depletes brain glycogen, perhaps explaining why studying all night, or spending 10 hours behind the wheel, wears you out.

Thinking and Willing

Modern thinkers haven't given much credence to free will. The entire concept has been called into question on scientific and philosophical grounds, with many wondering if the idea even makes sense given the cause-and-effect determinism of the physical world. Every effect having a clearly-defined cause seems to rule out the idea of thinking beings able to act of their own volition.

Although the issue is far from settled, we do have some hints that willpower does exist in some sense, insofar as "free will" means that we can make conscious decisions and then act on them (in contrary to more impulsive or emotional desires) — as in a moral choice or, perhaps closer to home, avoiding the cake while on a diet.

In this sense, willpower does exist, but if the findings of Florida State psychologist Roy Baumeister are any indication, it's a limited resource. In a series of experiments, Baumeister has repeatedly found that people who exercise their willpower for one thing, say turning down a cookie while hungry, or doing complex math problems before making a decision, are more likely to give in future temptations.

We've seen that our brains operate in (roughly) two modes: System 1, the unconscious emotional self, which is impulsive and attracted to shiny things, and then the rational System 2 that keeps the books and turns down beer. Those self-control circuits, remember, are relatively new features of the mammal brain, and they spend much of their time not only doing math or making decisions, but also in choosing which impulses to ignore or restrain.

Resisting temptation, doing complex problem-solving or making a challenging decision wears it out just as if you were standing there flexing your guns. Baumeister calls this *ego depletion*.[40]

The ego, in Freudian parlance, is literally the "self", what you talk about when you say "I". When you throw your ego's mental weight around, enforcing your rational edicts over your animal passions, Baumeister argues that you're draining a reservoir of limited energy. This is no metaphor, as "the self" depends on the brain's supply of glucose (echoing Meeusen's earlier point about glucose turnover). When we're low on energy, willpower is quickly exhausted (and conversely, when we top up our blood sugar, willpower recharges). You literally exhaust your ability to focus and muster up the "oomph" to get anything done.

The will exists, says Baumeister, but it exists by degree. Anything that calls on our self-regulation resources, which includes diets, being nice to obnoxious people, sitting in traffic, doing complex math problems, or driving yourself through intense exercise, depletes that reserve and leaves you vulnerable to temptation.

We've already seen the connection between mental exhaustion and exercise performance as a potential candidate for central fatigue. Confirming that the phenomenon isn't limited to endurance activities, research from Kathleen Martin-Ginis reveals that ego depletion also impairs maximum strength, as measured by the ability to complete a hand-grip test.[41]

Deplete your supply of willpower, even doing something totally unrelated, and your ability to generate force and push through fatigue signals is equally diminished.

Not only that, but it seems like exhausting your self-regulation powers dials up the intensity on the signals flowing in from the body. The activity of ACC, which you'll recall as a key junction between conscious mind and unconscious sensation, drops off during intense concentration, leaving you extra sensitive to any and all emotional stimulus. You feel everything, like hunger or the screaming burn in your legs, more profoundly when your willpower is depleted.

Drawing on your rational powers actually causes physical changes very similar to the sympathetic stress-response. Self-regulation and autonomic control operate through similar parts of the brain, and researchers can actually measure mental effort and the exhaustion of willpower using a measure called heart rate variability (HRV).[42]

This is the one-two punch: exhaust yourself mentally from any kind of concentration or intense mental effort and you're going to be at the mercy of any emotional desire that comes along. That might be ice cream and cookies, or it might be the desire to skip your workout, to skimp on cardio tonight, or to give up during that 1RM attempt. And on top of that, you aggravate the disrupted state-of-being caused by the stress-response.

Perceived Recovery

We can see now that central fatigue isn't quite what we've been led to think. There is a process of "getting tired" happening, and it is as much psychological as it is physical ('psychological as physical'), but it isn't quite that ambiguous killer-of-gains that "takes longer to recover" than muscles.

CNS fatigue is nothing more — or less — than "getting tired" during training. It's a kind of tired that you can overcome with enough motivation, mind you, and that can be important to understand in itself. The difference between a PR time and second place, between hitting that PR lift and missing it halfway, or making your last two sets or going home tired can, literally, lie inside your own mental estimations and your desire to get it done.

It also means that you push past your current limits, and will probably suffer the consequences tomorrow when you wake up feeling like a mess.

This has an interesting consequence. While there aren't any "recovery hitpoints", what we see here is that fatigue (or "overtraining" if you prefer) has at least as much of a mental dimension as a strictly physical one. This might be confusing since I've said they're the same thing — and they are — but this is an important difference.

An unmotivated or cognitively-exhausted person will be "fatigued" just as sure as a person who just finished a marathon. It's the psychological perception that dictates this, generating the feelings. Regardless of what causes it, the sensation of fatigue and estimate of difficulty is, indeed, in our heads.

Let me be clear here: the distinction I'm drawing between "mental" and "physical" is not intended to invoke any sort of New Age woo-woo or to draw any sharp lines between mind and body. I'm not suggesting that there is any kind of spirit or soul or ectoplasm clinging to our brains.

What I'm suggesting is that the psychological aspect of fatigue is *how we experience* the changes in brain activity which are, in turn, caused by fatigue in our muscles. This is the subjective aspect of an objective process.

We might be better served to think of recovery as *perceived recovery* — that is, *the experience of feeling recovered* — rather than using "real" physical recovery of muscles and nerves and whatever else as the metric. We can't do anything about the physical condition, but I don't believe that's the critical problem in the first place. The feeling of not-recovered reflects an underlying stress placed on your body, but that condition need not be a genuine physical limitation.

It might be that you feel bad for reasons that have nothing to do with your ability to train — and details that you might not consider important can impact your performance. Your ability to train hard while dieting, for instance, might be compromised if carb and calorie intake is low. Without glucose to fuel your brain, you might find that it's harder to generate and maintain effort, independent of any issues in your muscles.

Intense concentration and focus, or mentally-demanding stress at home or at work, might sap your self-regulatory powers, and this too would qualify as "neural fatigue". You're

tired and not hitting all cylinders even though you didn't "do" anything.

Ego depletion sounds like an argument for training however feels right to you. When your training doesn't feel like a chore — whether that's HIT-style high-intensity or the bodybuilder's volume or something else — you're more likely to repeat it. On the other hand, when your training beats you up and makes you feel bad, when you hate it and have to really force yourself to go, you're setting yourself up for issues.

"Do what you like" does make sense, and is probably a good strategy at least some of the time. The pitfall should be clear, however: doing what you like isn't always a recipe for ideal results. If it just happens that you like doing 50 sets of arms every day or running 20 miles a day, that doesn't help you if you've got it in your head to compete in powerlifting.

We need a compromise between our willpower and goal-oriented processes. Otherwise we're just training haphazardly, chasing feelings with no regard for outcomes. That's what most of the gym-going populace already does, and it doesn't work out so well for them.

Regardless of our natural tendencies, we can probably train and condition our psychological responsiveness to some degree. Even though behavioral leanings have a genetic component, there's truth in the statement "you do what you become".

Baumeister has since discovered that willpower can indeed be trained with practice. By regularly flexing your self-control circuits, you can strengthen them much as a muscle gets stronger with practice. The more you exert your will and train your attentional focus, the better you get at staying focused and in control. Better yet, the simple act of following an exercise program is one of the methods shown to improve your self-control resources. Other methods, which I'll talk about later, include meditation and mindfulness training.

I think that "self-training" is a crucial skill. Just as our muscles can tolerate a lot of things if we take the time to build up to them, so can our minds. A good many folks will give up the instant things get difficult on a psychological level, or throw up their hands and go "overtraining!" at the first signs of a sore muscle. Worse, they'll invoke science as a rationale. This is not simply a defeatist view, but one that depends on a particular set of ideas about the mind that, as I've hopefully demonstrated, just aren't right.

A bolstered sense of self-control, though, means that you're better able to last through a challenging workout and better equipped to come back the next day. The psychological dimension of recovery means that a stronger mind can, literally, out-will a physically-stressed body.

Can we train ourselves to freaky levels of strength by training willpower and mental focus alongside weight training, learning to "overcome fatigue" regardless of our "genetic" tendencies?

I offer a conditional "yes".

I don't believe that anyone without the right biology will, as an adult, be able to train for world-class performances in any sport of choice. You can't take a burly 25 year old or an underweight 35 year old and make a top marathoner or a record-setting powerlifter, and if it does happen you're looking at genes.

However, the question of elite performance is a separate issue. We want to know if we

can train to do the best we can do given what we've got.

I do think that you can set massive gains relative to where you started, and that part of doing so is learning to treat exercise as mental, as well as physical, training.

Just showing up every day and moving around a reasonably heavy weight could count as training these psychological elements. I found an effect much like this, in that lifting became very automatic rather than a Big Event to get excited over. You might even find that your desire to train reflects the gym you train in, the people you train around, even the programs you use and books you read about training. Our minds are remarkably sensitive to circumstances like this, which in itself offers some intriguing performance-enhancing possibilities.

While our brains may come with presets that skew our behavior one way or another, we need not be slaves to them. The mind reflects brain function, and brain function reflects the state of your body. We can train all of these.

I want to close this chapter with a cautionary note.

I know some of you will read this and instantly start thinking of ways to cheat your brain with nutritional strategies and supplements and drugs. Allow me to reiterate that the neurology is a very poorly-understood area with lots of interlocking pieces that continue to defy explanation by the best minds on the planet.

Much like I think trying to cure "high cortisol" with pills is a waste of time and money, I don't think you're going to cheat central fatigue. If you're having these thoughts, I wish you luck in trying to apply performance-enhancement thinking to the problem.

It's important to understand why we feel fatigued during training and why we feel awful between sessions, but as with so many topics in this book I don't intend this explanation as a way to change things.

What we have now is a handle on neural aspects of fatigue, which is really just how you perceive physical exhaustion dependent on how much mental effort you've recently spent, and more importantly, what "overtraining" really is. Training alters the workings of the brain, and training agitates specific immune-system and neurological symptoms, which translate into feelings of tiredness during training.

Biology likes safety margins, the kind that engineers build into bridges. You always want to keep a buffer between working conditions and theoretical maximum tolerances lest you risk a catastrophic failure.

The safety margin is there for a reason. And yet there's a conflict of interest with exercise, in which the entire purpose is to push, and hopefully expand, those physical limits.

The survival systems in your body are dumb. They can't distinguish between a deliberate exercise program and physical labor that might kill you. Your body treats conditions as they come without concern for the intent behind them.

The question is, how much of the fatigue response is over-cautious helicopter parenting on behalf of your brain, and how much is a legitimate need to rest? How much of

this phenomenon is a safety margin at all, rather than low pain tolerance?

These questions don't, as yet, have concrete answers.

I don't contest that there must be some limit to training. There are only so many hours in the day, and most of us don't want to train for 20+ hours a week even if we have that kind of spare time.

There are also instances when lots of training is counterproductive. Some people already do push these limits in pursuit of pain or euphoria, when they'd be better suited with a more conservative but smarter approach to training. Overtraining is real, if you're one of these self-motivated types who can't sit still, and the last thing I want is to give the impression that I'm justifying that kind of reckless non-programming or being in the gym just so you can tell yourself that you're one of the real hardcore.

But I do question the over-reaction that pervades the mainstream. I do think that most of us never approach the real physical limits, and in being so conservative we leave a lot of unused potential on the table.

I question the consensus opinion that lifting weights, hard and heavy, six or seven or ten hours a week is unsustainable. While 20 hours of training might throw off your work-life balance, it's hard to see how training once a day, or even twice a day if you have the time, will send you off into an endless spiral of overtrained exhaustion.

The feelings are just that: feelings. Your nervous system is built from the ground up to respond to the sensory information flowing in from your body. Sensory input is sometimes right, as when you step on a nail or burn your hand, and sometimes it misleads us.

My contention is that, while it's easy to rely on our intuitions about "feeling bad" as a marker of exercise performance (whether that's avoidance of overtraining or the the pain-fetishism of mainstream exercise), we're not always best served by doing that.

You want to pay attention, but sometimes ignoring it might be for the best. Of course, how well you handle that might have a lot to do with how you — and your brain — respond to exercise.

4

Hardgainers & Responders

"Strength does not come from physical capacity. It comes from an indomitable will."

–Mahatma Gandhi

Crime & Punishment

Criminologists, as the name hints, study crime. They want to understand why people misbehave. Since the beginnings of the field in the mid-16th century, criminologists have developed a range of theories to explain social deviance: actions that violate the rules and norms of society.

The earliest criminological theories treated human beings as reasoning actors free to choose, and with those powers of reason people would carefully weigh the costs and benefits of their choices. To theorists of the classical school, punishment — especially quick, certain, and appropriate punishment — serves as a deterrent to criminal behavior, as these rational actors will always factor the consequences into their choices.

Classical thinkers later gave way to the emerging school of behavioral positivism. Figures like Emile Durkheim and Robert Merton attempted to explain crime as a response to social inequalities and injustices. Circumstances, they argued, played as much of a role in crime and deviance as anything.

Others believed that physical traits could predict criminal behavior. According to Cesare Lombroso, a pioneer of biological positivism, criminals were evolutionary throwbacks, distinguishable from right and proper citizens by the abnormal shape of their skulls. The general premise — that behavior could be linked to biological factors — isn't fundamentally wrong, even if the forebears of the idea were driven by the kooky racism of their age.

The paradigm shift brought about by modern neuroscience places the positivist view on much firmer ground. Now, instead of the crude measures of skull shapes and thick brows, we can draw on knowledge of the brain's deep structure and observe how brain function correlates with behavior.

Still, the old beliefs persist. If you want to succeed in life, you simply apply yourself, work hard, and never flinch. Your success in anything, career, diet, athletics, comes down to how much you want it and how much you're willing to work. As we've seen, current trends in neuroscience and psychology call these assumptions into question at their very core. We haven't eradicated free will just yet, but there is a growing mountain of evidence suggesting that human behavior is strongly influenced by deeper biological drives in subtle but powerful

ways.

We've already seen how Antonio Damasio's patients can't make decisions without their emotional inputs, how the brain can fool us into thinking we're tired when we aren't. We are body-centric thinkers, and the state of our bodies can have a powerful influence on our allegedly reasonable selves.

In the early 20th century, British psychologist Hans Eysenck wrote that extraverted personalities and neurotic behaviors, traits both linked to arousal in certain parts of the brain, could lead to criminal behavior. Eysenck's arousal theory was expanded into the *arousal-seeking theory of behavior* by Donald Lindsley in 1952. Criminals, being more likely to feel unsatisfied by a normal, wholesome life, go out looking for action to sate their cravings, which Martin Zuckerman calls sensation-seeking behavior: "a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience."

We've seen how fatigue can be likened to an emotion, and how it can percolate into conscious awareness and convince us of things that aren't quite true. In this chapter, I want to take the premise of body-centric thinking in a slightly different direction.

The search for sensation and stimulus is a powerful driver of behavior in birds, reptiles, and mammals, humans included. These drives originate in the deep brain structures of the limbic system which, as we saw in the last chapter, are closely connected with our senses. Things we encounter in the environment, and things we feel on the inside, filter into the brain through these networks and, consciously or otherwise, generate emotions and feelings.

To what degree, and in what direction, these motivations influence us can vary widely from person to person. We're all familiar with calm, quiet types, and loud, out-going types (and a range of personalities in between) even if we've never put too much thought into it. These temperaments (or "affective styles" in the lingo) suggest that we can become pegged to certain habits of thinking and acting, and these may be biological in origin.

The Reactive Mind

As far as out-going stimulus-seeking behavior goes, I'm about as far as you can get from the personalities envisioned by Eysenck and Lindsley. I don't feel comfortable around crowds, especially unfamiliar faces. My idea of a good time is sitting in a quiet room with a book, or working on a project that has me plugged in to a keyboard. "Noisy" environments, places with lots of things going, lots of activity and lots of new faces, tire me out and quickly become overwhelming. Compared to the stereotypical stimulus-seeker, I'm a total buzzkill (unless you add beer to the equation).

While lots of hypotheses have been put forward to account for why stimulus-seekers are different from more reserved personalities, the one I'm most attracted to strongly resembles positivist ideas. While I want to walk carefully in laying out the relationship between mental characteristics and biology, I think there's a strong case that the positivists were aimed in the right direction. Namely, I think that biology — specifically, brain structure and function — is a key influence on our behavior.

On one level that is obvious. Of course our brains determine how we think and behave — it's the brain. But we can also make the more subtle case that the different traits that make up our personalities and temperaments are, at least in some sense, wired in to us.

Eysenck's ideas on extraversion and neuroticism hint at this. Brains can come wired with dispositions for more impulsive, more energetic personalities, and people built that way will demonstrate this by having less of what we'd call "self-control".

The most compelling research I've found to support the idea of brain-influenced dispositions comes from Harvard psychologist Jerome Kagan. In a series of experiments in infants and, several years later, follow-ups with those same children as toddlers, Kagan found exactly this.[43]

Kagan first ran an experiment with 460 four-month-old infants to assess their responses to environmental stimulation. The children were placed in a stressful environment, and their the responses, measured by crying and "motor activity" (squirming), were recorded. The infants who had the strongest responses were categorized as "high reactive", while those with mild responses were labeled "low reactive".

Follow-ups at 14 and 21 months used similar methods, testing sensitivity to lemon juice on the tongue and reactions to unfamiliar people and recording the distress or fear reaction (if any). Finally, a sample of 193 toddlers were tested again at four and a half years, based on their reactions and verbal replies to an unfamiliar tester as well as their willingness to play with other children the same age.

What Kagan discovered was two distinctive behavioral styles based on responses to the unfamiliar. Inhibited behavior is what we'd otherwise call shy or avoidant. Inhibited children, as Kagan discovered, react to the novel and uncertain with avoidance or distress. These are the quiet people who will go out of their way to avoid conflict and novel or uncertain situations. Uninhibited behavior, in contrast, is defined by sociable and out-going behavior, including a draw towards the unfamiliar.

Where it gets interesting is in the connection between reactivity and temperament.

The high reactors, who make up about 20% of sampled European American populations, are said by Kagan to "possess a low threshold of activation in the amygdala to sensory stimulation". Low reactive infants, around 40% of the samples, are considered to have high thresholds.

In other words, the behavioral styles of these children as infants was a strong predictor of how they'd behave as they grew up. By all appearances, this is not learned behavior. That these responses happen in young infants suggests that it's the innate sensitivity of the brain that leads to these behavioral dispositions.

You can imagine your brain as something like the receiver in a radio. It's always soaking up signals from the environment: sights, sounds, tastes, temperatures. All of that sensation is information, a background noise to the brain through which it constantly sorts, looking for anything interesting.

A quiet room with dim lights and soft music playing will be a low-stimulus environment. Front row at a rock concert, overflowing with sights and sounds and the raw energy of an excited crowd, will be high-stimulus. The brain has more to handle, more to sort, and more to work to do.

Reactivity can be thought of as how sensitive or numb you are to this environmental noise. Someone with low reactivity will be virtually immune. They will be literal stimulus-seekers for whom lots of bustle and excitement feels normal.

With their gain turned way up, however, high reactors find that kind of sensory input overwhelming, and this turns up as introverted behavior. Mental stimulus of any sort leaves them exhausted, so they turtle up and hide away in quiet places away from crowds and excitement.

Now, you might think, so what? So I don't like being in a loud night club. So I don't like sitting in a quiet room reading all day. What does that have to do with strength training or recovery? Well, it turns out that reactivity affects more than your feelings and behaviors. In *Why Zebras Don't Get Ulcers*, Robert Sapolsky details how reactivity and your temperament are also strong predictors of how stressed-out you are likely to be.

Our sensitive high reactor can be compared to a neurotic "Type A" personality. Any little thing sets them off, and once they're going it can be hours before they settle back down. It's easy for a high reactor to stay soaked in stress hormones for hours on end, set off by an ever-compounding series of morning traffic, meetings, bosses, co-workers, and traffic on the way home. These people set themselves off, yes, but it's in their nature to do so.

Being effectively numb to the same pressures, low-reactors can handle much more without flinching. The low reactor isn't a psychopath, as they experience emotions and react to life-events as anyone would, but the effects of stress aren't pronounced. It takes an extraordinary event to provoke a response, and they're much better at turning all the coping systems off after the fact.

You'd be absolutely right if you guessed that these neural and psychological differences translate to different physical outcomes. Stress is stress. Your brain is the master controller, and it doesn't care if the threat is a third-degree burn or you clenching your teeth for 16 straight hours because you don't know how to relax. To the high reactor, intense exercise

becomes just another log on the bonfire, whereas a low reactor may not even notice.

The Activity Set-Point

Back in the 1954, James Olds and Peter Milner at McGill University got the idea to hook electrodes into the brains of lab rats. This wasn't done to make an army of cyborg rats, as was typical of mad scientists at the time. The electrodes targeted specific areas in the rat-brains, and the rats were then given access to a switch that delivered a tiny dose of electricity to the area in question. These experiments score pretty high on the creepiness scale, but they revealed a set of interesting behaviors on the part of the rats.

The rats learned to hit the lever repeatedly, up to 100 times a minute, and keep up that pace until they were too physically exhausted to move. They'd run across electric-shock grids, or ignore warnings of impending electrification, to hit the lever. If given a choice between food and self-stimulation, these rats would starve themselves to death.

Olds and Milner knew that they'd found a powerful motivator for rat behavior.

Later work revealed that these wirehead rats were lighting up a particularly powerful network, a circuit made up of the *ventral tegmental area* (VTA for short) and its cohort the *nucleus accumbens*. Together these make up the *mesolimbic dopamine system*, which Olds and Milner labeled — prematurely, as we'll see — the brain's pleasure or reward centers.

Mammal brains are divided into specialized networks that use different neurotransmitters to communicate. The mesolimbic system runs on dopamine, which you'll recall as serotonin's partner in central fatigue, and is, as wirehead rats indicate, one of the most powerful motivators of behavior in the mammal brain.

Of course, there are easier ways to light up the mesolimbic system than mad science experiments, albeit with similar results. Drugs like nicotine, cocaine, and the entire amphetamine family all work on the mesolimbic system to varying degrees (and with familiar results).

Surprisingly, so does exercise.

We see this connection play out repeatedly in addiction studies, whether the addiction is cocaine, the slot machines, or cookies. Addicts are driven to *go get*. This loop between wanting and doing also shows up in voluntary exercise, as demonstrated in recent work by Amy Knab of Appalachian State University and Timothy Lightfoot at the University of North Carolina.[44] Arguing for a strong genetic component regulating our desire to exercise (or not), Knab and Lightfoot have tested their hypothesis in two lineages of mice selectively bred for differences in exercise behavior. Mice in what they call the high activity group will run on their exercise wheels for up to 17 times longer than their less-athletic cousins, without any prompting or coaxing.

In a range of supporting research, they note a strong connection with dopamine transmission, which is genetically determined, and the behavior of the animal subjects.[45]

Knab and Lightfoot argue that this neurologically-motivated desire for exercise likely apply to humans just as well as mice. You may wonder how, given the many and obvious differences between humans and rodents, but it's not that far-fetched in this instance. Sometimes rodent research is way off base, but in this case the relevant brain structures are

evolutionarily old and conserved across mammalian brains. Just by paying attention we can see that even us primates have a range of dispositions for activity or laziness; what Knab and Lightfoot's findings tell us is that there is likely to be a deep-seated biological connection.

If true (and for the sake of the argument I'm going to assume it is), then naturally-active people probably have a positive response to activity, in which exercise "normalizes" their brain chemistry (and thus makes them "feel normal"). This translates to something like a compulsion or desire to move around.

Meanwhile the couch potatoes are quite happy to stay sedentary. They lack the deep-seated drive to get up and run. For them, exercise may be another annoyance — or, in a suggestion that will doubtless be controversial, may actually make them feel worse than their naturally-active counterparts.

Now you may be wondering exactly what this means. So some people move more and others don□ft. What's the big deal? Should you use your natural proclivities as justification for training lots (or not at all)?

Responders

Over the years, I've noticed that athletes in general, and strength athletes in particular, fall into one of two categories. The first group trains the traditional way — brutally hard work in the gym, and lots of rest between those workouts. For bodybuilders, this means splitting up body parts so that each muscle group only gets trashed once a week. Powerlifters and other strength-focused athletes likewise train each major lift with one workout, or one heavy and one lighter session.

Each workout challenges the mind as well as the body. The watchwords are intensity and exhaustion, whether training more HIT style or with a bodybuilder's volume-heavy pumping and blasting. Leave it all in the gym and then rest those muscles for the next week.

The other group trains more. They do more sets and schedule more workouts. These people train hard, but with less focus on raw intensity as the goal in itself. They make up for it by doing more work. I've noticed this in your "anaerobic" athletes: sprinters, throwers, cyclists, middle-distance runners, martial artists, football and rugby players, triathletes. You could even include those Olympic weightlifters who train multiple days each week, or pure strength athletes like Anthony Ditillo and Bob Peoples.

Between these two groups, it seems like people respond best to one or the other (and swear that nothing else could possibly work as well for anyone). Why, I don't know exactly. Some of it is obviously due to the needs of the sport or activity. Beyond that, even limiting ourselves to powerlifters or weightlifters or strongmen, there are certainly many potential biological candidates, some we've discussed, others we haven't — and that's without even getting into lifestyle or social reasons.

Whatever the cause, some people genuinely do love to train "a lot", and others don't enjoy more than the bare minimum.

I don't really know what to call these groups, so I've used the word "responder" to distinguish the two. That's a loaded term with lots of potential to cause confusion, so I want to clarify what I mean.

First, we can look at the activity set-point. Like the well-bred mice, if you crave stimulus, you'll want to train and train hard. If you don't, you won't. So people who respond well, in the sense that being active is a natural disposition, are one dimension. They respond well to activity and, in particular, mentally- or emotionally-intense activity.

We can also define responsiveness as a physical trait. Studies that measure strength gains and hypertrophy gains often note that some individuals do remarkably well, others remarkably poor, and there's a comfortable middle ground of average gains for everyone else. A high responder in this sense is a person who sees an extraordinary gain from any single bout of exercise; a low responder sees very little return. These differences seem to lie right down at the cellular level, so they're likely genetic in nature. Some people really are going to grow more or get stronger than others, both in absolute terms over a career as well as their response to any given workout.

Based on these two ideas, let's do a little thought experiment. Say you have someone who is a remarkable responder to exercise, but also scores as high reactive. This person

won't do well with high levels of stimulus, and like the low-activity mice in Knab and Lightfoot's experiments, probably won't care to do a lot of training.

What you're going to have is a person who gets brutally strong on almost any kind of workout plan, and who may feel unusually bad after any intensive, exhaustive mental effort.

Take the opposite case, someone with poor physical responsiveness but low reactivity. This person will be outgoing, energetic, probably moving all the time, but will find it difficult to get stronger or add muscle.

These two polar opposites are probably not real people. They fit certain stereotypes, yes — one is a Typical Meathead, the other a Typical Runner. The strict categories aren't the point here. What I'm suggesting is that responsiveness has more than one dimension. The results you get from exercising are distinct from your actual "recovery" ability.

I'm going to make a connection that might seem tenuous, but hear me out. Reactivity determines how sensitive you are to the environment, and that shapes your desire to exercise. Another way of saying this is that the naturally-active low-reactive person is more resistant to fatigue and to stress.

At the other end of the continuum, the natural couch potato is disposed to watch TV, read books, and play on the computer all day. There's no deeper motivation driving them to exercise or gamble or engage in risky criminal behavior to normalize themselves, so their default state is to sit down.

It's not just that, though. It takes conscious effort, an act of will we might say, in order to get up and exercise and, when encountering fatigue, to push through it.

We could say that, just as the uninhibited type is resistant to fatigue, a more introspective high-reactor will be more susceptible to it. Their minds simply aren't constituted to push through exhaustion. Intense exercise depletes them, making said activity feel harder than it should. The next day, with a combo of physical stress and mental depletion, they're going to "feel" a greater hit to perceived recovery.

The high-reactor has the ultimate double-whammy, less able to handle intense effort and feeling more beat-up for their trouble. It's no wonder so many people have convinced themselves they have "poor recovery". Some people may just be built that way.

These are your alleged "hardgainers" with the worst of all worlds. Not only do they not enjoy intense, exhausting exercise thanks to high reactivity, but they also see relatively poor results for any amount of training they do. For these unfortunates, intense strength training won't be fun, won't be very productive, and they'll feel beat to hell after the fact.

Top lifters are natural intensity responders. Low-volume, low-frequency programs work for these people not because they can't *handle* more but because they don't *need* more in order to reach world-class levels of strength. This unique responsiveness to training, the fact that they can get so strong on minimal training, defines them as outliers and "genetic freaks".

Take a person like this and add in the fatigue resistance of a low-reactor and you've got a monster of an athlete in the making — someone who not only wants to train all the time but who also has the body to make the most of it.

The poor responder — I'd rather use this than "hardgainer" — gets confused because typical training recommendations don't separate recovery ability from muscle and strength gains.

True, these people see smaller gains in return for each workout, and exhausting workouts beat them up too much to repeat often. Poor recovery, as we see now, has a mental dimension, one which partly stems from neurological factors.

It sounds like a dead end, but I think there's a way out.

Poor responders aren't necessarily unsuited for hard training (as if all kinds of hard training are the same). They are, however, unsuited to single doses of high neurological intensity. Being sensitive to fatigue, these people may actually be "volume responders".

If you follow along from my basic premise — that the biological machinery of nerves and muscles responds to repetition as well as effort — then you can see that, by doing less, the poor responder reduces an already small stimulus. These folks need *more* stimulus to make up for the shortfall, not less.

The trick is to stimulate without exhaustion. Spread the work around, racking up higher volumes of work while avoiding emotional exhaustion. That's the prescription for the poor responder. More accumulated volume by way of higher frequency. More quality practice. More work at a lower dose of intensity.

Plenty of spectacularly strong people got there by squatting once a week, but this says nothing about the fate of people who *didn't*. Variation in responsiveness, in stress reactivity, in extrovert-introvert tendencies, and who even knows what else, all means that there are no universals.

If you don't respond to brief, intense, and infrequent, then maybe you need to think *practice*. Practice builds proficiency with lots of repetition at the edge of our limits. Forget about hammering your poor body into submission. Coax it and nurture it through consistency and repetition. Aim to do as much quality work as possible.

This is what daily lifting is all about. The more often you practice training, and training heavy, the better you become at it.

Can’t Do That

Those seemingly gifted athletes who train like madmen with workouts you “could never do”? I think there’s more to their results than just genes. There’s an obvious connection between motivation to train, the training that gets done, and the results over a career.

This isn’t a strongly supportable claim unfortunately, but there are hints that the overall result, insofar as what you gain from time spent training, can scale according to the work you put in. That is, a “low responder” doing a high responder’s low-volume workout may see poor results — but that same person doing a more volume-heavy workout may suddenly transform into an average or high responder.

Take a 2011 study from Australia and New Zealand which examined the strength gains from 6 weeks of training with 1, 4, or 8 sets.[46] The researchers took 32 males with at least two years of twice-weekly lifting and a squat 1RM of at least 130% of body weight and put them through a total of 12 weeks of training. The main phase of the test divided the subjects into 1-set, 4-sets, or 8-sets groups, in which squats were trained twice a week at 80% of the tested 1RM for the assigned number of work sets.

So the 1-set group would do 1 set of squats to volitional failure at 80% of their 1RM, twice a week. The 4-set group did 4 sets, and the 8-set group did 8 sets. Yes, 8 sets to volitional failure at 80% of your 1RM is a very hard workout. This study produced a range of interesting results, including the finding that the 8-set group out-performed both the 4-set and 1-set group in every measure.

That’s interesting enough, but this paper also took the time to analyze the subjects as low, medium, and high responders. High responders, regardless of training group, increased their squat strength by almost 30% on average, while low responders were a paltry 2.6%. That’s not the surprise, though. Where it gets interesting is how the responders were distributed between the training groups. The researchers found that 11 out of the 13 low responders were in the 1-set or 4-set groups, and 10 (also of 13) of the high responders were in the 4-set and 8-set groups (only three were found in the 1-set group).

Now, it’s possible that through simple errors in assigning the subjects into groups, most of the high-responders ended up in the high-volume group and most of the low-responders in the low-volume group. The authors also wisely note that there’s no way to know whether the high responders in the 8-set group would see even better improvements with lower volume, or that the low responders in the 1-set group would do better with more sets.

Nevertheless, this is an intriguing result that raises the question as to whether, on average, more might be better. If a good percentage of people really do become “high responders” with more volume, that’s a possibility we need to explore. The authors suggest that we might start our programs with low (or lower) volume, and if we discover that we aren’t seeing expected results after a few weeks, we should then start adding sets.

The lesson is that if you don’t find that “less” works for you, then you might be better served by upping the amount of work you do.

❧

As tempting as it is to draw direct connections between brain chemistry and exercise responses in humans, I'm not prepared to go there just yet. My goal is to illustrate that biology's doing some weird, quirky, and sometimes unsettling things right beneath our notice. The behavior of these systems affects us and influences what we do.

But.

There's little point in focusing our attentions on that micro level when we barely understand what's happening there, and couldn't do much about it if we did. The fine details of biology aren't directly important, in that they don't — can't — give us practical, useful training information. You aren't meant to read this material and say "Aha! My dopamine receptors indicate that I should train *this way*!"

The intensity- and volume-responder classifications are not meant to tell you what you *should* be doing at the gym. Just because you're shy and like to stay home on Friday night doesn't mean you need to train once a week with a single work set. Being a problem gambler who can't focus and can't sleep at night doesn't mean you should be in the gym two hours a day every day. You may find that calm "low-active" types still exercise regularly, and plenty of "sensation-seekers" don't do any kind of formal exercise at all.

More to the point, since when was wanting something any guarantee that it was in line with what you're trying to achieve? Simply being an outgoing type, always moving, always overflowing with energy, is not any guarantee that your energies will be focused towards any useful ends. Plenty of exercise addicts train themselves into the ground, doing too much, too often, and driven entirely by superficial feel-good signals. This applies to would-be bodybuilders as much as would-be endurance athletes, who become hooked on soreness, on the pump, or the rush of the brain's own pain-relief chemicals. As addictive behaviors demonstrate handily, there are lots of things that we can want which cause more harm than good. By itself, the drive to exercise doesn't mean that you're making good things happen.

Think of the stereotype of a child with ADD, all motion with no direction, and you have the idea.

Desire also doesn't say much about how other important factors, like muscle mass, lever arms, robustness of joints, or various metabolic systems will respond to training. Responder types are a little better, but since I pretty much made those definitions up for my own use, I'd be getting ahead of myself by saying I had it all figured out.

If that's what you've taken away from these science chapters, well, don't do that. The biology illustrates a point. No more, no less. This is a crucial role, make no mistake, but it has no power to prescribe workouts or anything like that. Keep in mind my anti-reductionist message.

Let's instead think of the influence of biology over our lives: people think and behave differently because of biological differences in their brains, and that individual variability includes a range of psychological relationships to exercise. We probably have a natural tolerance for exercise, which is rooted in our underlying neurochemistry, and this will affect how we prefer to exercise.

If it happens that you get brute strong and big as a mule by doing things the traditional way, then awesome. You won the genetic lottery, and chances are you haven't made it this far anyway since you're convinced I'm full of it.

But if you don't have that going for you, if you're a low-key person who doesn't like intense training and doesn't respond well to it anyway, then you've got some options. For you, training more often, but with the intensity dialed down, will be a better choice than hard, heavy, and lots of rest.

If you're one of those people who can't stay out of the gym and get decent to good returns on the time you spend there, then even better. Your goal is to put that energy to good use.

Natural tolerances and tendencies aside, we also have a degree of control over those tendencies, to the point that we can probably move ourselves, with practice, away from the presets and towards the other zones.

Science can only give us signposts. In order to really know how you're going to react — in mind or in body — you have to be willing to experiment and see how you react to different kinds of training methods. It's about finding what fits you, which, as you can see by now, may not be so simple as the annihilate-and-recover training methods endorsed by popular opinion.

5

Nerves of Steel

"As a rule, what is out of sight disturbs men's minds more seriously than what they see."

–Julius Caesar

"I am an old man and have known a great many troubles, but most of them never happened."

–Mark Twain

Training on Nerve-Power

Back in the early 20th century, physician and strongman Paul von Boeckmann wrote several books about the need to conserve "nerve force" in daily life and in training. [47] Bob Hoffman, the flamboyant mid-century spokesman for Olympic weightlifting, would take up the cause and argue against training "on nerve-power". Although medical science at the time had no deep understanding of how the nervous system worked, warnings like these are scattered in the lore of the old-time lifters, making it clear that they knew what we all learn sooner or later: if you constantly push yourself to the edge, sooner or later you're going to fall off the cliff.

Conserve nerve force. A profound statement, but what does it mean?

Ask most lifters how they train and you'll hear the same word: "intensity". Training means training *hard* — throwing yourself into the session and destroying yourself, leaving everything in the gym.

Training with "intensity" — using heavy weights and throwing your focus into each set as you grind through fatigue — works great as a strength-building tool. The problem is, training that way also takes a lot out of you. You aggravate your stress-response, push your body into a state much like sickness, and deplete your willpower so that all those feelings feel twice as intense.

Some thrive on this, with every workout a battle against the weights. Some don't however, as because of the effort involved, it's easy to peak quickly and go stale. Your lifts may shoot up in the early phases, but soon level off to a plateau that you may find difficult to surpass.

Advocates of "intense" training thus compromise with the frequency and volume. One hard leg day is enough to scare off most everyone for at least a week anyway, so it doesn't take much convincing.

This isn't a big deal, really, except that you won't hear this come up when training wisdoms are being shared. "Intensity" is the all-or-nothing goal, and you either train that way or don't bother.

I've been using the word "intensity" in quotes because, while that's the accepted use in the gym, intensity has a different meaning in exercise science. I'm talking about the former, the mental effort, but for this chapter I'll consider the two terms equivalent.

Think about what intensity really is. Intensity flows from the wellsprings of emotional and motivational arousal, which are analogous to parts of the brain and the nerve impulses they generate. We can visualize intensity as water gushing out of the emotional brain, while the conscious self acts like a hose and focuses it into our movements. This isn't to be taken literally, but it works as a metaphor. Desire, intent, and the neurological activity that primes you to "go do it" are, crudely speaking, the same thing.

This represents the mental energy or *oomph* that we can put into any activity. Studying, doing a puzzle, driving, or forcing yourself through a triathlon or a new PR attempt, these all tap into and potentially deplete our psychic energy.

When you train with intensity, with maximum focus and effort on every set in every workout, you're also dipping into that pool of mental energy and switching on the stress circuit. Great for training, but it leaves you feeling empty and drained afterwards. The Russians knew this, hence their term for staleness caused by the emotional arousal of too-frequent maximum attempts.

Exhausting yourself isn't any big deal if it only happens during occasional workouts. One or two hard-out workouts every week will hardly cripple you. Indeed, moderate and transient stress events elevate dopamine and actually feel good, helping to rejuvenate and reinvigorate you. But, as any time in the gym will tell you, frequency doesn't mix with all-or-nothing intensity.

Some people are constituted for this style of training, and they will get immensely strong from intense but infrequent workouts. Unfortunately, that isn't everyone.

The Other CNS Fatigue

We've already met the sympathetic nervous system, responsible for the adrenaline rush. The SNS, which handles excitation and arousal, has a sibling, the *parasympathetic nervous system* (PNS), which balances it out with inhibition and calming. Both of these together make up the autonomic nervous system, which governs our arousal level.

Autonomic output, as the sum of SNS and PNS activity, can serve as an indicator of how stressed-out we are at any moment. When you're at a happy place, relaxed, unstressed, neither of those systems is particularly active.

When you're in stress-mode, you'd expect to find both SNS and PNS switched on, one revving you up, the other desperately trying — and usually failing — to pull you back to normal. It's like flooring the accelerator with your foot on the brake. Sure the car isn't moving, but you're not exactly in an ideal situation (for your car at least).

Robert Sapolsky uses the analogy of two elephants on a playground see-saw. They might cancel out, leaving the see-saw in balance, but it's still two elephants on a see-saw. Balanced or no, the system is less stable than it would be with two toddlers.

For obvious reasons coaches and sports scientists have taken an interest in autonomic output as a way to gauge stressed-out-ness or "recoveredness" in athletes. The currently popular way to do this is with the measure of heart rate variability (HRV), which aims to measure differences in the interval between heart beats as you inhale and exhale. When you inhale, the sympathetic system activates and the parasympathetic nerves are inhibited. Exhale and it's the opposite. HRV measures the interval between heart beats in each case, the variability, which in turn acts as an indicator of autonomic nervous activity.

The more stressed-out you are, the less variation you'll find between inhalation and exhalation. When you're zapped and feeling like a wreck, you can expect to find the SNS on overdrive and the PNS basically giving up in trying to relax you.

This is the state of chronic, corticoid-soaked stress that causes wear and tear and which we want to avoid. HRV gives us a reliable measure of that condition.

HRV isn't limited to measuring purely physical stress, either. Research showing that HRV can also detect the autonomic disruption caused by ego depletion. If you're zapped after a 12-hour drive or a hard day of sitting through meetings, you may not have the fight in you to have a spectacular workout and HRV will reflect that.[48]

One way to view "CNS fatigue" is a feeling of tiredness that accompanies maximum performances. Fatigue of this type reflects both physiological changes during exercise and your brain's processing of said signals.

When people talk about a "fatigued CNS", however, it almost always refers to feeling like crap between workouts. On one level this doesn't even make sense; even a basic grade-school understanding of biology would tell you that a "fatigued" nervous system would be a serious health problem for any animal.

I know what they mean, though, even if the wording is crude. A hard workout really does make you feel like crap the next day, all the more so if you aren't used to what you did.

Squat flu is no joke, and it really can impact your workouts (not to mention your motivation to do other things). Even if you somehow make it to the gym, you might find that you just can't get the juice to turn on. Regardless of what's really happening, the label "CNS fatigue" does at least have some reasoning behind it (it's not great reasoning, but hey).

The tug-of-war between excitation and inhibition happening in your autonomic nervous system, which determines how "stressed" you are at any given moment, might be a good candidate. It's easy to see how throwing this system out of balance — with lots of stressful training, for instance — could leave you feeling pretty well trashed if it goes on too long, just as the allostatic model of recovery suggests.

The only problem is, this theory runs into the same objections as raised before. What's getting fatigued? It's not the adrenal glands. It's certainly not the nerves or the regulatory loops. If anything, all of those show *overactivity*, as we'd expect in a coping process, rather than any signs of exhaustion. Autonomic function is *altered* during chronic stress but fatigue and exhaustion don't accurately capture what happens.

The same can be said for changes in exercise performance. Back in Chapter 2 I mentioned the testosterone-cortisol (T/C) ratio used by Michael Hartman and Glenn Pendlay as a measure of stress in weightlifters. They found that the T/C ratio was an accurate marker of physical stress, and that the recovery of the ratio did correlate with subsequent peaking in strength performance.

They also discovered that in the short term, that condition of being stressed didn't have much to do with workout performance. Their lifters could be stressed to maximum, going by the blood work, and still capable of hitting PR weights.

We now understand that serum levels of these hormones reflect the stressed-out condition of the whole body, much the same way as HRV indicates a deeper process. These physical markers of stress suggest that your body is coping with something it perceives as a threat, yes, but at the same time, these measures don't really tell us the full story.

That leads me to a question: if you can test as "stressed-out" by HRV or crashed T/C ratio but then go hit a PR squat, is it really fair to say you "aren't recovered" and should go rest?

Is it right to consider yourself "burned out" and in need of rest because your autonomic signals have gone wacky and you feel bad? And if not, if neither your body nor "you" are tired in any meaningful way, why are we describing this phenomenon as "neural fatigue"?

You feel bad after a knock-down workout, but by now, we should be skeptical of feelings. They lie to us.

Sickness Behavior

Being sick isn't fun. Whether it's an eight-hour case of the sniffles or this year's strain of the flu, nobody wants to deal with the fever, the achy joints, or the lack of energy. You don't want to do anything but lay on the couch and ride out your misery. While it's easy to blame these feelings on the bug, you might be surprised at how much is your brain's own doing.

Robert Dantzer of the University of Illinois studies the rather complex subject of *psychoneuroimmunology* (PNI).[49] Fortunately PNI is easier to understand than to say in one breath.

As biologists have come to understand that living organisms are woven into complex nonlinear networks, it makes little sense to treat organ systems as separate, independent units. All the pieces integrate into the whole.

The mind, once treated as a spooky and immaterial x-factor, can be seen as interchangeable with the behavior of the brain, making mental health an important part of physical well-being.

In that spirit, the immune system and the nervous system overlap in so many ways that it's difficult to draw a line between the two. The brain's hormonal and neural messages stimulate the immune system into activity, and meanwhile the immune system's own messengers relay information back to the brain.

Thus we have PNI, the intersection of psychology, neurology, and immunology. Mind is brain is immune response, and it makes little sense to speak of their function in separate terms.

When you get sick, even elementary school biology teaches that the immune system kicks in to fight off whatever bug has invaded your body. You've heard the story about how the white blood cells act as sentries, roving our bodies for troublemakers and shooting antibodies at invading microbes before digesting them.

The circulating immune system, including those T-cell and B-cell lymphocytes, is another evolutionary newcomer. The immune system has a much older set of defenses, found even in insects, meant to handle damage and infection at a local level. An infected cut, or a second-degree burn, or a twisted ankle will all turn red, swell up, and get hot to varying degrees, a process called *inflammation*.

That's the innate immune system at work. Unlike the circulating white cells, the innate response happens in the damaged tissue itself, using a first-aid kit of growth factors, specialized clean-up cells, and inflammatory signals called *cytokines*. When you get that burn or twist your ankle during a run, all that machinery kicks in and starts running damage control.

Cytokines really set off the process. Almost every cell in your body is capable of producing them in response to trauma, broadcasting a signal that says "hey, something's wrong here!" and bringing backup in the form of macrophages and other clean-up cells.

When the problem stays small, just a cut or mild burn, you won't notice much else. The

area might stay tender for a few days, but it heals soon enough and that's the end of it. In cases of more severe trauma or infection, however, it's not so simple, and the inflammation process can itself become lethal in extreme instances.

Think what it's like when you catch a nasty cold. You feel warm all over, more sensitive to pain, maybe stiff and sore, and you're so tired you don't want to get off the couch. Regardless of what kind of bug you catch, you always experience the same set of symptoms. Even though a case of the flu might leave you in bed, it's still the same symptoms, only worse.

Inflammation-signaling cytokines not only attract immune cells for clean-up duty, but they also act on the brain through various channels. Those signals tell the brain that some major fighting and clean-up is going on, so the brain responds with a coping strategy. It wants you to stop moving and wasting energy so it can use those resources for recuperation, and to make that happen it triggers that set of physical symptoms. Dantzer calls this *sickness behavior*.

"Coping strategy" should ring a bell. Cytokines work on the hypothalamus, which you'll recall as being involved in the stress-response, and as you might expect from that, sickness behavior evokes roughly the same set of stress-coping responses.

That isn't too surprising if you think about it. "Squat flu" and similar terms are often used to describe how we feel the day after a beating in the gym, and for good reason: those sensations work through the same mechanisms.

What's more, that mechanism holds some unsettling connections with the biology of depression. Serotonin, a neurotransmitters which you'll recall as having a role in central fatigue, works in parts of the brain responsible for, among other things, mood and the formation of memories. When serotonin transmission is low, you feel down in the dumps and can have trouble learning and remembering, and this state-of-being is thought to have a connection with major depression, anxiety disorders, and other assorted emotional problems.

Brain scans show that the majorly depressed have marked differences in the size of these serotonin-using regions compared to healthy people, leading some psychologists to hypothesize that the chronically-elevated glucocorticoids under prolonged stress can actually prune back the serotonin neurons. This leads to higher anxiety, deeper depression and, perversely, even higher corticoid levels, kicking off a self-sustaining death-spiral.

The similarities between "squat flu" and depression run deep. The inability to trigger voluntary movement is a pronounced symptom of depression. Patients literally cannot summon the will to move, a condition that mirrors the (admittedly less-pronounced) loss of motivation in both the sick and the overtrained. This is probably not a coincidence; I think it's likely that all three work through similar (through probably not identical) mechanisms.[50]

Exercise scientist Lucille Smith first suggested the connection between the immune response and overtraining symptoms back in the 1990s. Smith found that elevated levels of a cytokine called interleukin 1-beta (IL-1b) correlated with "feeling bad" symptoms of tissue-damaging exercise. It was later discovered that IL-1b acts directly on the brain, not only signaling inflammation in muscles and other tissues, but activating sickness behavior.[51]

When you feel sore, achy, warm in the day or two after a hard workout, that's the immune system telling you that you're coping with the stress, what Smith called the *cytokine hypothesis of overtraining*. The overtraining symptoms experienced by athletes really are like being sick.

As with earlier "mental" phenomena associated with fatigue, the problem is not limited to your mood. Research is finding that the sickness state can, like other forms of stress, directly trigger muscle atrophy by activating the HPA. I'll spoil the surprise: it's IL-1b again. Inflammation signals the brain, signaling the HPA to increase glucocorticoid levels, and that triggers the catabolic atrophy effect in muscle tissue.

Now, most everyone you'll talk to in the fitness industry will get mad and shake a fist at poor cortisol, but notice that the inflammatory cytokine, and the overall state of being inflamed and sick, is the real culprit here. Catabolic states are coordinated in the brain, and signaled by the immune system's response. If you want to blame something, blame the brain. The hormone is just doing its job.[52]

What we have here is a reasonable explanation. Lots of exercise – especially unaccustomed exercise – triggers the inflammation response in your muscles and connective tissues, leading to mood-altering changes in your brain state as well as elevation of stress hormones. High volumes of tissue-damaging exercise can, like infections and trauma, trigger a feeling almost like a mild form of depression.

A Set-point for Stress

What catches my eye here, relative to this particular feedback loop, is the relationship between this axis of sickness behavior and the mechanism thought to underlie major depression. I'd like to return to this for a moment.

Research in the field of positive psychology, the psychology of happiness, has given us the idea of a "hedonic set-point" ("hedonic" is a fancy word for happiness). First proposed by Philip Brickman and Donald Campbell back in the 1970s, the hedonic set-point is much like running on a treadmill: no matter how hard you work to be happier, you never really get anywhere. Win the lottery, get the girl, wake up to that Christmas present you've wanted for six months, these things can all make us happier, but only briefly.

The idea is that our mood, or our range of moods, is neurochemical in origin. Being that our bodies, and our brains, like to seek out equilibrium, we'll always return to our pre-wired baseline of happiness. Some people, so this theory says, are naturally prone to being depressive. Their brains are literally built to be susceptible to that vicious cycle between the stress-response and the serotonin neurons governing it.

Since major depression and related anxiety disorders almost always run in families, psychologists have suggested the happiness set-point is probably inherited. Even if the genes aren't carrying it, families tend to behave the same ways — which might mean there's a cause found in early development, like elevated stress hormones in an anxious mother-to-be or a neurotic household.

While I have to offer the disclaimer that any research of this nature remains speculative, it is another piece of the "responder" puzzle as raised in the last chapter. Indeed, it is the high reactor who seems most susceptible to the depressive death-spiral, and those underlying neurobiological differences may be part of an explanation for the variation in sensitivity to high-intensity workouts.

Sensitive, easily disturbed brains are going to freak out and experience all the negative symptoms of any stressful episode, whereas a more resilient brain may not even notice.

You do experience a physical reaction to exercise, which isn't too different from being sick. But, just as we saw with the perception of effort and fatigue, there is a strong mental component: your tendency to freak out about minor details can, itself, be a huge contributor to that state-of-recovery. You aren't necessarily overtraining, and you certainly haven't even "fatigued your CNS" in any meaningful sense. What you've done is create the problem, or at least make it substantially worse, by adopting a particular emotional state.

From personal experience, I will say that this state can affect your lifting. When you feel well and truly cooked, like you're "swimming in cytokines" as I've often put it, you won't have the motivation to load up your body with PR weights. You feel tired, but it's a specific kind of mental exhaustion where even warm-up weights feel heavy and you never really get the cylinders to fire. This is paired with a physical exhaustion that feels "deep down in the bones", so to speak, rather than the kind of superficial tiredness you'd feel after eight hours of working in the garden.

What's interesting is how this state of sickness seems uncoupled from performance.

You can feel awful and still hit records, so it's clear to me that however we classify this condition, it's not right to call it "overtraining" or "CNS fatigue" or any of that. It's not a good place to be, don't get me wrong, but it isn't the crippling "need to rest" that we're told, either.

The view that makes sense to me right now: sickness behavior is the equivalent of muscle soreness for your entire body. "Squat flu" is your brain's way of making you aware that Something Big happened, and it's trying to make sure you aren't in danger (recall allostatic load from Chapter 3). You're experiencing a tantrum of the emotional brain percolating up into conscious awareness and creating a genuine feeling of illness, your brain gently nudging you away from more squats.

Much like muscle soreness, the physical symptom doesn't mean that your body is *incapable* of handling the stress, only that it was *unprepared* for it. Muscles stop getting sore if you keep training them, and I think that your "CNS" will act the same way — by which I mean that your entire system can become accustomed to stressful efforts, provided you give it a reason.

How that affects you, or doesn't, depends (in part) on how you're wired, but also on what you do and what you have done. Shifting set-points is one of the cool things that exercise does, and it's very possible that, say, the mood-boosting effects of exercise can cause long-term changes to at least some degree.

A prepared body can handle more than an unprepared body, differences in reactivity and constitution aside.

Taming Fight or Flight

I've outlined exactly why I think people recoil at the thought of squatting six days a week. To them, weight training is a battle, a blood-pressure raising, tooth-gritting, heart-pounding battle between you and the weights. There's no graded effort, no thought given to training hard without the mental wind-up. Thanks to mainstream fitness culture, most people don't even realize that it's possible to train productively without physical self-destruction and psychological exhaustion.

Likewise, we're also given a limited and naive view of recovery. The "feel bad" and the wacky hormones and HRV measurements aren't, by themselves, any indication that you've overtrained. You need to see when these symptoms happen and how long they last. They might go away. They might persist through your entire training cycle and then vanish after recovery during a deloading week.

This is the problem that periodization, or planning and organization of training, was meant to solve. By spacing out maximum efforts with less-stressful training, you aren't running with the throttle wide-open all the time. That saves on wear and tear and, ideally, keeps progress moving along.

So there's one solution: manage training stress so that you only occasionally go all-in. Periodization side-steps the problem in the first place, deliberately limiting the amount of "effortful" training. Since the reserves are finite, we should avoid tapping them and prolonging our recovery.

Scaling back the stress of heavy lifts by way of periodization is certainly one way to address recovery. That's the preventative strategy: fix the problem by avoiding it in the first place. The only problem is, you miss out on a potentially crucial skill.

Say you increase your volume by 10%, and you notice all the symptoms of "overtraining" within a few days. You start second-guessing the program (your ego's depleted a bit, so you've got extra uncertainty and more moodiness to deal with) and have to make a decision.

You could rest, yes. Cut your workload back and get more downtime. If you're still a supercompensation card-holder, the answer is clear. You have to rest and let all the fatigue symptoms settle down before training again.

But what happens if you keep going?

Conventional wisdom says you don't have long before you exhaust your body and collapse.

Since you've made it this far, I hope it's clear that I'm not entirely on board with that point of view. We don't have recovery hitpoints that drop as we train and recharge with rest power-ups. Exhaustion of mental energy, accumulated wear-and-tear of tissues, and the processes of adaptation are three related but different things happening on their own timetables.

It's not that I disagree with periodization; far from it. Back in Chapter 3, I mentioned the "superadaptation" concept: the idea that the adaptive processes can, themselves, adapt. I think we should treat the psychological as we treat the muscular and neural, as another

quality to train. The "fatigue" response isn't the enemy but another target of our training.

So you keep training, and after another week you feel great. All the stress symptoms are gone and you're stronger than ever. You experienced "adaptation sickness" which went away when you adapted. Had you listened to the stress indicators, you'd have stopped, rested, and never adapted to the new workload. Since you were consistent and trained through the symptoms, you adapted and it became your new normal. "Stressed out" is always a moving target.

Obviously if you spend endless months in that stressed-out mode you'll suffer the consequences, but from day to day and week to week performance and stress-mode have little overlap. What I think needs to happen, and where monitoring comes in handy, is in seeing when and how the stress-mode happens. If you've just made a change in training, maybe hit a new PR or added more volume, and you get a blip of autonomic disruption, then it's worth waiting to see what happens. If your lifestyle changes suddenly and you're more focused throughout the day, getting less sleep, or whatever else, it's worth waiting to see what happens.

You might not adapt and end up sitting in stress-mode until you collapse. You might not want to deal with the headaches of adaptation if your first child has just been born or if you're enjoying other things in life. If so, it's time to take a break and let everything settle down.

High reactors are of course more prone to falling apart. Getting anxious or psyched-up to train is going to have a large impact these people thanks to an aggravated autonomic response. More mellow types can train calm, leaving adrenaline in reserve or having a less-harsh response if they do get worked up, and cool down fast once the threat resolves. Cooler heads probably won't feel so bad the day after a high-arousal workout, but they may not need to get worked up in the first place.

That's a pretty clear advantage. We want to be like these people. But if you're not, monitoring your autonomic responses over time helps you make sure that increased workloads are "adaptable", and if not, that you take breaks to let everything settle down.

You'll have days when it's hard to separate *excuses* from legitimate bad days. You can be sore and stiff and feeling a little ill but still be just fine to train. Tracking these variables means that you can see if you are or aren't adapting to any particular training. Just like the beginner's ultra-sore muscles, however, I think that we need to learn to deal with a little system-wide discomfort in the pursuit of our goals.

We don't *want* to train often because we don't train often. We make up for it by grinding ourselves into paste, which makes us hurt and convinces us that we *can't* train often. Inactivity feeds on itself.

You never get the opportunity to condition yourself.

Exercise is supposed to be uncomfortable. You might even say it's supposed to hurt (though I'm hesitant to say that, as not all "hurt" is created equally. Injuring a joint or tearing a muscle is certainly not what I'm talking about). That's what all the slogans and affirmations tell us: No pain, no gain. Go hard or go home. The virtues of self-improvement through self-destruction.

Nothing says you have to train to *deliberately maximize* the discomfort. Let's be more progressive than mainstream feeling-chasers and train in a way that doesn't leave us so wiped out. If you're a type that needs a calm, low-arousal setting and the simple thought of squatting makes you nervous, then spend more time squatting so that you take the edge off.

Do it every day and sooner or later you'll get over your fear.

Practicing Chill-Mode

Organizing your training by motivation and emotional output requires knowing when to let go and unleash the beast, when to keep a safe distance from gym-intensity, and it requires, most of all, that you practice these skills.

We need to challenge ourselves, but in measured drips of effort, not the crippling, soul-emptying exhaustion that defines most "go hard or go home" theories of exercise. We need focused, directed application of nervous energy, directed right into the bar or the tire or the stone.

We need to learn the opposite: how to leave that psychic energy in reserve when we aren't using it, an elusive condition otherwise known as relaxation.

We're grading our mental efforts, using our mental energy appropriately and in the right circumstances. We grow larger reserves of willpower, become more resistant to fatigue, and better at switching on and releasing that energy exactly when we need it and nowhere else.

Not *Less*. Appropriate. Knowing when to go all-in, when to be easy, and teaching ourselves how to do this with the right programming.

Ivan Abadjiev, recognizing this, says to go for it. Don't worry about the emotional wind-up or feelings of exhaustion. By his thinking, lifters will eventually adapt to routine max attempts, and the neuro-endocrine systems fortify themselves. With repeated exposure to the stresses of heavy weights, lifters become better able to handle those stresses.

Abadjiev suggests that these lifters aren't simply boosting their arousal levels, but are actually becoming better at throttling back down to normal. It's the calming and soothing response of the parasympathetic nerves that they develop and learn to control.

Lifters with better autonomic control are only putting their mental energy into the actual working sets, switching it on exactly when they need it and no longer. Like Sapolsky's zebra fleeing the lion, the stress-response acts as intended. Face the threat, then relax.

That's what we want. We want to conserve nerve force, as Boeckmann wrote, to keep our cool in training and learn how to mete out our energy only when it's most needed.

What happens after you spend a few weeks squatting every day? The stress-response kicks in when you're actually lifting the weight but, crucially, you aren't spending hours jittery and nervous before it happens — and when the lifting's done, everything winds down back to normal.

The stress is intense but brief, just how it's supposed to be.

Feelings of control and predictability make the difficult — like jumping out of an airplane — into the normal. You spend a few weeks riding the adrenaline and on the edge of collapse, and then it becomes normal.

No big deal.

V.S. Ramachandran speaks of the "James Bond reflex", in which the emotions are

inhibited but the actions are not.[53] This is what we call a dissociative state, in which you lose yourself in the moment and your emotions separate from the experience. This is the kind of thing that soldiers, police, and martini-sipping secret agents receive training for. Diminishing the automatic emotional response is, in effect, improving your recovery powers (I'll say more on this in Chapter 10).

I can't overstate how huge this is. You can train as often as you want as long as the *motivated workouts* are managed. Here, *motivated workout* covers any artificially-inflated performance. Using pre-workout stimulants. Psyching up to hit a training max. Entering a competition. Anything you do that elevates your performance above your normal calm baseline.

Managed can mean that your psyched-up workouts and maximal attempts are infrequent. Maybe you take one or two workouts each week — or each month — and use them for PR attempts. Let a little adrenaline go, rest a little longer than usual, and see if you can't add 5 or 10kg to your best poundage, or squeeze out an extra rep or three on your best set at 85%.

Managed could mean that you don't have any plan, but you take legit PR attempts any time you feel up to it. And in exchange for a few weeks of hard efforts, you leave every third or fourth week for psychological recovery — you still train, but without any emotional wind-up.

Managed could mean powering your way through and forcing your body to adapt to regular max attempts.

Whatever you do, the important part is that you have a strategy acknowledging your mental preparation.

Whether Abadjiev's explanation meets the strictest standards of scientific correctness, I can't say for sure. I'm not particularly concerned with those technicalities, as I think he's on to something in principle irrespective of the precise science. Abadjiev points out an often-neglected aspect of adaptation, illustrating that our bodies are far more robust than we give them credit for, and that our training can benefit from that resilience.

This opens an exciting possibility. We can make lifting a maximum weight a normal event in our daily routine, as uneventful as reading the paper with your morning coffee. Make it normal and the stress-response can be trained just like any muscle.

Why not? After all, we've seen that feeling bad is only weakly coupled to performing badly. How you feel really is a lie.

There are limits, of course there are. Following this line of thinking will not be easy and is not for everyone.

You suffer. But you adapt.

In as much as we can identify "a thing" responsible for overtraining at all, the brain is it. CNS fatigue, that modern-day bogeyman waiting to destroy anyone who works hard, is a function of altered brain activity. Your brain-state changes in order to cope with a perceived

stress, and that creates a cascade of physical symptoms that include feelings of fatigue and reduced motivation, altered hormone profile, and, when taken to extremes, decreased performance. Whether caused by accumulated tissue trauma or lots of excessive emotional arousal, there's not too much difference in the outcome.

Muscle recovery, hormones and immune signals, even CNS output, that's all beside the point. Those processes are all aspects of an incredibly complex system trying to keep itself (that is, you) alive.

In the last few chapters, we've seen how intricate, interrelated, and almost miraculous that relationship between mind and body truly is, not to mention how poorly we understand the threads connecting squishy flesh to the not-physical world behind our eyes.

Psychology matters. Where you sit relative to the avoidant introvert or sensation-seeking extrovert, or between the neurotic high-reactor or sedate normal-reactor, impacts your life. Your intuitions, your gut feelings, your instinctive reactions, that all influences your physical state. Your mind lays the foundation for subsequent physical responses.

The link between mental well-being and physical health is becoming clearer by the year. While there's as yet little to no research into the effects on exercise and physical training, we're talking about many of the same biological systems and behaviors. The same "stuff" that keeps you healthy and vital also happens to be the same "stuff" responsive to and cultivated by exercise.

It's obvious that some people are "just like that" when it comes to temperament and personality (although whether that's truly inherited or a product of environment is up for debate).

What isn't so clear is which — or how much — of those tendencies are fixed, and what can be cultivated with effort. Plasticity means that nothing need be set in stone and many traits we've taken for granted as fixed actually can be changed with the right set of circumstances. If you train hard and often, will your mind and body trend towards a more stress-tolerant, fatigue-resistant mode?

I think so.

Training often conditions you to train often. We can train our whole psycho-biological system to handle brief, intense, and frequent stress events, to take the edge off and remove their destructive power.

We just have to make the effort to do it.

There's something to be said for treating physical training as mental exercise. Training has a belief-dependent quality which matters perhaps more than any of the physical explanations. If you don't *believe* that your goal is achievable or your program is going to get you there, then your entire condition — psychological and physiological — will respond as if that were true. That goes for medical interventions and I'd be highly surprised to find it has no impact on athletic performance.

Part of making daily training, any training, work is the belief. Your mind follows your thoughts. If you don't believe that you can toughen up, push through dark days of sore muscles, and come out the other side as a more robust and fatigue-hardened lifter, then it

won’t happen. You’ll give up and go complain about how overtrained your CNS got. You’ve got to practice the mental along with the physical.

What you do is what you become. If you don’t practice it, you’ll never get good at it.

PART THREE

How to Squat Every Day

6

Practice, Not Pain

"We are what we repeatedly do. Excellence, then, is not an act but a habit."

–Aristotle

No Pain, No Gain?

I'm not exactly sure when the fascination with The Pump began, but it can't be too far removed from *Pumping Iron*, the iconic 1977 documentary following the now-legendary trio of Arnold Swarzenegger, Franco Columbu, and Lou Ferrigno as they prepared for the 1975 Mr. Olympia. It's Arnold who so eloquently sums it up:

> *It is the greatest feeling that I get. I search for this pump because it means that that my muscles will grow when I get it. I get a pump when the blood is running into my muscles. They become really tight with blood. Like the skin is going to explode any minute. It's like someone putting air in my muscles. It blows up. It feels fantastic.*

You don't have to stray far from any kind of mainstream exercise to find pain-chasing. Step class attendees and circuit cross-trainers and long-distance runners can all tell you stories of the euphoric high, the hit of dopamine and opioids that come along with the discomfort and exhaustion of exercising. Pain is practically a religion. Pain means "you're doing this right", whether that means a pumped muscle or sucking wind after a timed circuit.

No pain, no gain.

We naturally equate discomfort and effort with productivity. We seek out painful, physically- and mentally-exhausting exercise because fatigue brings us warm, euphoric fuzzies. Even the sore, stiff muscles that accompany the day after a hard workout leave us feeling satisfied. It just *feels right*.

Among the weight-training population, capillary-bursting effort otherwise known as "intensity" has taken a place alongside The Pump. Taking each set to excruciating failure makes it feel like you've *done something*.

Bodybuilding has always been about smashing and exhausting. Whether blasting and bombing our muscles with high volume, or going the HIT route of effort and intensity over quantity, it's understood that obliteration, exhaustion, and leaving the muscle a pumped-up mess are the goals. The only real point of argument is how best to make this happen.

In the culture of pain that is mainstream fitness, it hardly ever occurs to us that weight

training can be about something else. That bodybuilding is only one possible goal in strength training. That you can improve without reducing yourself to a nauseous mess.

It's always about "surviving" the training. You can squat every day if you *survive* it.

We're back to the same arguments: More will break you down. More will take, not give. So they say.

Nature and Nurture in 60 Seconds

"He'd be at the top regardless of his training, with his genetics."

It's nearly impossible to watch a world-class performance without hearing those words. Whether we're talking bodybuilders, cyclists, powerlifters, sprinters, or weightlifters, from the annual taker of the IFBB's Sandow trophy, Usain Bolt's record-shattering sprints in the 2008 Olympics, or Benedikt Magnusson's effortless demolition of a 1000 pound deadlift in early 2011.

There's an inevitability built into our genetic makeup. Our athletic destinies are governed by inheritance with little room for your input. Genes dictate everything: your build, the amount of muscle tissue you can hold, the efficiency of your nervous system and cardiovascular tissues and endurance capacity. Everything unfolds from the genes, with the rigor and precision of a foreman directing his crew from a set of blueprints.

Strict genetic determinism — the belief an organism's future is determined by the content of its genes — has an obvious appeal. And how else do you explain the differences between the reigning Mr. Olympia and the underweight string-bean who'll be lucky to gain 20 pounds in his entire career?

Genes carry all the information used to build us into functioning organisms. With the understanding that DNA molecules encode the information of life and transmit it between generations, the case seems closed. Your genome determines who you are. Don't like it? Too bad.

Genetic determinists were forced to rethink their position, however, when it was discovered that DNA could be chemically altered by certain regulatory proteins. In response to signals from the environment, the genes you're born with can be switched on or off as casually as we'd flip a light switch.

Biologists now suspect that genes aren't simple data-storing devices, like the biological equivalent of your computer's hard drive, but are actually participants in biological processes. The way your genes switch on or off determines how you develop and behave as much as the genes themselves.

The study of *epigenetics*, the influence of environment on gene expression, has added a new dimension to the nature versus nurture argument, and it turns out that nurture has a far greater role than "it's genes" would suggest. What kind of signals do genes respond to? Name it. How much you've eaten (or haven't eaten). How much fat you hold (or don't hold). How often you exercise, and what kind of exercise you do. Stressful day at work? That alters the way your genes work. Taking a challenging test or learning a new language? Ditto. Supportive parents and a stress-free home? You bet.

Every single thing you do, everything you encounter, every event or activity that elicits a response from you can influence the way your genes express themselves. Your *phenotype*, the final realized product that is "you", emerges from the effects of your environment on your active genome. This includes your frame, your musculature, and all the neuro-psychological issues covered in previous chapters.

Nurture acts through nature to create the final product. Genes set the stage, providing

a background of tendencies and probabilities so that we aren't a *tabula rasa*, but everything about your little part of the universe — feast and famine, friends and foes, joy and sadness — dictates how those traits express themselves and how you develop into a realized human being.

Practice, Deliberately

We're gradually coming to understand that, while genes aren't irrelevant, we're not entirely slaves to them. Epigenetics, like neural plasticity, gives us considerable breathing room.

What we *are* is flexible.

Suddenly work ethic, family life, and even cultural background are relevant to the discussion of natural talent. Might it be that, with the right encouragement and supportive surroundings, we could all be champions?

A whole range of books have attempted to answer this question, notable among these being Malcolm Gladwell's *Outliers*, Daniel Coyle's *The Talent Code*, and Geoff Colvin's *Talent is Overrated*. All three authors examine talent development in light of these findings, suggesting that the common variable between mastery in any field, be it music, math, or athletics, is not genetics but practice.

Practice, however, is not just a matter of logging hundreds of uninspired hours. According to "expert on experts" K. Anders Ericsson of Florida State University, what defines the high performers is *how* they practice. Ericsson, the source of the current buzz around talent development, says that achievers go through an intense, directed effort which he calls *deliberate practice*: "considerable, specific, and sustained efforts to do something you can't do well — or even at all."[54]

You become an expert by pushing outside your comfort zone and working on those things just outside your grasp. Deliberate practice skirts the edge of your current skill set while not making for an unrealistic challenge.

It's through years of deliberate practice, gradually chipping away and refining their skill-set, says Ericsson, that experts are made. And time is certainly the defining factor. The magic 10,000 hour number, cited by Gladwell and everyone else, originates in Ericsson's research.

A little math puts that in perspective. Any non-leap year contains a little more than 8700 hours. Practicing two hours a day, seven days a week, would take you almost 14 years to reach the mark. An average of 2.7 hours a day, every day, for a decade, is what it takes to become an expert in most any task.

Ericsson believes that this dedication shapes expertise, arguing that the difference in the expert and the average is not so much the genes, but the way the environment brings them out.

Is success in sport then just a matter of a 10-year commitment to deliberate practice?

This question has an obvious answer. You can walk down any street, most anywhere in the world, and see a tremendous range of body sizes and types. You see textbook examples of ectomorphs with a lighter structure and heavier-set endomorphs, with most everyone falling into a mediocre of average.

Indeed body size is mostly genetic, as shown by twin studies. Since you can expect the lives of adoptive families to be different, while adopted twin siblings share their genes, you

can get a better idea of which traits result from genes and which result from upbringing. Twin studies routinely show that physical characteristics, like height and bone structure, are almost 100% genetic.

Upbringing has nothing to do with it, which is unfortunate news for those convinced that hard training and strict dieting can make substantial changes in a body.

There's less information on genetic contribution to traits like the tendency to store body fat or to build and hold large amounts of muscle, so it's not currently possible to speculate on hard numbers. But, much in the way we see different body types walking down the street, it's clear that bodybuilder- and powerlifter-friendly traits are largely genetic. Some people are just naturally inclined to hold more muscle, keep lower body-fat, or have more strength-friendly body structures, and the majority of that difference is inherited.

The discovery of single-nucleotide polymorphisms (SNPs, pronounced "snips"), which are minor differences in an otherwise identical gene shared between two people, shows that even the version of the genes we inherit can make a huge difference. According to what we can see at the moment, there really are hard-wired differences between people, and these will not be changed by lifestyle — including dedication to the gym. Ericsson himself acknowledges that genetic traits dictating body size are largely outside our control, disappointing all the would-be Mr. Olympia contenders.

Genetic variation neatly explains the "born bodybuilder" type. You'll always see those people who seem to grow muscle from smelling iron, who respond extremely well to weight training and never have trouble staying lean. Assuming there's a cluster of genes and genetic polymorphisms that lead to bodybuilding success, absolute success will come down to the luck of genetic inheritance. You could make a similar argument for strength and power sports like powerlifting and sprinting, just as the same would go for sports on the endurance end of the spectrum. Those born with the right bodies are more likely to succeed in certain sports (on average).

We're almost, if not quite, back to square one. While we can't radically change our height and build and related traits, the difference in performance between individuals *of the same body type* does come down to practice and plain old work ethic.

A top performer is gifted with 'good' genes, but it's also difficult to separate the genetic gifts from the years of deliberate practice. Given two individuals with similar frames — similar in height, in joint measurements, and in skeletal leverages — the difference in mediocre performances and crowd-stunning accomplishment will come down to the time spent training.

Absolute records may be outside your scope, but *relative* progress in muscle mass, body composition, and strength can still be impressive even in adults. We can't all be Kobe Bryant, but the difference in Kobe and the guy you've never heard of with the exact same height and build comes down to practice, support, and work ethic.

Consistent practice working through not-so-great genes yields athletes who are still well above average.

So that's our target: to think of training as deliberate practice instead of another round of beating ourselves to paste.

What Heavy Feels Like

Ezequiel Morsella, director of the Action and Consciousness Laboratory at San Francisco State University, argues that conscious awareness is driven by urgency.[55] To see what he means, hold your breath for as long as you can. When you feel that burning discomfort compelling you to breath, and how it dominates your attention, you've experienced what he means.

The motor-control hardware in our brains acts "like a steering wheel that different parts of the brain are trying to influence at the same time," says Morsella. These 'want' signals often conflict, their intensity in proportion to urgency. When one of them becomes critical for survival, as it would be after 30 seconds without air, that's when you become *aware*. Consciousness acts as the tie-breaker for otherwise unconscious processes.

The brain, as we know, is particularly sensitive to the intensity of physical sensations, and when you exercise, fatigue in heart and lungs and muscles begins competing for our attention. As we saw from the work of Noakes and Marcora, our conscious perception of difficulty, expressed as a rating of perceived exertion (RPE), increases as we tire out. The feeling becomes sharper, more demanding. We come with a built-in fatigue sense, and we can put it to work.

The RPE scale was first applied to exercise by Gunnar Borg at Lund University in Sweden back in the 1960s. Borg's RPE scale was originally intended for cardio training, using a 20-point rating that could rate whole-body effort anywhere from "asleep" to "I'm about to die". [56]

The whole-body effort of a racing heart and burning lungs is somewhat different from the local muscular and mental effort of lifting weights, so it's not immediately clear that the RPE scale would apply.

Fortunately, researchers like Kristen Lagally of Illinois State University have taken the RPE scale and tested its application to resistance exercise. Lagally's research shows that, provided weight-training subjects are familiarized with the RPE scale, their ratings of muscular effort are accurate to a fault. These findings suggests that RPE scale can apply to the perceived effort of active muscles as well as they can to "breathing hard" cardiovascular difficulty.[57]

How you feel may be a lie over a span of time, but while the effort is going on, how you feel is remarkably accurate.

Mike Tuchscherer, record-holding powerlifter and author of *The Reactive Training Manual*, developed an RPE scale as the basis of his Reactive Training System, which is geared towards powerlifting and overall strength training.

A maximum effort anchors the top of the scale with a score of 10, which would be a best-right-now lift without the possibility of another unassisted rep. A nine leaves you with one or two reps, still hard but staying just shy of maximum. An eight leaves you with 2-4 possible reps — heavy but comfortable — while a seven qualifies as speed work, only felt as "hard" when you focus on acceleration.

RPE measures *quality*. Lifts with RPE scores of 7-9 could be described as *smooth*, *crisp*, or *springy*, whereas a more fatiguing lift in the 9-10 range brings to mind words like *grinding* and *straining* (these aren't precise wordings, but most anyone can relate to these descriptions if they've lifted weights). One rep or twenty, you can rate any set according to how hard it felt.

Don't underestimate subjective feedback. When you look at a program on paper, all you see is numbers. When you start a program, six sets of three at 80% leaves you winded and seeing stars. A few months later, the same workout barely registers. That's a huge difference in quality which the numbers alone just can't capture.

I've always used informal notes to record feelings, jotting down "really hard" or "surprisingly easy" or "that was a 5" whenever an important set did something unusual, ever since I first read about RPE in *Supertraining*.

While I think a five-point scale, or even using descriptive words like "easy", "hard", or "saw stars", works fine as long as you're consistent with it, the RTS scale standardizes all that in a way that makes a lot of sense, and I've found that having a consistent numerical scale is useful just for consistency's sake.

Forcing yourself to pay attention, to reflect on and honestly evaluate each set, adds information that percentages and sets can't quite capture, and this helps you keep your work sets dialed in to that zone of quality.

Think smooth. Think crisp.

Learning how to lift with quality is critical to any kind of training, but if you want to train hard on a regular basis, it's absolutely essential to be honest about your effort.

Quality means less physical stress and less emotional stress, which means you'll feel more "recovered" between workouts. Quality means you're owning the weights, even if they're heavy and a little slow to the eye.

Quality means deliberate practice, working right at the edge of your limits – but no further – every time. You're already naturally good at this. All you have to do is pay attention.

Prilepin’s Table

In 1974, Russian weightlifting coach Alexey Prilepin began a “natural pedagogical experiment” with the Russian national team.[58]

Russian coaches wanted to know how many lifts were just right to develop strength. They wanted to know what kind of intensity produced the best results. Over the years they’d waffled between high volume methods and lower volumes with higher intensities, eventually leaning toward the higher intensity approach.

What better way to figure out what’s working, and what isn’t, than to try it and see? A “natural pedgagogical experiment” isn’t much like the formalized experimental trials you’d expect to see in the *Journal of Applied Physiology*. Natural experiments just happen, and you stand back to record what you see.

From the late 70s until the early 1980s, Prilepin monitored the training of these weightlifters with an eye on their volume and intensity in each training cycle. In 1985, Prilepin digested the information and produced his findings, leading to the now-infamous Prilepin’s Table. As you can see in table 6.1, Prilepin’s Table classifies training weights into four intensity zones, each with a suggested rep range and total volume of lifts.

Intensity Zone	Reps per Set	Optimal NL	Range
90%+	1-2	4	4-7
80-89%	2-4	15	10-20
70-79%	3-6	18	12-24
< 70%	3-6	24	18-30

Table 6.1 – Prilepin’s Table

Prilepin, being a weightlifting coach, was interested in development of the snatch and the clean & jerk. The quick lifts, above all else, need quality, and these numbers represent that. A small diet of maximum lifts and moderate lifts, with a slightly larger intake of medium-heavy weights, generates the best results in those exercises.

Like anything Russian, Prilepin’s Table has become popular among strength coaches and athletes. This isn’t a bad thing, but we should keep in mind that Prilepin’s results apply to what he saw and tested with the USSR’s top-tier weightlifters in the late 70s and early 80s. That’s an obvious if under-appreciated point which you should take into account —

implied subtext included — when making use of these numbers.

That said, these numbers are a surprisingly good starting point even for 'slow lifts' like squats and pressing exercises. You could do much worse than to follow Prilepin's Table as a guideline for your workouts.

More importantly, these numbers are built on the concept of power and explosion. Sticking to these guidelines, plus or minus a few reps, you'll help keep yourself in that "fast" zone we're after.

Fast Lift, Slow Lift

While we're on the subject of Olympic weightlifting, I want to take a quick detour. We're told that the so-called slow lifts — squats, bench presses, deadlifts — cause large amounts of tissue trauma, thanks to the loaded eccentric (lowering) phase. Since these lifts are so taxing, you can't handle them often. You need rest and recovery. Or else.

Olympic weightlifters, with their eccentric-free snatches and cleans and jerks, can get away with frequent lifting. You just pull it and then drop it. The quick lifts are compatible with regular training simply they don't traumatize your body with all that resisted lowering — or so the story goes.

Whoever started that myth must have had little exposure to Olympic weightlifting. The one thing weightlifters do, and do often, is squats. Back squats and front squats. Heavy squats. Lots and lots of squats.

Once upon a time, up until the early 1970s, weightlifters also did the capital-p Press — another slow lift with an eccentric overload phase as the bar returned to the rack position at the shoulders. The Press was trained heavy and often, too, with the outrageous programs used by lifters in those days.

Either the eccentric element isn't that big a deal, or the legions of Olympic lifters around the world are squatting — somehow — without performing the eccentric phase of the lift. While dive-bombed squats are hardly a rarity in that crowd, it's impossible to eliminate the lowering phase of a lift without dropping it.

Either the slow lifts can be trained like quick lifts, or else the human body can adapt to frequent eccentric overload.

Or, more likely, both.

If you've read this far you know my position. Our muscles can turn to hash when they're first exposed to unfamiliar overload, but they quickly adapt and most of the damage goes away. Given the opportunity, you will adapt to even the eccentric loading of heavy squats and presses.

But we can also go with the second option: training the slow lifts quickly. While the label "slow lifts" suggests that these movements are expected to be straining, grinding efforts, this need not be true. Nothing stops you from training these lifts with high quality, even if the weights are heavy.

Singles Therapy

"Strength comes from intense effort, whether in the form of low repetitions or single repetitions, it does not come from pumping out set after set with medium heavy resistance," wrote Anthony Ditillo. "The need for single attempts as a training medium cannot be overlooked because they teach you, just as the power rack teaches you, to fight against heavy weight."[59]

Sets of four to six reps, with five being the Gym Math compromise, are an old standby when training "for strength". Ditillo, however, spent a lot of words arguing against these "pumping" sets as mainstays of strength-building. High-rep sets — even as few as 3-5 reps in this case — don't teach you how to lift maximum weights:

> *Some may argue that all that is necessary is medium heavy resistance and the strength will come whether you perform singles or not, but I beg to differ. What happens in most of those cases is that the lifter becomes proficient at performing many sets of three and five reps with a medium heavy weight and he also gains in muscle size and density from the work but his limit single and double attempts do not come to par with his repetition capabilities.*

Doing maximum sets of five will not make you maximally strong, at least when it comes to handling 1RM weights. A lifter who never trains with maximum weights will struggle when it comes time to lift maximum weights. That's a debatable conclusion, of course, but I've come to believe it's true when you need to lift a maximal weight in the next few months.

Ditillo had a simple solution: do lots of single reps. To lift heavy, we must lift heavy. Training with really low reps has all but vanished outside strength sports. Everybody knows that you train lighter and with higher reps to build muscle (or "tone up"), and you train heavy with low reps to build size. Singles, doubles, and triples — sets of one, two, and three reps — are off-limits.

Bob Peoples and his protégé, the legendary Paul Anderson, made ample use of singles. In *Rock, Iron, Steel*, the eccentric strongman Steve Justa relates a range of programs that center on doing many singles with 70-80% weights, 3-6 days per week. Perhaps drawing on the knowledge of the Olympic lifters that predated them, powerlifters have always incorporated heavy singles.

Anthony Ditillo had his own ideas about his so-called Single Rep Principle. He wrote that you should warmup briefly before you "jump to 90% of your maximum and perform 5 single repetitions with this weight." After the singles, you back off to 60% or 70% and "gut out 2 or 3 sets of all the repetitions you can possibly handle." Progress happens by adding a rep or two to the initial five singles; once you get comfortable enough with the five, you'd go to six or seven. That gain in reps is the trigger to rest a few days, take a new PR, and start over with a newly-adjusted training weight.

Lifter and strongman Doug Hepburn used a similar method. One of Hepburn's progressions involved starting with four singles and adding one rep each workout until reaching 10, at which point you'd add a little weight and start again.

Reps build strength by taking you to a point of failure, with the final grinder of a rep thought to do much of the strength-building. Reps mean grinding, and we know what grinding means. In contrast, singles aren't all that much of a mental challenge unless you're using serious competition-grade weights. You just do it, and then the bar's back on the pins. Single reps maximize the quality we're after.

With only the one rep to worry about, technical cues and a focus on rep quality can take priority over straining with tired muscles. Lots of first-reps give you lots of opportunity to practice getting a complex lift down to an art.

Remember, your form on a squat or bench press or whatever else isn't just movement through space. *Technique includes weight and speed*. It's not good enough to get picture-perfect form at 100kg your goal is to move 300. To get good at lifting a really heavy weight one time, you need to practice lifting really heavy weights one time. Singles let you do that.

Think you can't get enough volume without reps? Then do more. Singles almost dare you to rack up high volumes. You don't need to rest all that long between reps, and it turns into a race to beat the last one. It wasn't *that* hard, was it?

Since you can handle much heavier weights on average, you won't need to do as many total reps to see a big effect. Most of the "tone up without getting too bulky" crowd would find themselves right at home doing very low-rep sets, which build immense strength without size to go along with it. If you're still a believer in the idea that eccentric tissue-trauma limits training frequency then singles are your cure: less volume and less grinding means you aren't creating anything like the same tissue stress as maximum fives or even triples.

Heavy singles may seem intimidating if you're coming from a high-rep background. Singles imply very heavy weights, nosebleed-causing, blood-pressure-raising, joint-popping weights. Surely it's better to focus on reps, going lighter and saving our bodies from the wear and tear?

Fatigue, not weight, causes injuries. Squeezing out One More Rep, performing technical movements while tired, or simple repetitive strain from endurance training account for the vast majority of injuries inflicted at the gym. Weight, by itself, is rarely the culprit.

Training with quality – heavy but smooth – keeps you fresh and in control of the weight.

The Any-Day Max

How is it that lifters, from Bob Peoples to Abadjiev's team to Taranenko, can squat to a max every day of the week and keep getting stronger? Right now I want to take a look at these daily-maxing methods with a brief overview of the Squat To A Max Every Day metho that inspired me. As a program, this is right on the edges of what I'd call extreme. There's enough workload to scare most people away, but it's really quite tame as these things go. I'll lay out my thoughts here, and in the next chapter we'll go over more options and details.

When you think "max squat", the default image is a tomato-faced powerlifter straining under a bar and about one heartbeat from an aneurysm. How can you do that every day? You don't. You can't. That's not what daily max means.

Get away from that image. It's centered on aggression and intensity, which we don't need. We need to move into a calmer, more tranquil mindset.

Think of a weight you can walk into the gym, right now, and lift for one rep with no question in your mind. No warmup, no psych-up, don't even change clothes. What could you walk in there and hit *right now*?

That number will be a no-brainer lift, a weight you'd hit any day of the week no questions asked (scratching those days you're injured or seriously sick, of course). The number is probably heavier than you'd expect — probably well off your best performance, but not anything to sneeze at.

Let's call this your *daily minimum*. If you walked into the gym every afternoon, seven days a week, and lifted your daily minimum, how hard would that be? Do nothing else; hit this weight and go home. Are you going to feel sore and beat up? Maybe a little, at first, but if you kept this up for a few weeks or longer, you'd never notice it.

That's the central idea that makes this work. If the weight you're lifting on the regular isn't treated as a threat by your body's coping systems, then you are avoiding most of the problems of 'recovery'.

Hitting a daily minimum won't do that. All the daily max does, then, is give you the option to tinker with the heaviest weight on the day. Specifically, the daily max method tests the maximum weight we can handle without getting mentally wound up.

These folks doing the insane Bulgarian-style programs aren't grinding out absolute contest maxes every day. What they're doing is better thought of as figuring out their best training weights through the process of training (as contrasted to writing them down beforehand, based on a best-guess in a spreadsheet). This combination of RPE feedback and a coach's eye, adjusting the workout set by set, is known as *autoregulatory training*, or just *autoregulation*.

Autoregulation is an old idea, but the word has its origins in the Daily Adjustable Progressive Resistance Exercise (DAPRE) system developed by Ken Knight. DAPRE begin with three sets based off a predicted 6RM: 10 reps at 50% of the 6RM for set one, 6 reps at 75% for set two, and set three is max reps at the 6RM weight.

The weight used on the fourth set depends on the reps you get in the third set. Hitting 8 reps or more means adding 5kg. Hitting 4 reps or less means dropping 5kg, while anything

from 5-7 leaves you at the same weight for that fourth set. The reps you complete on set four determine your 6RM for the next workout.

In *Supertraining*, Siff suggests a modification called Autoregulating Progressive Resistance Exercise (APRE), building on Knight's original concept by adding both 3RM and 10RM versions. In all cases, the fourth adjusted-weight set determines the starting weight for the next workout.

That's all autoregulation is: adjusting the next set based on the set you just did. You plan on the day, not in advance.

When John Broz has his lifters squat to a max, he's there the whole time watching each set, getting a feel for the energy and motivation, how much is left in the tank. On a bad day, that lifter can take it easy. On a great day, he can knock out a PR.

What do you do if you don't have coach there watching all your lifts? That's where the RPE scale shines. Going by the RTS scale, you'll want most of your reps to fall in the 8-9 range, leaving you with a reserve of 1-4 reps. A daily training max wouldn't allow for second rep, but might still be 20-30 lbs shy of a genuine psyched-up max.

If you like percentages, then you're looking at the 85-90% range, plus or minus a few percent depending on the lift and the person. The actual percentage will shift upwards as you get used to handling heavy things on the regular. Avoiding psyched-up grinders makes it really hard to get above 92-95% of a true context max — and that's exactly what we want.

It should go without saying that this is no kind of "max" you're used to thinking about — which is why I'd rather you think of this more in terms of a daily minimum. Once you have to start rolling dice and putting odds on the weight, it's too heavy. The daily maximum is what you can do right now. Ask yourself "what's the lightest heavy set I can hit today?" That's where your head needs to be.

This is not to suggest that these workouts are "easy". This is still good old fashioned hard work, and that's how the magic of daily training happens. Work hard, and keep your eyes open for opportunities — whether that means a PR or an opportunity for a light day.

So there's your plan: go hit a daily minimum and come home. After you've done that for a month, start tinkering with a daily max. This should translate to an RPE of no more than 8 or 9. When RPEs stay low and all your reps have snap, you can keep working up. When difficulty takes a jump, you're done. It's that simple.

What can you hit today, *right now*, without getting too excited? Some days that will be a weight that shocks you. Other days you'll leave it at the baseline and call it done.

7

The Longtails Strategy

"The difficulty is to try and teach the multitude that something can be true and untrue at the same time."

—Arthur Schopenhauer

Harnessing the Power of Overtraining

By now it's clear that we can make some tweaks to our ideas on training for strength. Your body is a complex adaptive system, which means there is a fundamental limit to the kind of detail we can see in it. You don't get better by focusing on molecular signals or stuff happening inside living cells. More importantly, we can't really predict how it's going to behave in the future, at least not in response to any of these specifics. You don't see better results by working out according to inflexible schedules and precision-engineered lists of exercises. You need to plan, but the plan needs to include flexibility.

It might help if you think of your body as more like a garden than a factory.[60] If you try to manage your garden like a factory, you probably aren't getting much of a crop. Gardens require tending rather than intrusive management. You pick the kinds of plants you grow, and pull out weeds, and make sure that light and water and even temperature are suitable for your flora. Contrast that to actual management, the belief that somebody has to be there overseeing and guiding every aspect of the process lest it collapse into itself.

Tending a garden means guiding along processes which, for their intended purposes, are far smarter than you could ever be. Respect the garden's nature as an organic, fluid, adaptable system and it will flourish. Your job is to guide the ship, so to speak, to provide direction.

That's how we need to envision the entire process of training for self-improvement, whether that means strength, muscle mass, or improving body composition to look better.

Greek Gods and Bell Curves

Every time I come across someone discussing the idea of "optimal" in a biological system, I giggle on the inside. There is no such thing. In biological systems, stability is change. "Optimal" is a space of possibilities rather than a single spot you can point at and call "ideal".

I brought this up not to confuse you but to argue against rampant detail-thinking. There's no point in focusing our attentions down in the basement, on biomolecules and even cellular-level activity, if your goal is finding more productive methods of training. The gap is too large, our tools too imprecise.

We can tell ourselves neat little stories about causes and effects, but ultimately that's all they are: stories. Biology Is Not Like That.

My ideas on this topic had been brewing a long time as I researched this book. Many things finally clicked into place when I was pointed to Nassim Taleb's exploration of uncertainty in volatile environments, his book *The Black Swan*. A black swan is an event that appears unlikely in the extreme, at least according to our forecasting methods, but actually has a substantial probability of occurrence. Taleb argues that our statistical methods can't capture the risk of catastrophic events in certain types of systems. But since we're so invested in our belief that we can analyze and predict, we're blinded to the reality and black swans — the 9/11s, the Hurricane Katrinas, the global financial meltdowns — blindside us.[61]

Key to Taleb's story is the power-law distribution. Normal, orderly, regular events distribute themselves across the familiar Bell curve. Likelihoods cluster around the bulging hump of the average, and wild deviations, out in the tails, are unlikely in the extreme. But many real systems, Taleb argues, don't play so well with the expectation of regularity.

The weather, the stock market, even earthquakes, all tend towards volatility, meaning that they're prone to wild swings. The appearance of regularity for the last hundred or even the last thousand years is no indicator that you won't see a catastrophic upset tomorrow. Regularity is an illusion created by the method.

These volatile patterns follow power-law distributions. A majority of events will cluster around the "ordinary" value, but a power-law distribution also comes with a "long tail", wherein the probability of the abnormal, the unpredictable, and the wildly, dangerously unlikely are dramatically increased. The long tail is where black swans happen.

The application to exercise hit me immediately. Typical training thought treats our bodies as orderly, regular and — crucially — predictable. Think about it. Program design means training 2-4 days a week with a precise list of exercises and sets and reps. Periodization means train in precisely-planned training cycles, or even the more basic "linear progress" of adding small increments of weight every week. Even the hysteria over picture-perfect technique, which leads to endless over-analysis and form-checking, reflects the belief there is some Platonic ideal of "perfect form" which we must measure our movements against.

Your body is the outcome of a few million years (at least) of mammalian musculo-skeletal evolution. No mathematical model, no matter how rigorous and how well it explains

the situation we observe, is going to "know better" than your body about how it moves.

Earlier on when I criticized the idea of diminishing returns, which leads to misleading abstractions like saying that four sets is "most of" your gains from a workout, this is what I had in mind. We create a structure to "explain" and then confuse our construct for reality.

Typical programming can fail for similar reasons. We're trying to out-think a system that is at once extremely complicated and extremely simple. When it comes to predicting how we respond — particularly with advanced lifters — there seems to be little pattern. You can build up a head of steam, train great for a few weeks, and then fall into an inexplicable rut.

I always found this confusing. After all, isn't the whole point of exercise science to figure out these regularities and build programs around them? It seems like the formalized understanding of academia doesn't much resemble what's actually happening.

It's only a problem when you presume an orderly and predictable body in the first place. Complex systems don't have obvious regularities or neat chains of cause and effect. This is why we can't predict the future of the stock market, why weather forecasts always fall apart more than a few days in advance.

At the same time, complex systems do have structure, of a sort, although it is not the type of regularity that you pull into pieces and plug into a spreadsheet. What we get is rather a case for relaxing and letting things go as they please.

Complex systems have no gradual, smooth changes. What we get instead are sharp phase transitions and abrupt jumps, what Malcolm Gladwell called tipping points in his book of the same name. In evolutionary history, this meant mass extinctions and sudden explosions of new organisms. It means economic booms and stock market collapses. It means liquid at 211 degrees and gas at 212.

You can make what seems like a big change and see no real difference. Meanwhile small, seemingly irrelevant things echo, amplify, and suddenly boil over into an unexpected mess. Living organisms share these features, and that makes large-scale predictions from micro-level events all but impossible. What we take to be important, as 'more data', really isn't; and likewise, things that escape our attention prove to be the deal-makers (or breakers).

Exercise science isn't alone in this, of course. The undercurrents of order and control run deep in the modern world. We're under the impression that science, and the analytical, objectifying mindset implied behind science, can establish all truths if we just look hard enough. Friedrich Nietzsche called this the Apollonian tendency. The analytic mindset gives rise to an appearance of order, and that order is necessary for control. The entire enterprise is predicated on our need to be in charge.

That works for physics, maybe chemistry and a few other assorted domains, but Biology Is Not Like That. Biology is squishy and it exists in a state of flux. The toolkit of ideas and concepts that thrives in physics is not going to get us far here.

In the arena of human performance, this is an illusion. We do not have the kind of knowledge required to make training into a 'managed' process, guided by the well-crafted plans of Those Who Know Best.

But Matt, you say, aren't we trying to stimulate our bodies into an unnatural state of strength and muscle mass? Doesn't that require some initiative and a plan? Yes, it does. As we have all experienced, our bodies won't, on their own accord, add tens of pounds of muscle or develop the capacity to squat multiples of their own weight. Improved performance requires stimulus, and that stimulus can be (and should be) informed by scientific findings.

The key phrase there is 'informed by'. We can and should draw on science in order to help figure out what may or may not be a good idea. This is not synonymous with using science as an all-encompassing account of productive training, however, nor is it meant to imply that illusions of the Apollonian mind are in any way useful.

As tellers-of-stories, we will find our stories whether they exist or not. Your body, however, doesn't care about any of that. In other words, don't worry about the details. You can't manage them, and, contrary to popular opinion, this isn't even a problem. It bothers the hell out of the Apollonian thinker, but your body can function just fine without active management by science.

Your training (and eating) gains no benefit from over-analysis and detail-fixation. Good enough isn't just good enough – it's all there is.

The Longtails Strategy

Interestingly enough, thanks to the chaos that is a living system, the mediocrity of "optimal" isn't always good enough to trigger the changes we want. Apollonian thinking tempts us to look at extremes — say HIT-style intensity or Arnold's volume — and conclude that a compromise at the middle ground is the best choice. Analysis moves us towards safe middle-grounds.

I think the middle ground is probably how things will appear if you look over the long run. But I also think that we'll benefit more from contrasting methods that *average out* to moderate over the long run, rather than *actually training* in the middle ground. Your body responds to exaggerations and extremes — to volatility — more than it does to nice predictable rhythms.

Thinking on Apollo's terms might actually hold you back, robbing you of much-needed stimulus by focusing too much on orderly programs. We need to think more like the drunken Dionysus, adding a little uncertainty back to the process. Uncertainty can be frightening, but it also works for us. In fact, our bodies thrive on it — and don't work right without it.

If you'll recall, Hans Selye argued that stress comes in two flavors. One type, distress, is what we normally associate with being "stressed out". Autonomic activity is up, catecholamines and corticoids are up, and we're stewing away as our bodies try to cope with whatever we've perceived as a threat. Distress is what we'd normally associate with a workout.

Selye also identified a friendlier form of stress which does none of this. Eustress is mood-elevating, growth-enhancing, the "good" kind of stress. Our bodies thrive on this, and we can make a strong case that we actually *need* a degree of low-level disorder in our lives in order to function properly.

You push out of your comfort zone, but just slightly. You go for an hour-long walk, maybe covering a few hills. You get up and do some body-weight squats and a set or two of pushups. You swing the kettlebell for a couple of sets. Your body, now forced to deal with modest demands of moving around, has to compensate.

This is a tiny drip of effort, not nearly enough to really challenge you in mind or body — but it has an effect even so. The work is just enough of a challenge to wake everything up, to get it moving, to switch on the lazy genes and metabolic systems and pull yourself out of that low-energy state on the bottom rungs.

Eustress is similar to the related concept of *hormesis*. Biologists have long wondered why certain toxins, when taken in low doses, can actually have positive benefits. While too much will hurt or kill, there is also such a thing as too little. Your body needs the kick provided by environmental stresses; it just needs them at the right levels.

Our bodies are not creatures of order. A completely orderly body is dead. A fluctuating, dynamic, living body is inherently disposed to a little chaos.

We can visualize this with the power-law distribution. The picture is simple: most of your outcomes result from a minority of causes. The Pareto 80/20 rule is a fine example of this. For us, the productive minority are the hard-hitting "intense" workouts. They cause a

powerful effect in us, stimulating strength and muscle gains while also incurring a recovery penalty as we've discussed.

The Apollonian focuses on this and says that it's all we need. Just do the hard-out, all-in workouts. They are what creates the greatest effect. Why do anything else?

There's a wisdom to that, and in fact I believe it is good wisdom, but it also comes equipped with a major blind-spot. By focusing on raw analytical efficiency, you ignore the total impact of the workouts out in the "long tail".

For us, that means workouts that are deliberately sub-par, what have variously been called GPP, feeder workouts, 'punching the clock', or just 'light workouts'. These workouts all contribute to fitness-building, and in a way that the Apollonian's Bell curve cannot allow.

The contrast between *hard* and *easy* adds up to more than is obvious with a single-minded focus on efficiency.

For the purposes of getting stronger, I want to point out the parallels with the daily autoregulation strategy I've outlined. Consider that in any given week, most of your workouts will be mediocre. You'll hit the daily minimum and call it a day. Some smaller percentage will be great, where you hit weights around PR territory, and some will be bad, where nothing clicks at all.

The entire point I've tried to communicate is that, by autoregulating, the "daily max squats" will, more or less, take on this power-law structure. *Most of your time will be spent doing lighter, easier work in the eustress zone with occasional breaks into high-payoff, PR-delivering workouts*.

Your body rarely ever needs complete rest, and it has become clear to me that we need to be thinking less about *inactivity* and more about *varied activity*. We need to frame training in terms of big payoffs and long tails, with lots of mild training broken up by small drips of extreme effort.

Consider Dave, who trains with the same program all the time. Dave's conservative, always doing the same reps for the same number of sets. Dave tries to get stronger doing what he read on the internet, by steadily adding weight in progressive increments. But he always stalls out around the same weight until he loses interest and goes back to playing video games (or he gets hurt, which is a real issue I will discuss later; either way he's back on the couch).

Then you've got Joe. Joe doesn't really have a program, or anything you'd consider a consistent schedule. Joe just shows up, works his ass off for a couple of weeks, and then spends the next week or two on the couch with Dave. Joe has to spend a week working all the kinks and soreness out when he gets back to training, but it seems like he has no trouble getting stronger despite his erratic workouts.

Don't be like Joe. The whole story is ridiculous on several levels — although not as much as you might think — but that's okay because Joe is just here to illustrate a point: being extreme can pay off.

Your body seems to react much like the 'punctuated equilibrium' version of evolution. Evolution is often explained as a process of gradual, incremental changes that add up over

time. Punctuated equilibrium offers a different account in which substantial changes happen almost abruptly, over spans of thousands of years rather than the numbingly slow pace of geological time.

You don't always see the best improvements by aiming for small increments and mediocre progress, hanging out around the middle of the Bell curve. Think big. Think aggressive. Think extreme. Contrast between ups and downs is a better fit to living bodies than a fixed schedule of progressive overload. Lots of small doses and occasional extremes can create better long-term results than a gradual, incremental process.

Since we can see the pattern, but can't predict the highs and lows, we autoregulate. You cannot predict your condition, but you can prepare yourself for the uncertainties.

There's another advantage to thinking this way, and I actually consider this to be more important than the physical issues. When you train on a typical split routine, you invest a lot — mentally speaking — in each workout. You walk in the door with an expectation in mind, and you'll judge a "good" or "bad" day according to how close you got to the mark. This is even worse when you're running a planned-out training cycle with numbers you've got to hit at risk of upsetting the whole plan.

That's all great when things go to plan — but what happens when they don't? If you get sick or have a tweak or twinge that makes it hard to keep up the pace one week, you've just lost a whole week of training. Planned-out programs work great in principle, but they don't hold up well in the face of the unexpected. This is why the best training cycles are relatively short, varied, and come Break In Case of Emergency back-up features.

Even simple "linear progress" is not immune to this. Building a lift up week by week by adding five or ten pounds at a time is not a bad way to do things. A lot people push this strategy long past its usefulness, however, adding weight until the whole workout is an exercise in willpower and you're resting 20 minutes between sets just to make the quota.

Don't do that. That's a great way to make friends with staleness and mediocrity. In that position, you're better off backing off and starting a new cycle with lighter weights to build back up. Even so, a shocking number of people have it in their heads that running head-first into the wall of a maxed-out lift is the way to get stronger. All that does is wear you down and destroy your motivation.

By thinking in terms of "lots of training" and contrasts between ups and downs, none of that even matters. When you're squatting 5-6 days a week, a bad workout is nothing. So you've had a bad day? You're coming back tomorrow.

You've totally removed your mental investment in any single session. On a 12-week cycle, a bad workout can be ruinous. When you're auto-regulating on a regular basis, mistakes are painless. No single workout is that important; you can absorb a screw-up and still benefit from it.

This approach to performance improvement, ditching the Apollonian in favor of the reckless and unpredictable Dionysian – exploiting the contrast between highs and lows – is what I've taken to calling the Longtails Strategy.

When to Grind, When to Chill

As we know by now, your mental and emotional condition is a crucial part of stress, and it's also key to workout performance. When I talk about "light" training and "heavy" training, your emotional state is inseparable from that. "Heavy" training is that dig-in, drop some adrenaline, strain on nerve-power type of session where you get blasted out of your skull to train — taking stimulants, listening to loud music, brooding for three hours before lifting.

Easy days are meant to be chill. You want to be relaxed mentally as well as physically. "Physically relaxed" is probably the wrong way to say this, as exercise is physically strenuous by definition, but the idea is more that you aren't pushing to any limits. If you're keeping the mental energy dialed back, this won't be an issue. On these days, chilling out is as much a part of the workout as getting hyped up is for the hard days.

We can talk about intensity and volume and all that, and those things are important, but it's the psychological and emotional that I am most concerned with. I want to emphasize again that it isn't what you see — the workouts — that is so important to recovery, but what happens outside the gym, throughout the rest of your life. These factors are often invisible, sinking into the background noise of life as we take them for granted. But all that chronic stress adds up, and it is far more damaging both to your performance and your health than a one-hour workout every day.

Learning to relax in the rest of your life is as critical to this process as what you do during training.

This is emphasis on both the visible and the hidden aspects of recovery is the centerpiece of our strategy, no matter what your actual workout ends up looking like. My program design strategy will focus on when and where to drop adrenaline and go all-in, and when to pull back and stay easy.

Drawing on the Longtails Strategy, we'll be putting this asymmetry between brief, stressful effort and cool relaxation to work. Our mindset needs to be thus: Light is light. Heavy is heavy. The middle ground is best avoided. Light doesn't mean literally lifting 10 lb dumbbells, and likewise heavy doesn't mean a 300kg squat. These terms are vague at best, so let me clarify that I'm talking about a somewhat less vague idea which I'll call *training effectiveness*.

Training effectiveness is all the *effortful* things about the workout. Heavy weights count. High reps taken to the limit, even as high as 20-30 or more, count. Even high volume, short rest types of training can qualify. Anything involving mental effort, grinding, and straining — and lots of it — would be a "heavy" workout by this standard.

A light workout would fall on the other side of the continuum: medium to light weights, lower volume, and most importantly, only lightly tapping into the mental-neurological stuff. You'd be tempted to call that "easy" training, but that's not the route I want to go. "Easy" gives the impression that these workouts are useless or somehow not manly enough to be productive, but I don't believe that to be the case. The effort dimension and the actual fitness-promoting effects on the body are two different things. You're still moving in a light workout; nerves are firing and muscles are contracting.

Training effectiveness, as I mean it here, can be summarized as the net effect on your body, which is maximized by exhausting yourself with straining, grinding effort. A light workout would score very low, whereas a heavy workout would be high. In that sense, we're trying to tie it back to our emotional state. You need to be able to train without emotional effort most of time, and then to intentionally drop adrenaline on days you're good for it. Most of you will naturally want to do the latter, all the time, when in reality we need to learn to do what Dan John calls "punching the clock" for the bulk of our workouts.

You might be a neurological hard-ass who can get away with mentally-exhausting training (or maybe get away with it longer than most), but I don't think this applies to Joe Average. Unless he has reason to believe otherwise, Joe Average needs to relax.

This does not mean that you should never ever get excited when you train. Getting fired up from time to time is not just a good idea, it's key to getting stronger. The whole idea here is to practice what needs practicing — if demolishing a PR set is part of what moves you, then you need to practice it, adrenaline and all, and then cool back down.

We just need to let that happen with some kind of variety, instead of every single time you lift a weight. Spend most of your time cool and then let all the energy out when you're ready. We're after volatility. We want a sharp contrast between the highs — the daily-max sets and the heavy days alike — and the lows, which will make up most of our training.

We want that asymmetry at all scales. Only a small number of sets should be psyched-up attempts. Your mind before and after those sets should be calm and relaxed. Tomorrow's workout should be a break from today, and next month should be different from this month. The power-law pattern will turn up wherever you look: maybe 10% to 20% of your training week, your training cycle, and your training year will be "hard", on these terms, with the remainder left for "easy" training in the long tail.

The Russians knew this, as evidenced by what Yuri Verkhoshansky called *concentrated loading*. In a block of concentrated loading, they'd take a group of athletes and hammer them with insane workloads for a few weeks. Just when their bodies couldn't stand it anymore, the athletes physically stressed and emotionally drained, the training effect would throttle back to nothing. Suddenly all that adaptive energy had nowhere to go; after a week or so to let the fatigue settle down, these athletes would see amazing jumps in strength and power.

This is the idea behind currently popular load-and-release methods like the Smolov squat cycle. You deliberately over-work yourself, switching on all the growth and adaptation processes, and then take the work away. Your body responds to the contrast of extremes better than it would by spreading out that same amount of work.

When you go hard, go hard. Push your weights, add more volume, and lift all the time. When you rest, don't half-ass it by saying you're "deloading" while hitting the gym for a couple of PR attempts. Rest. Stay away from the gym. In fact, don't think about the gym. Eat bad foods and drink beer.[62]

You might spend 2-3 weeks going all-in, and then take that much time cruising with easier training. If you've had an easy spell and feel like you're settling into a rut, then you can ratchet up and really push yourself the next few weeks, or shift into cruise-control if

you've been busting ass for the last 3-4 months. You might not plan out anything at all, training until you get tired of it and then taking a week or two for easy R&R. This, too, can be as organic or as structured as you need it to be.

Now let's take a look at how this might look on a day in the gym.

8

Squatting Every Day

"If it's worth doing, do it every day."

—Dan John

Daily Squatting: What I Did

Since daily lifting is not something you can write out as a program, you might still find yourself confused. To see it in action, I'd like to walk through the strategy I used and my observations about what happened and what might be worth exploring.

Before we dive in, I want to remind you that these are only examples. This style of training depends heavily on the tacit knowledge arrived at by doing the thing, and tacit knowledge doesn't summarize into neat lists and tidy sets of rules. There are going to be a lot of vague suggestions and loose ends that won't fit into a fixed workout template, and that's okay.

Lists of exercises and sets and reps should only be a skeleton in the first place. What actually happens in your workout depends on what actually happens in your workout, so what you're reading here is best understood as a recounting of a story, not a workout strategy as such.

I understand that some of you aren't comfortable with that, and that's okay too. There are plenty of programs that will fill your need for certainty and control, and you can learn while you're doing one of those.

As I'm not an Olympic weightlifter, and my goal was to see how this worked with "slow" lifts, I had to make some big changes from the systems used by Abadjiev and Broz, so I don't even consider my template "Bulgarian". Bulgarian-inspired, maybe, but in reality this is just a system of very-frequent strength workouts. I took as much from Anthony Ditillo, Doug Hepburn, and Jamie Lewis as the Olympic weightlifting routines that inspired me.

My workouts were set up to focus on two main exercises, which were a squat and a press, and then anywhere from one to three accessory moves depending on my motivation and energy level. It was almost always one upper-back exercise, either chin-ups or dumbbell rows, and then if I felt like it, a few sets for arms. Back squats and bench presses were the bread and butter, with front squats making an easy substitution if I wanted a lighter day. Also, if you have any concern about your overhead pressing strength — and I did — you might want to rotate it in as well. I alternated days between push press and bench.

The first time I ran through this, I alternated back and front squats, as well as bench

and overhead presses, each workout, for a total of five days a week. I found this made for a nice heavy-light contrast between days. In a later cycle, I stuck to back squats but alternated between belted and non-belted lifts as a way of tinkering with the daily effort levels. Since I get a fairly consistent 10-15kg boost from a belt, that works well for me (more on exercise variety below).

I aimed for the daily max as I outlined in the last chapter, and it quickly turned into a focus more on the daily minimum — after a week or two, I knew what I'd be able to hit as a "no-brainer" weight for the day, and I always made that my benchmark. If I could do more, I would. If I wasn't feeling so hot, I'd hit it and call it done. When that weight wasn't on the table, because I was achy or just couldn't get the juice to switch on (you will come to know what this means), it meant I needed a couple of days off.

There isn't much more to it than that, really. It's just a matter of tinkering with the details.

Ramping It Up

I tried two ways of warming up to the top lift, each having pros and cons. The "small jumps" approach gets in a lot of volume, easily 10-12 sets before you get anywhere near daily-max territory. I found this was useful for building "strength fitness", since the small change in weight combined with low reps means you don't have to (or want to) rest very long.

If you're doing this every day, though, it can get boring, and sometimes you don't want to go through all the motions. Eventually I wound up at the "big jumps" warmup, which is exactly what it says. I'd take as few sets as possible to get near the day's training weight, and then see where I stood. Most days, I'd stop there or add maybe five kilos if I was feeling good. An exceptional day would hit anywhere from 10-20kg over that baseline weight.

As I said previously, after you get into a habit of daily maxing, most days turn into "punch the clock" workouts where you can predict the weight you'll hit any day of the week (allowing for injury, illness, and random bad days). That's your target for the day, the weight you will attempt before making any decisions.

Taking small jumps can mean a lot of sets. At a point when my daily baseline was 160kg, I'd start with the bar (because why not? It still gets blood moving and joints mobilized) for a set or two, add a plate for a few sets of 5-8, two plates for a set or two 5-6, then start with 10kg increments for doubles or triples on up to three plates, then 5kg increments for singles on up to the top lift. If a weight feels heavy, you can repeat it for 2-3 sets on the way up. This quickly adds up to a lot of sets, but you don't have to rest all that long either (and if you are resting a long time, try to bring that down. Part of the rationale for all the sets is to "get in shape", and if you're too tired to hit an ego-lift as your daily max after all that, well, good.)

Notice also that you aren't really hitting a lot of high reps. I found it was better to cap the reps at say 5-6 on the light weights, maybe as much as ten with the bar, and then limit it to triples on anything beyond the first plate or two (if you're a lot stronger). You make up for that by doing multiple sets at each weight.

Going with big jumps, I'd start with the bar, add a plate at a time up to three plates, and then make the call from there. If you're weaker or stronger, you'll again make adjustments to this, adding big wheels or dimes and quarters as the case may be. Making big jumps makes a tremendous difference in your daily volume, and you'll need to play around to see how these differences affect your top lift.

Which do you pick?

I think that big jumps are best when you're going hard-out, hitting the lift every day or near to it. After 5-6 consecutive days of squatting or benching, you won't need much of a warmup.

That means the opposite if you're only hitting the lift twice or three times. You'll get more play from a lot of sets on the way up.

On days when you don't feel switched-on, it's a judgment call. You might want to make the big jumps and call it done, but I found that a lot of these days I came in feeling bad were

misleading. I'd get 5-6 sets into a warmup and suddenly the lights would come on. You might find that doing more warmups gets the power flowing.

I think there's something for doing more warmups on exercises you're bad at, too. For example, my pressing strength is embarrassing compared to squatting, and I've always found that benching and overhead work benefit from a lot of warmups in comparison. There's just something to building a weak lift with volume before you tackle more intense max-lift training.

Wave Loading

Back in the late 1980s with the warming relations between the West and the Soviet block, there was a sudden cross-pollination of ideas. One of the outcomes was a series of exchanges, with Eastern bloc coaches opening up and revealing what they'd been up to.

According to a series of articles by Angel Spassov, one-time coach on the Bulgarian national team, which were published around this time, the Bulgarian weightlifters used a 'wave-loading' daily max strategy at some point in time. We can leave the when and where to the side for the moment, as it's the method itself I want to look at.[63]

Spassov described a series of waved attempts up to the daily training max, which set the bar for the day (so to speak), then backed off for a few sets and then moved back up to that training max for a few more attempts. This would be repeated two or three times at each workout, much as below:

Wave 1: -20kg for 2, -10kg for 1, Tmax for 3-4 singles

Wave 2: -10 for 2, -5 for 1, Tmax for 2-4 singles

Wave 3: -20 for 2, -10 for 2, Tmax for 3-4 singles

I tried the wave loading system for a few weeks and found some pros and cons. The major difference, which was both pro and con for me, was the relatively heavier loading. My own daily max strategy was lighter and more conservative, in that most of the training was submax work with comparatively fewer max attempts. With the Bulgarian waves, I was getting a lot of training max singles, and then back-offs that weren't very backed-off.

I also found it too easy to get riled up, pushing too hard thanks to pushing myself into a "beat the record" mentality. Max singles have a way of getting in your head and becoming almost addictive. Hit one and you want to hit more. I was reminded of something the late coach Charlie Francis once wrote, roughly paraphrased: the hardest part of the coach's job is holding back an enthusiastic athlete. It's easy to get in "dare mode" with yourself, where hitting a heavy attempt makes you want to lift more heavy attempts.

I found that one wave was pretty easy to handle. The second wave was a bit more challenging, and I never reached a point where I felt up to a third wave. After two waves, which included anywhere from two to six daily max attempts, I never found I had the energy or motivation to do any more work.

If you want to experiment with wave-loading, my suggestion is to leave it for a 2-3 week block where you want to reach a new peak, and then prepare to take at least that long in cruise-mode once you're done. After you've given it a try for a cycle or two, you'll have a better idea of how you respond and you can make whatever changes.

Of course, wave-loading can be dialed down a notch or two so that it's less extreme than what I did. Leaving the training max at your daily minimum — and *really* leaving it there instead of slipping into PR mode — would work just fine I think.

I think the best option is to wave your back-off sets. Instead of backing down to -20kg and grinding out sets at that weight, change the weight each set. Do a triple at -20, then a double at -10, and alternate like that. You might want to work back up to the max again, or

you might not.

Back Off Sets

I always tried to hit at least 2-3 back-off sets unless I was totally wiped out. I'd just take 15-30kg off the bar and try to knock out some triples. How many? It always depended on how the daily max went. I found that I'd have days where the top lift would be mediocre, but I was able to crank the volume. Other days the opposite would be true. The top lift would be great but I wouldn't have anything left for back-off work (and honestly if after a PR, back-off sets weren't on my mind anyway). Broz suggested two or three doubles or triples as a starting point, and I found no reason to disagree.

There are potentially infinite options. You could do sets of 5-6 instead of triples. You could do a widowmaker rep-out set of 20, or for those not impressed by that idea, take a more modest attempt for 8-10 reps. You could work back up in waves (discussed below). The point is to tinker and find what works (and what agrees with you) rather than fixing yourself to something arbitrary. Experimenting costs you very little, but it has a potential for large payoffs.

The daily max can work just fine without back-offs, especially if you're just working your way in to frequent lifting, but my own experience leads me to believe that back-offs should probably be there if you can at all make them work. In a sense, they're the "real" work of the day, whereas the max is more of a testing or fine-tuning benchmark (that's not exactly true, as taking 2-4 max attempts is still strength-building, but there's just something about groove-greasing with a little volume).

Pushing back-off sets too soon will take you bad places. Always be conservative; if you aren't sure, the answer is no. Like the daily max itself, the volume of back-off sets needs to ease in slowly. Be consistent and it will come to you. If in doubt, the answer is no.

You might want to spend your first two or three weeks just getting used to the training, then throw in the bare-minimum (two or three triples) and see where that takes you. I enjoyed having the extra volume, but it's important to realize what that's going to mean for you if you aren't conditioned for it. Also keep in mind that you aren't me. If you're built differently, if you're substantially stronger (or weaker) than I am, or if you don't respond to volume like I do, these will all make a difference.

Anchor Days, Higher Reps, and Split Schedules

I found that once I got into a rhythm, I could usually tell how certain days were going to go. When I first went through this system, I was training in the morning on Monday through Thursday. Friday's workout was at night, which meant that I'd get an extra 12 hours for my body to settle down (and eat) before I trained again, and I always felt stronger in that workout.

It wasn't long before Friday became my regular "PR night". Not to say I actually did PR every Friday, but since I felt more energetic, more attempts happened there, and I was more aggressive with back-off work.

I was inspired by Glenn Pendlay's weightlifting team, who were using a similar frequent-training schedule at one point, and they always reserved one day each week for hitting squat PRs and rep-maxes. It might be a top single, double, or triple, or a set of 5-6, or even 8-10 reps.

When you train like this, some days will feel like "intensity" days, when you want to push the top weights. Others will be more "volume" days, where you stay easy on the top weights but hammer out the back-off work. If you find you've got a day that consistently pops up as a "high energy" day, you might want to anchor it and leave it as your PR day. It doesn't matter what you do; pick something on the day that feels right, and try to beat your previous record.

'Reps', by which I mean anything more than singles, doubles, or triples, can be hard to slot in to every-day lifting. Singles are amazingly forgiving on a daily basis, but I always found the thought of tens and even fives to be more intimidating. I know I wouldn't be too motivated to hit a 10RM on a squat multiple times a week, even autoregulated, and there's good reason for that.

Things change on a split routine. You might find that aiming for a 5-6RM or 8-10RM works well three times a week, giving you that extra day in between for mind and muscle restoration. Something much like this has been the basis for many useful bodybuilding workouts, from Bryan Haycock's Hypertrophy Specific Training to the six-day routine used by former IFBB Pro Phil Hernon.[64]

An interesting option would be throwing in rest-pause and cluster-rep methods. The type of hard-out rest-pause training made famous by Dante Trudel's DC Training might be a bit much, but cluster-reps, like Borge Fagerli's Myo-Reps, would be a good fit as you can tinker with both the initial weight and the total amount of reps.[65]

Using rest-paused clusters, you'd work to a high RPE, maybe an 8 or 9, and then set your timer for 30 second rests between 'mini-sets'. You might hit 8-10 reps on the initial set, then drop back to triples for the mini-sets, stopping when you reach a point of fatigue or a target rep-count.

I think you can bring in any of these 'rep methods' for your back-off sets if you keep the volume low. You might want to see about hitting say 2-3 sets of 5-6 reps or even 8-10 reps

after a daily max, just for something different. I tried this from time to time and it was a decent change of pace.

If you're brave, you could even bring in a higher-volume day. You'd leave the daily max at the daily minimum, mainly using it as a warmup, and then knock out some hard back-off sets — eight sets of triples, five sets of five, something like that. Yes, this will make the next day or two feel horrible, but that's okay. Remember: the whole point is to take the emphasis off any single workout. You had a bad day? So what? You're coming back tomorrow. Mistakes cost you nothing.

After a few weeks, you'll get used to the higher volume anyway, and once that happens, you will start to understand why this is such a powerful setup.

Once you start anchoring days like this, you may notice something like a "real program" taking shape. That is also okay, because you arrived at it by tinkering and figuring it out yourself by actually training, rather than trying to organize it all from a manager's top-down point of view. Pay attention to these lessons.

Of course, none of this means you can't use a structured workout if it hits your fancy. In the latest edition of 5/3/1, Jim Wendler lays out a version of his program that incorporates some daily-training magic while still sticking to the core of his method. One day is set aside for squatting with the bread-and-butter 5/3/1 cycle, which in my experience is also a great way to make use of higher reps. There are also four other squat workouts which have you working up to 'easy' singles at a percentage of your training max for the cycle. I think that would be a great compromise for anyone not so keen on free-styling it with auto-regulation. You're getting the advantages of self-adjusting training within a reasonable structure.

If you aren't totally sold on squatting and pressing every single day, the easiest change you can make that will still keep you in the ballpark is a two-way split. Popular choices would be upper and lower body, hitting bench and overheads and then squats and pulls, or pushing and pulling, hitting squats and pressing followed by pulling and back assistance.

You could train six days each week, so that each one day is repeated three times, or if you don't care about days off, just alternate back and forth until you need or want a day off.

I haven't toyed with either long enough to say which I like best, although the push-pull type of split is similar to what I wound up doing anyway. The main difference is that you'd get more pulling, since you'd have three 'pull' workouts instead of throwing them in as subs for squats, and less overhead pressing, since it would have to work with benching. Honestly, nothing would stop you from using a simple squat/bench and overhead/pull split, and I think that would be a good choice.

Rotating exercises is another option that can be split-like. Instead of sticking to the same lift, you'd pick something similar but different. I've already mentioned rotating front and back squats, but you could throw in box squats, safety-bar squats, squats with chains or bands, pretty much anything that your creativity and equipment allows. You could do the same with overhead work, benching, pulls, all of it. Use fat bars, use dumbbells, throw in odd lifts and strongman events and old-time circus lifting like the bent press. Don't be afraid to tinker around and see what suits you – and if you feel like hitting a different lift, hit that lift. Be volatile.

Dealing with the Deadlift

You'll have noticed by now that the deadlift has been conspicuously absent. The deadlift may be the hardest exercise to plan for, overlapping with as it does with the squat while having its own needs and quirks. Since the deadlift is a wily beast, we need to talk about it separately.

The name alone hints at why. With a squat, you unrack the bar, get in position, and then drop into the bottom. You benefit from the eccentric lowering portion of the lift, activating the stretch reflex and taking advantage of your body's natural tendency to rebound stored energy. The "dead" in deadlift refers to the starting position: the bar sits on the floor, and you have to lift the weight from a dead stop.

Dan John calls the deadlift a "hip hinge" movement, in that it uses mostly hips rather than the "true compound" movement of a squat, which involves more torque at the knee.

For most everyone, the deadlift will be the lift in which the most absolute weight is moved. Heavy weights combined with unique leverages give the deadlift a different quality from squatting, no matter how many muscles overlap. Combine these factors and you wind up with an emotional, taxing exercise.

Being at once redundant with squatting and entirely different in how it responds, the deadlift is hard to mesh with a daily squatting program. I've tried two solutions, neither of which is entirely satisfying, but each is worth trying for your own sake.

The first option is to treat the deadlift as speed work, aiming for six to ten singles or doubles with that magic weight of 70-80%. Shoot for quality and stay away from any attempt that even remotely grinds. This is John Broz's suggestion, and I've found it to be practical. Once you get fairly strong at the pull (let's say 2-2.5 times bodyweight just for a number), you'll find that the useful percentages can drop down as low as 50-60%, and especially so if you're squatting regularly. You'll be able to get more out of lighter weights than you might think, so don't turn up your nose at a deadlift workout that's "only" 70%.

For the second option, you'd train it like the squat but at much lower volume, much like Anthony Ditillo suggested. Work up to a medium-heavy, non-grindy triple and call it a day. After squatting you'll already be warmed up anyway, so it shouldn't take many sets to get there. On days you pull, you could be more conservative with your squat back-offs, or even do front squats instead.

You could combine the two methods, with one relatively hard deadlift workout and then another day or two to do fast singles or doubles. I found this option appealing since I love to pull, so I'd set aside Thursday for light front squats (up to a casual training max with no back-offs) or no squatting at all, and then give the deadlift some attention. On one or two other days, I'd do fast pulls as either speed deadlifts or high pulls. I don't think the kind of pulling you do matters as long as it involves a tight setup and a lot of speed or intent-of-speed explosiveness.

For you brave souls, there's the Bob Peoples option: just pull to a limit set every day. I have to admit that I found this to be one of the more intimidating options. Don't let my scruples discourage you, though, as there are plenty of ways to make this work. I've briefly

tried this method and I think that much of the anxiety is just anxiety. Once you suck it up and go do it, it's much easier than your nerves suggest.

This will be personal, however, and if it doesn't agree with you, I wouldn't suggest pushing it. Some will find value here, though, so it's worth mentioning for the sake of completeness.

A less intimidating option is to throw a little variety in from day to day, using the planned training max option from above. Instead of working up to a daily max every day, do that only once or twice a week and then use light and medium percentages for the other days. You might pull up to the training max on Monday, then drop to 80% (or just take off 100 pounds) on Tuesday, then 90% (or take off 50 pounds) for Wednesday, and repeat as you wish.

When using a planned max, be careful about taking attempts over that weight even if you feel good. You can get away with that on a squat, but the deadlift is not so forgiving of missed reps so take extra care in choosing your attempts. If there's doubt, you're done.

Bob Peoples used lots of partial lifts, what we'd now call rack deadlifts or pulls from blocks, in order to overload the lift. I've found that this is useful but with a caveat: anything done from about the knee or higher isn't much good for anything but showing off. Rack pulls, or pulls from blocks, or any pull where the plates are elevated off the floor, are handy from mid-shin or just below the knee. Any higher and it loses carryover to pulls off the floor. Current pulling machine Konstantin Konstantinovs reportedly bases his deadlift training on pulls from blocks at several heights, as does British powerlifter Tom Martin who's pulled 350kg in the under 85 class.

I think that, like most everything else, you'll benefit the most from cycling in between squat-focused and deadlift-focused phases. Bob Peoples wrote that he cycled like this, training one lift until he reached a new plateau and then shifting to the other. Bouncing back and forth over time is what built his tremendous strength, so you wouldn't have to stick to one or the other more than 4-6 weeks at a stretch.

Also, don't be shy about using any of these approaches with squats as well. Heavy partials can have a place in squat training, and you could throw in quarter squats or dead-stop squats (set the bar on pins and start the lift from the bottom) as a replacement for back-offs on your heaviest days. As with pulling, you need to get a decent range of motion or else you're just showing off.

The same goes for the cycling methods mentioned above. These work just fine with squats as an alternative to daily maxing.

To summarize the two approaches: Squat a lot and limit deadlifts to fast pulls or one hard deadlift day. Or pull a lot, limit squatting, and cycle the daily training intensity and the range of motion (by pulling out of the rack or off blocks).

The Lite Program

All the options so far assume you're lifting at least five days a week, and potentially up to 14 if you're doing two-a-days. I realize that's a big time commitment, and not everyone wants to spend that kind of time lifting weights.

I'd like to remind you that the principles behind heavy autoregulated lifting don't commit you to any set number of workouts each week. If you want to make use of these ideas, then you can do it with four or even three days.

Since you're lifting fewer days, you'll probably be able to take a little more volume. You might want to take a harder look at Anthony Ditillo's single-reps, or if you're adventurous, Jamie Lewis's suggestion for as many as 15-30 sets of threes, twos, or singles. A happy medium might be warming up and then making 3-5 single attempts to a daily max, and then throwing in a back-off set. A heavy set of 3-6 and(or) 8-10 would be good medicine.

Since I have issues with benching, both being weak and having some limiting injuries in my shoulders, I'd probably limit that to a top triple or five for the day. Working with near-max singles doesn't have a great track record with me, but benching does like slightly higher reps and more sets. You might want to consider that an option if you've got any lifts that react similarly. Throw in a couple of back-offs if you'd like and call it a day.

Simmer to Boil

In the time since I started writing, some things have changed for me. Call it 'life' getting in the way or just boredom, but I've lost my interest in training for big numbers. Don't worry, I'm not pulling a bait and switch. I stand by everything I've written here, and if I ever do get the urge to powerlift, this outlines the exact strategy I'll use — and what I'd recommend for anyone I coach.

But speaking for myself, it's been a shift to the more mundane goals of "don't be fat" and "keep in reasonable shape". I'm much more interested in hanging on to a reasonable amount of muscle at a low-ish body fat, and being able to enjoy beer and occasional junk food, than I am with any performance goals.

The end result is that I don't lift that much anymore (in any sense). Two or three days a week is about all I care to be in the gym. But that's not to say these are the only days I exercise.

As I say, I practice what I preach, and based on the lessons I learned here, I still train often — just about every day, in fact. Just not with a barbell.

I started playing with kettlebells after my wife picked up a small set for us. I figured that if I wasn't going to be Serious Training, I could at least stave off the inevitable disuse atrophy.

My kettlebell workouts are roughly what I outlined as "easy" training. They aren't heavy enough to constitute any real resistance, but by playing around with the movements and the rep-counts and rest-intervals and so forth, I can get reasonable workouts in. Squatting, pressing, carries, cleans, snatches, pushups, pullups — there's a whole lot you can do between kettlebells and bodyweight.

In another of those 'huh, that's cool' surprises (much like what happened when I discovered daily squatting), I came to find out that these short daily sessions — by no means do I invest longer than maybe 10-20 minutes at a go — were doing a great job of hanging on to strength in pressing and pulling movements.

These aren't 'stressful' workouts either, so there's no real hit to recovery. If anything, they're more like a tonic — making stiff joints and tight muscles feel better than they did.

To me, this is just more evidence that 'easy' training is not to be written off. A simmering pot of water can quickly roll into a boil.

As I thought about it, I realized that there are plenty of examples of this, and it really comes back to the same Longtails pattern. If you look at Olympic lifters, they get in far more "squatting" than might be evident. Every recovery on a snatch and a clean is a squat (albeit only the upwards concentric phase).

With that thought, suddenly it becomes clear that the bulk of an Olympic lifter's training is a whole lot of squatting with weights that might be a moderate percentage of their maximum front and back squats.

In other words, lots of low-effort practice punctuated by occasional and brief rounds of grinding.

And as my home KB workouts have been showing me, the same principle applies even without a barbell. Innocent-looking moves like the KB clean & press, the swing, and even the goblet squat have a powerful effect when used as a regular 'groove-greasing' tool.

Of course, I haven't dropped 'real' weight training either. Two or three times a week I still try to lift something reasonably heavy, following the auto-regulating methods I've outlined here. I have no set schedule; I just try to hit a mixture of front and back squats, bench press, overhead work, chin- and pull-ups, deadlifts, and whatever beach work for the arms and shoulders.

I've found myself wondering why I'm still lifting with daily maxes when I have no 'strength' goals as such. Since you might find it relevant, I'll share my answer.

Even without a concrete goal of competing in powerlifting or strongman or anything else, I still believe that heavy resistance training is indispensable the purposes of 'being in shape' and 'looking better'.

The point here is two-fold. One, you can adopt a similar auto-regulated 'chaos-friendly' mindset no matter how you actually train. The methods here are about how you think of stress and recovery — not that they don't exist, but that what we're told about them is largely wrong (or at best taken out of context). If you want to lift every day in the gym to push up your squat, have at it. If you just want to stay in shape and 'not be fat', cool. You've got options, too — train at home with whatever tools you have, even if that's just body weight. The point is that activity stimulates, and fitness demands stimulation.

Second is what a focus on volatility implies for 'common wisdom'. You'll notice that, even to 'just stay in shape', I still lift. Of course, strength *as such* is less the issue than keeping a body mobile and under weight. Moving heavy resistance is probably the best way of keeping joints and muscles and nerves operating under high demands. And, in so far as I want to keep my body under those fitness-inducing demands, barbells and dumbbells make for a nice blend of overload and instability. Standing up and moving a heavy weight is the best way to get that stimulus, so I stick with presses, pulls, and squats as the centerpiece of my weight training.

Note that my volatility is not to be confused with 'randomness' or throwing darts at a list of exercises on the wall. I stick to a battery of exercises and train those exercises in more or less the same way. Sure, I may decide on a whim that I want to front squat today, and that I want to hit a max triple instead of 3-5 heavy singles. I may decide the next time I train that I want to see where my deadlift is, so I'll work up to a decent gym-max.

But that's not even close to random. It's just picking what version of a lift I'm going to hit, and how I'm going to hit it. What looks random actually has a logic to it simply because there are only so many options.

To pre-empt a 'but that isn't necessary!' rebuttal from those well-meaning folks who believe that heavy lifting is dangerous and that doing so to 'stay in shape' is risky: I don't buy into all these concerns about "improper form" or joint damage or impending injury for all the reasons of complexity and volatility that I've previously outlined. Your body is not an idiot, and it is in fact smarter than many movement analysts who can only think in static slices of right-now. Your body operates over time as well as space, and what is low-grade

harm right now is the future adaptation to that harm.

As we've repeatedly seen, a lot of little injuries and harms are beneficial, since they add up over time to a more resistant body. And as we'll see in the next chapter, I believe that it is these excessive attempts to minimize transient 'damage', by locking a body into rigid patterns (or worse, encouraging them to use machines instead of real weights) and naively connecting injury risk with amounts of training, that ultimately leads to the avoidable catastrophes we call injuries.

Clearing out forest underbrush to 'manage' fire risk by preventing small burns is a direct cause of raging firestorms. I train with acutely "risky" methods precisely for that long-term trade-off.

9

Reality Checks

"'Tis not enough to help the feeble up, but to support them after."

—William Shakespeare

Suntanning: How to Ease In

If you've got milky-white skin and go for a vacation at the beach, it wouldn't be a great idea to spend eight hours out in the sun your first day there. The smart way to do it is more gradual, immersing yourself for a few minutes each day and letting your skin adjust with small doses of sun. Do that long enough and you'll eventually get that equatorial bronze everyone seems to love.

Let's have a brief intermission for a reality check: training heavy every day is not for the timid. Squatting to a max every day hurts until you get used to it, and even when it stops hurting, it still hurts. It's not that it gets easier as much as that you teach yourself not to care so much.

There's just no getting around that, so if you're of the type that doesn't handle discomfort well, remember that I did warn you. You have to be patient, and you have to be consistent. Most of all, you don't want to treat your workouts like the tourist who takes his top off and gets burnt to a crisp on the first day.

When you first begin, you'll face two hurdles, and both of them are more mental than physical.

You're nervous when you train. You've been told repeatedly, but you haven't trained yourself for calm arousal yet, so nerves are normal. You're going to get worked up automatically at the sight (or thought) of a heavy weight. Your nerves trigger the stress-response before you lift and make it worse after you lift. As long as this is happening, your perception of recovery time will take a hit. You'll learn to relax with time and practice, but it's probably out of your hands at the beginning.

Your muscles and connective tissues aren't prepared for regular exposures to intense loading. When you squat every day, it will hurt no matter what weights you lift. Frequency has it's own break-in curve. After a week or two, your legs (or whatever else) get used to it and it becomes part of the daily routine. But that can't happen if, instead of just squatting, you decide to alternate box jumps, sprints, leg extensions and leg curls, and whatever else you think of. You never give the legs time to adapt to any single input.

You're always the most sensitive to the least familiar. Anything new — a new weight, a

new exercise, more volume than usual, different rep range — triggers all the problems you want to avoid. Consistency, sticking to a handful of exercises and favorite rep-ranges, helps cut way back on the novelty symptoms, so you want to break in slowly. Make only gradual increases in frequency and volume, and give yourself time to stabilize, as the Russians say — let the weight and workloads mature and ripen — and only then add a little more.

There are two approaches to take when jumping in to higher frequency. The slow and gradual approach has you add sessions over months, and only when your volume gets high enough do you let it spill over into an extra workout. And then there's the head-first approach, in which you jump right in to five, six, or seven days a week. This has the advantage of quickly adapting you to the frequency, at the cost of extra soreness and probably a few weeks of diminished strength.

If you're after longevity and planning out over a career, the slow and steady approach is worth keeping in mind.

I favor the second approach if you want to give daily squatting a try for shorter training cycles. Frequent loading needs its own adjustment, and there's no real way to get your toes wet without going all in.

The first week or two, it won't matter if you're using the unloaded bar or even doing a set of pushups or bodyweight squats. Once you adjust, all is well again. You'll find that it's easier and easier to put weight on the bar, and few weeks in you'll barely notice anymore.

A Little R & R

No matter how well you manage your training and keep your stress in check, you might find that you hit a wall after 4-6 months of training. It won't be physical. You might notice that you feel more soreness than usual, maybe the aches and pains acting up a little more, maybe some nagging tendinitis. Otherwise you feel good, without any of the expected "overtraining" feelings, but the spark's gone. You're just sick of training.

When that happens, I think that you're as close as you'll get to genuine overtraining by way of lifting weights. You lose the desire to go to the gym, you have no motivation to train. You've gone stale when, just a few days before, you were ready to go squat. When this happens after several months of high workloads, you can almost bet that you're dabbling with emotional exhaustion. You're literally sick of training.

The problem is all the more insidious because you won't see it coming. You've learned to ignore the sickness symptoms, but the accumulation of allostatic wear-and-tear is inevitable with any productive training. Over a span of 2-3 months it's not a problem, but you eventually reach a tipping point where the cumulative stress boils over.

Don't panic, though. You can be saved.

If you notice this happening, the first thing to do is handle the symptoms. Mild doses of anti-inflammatories help both with physical pain but also in controlling cytokine production, which can be useful in blunting the feedback to the brain which triggers the central symptoms.

The key thing, though, is getting the skillet off the fire: remove the cause and the symptoms settle down on their own.

Plain old rest is one way to do this. Stay home, eat good food, and relax instead of worrying about your squat. Don't be shy, either. Take two, even three weeks, and get your head out of the gym. That's one option, though I don't like it very much.

John Broz says to keep going through these dark times. "You can always squat the bar," says Broz. Keep moving, rather than retreating to the couch, even if you're only doing a whole lot of reps with the bar. You're keeping muscles and joints mobile, and more importantly, you're keeping in the habit.

I think the not-stopping part is key. Stopping means you lose your momentum, and it's hard to get back when you're feeling mentally burned out. Do something, even if it's just body-weight squats or kettlebell swings. Active rest is better than atrophying on the couch.

Remember the Longtails strategy. Ups need downs, and light means *light*. Light doesn't mean that you show up and think, gee, I feel pretty good so maybe I'll work up to 95%, and oh what the hell, I'm already here so might as well take that shot at a new PR.

Light means *light*. Light means that the weights feel way too easy and you leave before you're anywhere near tired. It means feeling like you wasted a workout. You feel like you didn't go anything? Good. That's the point.

What can you do for light days?

If you're going by autoregulation, keep everything at an RPE of 7 or 8. With a planned-

out training max, cap yourself at 60% for a set of 3-5 and call it a day. Everything should feel fresh and snappy, so if you have a day where 50% of your usual training max feels slow, you're done. No arguing. Go home.

If you've been in the gym 5-6 days (or more) every week, scale that back to two or three. Keep mobile at home with body-weight exercises, stretching, and mobility drills.

I'm less interested in treating "active rest" as damage-control. That implies that we've done something "bad", that we've "overtrained", rather than simply dealing with a natural consequence of a hard-training life. A Longtails strategy means that ups will require inevitable downs, and this is for our benefit.

I'd rather treat this as a long-term wave: we spend a few months going all-in. Now it's time to throttle back and train lighter for awhile. Just as your daily and weekly workouts will self-organize into a program, as if by magic, your yearly schedule will naturally break itself into phases.

This all assumes you have a flexible schedule, of course. If you're an athlete with specific competitive seasons or events, you'll need to plan accordingly, but otherwise, why not let things develop as they will?

You're a step ahead if you keep records, logging your weights and your RPE scores and any abnormal good or bad feelings that might be relevant. Did you feel "on fire"? Were you unusually down? Get in a habit of record those details for a few months and you'll notice trends.

My suggestion is to not rely solely on feelings, as they will lie to you, but on feelings combined with performance. Feeling bad by itself can mean anything. Feeling bad and then having a bad workout means something.

For me a bad workout isn't when I feel okay but grind at 90%. Neither is a day when I feel awful but still hit 95% pretty easily. Grinding on a single at 80% and feeling awful at the same time? That's a bad day.

If you have access to any sort of HRV measurement, through a heart-rate monitor or online testing tools, or even the nifty plethysmograph smartphone apps which use cameras to do a quick and dirty estimate, that's another tool you can use.

I don't believe that any single HRV measurement tells you much, as per the current thoughts on establishing how "ready" you are to train — I've had days where I've been stressed off the charts by HRV but still knocking over workouts like nothing.

A negative trend over time, though, and especially combined with feeling bad and underwhelming performances, can be a good sign you need a break. You can tolerate that "excited" state for awhile, but even a well-conditioned body with well-managed training needs time to bleed off the wear-and-tear of fatigue.

If you're willing and able to do be honest and take the down time when you need it, then you can autoregulate your rest days and deload weeks. I will say that I think this approach works best as a group effort, even if it's just you and a training partner. One brain can lie. A group can have a more objective eye.

For that reason, I think that you're better off with scheduled breaks and even yearly

blocks as a solo lifter. Even the Bulgarians took light and easy weeks once a month, and entire light cycles every few months. Penciling in deload weeks, a light cycle every 4-6 months, and even breaking your year into something like "heavy strength" and "light bodybuilding" phases means that you have reason to take the downtime and less incentive to skip it. The game plan takes your ego out of the picture.

But remember, you don't even have to stick to that schedule if you find yourself overwhelmed, and if you're exceptionally beat up, take two weeks or four weeks of casual training to recharge. I think that the mental reset is more important than the physical when you feel burn-out coming on, and flexibility is *always* the paramount concern.

In my experience, losing your motivation for training and falling out of the habit is the hardest thing to recover from, and preventing that is always better than trying to fix it later.

Remember: if you don't do it yourself, it will be done for you.

You'll Just Get Hurt

While I'm not as beat up as many seasoned lifters, I've done my share of damage. Both shoulders have suffered partial tears in the rotator-cuff muscles and are full of scar tissue, which I blame on my early days as a bench-bro (along with long arms and a lightly-built frame). I've torn an adductor muscle in my left leg and, less than a year later, I tore the quad of my right leg while preparing for a powerlifting meet.

It's always been painful to bench and now I have to keep a close eye on both legs, so training heavy isn't always so fun. You'd probably expect that somebody in my position doesn't need to train heavy and certainly doesn't need to train often. The reasonable conclusion is that since lifting heavy hurts and entails some risk of injury, that I'd want to be even more conservative and do it less often.

If you recall from the introduction, I mentioned that, while lifting every day, I noticed my joints feeling better. That goes against the grain, but I've got a good explanation for it: the body is less a machine with a limited fuel supply and more an ecosystem that responds to cultivation.

When I first took the plunge, I was paranoid about getting hurt again, but at that point I had nothing else to lose. I could either train how I wanted — heavy and with the big lifts — or I'd just have to quit and take up stamp collecting.

As the days and weeks went on, I noticed something. Not only was I not getting hurt, but all the squatting felt like it was greasing the rails. The old injuries, which normally ached and made me very aware that I was bothering them, started griping less and less. They never became painless, but I'd not expect that. It was more like they retreated into a background noise of dull ache, sometimes irritating, but never once did I feel like a catastrophic blow-out was imminent.

At that point my interest was piqued, and I kept coming back to a post John Broz made on the Bodybuilding.com forums:

> *NOT training everyday leads to more injuries! IF you train everyday then your entire body is fatigued. Muscles, tendons, cartilage, ligaments, etc. When you train every other day, then the muscles and avascular tissues don't recover at the same pace. What happens is the muscles become fresh and recover but all the connective tissue is NOT. When the additional stress put on these weakened tissues (that never really got a chance to recover) by fresh muscles = injury. Lifting everyday keeps everything in a state that is equal and consistent within the system. A balance or harmony within. The fatigued muscles can't contract enough to harm the other tissues. The weak link moves from body part to body part, and in a sense is not letting the other parts max so that's when they are resting!* [66]

It made sense, at least from what I was experiencing and from stories I began hearing from others who found a similar "joint greasing" effect, and that's when I discovered the work of Michael Kjaer at the University of Copenhagen in Denmark.[67]

In the “mechanical” view, training under heavy loads causes damage and carries some non-zero risk of injury, so by extension, reducing training frequency automatically lowers that risk. It’s a simple one-to-one correlation between work done and risk, which entirely depends on the machine metaphor. That reasoning simply didn’t fit with what I found.

Kjaer, who has done extensive work with the connective tissues surrounding our muscles and how they react to physical activity, posits a more likely scenario. Our connective tissues, which include the tendons as well as the extracellular matrix — the layers of tissue which wrap and give shape to our muscles — are not quite avascular (receiving no blood supply) as was once thought. They do have capillaries delivering blood, but relative to their muscles it’s a paltry supply.

Muscles have dibs on a huge share of blood, and when you exercise that share increases by some 20 times. That blood flow delivers nutrients and clears away waste products.

Tendons don’t get that treatment. Kjaer notes that an inactive tendon receives somewhere around 1-3% of the blood flow as the nearby muscle. It’s only during exercise that the tendon sees an increase in blood flow, but even then the increase is remarkably low compared to the adjoining muscle.

You might wonder what difference this makes, although folk-theories of biology hint at how important blood is for living tissues.

In muscle, resistance exercise increases the breakdown of proteins but it also turns the rate of synthesis way up in response. The net result once all that settles down is a muscle with more proteins packed in it — a bigger muscle.

Like muscles, tendons are responsive to mechanical stress. Any kind of stretch or contraction triggers a cascade of biochemical signals which in turn triggers protein synthesis. Muscles build more of the contractile proteins actin and myosin. Connective tissues build more collagen.

A tendon which is being loaded regularly is receiving a regular supply of blood, and that in turn keeps collagen synthesis humming along. Collagen synthesis means that the tendon can heal from damage and, like muscle, can reinforce itself.

The opposite holds true: a tendon which isn’t receiving blood is a tendon which isn’t synthesizing collagen. While loading a tendon increases collagen repair, likely by way of increased blood supply, inactivity does the exact opposite. In animal studies, an immobilized tendon gradually becomes weaker and more prone to injury.

In humans, endurance training stimulates specific changes in tendon strength which are probably due to increases in blood flow, and the loading of strength training does even more. There’s a reason that old-timers said that lifting maximum weights would build “attachment strength”. These were the same old-timers who lifted regularly, rather than squatting once and letting everything waste away for the next week.

Loading a specific tendon — say the quadriceps tendon — only once a week means that the muscle will heal up just fine. Blood will pump in and out, and even though you’ll be sore and stiff for a few days, the tissue will restore itself.

The poor tendon, all it got was a brief spike of blood while it was massively loaded, and

then the next week was spent rotting away with no way to repair itself. Lack of oxygen eventually leads to degenerative changes within the tendons, with a weaker form of collagen replacing the damaged segments. Over time, not keeping your tendons mobile and loaded after strenuous exercise can actually make them weaker.

This means that Broz was largely right. Training hard but only infrequently, with the goal of "getting more rest", actually aggravates joint and connective tissue injuries, doing the exact opposite of what's needed to keep them healthy.

Age is no excuse, either. If you're older, you've got all the more reason to stay active. Tendons stiffen with age as metabolic by-products accumulate in the collagen structure. The stiffening leaves the tendon stronger, but this is a double-edged sword. Collagen turnover is inhibited in the age-altered tendon, leaving them more robust but less adaptable.

Never well-fed even on a good day, the connective tissues virtually starve as you move into old age. You get stiffer, more prone to injury, and in response you do less of the very thing that could improve the situation. We need to keep our joints mobile as we get older, even if that's just body-weight exercise, high-rep work with bands, or plain-old bodybuilding.

As I found, heavy squatting (and pressing and pulling) seem to get the job done too (provided you ease into them).

Given all this, it's no wonder that infrequent maximal training leads to so many injuries. You load up the tendon and then leave it to rot for a week, 10 days, even longer. Linear thinking says that training more often would only aggravate your tissues and add to your risk, but this isn't the case. Tendons and ligaments need movement, and they need blood flushed through them regularly. They need to be exposed to regular activity.

Otherwise you wind up with very strong muscles that can demonstrate amazing strength – and tendons that blow at the first opportunity. As Kjaer says in his papers, tendons need altered loading, not rest. It does you no good to be strong as an ox when you have tendons made of tissue paper.

Be Easy: A Warning for Beginners and Everyone Else

Every so often I hear that pop-quiz question: "If you could go back in time and talk to your younger self, what would you tell him or her?" The implication, of course, is that we could walk back into the past and convey the immense wisdom that we've accumulated, to teach our past selves to avoid all the mistakes we made, maybe steer them on to a better path.

That question makes me laugh, because I remember what it was like to be in Younger Me's state of mind. Having anyone, even a time-traveling Future Me, turn up and tell me this or that wouldn't change a thing about what I felt. I'd have taken my own future advice in the same way I did the advice any know-it-all adult back then.

Some things can't be learned by telling. Some things require a total change of perspective, so completely rewire and reframe your thoughts, that they can only happen with direct experience — or hindsight. Raw information doesn't mean a thing without the right perspective. Information can be taught. Perspective must come from experience.

For the more cynical take, we can't learn except for screwing up.

Still, the question is interesting enough to answer, even if only the slightly weaker format: "what do you think your younger self would most benefit from knowing?"

I can answer that one easily enough.

Patience.

Nature provides the ultimate examples of patience in action. Sandstone formations blasted by wind and water, stalactites in caves, even the eons-long processes of plate tectonics are all examples of minuscule effects combined with tremendous spans of time.

The smoothest pebble took hundreds of years of buffeting by water and jostling by other stones to rough out all the hard edges and sand it down to a fine finish. Adaptations to training aren't much different, though thankfully they operate on a scale friendlier to the human lifespan.

The most useful advice I'd want my younger self to follow: relax, slow down, and let things take shape on their own accord. There's little use in forcing things out, and then stressing out when they don't work out as you planned. Set ambitious goals, yes, but don't let them own you.

We all want results now. We expect to be muscled like an ox and shredded like parmesan cheese in six months. We put 30 hard-won pounds on our deadlift and, right over there, we see the next milestone: 50 more pounds! And, as we're basking in the glow of success, we expect it to fall even faster.

Building a physique takes time. Hitting a triple body weight squat takes dedication and a lot of hard work. These things don't just happen because you've decided to give weight training a shot. You don't reach that kind of strength because you're hardcore and never quit for anything. You don't get there with good intentions and motivational quotes.

Treat training the way the sculptor treats a statue. One chip at a time. One chip is nothing. Put 10,000 chips on the floor and you've made a difference.

Patience.

Back in the first chapter, I mentioned that the graph of progress over time won't be linear. You can't expect to simply add five pounds every workout forever. The graph shapes up like a sine wave, or probably more true to life, the saw-tooth pattern of the Longtails strategy — lots of steady going broken up by sharp spikes and abrupt dives.

We're all susceptible to situational blindness. All we see is the immediate landscape around us. Those last few weeks when you hit a new PR and training has been just so amazing it just has to last forever. That bad day where 80% felt like a ton of slag, and come to think of it aren't you just weak and hopeless?

We aren't good at thinking beyond our immediate context. The progress-chart for your entire career may reach spectacular heights, but at any given moment it's difficult to step out of the frame and see from that perspective. All we see is the new PR or the really crappy day.

We always regress to the mean. Our goal with training is to make sure that the mean trends upwards. The spikes and valleys come with the landscape, and our job is to work with them.

Beginners are, paradoxically, the least likely to need any extraordinary training methods and the most likely to want them. Beginners, by definition, have experienced little to none of the adaptations you'd expect after years, or even several consistent months, of lifting weights.

What I don't want to see is under-muscled people with three months of training behind them trying to copy the daily max strategy and claiming I said it was a good idea. I have two good reasons for saying this.

As I wrote in the first chapter, strength is built on a foundation of muscle. "Neural" training works by squeezing all the potential out of what muscle is there. If you're 6'4 and weigh 180 pounds, or 5'9 and 150 (as a male), I'm sorry to say that you don't have much of an engine to work with. Yes, there are weight classes in strength sports, and yes you can always find some outlier that seems to counter this argument, but if you really were the next Naim you would already know it.

You cannot tease out an impressive strength level from an under-muscled ectomorphic frame. You need muscle. Worry about body weight ratios once you've added some size.

This is not what beginners want to hear, I realize. Young men are particularly susceptible to this thinking, but an increasing number of women are also falling into this trap (which is good on one level, as it means more women lifting weights, but we still need to balance the enthusiasm with pragmatism if for no other reason than I'd like those women to keep lifting instead of becoming disgruntled and discouraged).

My ideas on daily training are not going to match up to the starry-eyed dreams of the fresh and enthusiastic. I'm pushing for a casual, relaxed approach to strength, and if you're not on board with me, you will run yourself into the ground.

There's an inertia to training that can only come from time spent lifting. What I didn't understand as a beginner is that tissues can adapt quickly, but there's also a lot of lag-time, and the delay increases as you improve. Stability-seeking mechanisms switch on and push back against your muscle-building and fat-losing efforts. These set ranges for muscle mass and body fat put the handbrake on, though they never truly stop your progress. All that time you train, you're making improvement at each step of the process.

It may not feel like it. You won't always see changes happening fast enough for that self-portrait satisfaction that we all want. You may not add 50 pounds to your squat and deadlift every year. No matter how awesome you feel after hitting a new PR, you probably won't see another 100 pounds on your squat with just six more months of training.

Enthusiasm is great. You need goals and the drive to reach them. Just don't get so caught up in the hype that you unravel when it doesn't happen, turning into one of those panicky program-hoppers who won't stick to a plan more than a week.

No matter how crappy you feel, whether or not you get the quick emotional reinforcement of new PR lifts, you haven't stopped gaining. Put in five years, ten years, twenty, you'll accrue more potential for muscle, stronger joints, a whole assortment of physiological adaptations that your lesser-trained self simply won't have. Changes in the way your genes express themselves. Changes wired right into your brain and in the structure of your muscle fibers. These processes all take time, and no motivational slogans, no amount of hard work, no drugs, can replace that investment of consistency.

A background of training is an advantage that I could never have imagined as a beginner, and that most people will never train long enough or hard enough to understand. They'll give up before the process really starts.

That's reason number two. Beginner, female or male, you do not have the background to accurately judge this. You aren't tuned in to your body, and even if you are, you're more likely to ignore it and train by your ego. If you can't train patiently, really spend time introspecting and learning when it's go-time, and when it's time to go home, then you are going to fail if you try to lift every day. You will overestimate what you can do, push too hard, and burn yourself out. You haven't learned how to train, and no amount of good intentions will overcome that.

If that describes you — and I mean really, honestly describes you — then you have no business using many of the ideas I've put forth. You can begin the process, make a habit of paying attention to how your sets feel and writing down RPEs so that you learn how you respond. You can practice "training calm" and learning to feel out the difference between an emotional lift and a casual effort.

But training every day, for the beginner, tends to be an exercise in ego rather than productive, progressive training. You probably won't listen — Younger Me wouldn't have — but I had to say it.

10

The Empty Life

"No thought, no reflection, no analysis, no cultivation, no intention; let it settle itself."

—Tilopa

"If it works, it works, no matter what anybody says."

—Franco Columbu

Are We There Yet?

Years ago, when I first set foot in a gym, the bodybuilders were my inspiration. The internet hadn't really hit stride yet, so my sole exposure to weight-training came from fitness magazines, which were overflowing with professional bodybuilders. All the guys I knew were into bodybuilding, and all the alpha-dogs at the gym were bodybuilders. That's what shaped my impressions.

When I say inspiration, I mean that I expected to look that way after some time lifting weights. Six months, maybe a year. Plug away, take these protein shakes and creatine, and you'll be all freaky-muscled with veins and striations. By the reckoning of my 18 year old brain, it made perfect sense.

Needless to say, my expectations weren't realistic. I was all of 125, maybe 130 pounds at that point, of average height, and for lack of better wording, "small-boned".

I didn't have any way to know better. All I knew was that lots of bodybuilders were *there*, muscular and veiny, and it only stood to reason that they'd once been *here*, where I was. My job was to bridge the distance by spending a lot of time in the gym and, as I'd later learn, the kitchen. Simple as that.

And really, it was. Only problem was, I'd set my sights on a mountain poking up over the horizon and convinced myself it was only an hour or two away.

I smile when I think back to those days, when all I had to do was bust ass on this split workout and then, one day, I'd wake up with the physique of a pro bodybuilder. I had no idea how much work, and how many sacrifices, go into a top-quality bodybuilder's muscle and condition. Or the necessity of genes. Or the sheer inertia of experience and practice and background in shaping our adult bodies.

I expected a measly 24 weeks of hard work. I made the same mistake that both genders, at all stages of development and every goal in mind, make: I underestimated the journey and

overestimated my own power to make it happen.

This mistake, which psychologists would call an example of the planning fallacy, is but one of the many forms of biased thinking we know as a positive illusion. Your brain is wired to think in a way that bends reality to your needs.

You will overestimate your chances. You will ignore the statistical likelihood of achieving what you say you will achieve. You will believe that you are the exception and the outlier. You will ignore the contribution of environment and circumstance — otherwise known as "luck" — and give undue credit to the role of your own unique talent in your success. You will base your expectations and beliefs on the world around you: who you hang out with, what you read, where you train.

Back in Chapter 3, I mentioned that our minds can be divided, roughly, into two modes of thought. There's the rational System 2, conscious, reasoning, deliberative, and much like a tiny rider sitting atop a two-ton elephant. And there's the emotional System 1, unconscious and intuitive and, while relatively simple, the dominant partner.

The elephant is a pattern-matcher. It connects and associate related objects and events. When I say "apple", the words "fruit" and "red" come to mind easily. This is a remarkably effective approach for what unconscious mental drives are intended to do, which is mainly to make sure we can find food, mates, and danger in our surroundings.

There's only one problem: the pattern-matcher doesn't come with any kind of error-checking feature. To be accurate, any sensitive instrument has to distinguish between, say, the earthquake it was built to measure and footsteps of the technicians in the room. Purpose-built equipment accounts for this and tries to eliminate the noise of randomness; even if the insulation isn't completely successful, simply realizing there's noise at all is an advantage.

Our brain doesn't do that, at least not without deliberate and costly effort. Until recently, with the invention of science and statistics, it had no reason to do so. Out in the wilds of nature, fast, intuitive, and anecdotal thinking is all you need. Consequently, we aren't so hot at telling the difference between meaning (the earthquake) and meaningless noise (the researchers in the lab and the cars outside). We aren't even good at realizing that we don't realize it.

The elephant is concerned with what it can see and what it can turn into a story with obvious causes. Facts that we aren't aware of, and facts that disagree with the story we have, are ignored or explained away. The elephant thinks quickly at the cost of accuracy, and, unless we specifically check ourselves — expending energy and effort to think things through — our rider will accept the elephant's conclusions at face value. Being reasonable is costly, and as such most of us are more comfortable thinking emotionally, intuitively, and incorrectly.

Since our brains tend to believe any old conclusion that comes to mind, humans — even intelligent, well-educated humans — believe all kinds of kooky things. Once we've felt out our personal version of the truth, only then do the reasoning processes kick in and explain, in rational terms, why we made the decision.

Objective world or no, a whole lot of things we think and believe and take for granted

are shaped by personal circumstance.

This book has, in its own way, been about *what you believe* as much as *what you do*. Whether you believe that you're in charge and responsible for your results, or the product of favorable statistical outcomes. Whether you believe that overtraining is a crippling malady best avoided and thus justifying plenty of rest, or it's just a transient sensation that goes away with practice. Whether you believe you can get stronger by thinking "practice" instead of "destroy". Whether you focus on every last detail or just go get it done.

This final chapter addresses the worry that made me think twice about writing this book at all: that a good many people just *wouldn't get it*.

Not the part about training often, or training "easy", or even conditioning the body-as-a-whole. That's all evident enough if you follow through my reasoning, I hope. What I mean is that, like young me from above, they just wouldn't *get it*. They'd just want A Program To Go Do and miss out on what I'm trying to say.

My message is, in some respects, hard to put across. It's about how you live, how you relate to the world and, ultimately, to yourself (which I mean literally: your *self*).

Enthusiasm is great, but there's a particular head-space you need to exist within to get "good results", and a lot of people aren't there. One reason is that "good results" has no concrete definition. The other problem is that "good results" are often disconnected from the reality of the situation.

The accomplished athletes you read about generate your impression of what accomplished athletes do. The people you train with, the people you know, the things you read about — these all become the ruler you use to measure everything else.

Statistically speaking, most of your results come from outcomes that you can't control. Your genes and epigenome. Your family life and culture. Your personality and tendency to behave in certain ways. The deliberate steps you take to improve, in comparison, have a depressingly low correlation with absolute results. Nearly everything about your life besides your training program and your diet affects your results more than those two things.

About all you can do is show up and train. If everything else falls into place, you succeed. If not, you don't.

But that's not how we think. We think that our training and talent and work ethic make us great and strong. Admittedly that sounds much better than "I was born with the right genes and right life-circumstances and was afforded the right opportunities due to a sequence of chance events", even though that statement is arguably much closer to the truth. Our brains like the illusion that we're in control, so that's what we believe. That's the myth we tell ourselves and each other.

I realize the immediate and intuitive reaction to that idea is not pleasant. Chances are you got a little angry, felt a little twinge of helplessness, or dismissed the whole idea when you read that you aren't responsible for your success. Maybe a little of all three.

After all, you work hard. You train your ass off and sacrifice all kinds of fun to hit the gym and stick to your diet. You feel great and look great and obviously this cannot be the right answer. And, if outcomes are mostly down to blind chance, and our beliefs about work

ethic are just delusions, then why try at all? Just do whatever and you'll get what's coming.

That inevitability is exactly what I've spent this entire project trying to argue against. That sounds nonsensical after I've just said that, by and large, it is exactly that. And yet, while the belief that you're capable and in control of your life may be unlikely, it's also powerful and deeply ingrained within us. That belief runs so deep that you instinctively recoiled when you read the paragraph saying it wasn't true.

Getting angry or depressed or arguing over genetics versus work ethic is beside the point and I don't care to address it. In fact, I think setting up the argument on those terms is the entire problem.

Whether you're a successful champion who believes that work means more than gifts, or the underweight beanpole who's resigned to genetic fatalism, you're both wrong by some degree. No champion is there solely because of his or her willpower or work ethic or determination. No "hardgainer" is there solely because of his or her genes.

To me the more interesting question is how we can reconcile both sides of this puzzle — or better yet, how to redefine the whole problem so that it isn't a problem at all. How can we accept biological inevitability, and yet take back a sense of control and purpose? How can we use randomness and our optimistic biases to our advantage, instead of falling victim to ego-stroking or bitterness when you realize that you probably won't achieve certain goals?

That all comes down to how you define "results" and what you expect out of your efforts. Understand the mindset and you can make anything work.

Totems and Training Wheels: A Case For Optimism

Jamie Lewis, who we met back in the first chapter, trains without holding anything back. He's in the gym most every day of the week, sometimes twice, lifting as heavy as he can stand. The work is brutal, but undeniably effective.

What sticks out to me isn't Jamie's training. He's unorthodox, to be sure, and he's got the results to back it up, but what really stands out is how he came to his workouts rather than what they are. He pulls no punches when it comes to criticizing the status quo, and takes a special joy in destroying commonly-held dogma about taking it easy.

A lot of readers would focus on the hard-nosed attitude and, as pale imitators, try to bring it to their own workouts. There's no harm in bringing a devil-may-care attitude to your training, but that misses the point.

It's not the flippancy or the "who cares?" attitude that brings results, rather than the mentality that leads to it: focusing on What Matters and ignoring everything else. You can be flippant about overtraining once you realize that it has no importance to your lifting.

That's really what separates this crowd of results-getting strong people from the mass of would-bes in the gym. It's not what you do or what you say, it's why you're doing those things at all.

Call it motivation. Call it enthusiasm or positive outlook. Call it belief if that's what you prefer. These people all have their head in what they do, and never look back. They do more than just believe in their training. They throw themselves in and never let a doubt enter their minds.

No second-guessing, no jumping to next month's new 16-week program.

These people didn't get strong because they picked up a new badass workout. They did the badass workout because that's what gets the job done, overtraining be damned.

Do our beliefs really affect our training like that? Might it be the other way around, that these people are enthusiastic and mentally zeroed-in because training goes good for them? Are they outliers after all, and the attitude only reflects their self-biased thinking?

Maybe. Probably. We can't rule out the effects of genes and circumstance on final outcomes. But, given all we've seen so far on the tight relationship between our bodies and our psychological condition, I'm more inclined to treat the attitude as more cause than effect.

What you do with what you've got depends on you.

❧

Beliefs are powerful. So powerful that researchers involved in drug and medical trials will tell you that the placebo effect is their worst enemy. Even researchers can fall for it, which is why the double-blind experiment — where neither subject nor experimenter know exactly who has what — is a standard. The things we want to believe have a way of creeping

into reality, making it hard to determine what's a real effect of the pill you've been given and what's the seemingly magical power of mind-body healing.

A placebo, a Latin word meaning "I will please", is otherwise known as a sham medical intervention. Doctors tell their patients a little white lie, making the patient believe he's being treated, and surprisingly enough, the fake treatment works as well as (or, often, better than) the real thing.

The classic example is the patient who desperately wants a pill, anything to help fix them up. The doctor grudgingly writes a prescription, and the patient goes on his way. A few weeks later, the patient comes back for a follow-up and he can't hold back his excitement.

The pills worked like magic, says the patient. Nothing unusual there, except that magic medicine was a sugar pill.

The placebo effect happens when patients believe they're undergoing a treatment meant to cure them. Even though the pills are just plain table sugar in a capsule, the patient gets better. This happens across a bewildering range of treatments and medical interventions, to the point that we cannot ignore it as a potent force in our state of well-being.

The placebo effect may frustrate clinical trials, but look at it from the patient's point of view and it's a kind of magic. Improve your health, and do so without drugs or surgery? It sounds like witchcraft.

This remains a poorly-understood process, but what we can take away is that the meaning — the ritual, the ceremony, the cultural importance — of any treatment we use is as important at the treatment itself.

Psychological outlook often matters in subtle ways. Robert Sapolsky mentions that feelings of control and predictability, along with social support, are the best ways to diminish an overactive stress-response in the chronically stressed, as one example. Other research shows that feeling motivated and in charge — called self-efficacy — with a positive outlook similarly affects your physical responses as well as your likelihood of sticking with a diet or exercise program.

If you're lifting weights or training for a marathon or just trying to get through the work day, it's important to believe you're in control so that you'll show up — and while you're at it, you decide to eat better since you're training, after all. Whether you actually are in control is beside the point.

From the standpoint of science, determining whether a treatment actually works or is just a matter of statistical noise is paramount. You have to be cautious and skeptical, and that in turn means approaching results with a reserved bearing. We weight-training and casual-exercising folks, we're concerned with results, and the strict correctness scientific specifics (beyond a point) isn't our concern as long as the end results are there.

You could "be honest" and tell yourself that you're not in control and at the whim of your genes, but to what purpose? You've adopted a mindset, one which may or may not be accurate, and have made that your reality.

The placebo effect doesn't mean that any old thing will work, but it does mean that our

beliefs, and the cultural rituals and totems that give them meaning, can enhance an already effective treatment.

If one thing's clear, whatever the common features are among successful athletes, obsession with minutiae isn't one of them. Does it really matter, from the standpoint of achievement and satisfaction, whether or not you're doing things "wrong"? Is that really the yardstick we should use?

Certainly it's sensible to take a critical look at your training and diet when you aren't getting results. When a skinny kid tries to gain weight with six meals of chicken and broccoli, when an overweight person tries to run marathons to leanness, then it makes sense to question and take a more science-informed approach.

There are objective facts about the human body and how it responds to exercise and feeding. Once those bases are covered, however, I don't think there's much use from zooming in even further in hopes of finding extra layers of efficiency. The tangled networks of biochemistry have little to say about the outcomes of workout programs or diets. There's too large a gap between the knowledge and its application.

Once the objective knowns are in place — and there are surprisingly few of these — there's just too much noise for words like "right" or "wrong" to apply.

We'll find patterns in the randomness, though. We'll believe that low-carb diets control insulin and make us leaner regardless of calorie intake. We'll believe that doing this tones up our abs, or doing that gets you a big squat. We'll always be able to construct a meaningful story out of meaningless correlation.

I think that the story is, in many cases, more important than the correctness provided it keeps your head in the right place.

Randomness works both ways. You can choose to see it as depressing and removing your power to act, as in the case of the hardgainer's "bad genetics" argument. If randomness drives the outcome, then your actions don't determine whether you hit a 1000 pound squat or reach 250 pounds at 5% body-fat, no matter how hard you want it and how hard you work. Why bother?

But there's an upside. You don't have to spend 20 hours a week going over your program. You don't have to spend $500 a month on magic supplements. You don't have to eat nonsensical diets to be lean and hold a healthy bodyweight.

Thanks to randomness, the details don't really matter that much. What you do, what you don't do, it's mostly beyond the threshold of importance. It won't make any difference to your results. This includes most supplements, most dietary strategies, and even most training methods and programs.

There are basics that should be in place but the rest doesn't — cannot — matter to your results. If it works, it works.

The way we navigate ourselves through our variable world, that might be important. And arguing about how "right" it is may be against your interests.

In her book *Mindset*, Carol Dweck of Stanford University's psychology department tells of an experiment in which school children were more willing to cheat on a test they believed to be important. This would be unwelcome news in any case, but there's a catch. Before the test, some of the children were asked about what they thought of people. Can people change, or are your skills and talents — like being good at math tests — fixed at birth?

The children more willing to cheat tended to believe in the latter. Only the outcome matters. The steps you take to get there mean nothing compared to being a loser. These results have been tested time and again by Dweck and her colleagues, and they formed the basis of her book.

Dweck's research has revealed that people tend to operate under one of two distinct belief systems, called lay theories of talent. Those with a *fixed mindset* operate on the belief that people don't change. Talents and abilities are hard-wired into us. Success and failure aren't matters of circumstance or luck, but directly connected with who we are as individuals.

Individuals with a fixed mindset tend to be very competitive, willing to do anything to win. That sounds like a recipe for a motivated achiever, but it comes with a critical flaw. When you fail, you didn't simply fail at the task — *you* failed, and you failed because you weren't good enough. Since people can't change, failure is the end of the line. Why try again, or try harder, when failure is intrinsic to your character?

The second category operates under a contrasting *growth mindset*. Unlike their counterparts, the growth-minded operate on the belief that people can and do change, even substantially so, with effort. The focus shifts away from traits of character and instead centers on work ethic. The growth mindset views success as a product of effort, and failure, rather than a personal flaw, is an opportunity to learn and try again.

Dweck's research reveals a consistent trend. In virtually every instance, growth-minded individuals out-perform their success-driven counterparts. The people who focus on the *doing*, rather than the *achieving*, tend to get better results. The fixed mindset creates a ego-preserving need to win at any cost, to the point that they don't want to accomplish so much as they want to *have accomplished*. From a psychological perspective, this little detail makes all the difference in getting it done and giving up at the first hiccup.

Dweck's work with children, athletes, and high-powered executives has repeatedly shown that our beliefs in the "fixedness" of human characteristics matter, regardless of the reality.

Even "success" and "failure" depend more on the person than the situation, according to what we believe about the nature of ability. There's more going on than feel-good self-esteem building. Beliefs matter. The mind becomes what you put in it. Success isn't just about *who you are*, but *who you think you are*.

Optimism, regardless of any other traits, is a precondition for success. The optimistic are more likely to take risks. The optimist is more likely to persevere in the face of daunting odds and outright failure. For mutual fund managers and hopeful entrepreneurs starting a small business, this kind of optimism can lead to ruin. For a strength athlete, it's the recipe for success.

I'm not saying you can wish yourself to a Mr. Olympia title or believe your way to Olympic-caliber lifts. I'm not saying that any stupid fad workout that mangles exercise science will be effective just because you believe in it. Nor am I talking about a "law of attraction" or any other confused New Age butchery of quantum mechanics.

All I'm saying is that, given two hypothetically identical people and the same physical exercise program, the results might be wildly different according to their perception of the situation. Absolute outcomes may be largely determined by luck of the draw, but where you get relative to your own potential is a matter of attitude.

In a 2010 paper, Veronika Job and Gregory Walton along with Dweck tested whether or not a belief in the scarcity of willpower could affect ego depletion. Across several studies in a laboratory setting, they found that only people given the belief in finite willpower showed any signs of exhausted ego after a demanding task. Once out in the real world (students preparing for final exams in this case), the more people believed in limited ego reserves, the poorer their self-regulation in demanding conditions.

Based on their findings, they suggest that ego depletion may not be exclusively physical exhaustion, but also dependent on *the belief that you are exhausted*.[68] That throws an interesting curve-ball into the argument that willpower is an entirely physiological phenomenon, and we'd do well to remember that. The line between physical and mental remains blurry and determining what causes what is complicated on a good day.

How much do you poison yourself by dwelling on "genetic potential" and training by a philosophy of what you *can't* do? You believe in your poor genetics. You believe that you need a special "hardgainer" workout. You believe that it's normal to struggle squatting your body weight. You've bought in to your own mediocrity, judging yourself according to what speculation and quasi-scientific theorizing tell you "should" be happening.

You cannot buy in to that set of ideas without implicitly accepting that you are genetically unfit and destined to be a puny weakling no matter what you do. That might be the practical viewpoint. It might even be "right" in the strictest biological sense, but it isn't useful.

When you train because you enjoy it and believe in what you're doing, you'll work hard at it. You don't miss workouts. You push harder and give it an honest run. Even if the training isn't "perfect" it yields results through consistency. *Perfect* is not a word that applies to biological systems in the first place, so there's little hope that numbers you write down on a page could fit that.

Your thoughts and beliefs matter. Your surroundings — the people we train with and the places we train in and even the things we read — all influence you. Even the words we use to discuss training all matter. The story you tell yourself shapes your actions, and when your story is only about limitations, failure, and doing less, that's your world. That's what your actions will reflect.

You might surprise yourself with what can happen when you get away from poisonous thoughts and poisonous people. Likewise, the best way to shape your beliefs is to hang around other people who believe and act the way you want to act. That means a team or training group or a good coach. At the least, it means immersing yourself in the activity,

living it and breathing it.

Success happens when you do for the sake of doing. Success happens when you see outcomes as a result of effort, practice, and consistency, rather than the exclusive province of natural talent. When you believe in what you're doing, when it provides visible, concrete results, when you enjoy it, when you're consistent and make every workout, when you're motivated to train and love your training, that's buy in. And when you buy in, regardless of what you believe about technical correctness, you get benefits.

In an earlier draft, I'd written a much longer section about the influence of culture in shaping your worldview. As an example, I'd compared the typical American-style of training to the Russian approach, or at least what Westerners think of as the Russian approach. As long as I've been around the strength community, lifters have wanted an edge from exotic foreign programs. Back in the 90s, it was the Russians and Bulgarians. Now it's the Chinese, the Bulgarians again, and whatever country turns out an Olympic champion.

We all want a peek at what the Other Guy's doing in the gym.

The idea that the superficial — the program, the supplements, the diet, maybe even the genes — isn't important has been the overarching theme of this book. Details don't matter. Every other part of your life, from birth onwards, from your emotional relationship to sport to the time you spend training, matters more than any of the shallow stuff.

Americans grow up in an American culture emphasizing specific values of personal liberty, individuality, and a self-oriented worldview. During the Soviet years, Russians grew up in a Russian culture with capital-C Communist features, a worldview far more collectivist in nature and emphasizing the good of the whole, where the individual fit like a piece in the larger social machine. [69]

Could we take a superficial feature of that Russian system, one of their training programs or a coaching style, and transplant that to an American sports program? Many have tried, but I wonder how successful you can be in translating workout styles and coaching philosophies across a cultural gulf.

The Russian sporting system, according to every account I've come across, was and remains structured and regimented as befits a machine-like approach to the world. Youngsters were identified as "talent" as early as ages of 6-8, encouraged in the equivalent of PE classes and funneled into development tracks that would eventually guide them through adolescence and into the more specific and demanding training of early adulthood (and hopefully a gold medal or two).

In his book *Powerlifting*, coach Boris Sheiko relates much the same story. Powerlifters in modern-day Russia start training for the sport around 13-15 years old. At that age, the training is all practice and technical development. As they get older, the groups reach new levels of qualification and the training becomes more challenging. By the time a group reaches their early twenties, their workouts resemble the Sheiko templates floating around the internet.[70]

Sheiko's got a whole process spanning years, organizing lifters of similar skill into groups focused on monotonous development — deliberate practice — that depends on the lifters self-coaching and keeping each other motivated. Is it any wonder that the Russians dominate the IPF at the international level?

Westerners don't train like Russians because Westerners didn't grow up in Russia speaking Russian with a Russian mindset developed out of Russian history. Russian and Eastern bloc powerlifters aren't brutes because of the program they use but because they've been training with machine-like regimentation since they were children, in a culture that promotes and supports those values.

What's the workout program compared to all that? What's it mean to pick up Sheiko #29 and do it for a cycle or two without the 10 years of dedicated practice and development behind you?

Are you going to get anything out of daily squatting, or daily anything, if you bring your shortcut-taking, results in a pill, time-efficient bargain-hunting baggage in with you?

Are you going to get anywhere if you surround yourself with Hardgainer books and sour has-beens who won't lift more than twice a week, but still have plenty of energy to spend hours explaining why hard work is bad for you?

My guess, as you might easily predict, is "no".

Training styles and methodologies and programs reflect an underlying belief that may not be evident from the program itself. If you get on board with that set of values, then you're gold. If not, then you wind up missing the whole point of the exercise.

It's not just programs that fool us. You might have noticed that I wrote a lot of words about science in this book, what I hope was a reasonably detailed account of how your body works, how it works under pressure, and how it makes you believe things which may not be true.

You now have a different way of looking at all these things you've probably taken for granted, calling into question the entire notion of "recovery" which you've internalized since your first day in the gym.

All that material gives you *reasons*. You can understand what your body's doing and explain it with a compelling scientific argument. You can tell yourself, on those dark days when you feel horrible but you're going to squat again anyway, that this isn't a recovery problem as you might have once believed.

The technical stuff is here entirely to give you a grounding in those concepts, and that grounding is what lets the whole process work at all.

Don't get me wrong, I haven't fed you a line of garbage, not by any stretch. What I've given you is legitimate research, and you can check it — and my conclusions — for yourself, which is why there are references. But now you've got a way to construct a "recovery theory", to believe that training often can work.

That's what will make it work.

Like a Still Pond

What worries me most about recommending full-throttle train-every-day kind of lifting is not the physical symptoms of overtraining or risk of injury or any of that. I don't think any of that stuff really matters, and to the extent it does, it's not because the training is intrinsically dangerous or harmful.

What worries me is what you can see on any short drive or in any shopping mall or supermarket. Inattention. Cluelessness. Going through life as an unfocused zombie with an unsharpened mind. That's dangerous.

Act with intent. Focus your attention on the task at hand and cultivate self-discipline. Make the effort without making it effortful.

Most of us don't do that. It's not something we're taught and, without a lifetime of practice, it's not easy to do.

I'm talking, on the one hand, about *mindfulness*, what practitioners of Buddhist meditation would call experiencing the "not-self". Existing fully in the moment. No distractions, no attachments, no ego or sense of self. Just being.

I'm also talking about the awareness and intention that comes from that state-of-being, when you're able immerse yourself in the activity so completely that you lose yourself along the way. Buddhist monks take walks or even do manual labor in order to experience that state, what they call "walking zazen".

It's about relaxing, letting go, and losing yourself in the doing of the thing. No emotion, no effort. Just doing.

Mindfulness techniques, which are really just meditation without the religious or metaphysical aspects, are becoming increasingly popular as stress-relief methods and as part of well-being programs. Dr. Jon Kabat-Zinn, who has spearheaded much of this movement, has written several books about his Mindfulness-based Stress Relief program, as well as several journal articles published in reputable journals that validate the idea.[71]

You just sit, without judgment, and breathe.

Relaxing, removing the self, and focusing your attention are all facets of the same process. You're literally changing the way your brain works, as measured by autonomic function — mindfulness programs really do reduce stress — and there are some hints that this, too, may lead to long-term "wired in" changes in your brain.

You can learn to be cool under fire. That's what Abadjiev thought was necessary: be cool and keep the aggression for the bar. The inability to do this is what stress research suggests to be perhaps *the* defining problem in our modern world, and why you have such a hard time lifting weights more than twice a week.

Our minds are as out of shape as our bodies.

Reversing that decay means learning to pay attention, live in the moment, and immerse yourself in the doing.

Hungarian-born psychologist Mihaly Csikszentmihalyi (pronounced chick-sent-me-

high-ee), one of the preeminent researchers in the field of positive psychology, studies artists, writers, musicians, and yes, athletes. He's especially interested in this exact state of mind: the cool, relaxed, doing-it-to-do-it mentality. Csikszentmihalyi's most well-known work, summarized in his book *Flow: The Psychology of Optimal Experience*, is a look at exactly what the title says: the focused, immersive, almost timeless experience that happens when you engage in a task. He describes flow as

> *Being completely involved in an activity for its own sake. The ego falls away. Time flies. Every action, movement, and thought follows inevitably from the previous one, like playing jazz. Your whole being is involved, and you're using your skills to the utmost.* [72]

Focused motivation. Immersion. In the zone. All of these describe that state of being where you lose your self in the doing, a state much like that achieved by meditating monks or participants in mindfulness programs.

The flow experience requires a balance between effort and ability level. You need clear goals, clear feedback, and a sense of control over the outcome. You need to enjoy the activity. With these factors in place, you can focus to such a degree that you lose all awareness of your body or the time. You literally lose yourself — your sense of self — in the activity.

Csikszentmihalyi notes that there are personality types, or at least personality traits, which make the flow-state easier to achieve. People who are naturally curious, persistent, who enjoy doing for the sake of doing, and those who are less driven by ego or self-centeredness find the flow-state to come easy. He calls this the "autotelic personality", literally "having a purpose in itself".

As we've seen, there's likely to be a strong connection between your possession of these traits and the biological machinery inside your skull. But if you aren't automatically a cool immersive personality, there's no reason to think you can't practice that, too.

These are exactly the things we want to happen with quality training. You want to move the weight aggressively, with snap, and you get instant feedback through the RPE score. You want to make your sets challenging enough to test you but not so overwhelming — emotionally or physically — that you feel out of control or don't have fun with it.

Japanese martial artists are said to enter a mental state called *mushin no shin* during combat, which loosely translates to "mind without mind". A mind free of ego or fear or judgment. No attachments. Just being.

You relax, go into the state of total concentration and immersion, and just do. You move with intention, but automatic, intuitive. Effortless effort.

The weights you use from day to day are not important. Relax and let strength happen. Let it come to you. Progress takes care of itself when you allow gains to happen. Lots of little changes add up to big numbers.

Forget all the Musts and Shoulds.

Some workouts will suck. Some workouts will be amazing, leaving you feeling like Superman. Most will be mediocre — and that's okay. Lots of mediocre workouts mean

progress over time. Strength happens as a consequence of patience and gradual, consistent improvements.

Don't force gains out. Allow them to happen.

Bad day? So what? Good day? So what?

Relax and let it happen.

Quality training is about an optimal experience.

It's easy to get emotional about your training, but we can forget that staying cool means learning to relax outside of training too. I can't emphasize this enough. It does no good to nail down your focus in training, to learn how to switch on and then wind back down, to fine-tune your daily intensity and volume, only to spend the rest of your day as a neurotic mess.

Recoveredness has as much to do with your overall state of being as it does with your time in the gym, and as I hope you see by now, your mental attitude is an extraordinary influence on that state of being.

Being cynical, depressed, and generally grim about the world may be all the rage these days, but the price is a self-fulfilling prophecy. Your thoughts follow your thoughts, and giving in to the dark cloud only guarantees that you'll face a dark cloud.

Wrap yourself up in a goal and you become it's slave. If the goal is modest and achievable, this is fine. Often it isn't. You overestimate your chances of getting there. You take it personally when you don't make it, and even if you can gut it out, you're living under constant pressure. You want to have achieved, rather than doing the things that leave to achievement.

Setting an unlikely goal and then hedging all your bets on it will lead to disappointment. When optimism crosses the line into blatant self-delusion and your ego rides on the outcome, you've already failed.

Optimism has to be balanced with rationality and cold pragmatism. Otherwise you wind up like the fixed-mindset children: you want to serve the ego, hit those big numbers, and you forget all about the enjoyment of doing.

Forget the goal, take your self out of the equation, and just train. Immerse yourself. Center your workouts on effortless effort. Seek optimal experience. Be mindful. Do what happens and nothing more.

You just go train, and forget the rest.

It's possible to construct a story about how these methods — meditation, mindfulness training, the flow experience — work in scientific terms. It all connects back to the biology touched on in earlier chapters. Allostasis. Central fatigue. Ego depletion. The interconnection between mental state and physical state. The placebo effect.

Jean-Paul Sartre wrote that mind is*nothing*. Mind is no-*thing*. Mind is, instead, a process of looking outward. It becomes what you put in it, it goes where you send it.

Where the mind goes, the body can follow. No magic, no voodoo, no supernatural forces: just the conjunction of Self and Body.

When you switch off and "just be", you're taking your cognitive self-regulation out of the process. You're not getting emotional and setting off (or aggravating) the stress-response. You aren't fighting against your body, introducing an artificial distance between Mind and Body. You aren't thinking about the thing, forcing yourself to do it, or stressing out over minor details. You just go do it, and enjoy the act of doing.

Everything else flows from that.

External cues and structure, in the form of programs and training cycles and team mates, keep us on task, off-loading our decision-making needs and freeing up our self-control reserves. That's important. The structure keeps you motivated and effortlessly focused. It's why the Russians can train on systematic, methodical programs. It's why others can thrive on autoregulated programs. It's why still others need the comfort of exercise lists and spreadsheet-planned percentages.

None of these are right or wrong. All that matters is effectiveness.

These workouts aren't just meaningless rituals or superstitions. They serve a purpose: they focus you and discipline you. Pre-workout rituals, training partners, teams, and coaches, even the habit of going to train all creates a structure that you operate within. Meditation, mindfulness, the flow-state, these all indicate that head-space where quality work is being done. These strategies are all about imposing a sense of order on your self.

It's easy to forget this. Year after year, new fads spring up. Trends come and go. It's easy to forget what a program or method is really about.

When you train, train. Don't go through motions. Don't train on feelings. Go in with intent. Whatever you do, make it *work*.

What you believe about your training matters. What you believe about your recovery abilities — or the non-existence of recovery as a concept — matters.

Train your body and train your mind, together, and you can surprise yourself.

❧

GO SQUAT.

Notes

1. From *Iron Man Magazine*, April/May 1952.
2. Ditillo wrote two books, *The Development of Muscular Bulk & Power* (1971) and *The Development of Physical Strength* (1982) , which are sadly hard to come by now. More accessible writings can be found in his MILO articles and through online collections.
3. From "Adaptability" by Anthony Ditillo. Available at: http://ditillo2.blogspot.com/2008/04/adaptability-anthony-ditillo.html
4. From Bud Charniga's 1989 interview with Taranenko, available at: http://www.dynamic-eleiko.com/sportivny/library/news/nv005.html
5. From Siff (2000).
6. See Ramachandran and Rogers-Ramachandran (2000). They describe the "body image", how the activity of the brain's sensory maps creates our conscious perceptions of bodily experience.
7. From Hebb (1949). Hebb would go on to be proven right by modern neuroscience, which demonstrates that the human nervous system, including the brain, has a higher degree of plasticity than earlier findings had presumed.
8. From Tsatsouline (2000). Pavel's "neural" style of training heavy and often, while staying away from fatigue, has been a major influence on my thinking.
9. From Siff (2000).
10. A surprising amount of research shows that skill isn't just about the gross movement through space, but that you have to "learn" the speed and resistance as well. See Carroll et al. (2006), Griffin and Cafarelli (2005), Jensen et al (2005), Adkins et al. (2006), and Flanagan et al. (2012) for examples.
11. You have to wonder what good it does to "work on form" by squatting with 70% weights when your goal is to lift as much as you can. You might as well go bench press or run a marathon for all that translate to strength with the heaviest weights.
12. See Ostrey et al. (2010). Feedback between the sensory and motor systems "wires in" changes to the brain as we learn.
13. From Yessis (1987).
14. From "Elevating the Peak of the Pyramid" by Bill Starr, in *Iron Man Magazine*. Available at: http://www.ironmanmagazine.com/only-the-strong-shall-survivebr-elevating-the-peak-of-the-pyramid/
15. See the slew of Sheiko spreadsheets on the internet, as well as the (bad) translation of

his book. A little time spent working through the translations makes this more productive than muddling through Google's ugly job.

16. See Jamie's blog at http://chaosandpain.blogspot.com Not always safe for work, but always entertaining.
17. See the project website at http://www.styrkeloft.no/nyheter/frekvensprosjektet/1437-resultater-fra-frekvensprosjektet Bring Google translate if you don't speak Norwegian.
18. From Feynman's lectures, collected in *The Character of Physical Law* (1967).
19. I declined to elaborate on the details of this in the text because that discussion would quickly get out of hand. For any interested readers, there is a staggering range of scientific and philosophical literature on both chaos and complexity. Recommended starting points are *Chaos* by James Gleick (1987) and *Complexity* by M. Mitchell Waldrop (1992) .
20. See everything with Bruce McEwen's name on it.
21. I am also indebted to Sapolsky, particularly his book *Why Zebras Don't Get Ulcers*, for perspective on these matters.
22. See Calvert and Banister (1976), Banister and Calvert (1980), and Banister et al. (1992). The notion of fatigue as being just one part of a complex series of biological processes has been central to modern ideas on program design.
23. See Busso, Candau, and Lacour (1994).
24. See Rhea (2003) and (2004), Peterson (2004), and Wernbom (2007).
25. From Siff (2000).
26. For a quick look, see Pendlay and Kilgore (2001). A more technical treatment is in Hartman, Pendlay, and Kilgore (2004).
27. Personal correspondence.
28. When trained to an unholy excess, a muscle's fibers can actually be killed off in a process called cellular necrosis. When a living cell dies, it deflates like a balloon and dumps its contents into your blood. In small amounts this is a normal part of your daily life-processes. When it happens to a lot of cells at once, those cellular by-products flood your system and become life-threateningly toxic.
29. From Zatsiorsky (1995).
30. From Moravec (1988).
31. See Kahneman's excellent book *Thinking, Fast and Slow* (2011) for a detailed account of how your mind works (and deceives you).

32. Damasio wrote a couple of books about the connection between emotion and decision-making. See his papers with Antoine Bechara for more technical accounts.
33. See Gibson et al. (2004), Lambert et al. (2005) as well as all of Noakes's citations for an introduction to the central governor. For a counter-point, see Weir et al. (2006) and Marcora (2008).
34. See Marcora et al. (2008), Marcora, Staiano, and Manning (2009), and Marcora and Staiano (2010). Marcora (2008) is also a strong criticism of Noakes's central governor hypothesis.
35. Also see Mehta and Agnew (2007) for more on the way cognitive effort and physical effort seem to run on the same equipment.
36. And again see Williamson, Fadel, and Mitchell (2006) for another perspective on the interplay between cognitive and motor fatigue.
37. The literature on loss of motor output thanks to central fatigue processes is literally too large to cite it all. I'd suggest starting with Enoka (1995) and Gandevia et al. (1995) for an overview, and then reading the work on supraspinal fatigue and intracortical inhibition done by Simon Gandevia and Janet Taylor, starting with Taylor and Gandevia (2008).
38. Meeusen et al. (2006)
39. Meeusen et al. (2007)
40. See everything with Baumeister's name on it, or Hagger et al. (2010) for a meta-analysis. A good lay-intro can be found in Baumeister and Tierney (2011).
41. See Martin-Ginis and Bray (2010).
42. See Segerstrom and Nes (2007) and Reynard et al. (2011) for a look at HRV and self-regulation.
43. Kagan's work on neurological reactivity is extensive. For further reading, I'd suggest beginning Kagan, Snidman, and Arcus (1998).
44. See Knab and Lightfoot (2010). This is the only work I was able to find connecting the reward-seeking pathways to voluntary movement, but the relationship makes sense based on everything else we know about these regions.
45. The amount of dopamine we produce, the type of receptors we have, and how long it hangs around all seem connected to our degree of wanting and liking — for drugs, food, sex, gambling, and many other things. Dopamine activity is considered a major driver of activity in mammals thanks to its role in these behaviors.
46. See Marshall, McEwen, and Robbins (2011).
47. Boeckmann's books are hard to come by, and I get the strong impression he was

something of a carnival salesman as far as the huckster-ish vibes given off by some of the old advertisements, but there is no doubt he was on to something about keeping "nerves" under control.

48. See Reynard et al. (2011) and Segerstrom and Nes (2007)
49. See Dantzer (2001) and (2006) for reviews of the connection between the innate immune-system response, sickness behavior, and depressive symptoms.
50. See Armstrong and VanHeest (2002) for the similarities between overtraining syndrome and major depression.
51. See Smith (2001), who originated the cytokine hypothesis of overtraining. Smith (2004) also proposes a connection between tissue trauma and overtraining symptoms, through this same mechanism.
52. See Braun et al. (2011). The brain is the master controller, and the various chemical signals do its bidding.
53. Borrowed from Ramachandran's *The Tell-Tale Brain* (2011).
54. Ericsson's writings on the topic are extensive. See references for more.
55. See Morsella (2005) and Bargh and Morsella (2008).
56. Borg's original 1962 paper on the subject was his doctoral thesis. He has since written more about RPE in conjunction with his daughter Elisabet.
57. See Kristen Lagally's work, as well as Day et al. (2004) and Gearhart et al. (2001) and (2002).
58. From Poletayev (2005), available at Sportivny Press: http://sportivnypress.com/documents/75.html
59. From Ditillo's article "The Single-Rep Principle", available at: http://ditillo2.blogspot.com/2008/02/single-repetition-principle-ditillo.html
60. An analogy I've borrowed from Eric Liu's and Nick Hanauer's wonderful book *The Gardens of Democracy*.
61. If you haven't read Taleb, please do so as soon as possible. So much of the thought processes in this book will click together in a deep way after reading *Black Swan* and his newest work, *Antifragile*.
62. I'm only partly kidding here. I leave it to your judgment as to which part.
63. Spassov's articles on the Bulgarian system were posted in the NSCA's Strength & Conditioning Journal back in 1988.
64. I wanted to say more about both of these routines as they are quite intelligent, but I decided to leave that discussion for another time just for the sake of brevity. I do

think that there is something to at least the regular inclusion of unusually high frequency for the purposes of physique-buildling, although it would look different from the daily-squatting setup. Both HST and Hernon's workout methods can be found online, and they're worth a look to get the gist of it.

65. Borge has done a lot of writing on Myo-Reps, and I think it's a solid system. Have a look for yourself: http://borgefagerli.com/myo-reps-in-english/

66. See Broz's post at http://forum.bodybuilding.com/showthread.php?t=121212081&p=433631911&viewfull=1#post433631911

67. See Kjaer (2004) and Kjaer et al. (2006) for lots of goodness about how tendon health seems to depend on activity.

68. See Job, Dweck and Walton (2010). Although Baumeister's work seems to suggest a purely physical cause, findings such as this call into question the actual cause. It isn't clear whether glucose depletion (or neurotransmitter activity, for that matter) is actually causing us to become ego-depleted, or whether those physiological changes just convince us that we are.

69. In *Supertraining*, Yuri Verkhoshansky levels this very criticism at Westerners who latched on to periodization theory in the 80s and 90s, oblivious to the fact that the orderly, intricate plans were directly inspired by the Communist ideology of central planning.

70. Sheiko's book is freely available online but the popular translations have been (very) bad, as Google Translate doesn't handle idiomatic Russian so well. Crawling through it with a good dictionary for a better translation takes time, but can be worth it.

71. I'd suggest starting with Kabat-Zinn's book (1995) *Wherever you go, there you are*. For a more technical start with the literature on mindfulness, see Kabat-Zinn (2003).

72. Original quote cited from from *Wired Magazine*: http://www.wired.com/wired/archive/4.09/czik_pr.html For a more thorough look, see Czikszentmihalyi's 2008 book *Flow: The Psychology of Optimal Experience*.

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