

Introduction to Fitness

A Technical Book on Fitness

Mihail Dunaev

Contents

1	Introduction	3
2	Nutrition	5
2.1	Calories, BMR, TDEE	5
2.2	Body Fat Percentage	6

Chapter 1

Introduction

I have no background in fitness or nutrition. In school I studied Computer Science and now I work as a Software Engineer. What made me get more into fitness was my weight: I was fat. Multiple times in my life. First, growing up as a kid I was fat and I managed to lose the weight in secondary school just by eating less. Second time I got fat was in university, just because I lacked any motivation to study for exams and would power my way through with food and energy drinks. After uni I found it much harder to lose weight than I previously knew. I would follow a lot of diets (keto¹, food replacement like soylent² or huel³), sometimes going really low in calories intake, feeling like I have no energy and gaining the weight back on after ending the diet. I needed a better solution to this: I decided to start going to the gym.

I guess my goal was to build muscle and lose fat. I've always liked muscles as a kid, just never got the time to look into it and start working out. This was my chance. I had a lot of questions: how do I train? What do I eat? Are there other things I need to pay attention to? One solution would be to hire a personal trainer to help me achieve this goal. What stopped me from doing this is the way my brain works: I knew I would just be given a list of things to do without any explanation. I really like to understand how things work and I would end up being disappointed. This is also a big part of my life by now, I definitely wanted to understand well how everything works. I started looking into fitness the same way I look into everything: start searching on google, looking at professional bodybuilders, what they say, does it make sense etc. I feel that if you want to know a subject really well you should look for competitions related to that subject, and see what the people involved have to say about it. This is why I started following people that compete in bodybuilding shows, strongman competitions and so on. What bothered me was how poorly organised the fitness information I found was. I couldn't find a single place that could take me from 0 knowledge to getting started in a matter of few hours. I had to watch a lot of youtube videos, read a lot of articles and posts in fitness communities until things were clear in my head. Now that I know all this information I think it's possible to put it all in one place: this is the purpose of this book, to get you started with your fitness journey, especially if your goal is to build muscles and lose fat. And as I understand, this is the case for most people working out.

¹Ketogenic Diet on Wikipedia

²Soylent on Wikipedia

³Huel on Wikipedia

I just want to stress out: there is nothing wrong with being fat. If you get really fat it is unhealthy and you'll end up with health problems. However, the main reason I don't want to be fat is because I get anxiety from it. I feel like crap, especially if I take my shirt off in public. Saying I don't care about it is just lying to myself and I try my best to not do that, just for my mental health. This anxiety is something I can't control so for me the only solution would be to stay in shape. Besides, I already said I like muscles, so becoming muscular would make me feel proud of myself.

The book is structured in two parts: nutrition & workout. There is a lot of information in here, you don't necessarily need to understand all of it to get going. That's why at the end I just added an example of everything I did to get in my current shape without extra explanations. I will try my best to present information in an unbiased way, presenting what people think works and what not, what I tried on myself etc. If you think something is wrong or don't agree with some of the information presented here, this is an open source book so feel free to submit a PR!⁴ At the end of the day I am a practical person, I only believe in results and what works in real life. I can say that the information I describe in this book worked really well on me, as you can see in the picture below.



Figure 1.1: From fat to muscular in 7 years: my lifelong struggle with being fat

⁴About Pull Requests on Github Docs

Chapter 2

Nutrition

2.1 Calories, BMR, TDEE

I feel like I need to explain how food works first before anything else. Your body is an energy convertor. It gets energy from food¹ and converts it to heat, movement (kinetic energy) and electrical energy for thinking. The amount of energy needed without movement (so for heat, thinking and perhaps others things too) is referred to as basal metabolic rate or BMR² and it doesn't change much from day to day. If you include the energy for movement too you get your total daily energy expenditure or TDEE. If you eat more than your TDEE in a day, the extra food will be stored on your body either as fat or muscle. If you eat less then your body will have to go to fat stores and muscles and break them down to get the extra food energy you need. Energy is measured in *kcal*, but most of the time you will only see the term calorie with the same meaning (basically *kcal* is the scientific term which was replaced by calorie when it started being used by food industries). To put energy values into perspective, the average human would need 2,000 calories for heat every day, or so I've seen in a physics course a long time ago. If I run on the treadmill for 1h I get a message that I burned roughly 600 calories. 1 Big Mac³ has almost 600 calories. It's important to understand that knowing exactly how many calories a meal has is next to impossible. There will always be small differences in every ingredient you use. For example not all loafs of bread are the same size, not all strawberries contain the same amount of sugar and so on. It's also impossible to know exactly how much energy you burn in a day. However, estimates work really well in practice. As long as you eat the same meals every week, you will either lose, gain or maintain weight.

People have tried to come up with formulas to compute BMR from different factors, such as height, age, sex or body fat percentage (this is just the proportion of fat you have in your body relative to your whole mass, so $100 \times \text{fat mass} / \text{body mass}$). At first only mass (*m*), height (*h*) and age were taken into account in Harris-Benedict formula for BMR from 1919⁴

$$BMR = 13.7516m + 5.0033h + 66.4730 \quad (2.1)$$

¹Food Energy on Wikipedia

²Basal Metabolic Rate on Wikipedia

³Big Mac on US McDonalds Website

⁴Harris-Benedict on Wikipedia

This formula was later revised in 1984 with just a few minor changes. Later in 1990 Mifflin St Jeor⁵ came with 2 formulas for BMR, one for men (2.2) and one for women (2.3).

$$BMR(males) = 10m + 6.25h - 5a + 5 \quad (2.2)$$

$$BMR(females) = 10m + 6.25h - 5a - 161 \quad (2.3)$$

Finally Katch-McArdle⁶ included body fat percentage (f) into the equation, removing age and height

$$BMR = 370 + (21.6m(1 - \frac{f}{100})) \quad (2.4)$$

Let's take an example using the last formula: if you weight $70kg$ and your body fat percentage is 18% then your BMR should be $370 + (21.6 \times 70 \times (1 - 18/100)) = 1609.84$ calories. Add your movement energy to this and you get your TDEE. I haven't spent the time trying to derive how to compute this one (e.g. from kinetic energy) because all of these formulas are great but at the end of the day they are just for your orientation. The best way to compute your TDEE is to actually measure it: without changing your habits, eat 2,000 calories every day for 1-2 weeks. Weight yourself every day: does your weight change? If no then it's safe to assume your TDEE is 2,000 calories. Does your weight go up? It probably means your TDEE is lower. Keep adjusting your calories intake until you find your TDEE.

In theory you should be able to tell your TDEE without having to change your diet again just by looking at how much weight you gained / lost in the initial 1-2 weeks: you should lose 1lb (or 0.45kg) of mass at a total deficit of 3500 calories⁷. Let's take an example again: you ate 2,000 calories for 2 weeks. During these 2 weeks you gained 2.2lbs (or 1kg) on the scale. According to the 3500 rule, you were at a total surplus of $3500 \times 2.2 = 7700$ calories. This surplus was achieved in 14 days, so the surplus each day was 550 calories. This means your actual TDEE is 2,550 calories. However I found this rule to not work on me, trying to adjust accordingly didn't put me at maintenance and I kept changing weight. As long as you always adjust to results you will be fine. I would personally start with an online TDEE calculator⁸ (there are plenty out there) just to get a value to work with, then keep adjusting intake until I hit my maintenance.

2.2 Body Fat Percentage

Some info on body fat percentage

⁵A new predictive equation for resting energy expenditure in healthy individuals (1990)

⁶Essentials of Exercise Physiology Book by Katch & McArdle (2006)

⁷What is the Required Energy Deficit per unit Weight Loss? (2008)

⁸Example of online TDEE calculator