# Essential Nutritional and Physiological principles

**for sports performance, physical fitness, and general health**


written by


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**This copy for:**

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# 1 Introduction

This handbook is a combination of knowledge informed by theory, and crucially, informed by practice and experience. Having delivered hundreds of training sessions with many clients over the last few years, of all body shapes, sizes, and fitness levels, I know from experience that the application of the dietary/lifestyle information contained within, in conjunction with a sound training program, yields highly effective results. One client I have trained successfully lost over five stone (approximately 30 kilograms) over around 18 months following principles contained within, whilst continuing to gain strength throughout. Another client, with rather different goals, practically doubled their real world strength over a period of six months. Yet other clients have gained visible musculature "where they have never had it before" – in other words, they have added lean muscle tissue to their frame.

Whether the objective is health and wellness, fat loss, strength gain, muscle hypertrophy, or, more usually, some combination of several of these goals, certain common principles and strategies apply. These are outlined below. More pertinently, most of the the specific dietary guidance is relatively uncontroversial and has been established by the scientific community for some time; a general empirical consensus has emerged as to optimum macro-nutrient requirements – in *broad* terms – despite the proliferation of alternative and "new-age" dietary practices. Small details may slightly alter in years to come with new research, but the overall picture is unlikely to radically change.

Naturally the information contained is by no means exhaustive – even were such a project possible it would take bookshelves to accomplish. So this is clearly not the objective of this handbook. Instead, however, I am confident that everything an individual *actually* needs to know and to put into practice is contained within. Eating well does not require that someone become a nutritional expert: a lot of it is sound common sense. Nevertheless, there are certain details that one should be aware of in order to ensure good dietary practice, and equally importantly, ensure the individual can guard against spurious marketing information presented by a rapacious food industry keen to continually find new opportunities to derive profits from fad products with patently dishonest claims.

So; *what* to eat?

# 2 Nutrition for sports performance and health

## 2.1 Core nutritional principles

Try to always make a meal "complete" by ensuring that it **contains a good balance of protein, carbohydrate and fats all at once**. Try to eat as **unprocessed and natural as possible.** The closer the foodstuff is to its original state the better. Human physiology has not fundamentally changed in the last 20,000 years, yet the foods we are putting in it radically so over the last 50 years. Most modern high volume food producers are not motivated by quality or health properties but by profit. Processed food is cheap to produce; any health "benefits" are an afterthought and marketing strategy.

The best foods are ones that you obtain either by hunting/killing/collecting it (i.e.. wild meat/fish/eggs) or pull out of the ground or pick (i.e. root vegetables, fruit), or obtain from agriculture with **minimal processing** (i.e. brown rice, quinoa, wholewheat). So, for example, poached eggs on wholewheat toast with butter is a lot better than white toast with margarine – the eggs are a

great source of protein and high quality fats, butter is a natural product that undergoes minimal processing (it is energy rich, so just go easy with it!), and wholewheat bread is less refined and more nutritious than white bread. Margarine (and other similar spreads) are highly processed, contain a significant amount of industrial chemicals and additives, and undergo high temperature treatments. It is poor quality product that is designed for maximum profit – butter also tastes much better anyway! (If you don't like butter, drizzle olive oil over the toast like they do in the Mediterranean).

Keep dietary salt intake low; processed foods are high in salt. Home cook and only add just enough for flavour.

There is a lot of nonsense in the media, particularly concerning fats. Provided you don not go to excess and eat things in proportion, there is no need to specifically avoid saturated or any other type of fat. (Moderate saturated fat consumption has actually been shown to improve testosterone and IGF-1 factors in males – i.e. a positive benefit). The most important thing is that the fats are **naturally derived from whole foods** rather than from processed and manufactured foods. The processing that convenience foods undergoes fundamentally alters the chemical structures of fats so that the body can no longer absorb them properly (hydrogenated fat is a good example of this process). These are the types of fats to actively avoid.

Whole yoghurt/milk is better than low-fat yoghurt/milk. It is **less processed** – removing the fat content requires subjecting the dairy product to high temperatures that denature the protein content and reduce its quality. The same principle, in general, applies to most "low fat" versus "high fat" (i.e. original) foods products.

Also, **beware hidden sugar.** A lot of supposedly "healthy" low fat foods are simply full of added sugar (to compensate for the complete lack of flavour). This is the case with nearly all flavoured yoghurt's and probiotic type drinks, for example. Go for the plain full fat yoghurt that has not been messed around with and simply add fruit for flavour. The fats removed from "low-fat" foods are lucrative and can be used as an ingredient in countless other commercial and industrial products. Low-fat foods are a mechanism for doubling profits under the disguise of creating a "health" product.

As a general rule, the more **manufactured or prepared the food is** – the worse it is for you! Very simple. If you don't like many vegetables or fruit, get to like them. They are what your body requires and is designed to eat! Learn to cook properly if your skills are limited...

## 2.2 Marco-nutrient listings

The following sections will outline the common foods and ingredients that provide the three main macro-nutrients (protein, fat, and carbohydrates), and in particular, the best quality sources of these "macros".

### 2.2.1 Protein

**Best protein sources:** Wild salmon, trout; oily fishes such as mackerel and sardines; sea bass, monkfish, and similar; wild fowl (wood pidgeon, duck, etc.) and game (venison, boar). Organic eggs (chicken, duck, and quail etc.).
**Excellent protein sources:** Organic beef, lamb, chicken, and white fish (pollock, haddock, cod, etc.). Free range eggs.
**Good protein sources:** Beef, lamb, chicken, pork. Steak mince.

**OK protein sources:** High quality sausages, high quality bacon, beans, lentils, other pulses and almonds, brazil nuts, cashews, brown rice, quinoa. Protein from dairy (i.e. full fat milk, Greek yoghurt, unprocessed cheese, butter).
**Poor protein sources (avoid):** All processed and reformed meat (e.g. hot dogs, economy burgers, budget cooked ham, SPAM, "meat" fillings in pasties etc.), cheap bacon and sausages, fast food burgers etc.

Vegetarian protein sources are "incomplete" (they lack some of the major amino acids) – so if you are eating a vegetarian meal/diet it is very important that you combine sources to make a complete protein; i.e. combine rice with lentils, or lentils with beans, or a mixture/selection of different nuts. When different grains and beans are combined, the overall quality can be pretty good. Quinoa is an unusual grain, in that it is more or less complete; it is widely available from health food shops/big supermarkets.

Eggs are a superb source of protein (and fat, and vitamins) and are complete. They are the best non meat/fish source of protein and one of the best overall sources, and so are recommended for regular consumption, especially for individuals following a diet free from meat or fish.

### 2.2.2 Fat

Fats are critical! ("Low fat" is not the way to go... It all comes down to quality).

**Best fat sources:** all types of nut, extra virgin olive oil, hemp oil, Omega 3 fish oil, flaxseed oil. All cold-pressed superior category oils obtained from solely mechanical means in glass bottles. Naturally occurring fats from the "best" protein sources listed above (i.e. salmon, venison, sea bass, etc.). Organic/free range eggs.
**Good fat sources:** Fats found in high quality cuts of beef, lamb, chicken, and pork.
**OK fat sources:** Fats found in dairy.
**Poor fat sources (avoid):** Fats found in all processed and reformed meat, fats from processed spreads (even the supposedly healthy "olive oil" spreads), any fat that has been hydrogenated; cheap sunflower, vegetable and cooking oil found in plastic bottles; fats found in biscuits, cakes, chocolate and other confectionery.

### 2.2.3 Carbohydrate

**Best carbohydrate sources:** Brown rice, buckwheat, millet, quinoa, oats, pulses, beans, and lentils. Sweet potatoes, yam, swede, carrots, pumpkin and other related vegetables.
**OK carbohydrate sources:** Potatoes (boiled/baked), parsnips, white rice, home made/multi-seed/high quality bread, pasta. Fruit.
**Poor carbohydrate sources (avoid):** Any and all foodstuffs containing refined sugars; cakes, confectionery, pretzels, crisps. All soft drinks and juices from concentrate. White bread and other "plastic" loaves. Chips.

## 2.3 Micro-nutrients (vitamins & minerals)

Micro-nutrients are the vitamins/minerals that facilitate the enormous number of chemical processes in your body. They are survival critical: without certain micro-nutrients you would soon die, even if you were getting sufficient calories (energy) going in. Scurvy and so called "rabbit starvation" common amongst explorers in the past are examples of micro-nutrient deficiency.

Fortunately, if you eat a good diet, you have no need to supplement with any vitamins at all. A good diet will provide everything you need. Conversely, no amount of vitamin supplements will compensate for an inadequate diet; whole-foods contain various enzymes, delivery mechanisms, and synergistic combinations that cannot be replicated with a factory produced supplement.

**Best sources:** As many different vegetables as possible! Broccoli, kale, spinach, lettuce, mange tout and any

and all other green vegetables; chillies, peppers, and tomatoes; carrots, onions, swede, pumpkins, etc., etc.! All of the "best" protein sources listed above are also high in important micro-nutrients (but still need to be combined with the aforementioned vegetables). Strawberries, blackberries, blueberries, raspberries, cherries, bananas, pomegranates, melons and similar.
**OK sources:** All other fruit; oranges, satsumas, lemons and other such fruit. "Best" carbohydrate sources listed above.
**Poor sources:** Just about any refined, processed, or "manufactured" food will almost automatically be highly deficient in micro-nutrients! Beware of products with "added" vitamins and minerals – if it has to have something added to it, it is because it a deficient and poor quality food to start off with.

# 3 The "EVIL" list

## 3.1 The corruption of the modern diet

There are a few foods, that in terms of both body composition (weight loss, fat loss, and improvements in lean muscle mass) and general health are a complete disaster. The following is a short concise list of foods/ingredients to **actively avoid or heavily limit**.

Naturally, life is for living, and food is one of life's great pleasures; it is not necessary to eliminate these types of food completely, but the better you can regulate them, the less you eat them, the physically healthier you will be and the more favourable your resultant body composition.

The most pernicious aspect is that **some of these foods are actively marketed by the food industry as being "healthy"**. The food industry is of course ultimately motivated by profit, and will always attempt to find "creative" interpretations of government and health organisation guidelines in order to aggressively brand/market their products and label them as healthy. Moreover, the vast power the food industry wields allows it influence government policy and form influential interest groups and lobbies.

## 3.2 Guidelines to avoid junk

One simple rule: **WITHOUT EXCEPTION**, ALWAYS **COMPLETEY IGNORE** WHATEVER CLAIMS ARE WRITTEN ON THE FRONT OF THE PRODUCT AS TO THEIR SUPPOSED "HEALTH" PROPERTIES. This point cannot possibly be emphasised enough. Also, ignore any and all affiliations or sponsorship deals with known athletes or sports stars – I can guarantee you that they're highly unlikely to actually consume the particular product as a regular part of their diet, and of course large sums of money in the form of sponsorship deals have passed hands in order to purchase such backing… Instead, immediately look at the back of the packet and follow the following guidelines:

1. Read the list of ingredients. Familiarise yourself with all the most commonly occurring ingredients – a quick Google search will soon allow you to identify exactly what any unusual sounding ingredients actually consist of. **Be wary of any product that has an ingredient list that reads more like a chemical laboratory.** It is **highly unlikely** to be good for you, regardless of how "healthy" **it claims to be** since it will be a highly processed food product**.** Unprocessed, natural foods, and less processed variants are nearly always better for you**.**
2. Read the actual nutritional information. This reveals the stark facts of the matter. Pay careful attention to the portion/serving sized claimed (e.g. if it lists a serving as 30g, and the whole product weighs 180g, ask yourself what your typical "serving" **actually consists of**. If in practice

you eat half the product (i.e. 90g in this example), that would mean your typical serving is actually three servings as listed, so you'll have to multiply everything by three). A lot of manufacturers deliberately quote artificially small "servings" in an attempt to dishonestly deflate their *apparent* calorie density/sugar content/etc. However, products will always display nutritional information per 100g, which is a constant measure that you can multiply accordingly based on the weight of product you consume.

3. Pay particular attention to the following:
   a) **Total protein content**. If the product actually has a high meat/fish content, the protein value should be quite high (at least 20g per 100g). A lot of processed meat/fish products actually have quite low values, which tell you that they are mainly full of "filler"...
   b) **Total fat content**. A lot of foods that are supposedly meat/fish/protein based (for example, breaded turkey escalopes/fillets) may in fact have little actual meat and instead be full of poor quality highly refined vegetable oil and other unhealthy bulking agents. This will be revealed by their high fat content. If the fat content per 100g is a larger value than the protein content, it is probably a pretty poor quality product (unless, obviously, the product is essentially a natural pure fat based product, such as butter, olive oil, cheese, etc.)
   c) **Total carbohydrate content**, in particular **starch** and **sugars**. *Generally* speaking starches are complex carbohydrates and much better for you. Avoid products high in sugar unless they are naturally occurring sugars such as those present in actual fruit.
   d) **Sodium/salt content**. Try to limit overall salt intake. Around 5g a day is the recommended maximum intake, though slightly higher intake is permissible if you're sweating profusely for extended periods due to strenuous exercise. This is pretty hard to achieve in the modern diet, since almost all products have it added. You certainly should not add any additional table salt to any meal you have cooked unless you have cooked/prepared **every single component yourself,** since any shelf bought ingredient will contain more than ample amounts for the resultant meal overall (i.e. bread, pasta sauce, cheese, curry sauce/paste, salad cream, butter, etc.).

## 3.3 A typology of six common "evil" foods & ingredients

### 3.3.1 I) Soft-drinks and fizzy beverages

If you want to become fat, develop insulin-dependent diabetes, suffer from coronary heart disease, contract cancer, and suffer abysmal energy levels, most soft-drinks and "health" drinks are quite possibly the single best way of achieving this goal. They are full of "empty" calories.

Drinks such as *Coca-Cola, Pepsi, Irn-Bru, Fanta, Sprite, Mountain Dew, Dr. Pepper* **are all terrible** from a nutritional point of view. Many contain **up to 50g of refined sugar** (or even worse, high fructose-glucose corn syrup – see below).

However, generally speaking, increasing numbers of people are at least somewhat aware of their poor nutritional properties, and at least these products make little attempt to claim any health benefits. More disgraceful are the emergence of supposedly "healthy" and "nutritious" soft drinks that make more or less explicit claims about their apparent health benefits and market themselves on this basis. In particular, some obvious examples:

*Drench, Volvic "Touch of Fruit", This Water, Vitamin Water*, and similar are all **just as bad** (and in some

cases, even worse) than the branded products listed above (and or often manufactured by the same drinks companies) and contain similarly unacceptable quantities of sugar. Putting an extract of 5% actual fruit juice does not magically turn a product with 40g of added refined sugar into something that is in any way good for you to drink on a daily basis during your ordinary day!

If it isn't a pure bottle of mineral water, plain and simple, make sure to check how much sugar is listed per 100ml of product and therefore how much per container.

The only exception to this rule are pure fruit juices (or, ideally smoothies which have the all fibrous part of the fruit in, such as Innocent Smoothies) that are 100% fruit juice with **no** additional added sugar**.** These have naturally occurring fruit sugars and are reasonable to drink on a modest basis.

The "diet" and "no sugar" versions of soft-drinks are arguably slightly better for your health overall, though in this case we trade sugar/empty calories for artificial sweeteners whose overall long-term toxicity has not been conclusively established. On balance I would probably choose the no-sugar over the sugar version if I had to make a choice on such a drink (unless I was consuming it immediately post-exercise[1]), but ideally try to limit these artificial variants too. Much better off with mineral water…

### 3.3.2 II) "Low fat" ready meals, convenience foods, pre-packaged meals, snacks

When you take the fat content out of a food, you generally also take away all of the taste. To solve this rather large problem, the food manufacturers get around it by instead filling the product full of sugar (and flavour enhancers). Most "low-fat" products are in fact **simply full of sugar**. So not only do they typically contain just as many overall calories as the original "full fat" product, they are in fact usually far worse, because now most of the energy density is coming from sugar, which is not very filling, is addictive, and causes a very strong insulin response. Verify the sugar content by checking the nutritional data on the back…

Buy a different product, make it from scratch, or buy the original full-fat product and simply consume less overall (e.g. use Greek yoghurt and have a small/modest portion rather than the processed "low fat" yoghurt with added sugar).

Paradigmatically, the chain store Subway in particular expend a great deal of marketing effort explaining how their "Subs" are extremely low in fat. However, what they do not point out, is that these same "Subs" have large amounts of sugar and refined carbohydrates, very poor quality mechanically reclaimed/formed "meat", obscenely high amounts of salt, high calorific content, and a high glycaemic index; they will quite effectively make you "fat" through excessive consumption despite their low fat claims.

### 3.3.3 III) All alcoholic drinks

Unfortunately these pretty much fall into the same category as the soft drinks listed above – if not worse. Pure alcohol has 7 kcal per gram, nearly double that of pure sugar, and also puts a toxic load on your liver and kidneys, which makes it an anti-nutrient and carries a dehydration effect. Alcoholic drinks like beer or "Alco-Pops" also contain significant amounts of sugar.

1 The only time when consumption of high-glycaemic index carbohydrate (i.e. simple sugars) food has a benefit is immediately prior/during/after exercise in the "exercise window", since it rapidly restores muscle glycogen that has been depleted during intense exercise and stops muscle catabolism. Nevertheless, it is important not to abuse this principle and for the sake of simplicity here it is better to adopt the policy of avoiding sugar as much as possible.

**Since all alcoholic drinks are bad**, the only advice (apart from drinking **no alcohol whatsoever**...) is to go for "less bad" choices. Here are some strategies:

a) Opt for a cocktail made with a large amount of *natural* fruit juice and modest amounts of alcohol (e.g. 20ml of Vodka).
b) Go for *quality over quantity*. Why not pay the extra for that high quality naturally fermented Belgian artisan beer, and drink just the one or two, savour and enjoy it, rather than knock back a six-pack of cheap mass produced bland tasting lager? Or buy that high quality bottle of Cabernet-Sauvignon at twice the price and really enjoy it with a friend, instead of going for the "2 for price of 1" on the cheap and nasty red wine that tastes like vinegar!
c) Mix your shots with a low-calorie mixer. Flavour it with slices of lemon. Etc.
d) Choose drinks that don't make it so easy to over-consume. Guinness is more filling, and more difficult to drink, than say, Fosters, for example. It is less bad to slowly drink 2 pints of Guinness than 5 pints of Fosters...
e) Drink a full pint of water between beverages. Chances are, with all that liquid in you, you'll feel less inclined to drink as much alcohol. This will also prevent you getting dehydrated.

### 3.3.4 IV) Hidden sugar and sugar substitutes

In the quest for ever larger profits, the food industry has been increasingly substituting high fructose-glucose corn syrup (you'll see several different variants of this name on the ingredients lists of foods) for sugar. This syrup is even sweeter and probably even worse for your health than plain sugar (which is bad enough).

Sugar/corn syrup is also disguised in many products where you might not expect it. It is not surprising that confectionery contains high amounts of sugar. This is pretty obvious. Less obvious, is the sugar that is often hidden in foods such as salad dressings (on the supposedly healthy "salad meals" at various restaurants and foot outlets) and condiments, processed ready meals (such as curries, lasagne, pizzas), mainstream bread and savoury products, and all manner of other prepared foods. Bottom line: **check the nutritional information yourself and see the actual content of sugar (and other macro/micro-nutrients)**, regardless of what the product is, or how healthy it purports to be. A lot of "healthy" meals and prepared foods are anything but.

Sugar and sugar substitutes go by many different names, as there are different methods of extraction and different legal methods of presentation. Broadly speaking, as far as your body is concerned, they are essentially identical, so consequently should be limited. Here is a recent list of sugar substitute ingredients sourced from the internet:

| | | |
|---|---|---|
| Agave nectar | Diastatic malt | Lactose |
| Barbados Sugar | Diatase | Malt syrup |
| Barley malt | D-mannose | Maltodextrin |
| Beet sugar | Evaporated cane juice | Maltose |
| Blackstrap molasses | Ethyl maltol | Mannitol |
| Brown sugar | Florida Chrystals | Maple syrup |
| Buttered syrup | Free Flowing | Molasses |
| Cane crystals | Fructose | Muscovado sugar |

| | | |
|---|---|---|
| Cane juice crystals | Fruit juice | Organic raw sugar |
| Cane sugar | Fruit juice concentrate | Panocha |
| Caramel | Galactose | Powdered sugar |
| Carob syrup | Glucose | Raw sugar |
| Castor sugar | Glucose solids | Refiner's syrup |
| Confectioner's sugar | Golden sugar | Rice Syrup |
| Corn syrup | Golden syrup | Sorbitol |
| Corn sweetener | Granulated sugar | Sorghum syrup |
| Corn syrup solids | Grape sugar | Sucrose |
| Crystalline fructose | Grape juice concentrate | Sugar |
| Date sugar | HFCS | Syrup Syrup |
| Demerara Sugar | High-fructose corn Syrup | Table sugar |
| Dextrin | Honey | Treacle |
| Dextran | Icing sugar | Turbinado sugar |
| Dextrose | Invert sugar | Yellow sugar |

### 3.3.5 V) Hydrogenated and trans-fats

Hydrogenated vegetable oil, other hydrogenated fats and oils, and all other "trans" fats are all fats that have been subjected to chemical processes at high temperature which prevent your body being able to process them properly. There is very clear research linking habitual trans-fats consumption to heart disease.

Absolutely avoid any product that contains *any* amount of added hydrogenated oil/fat. It simply has no place in your diet. Some of the fast-food chains fry their products in specifically hydrogenated vegetable oil (it lasts longer)[2], which already compounds the extremely negative nutritional profile of most of their foods.

Like sugar, some products have hidden hydrogenated fats – again, check the nutritional information and always verify a product yourself.

Unfortunately, a conventional oil also starts to become hydrogenated (or partially hydrogenated) by being subject to recurrent heat cycles. So in other words, don't keep reusing the same cooking oil or repeatedly re-fry in the same old oil. Try to always use fresh, good quality oil, stored out of sunlight. Naturally, all takeaways (such as fish and chip shops) only change their oil periodically, as it would clearly be economically non-viable for them to change oil every day, so for this reason, amongst others, try to limit the amount of takeaway meals you have.

### 3.3.6 VI) "Healthy" breakfast cereals

Most "healthy" breakfast cereals are close to the most unhealthy food you could possibly consume for breakfast. Cornflakes are made of maize (i.e. corn), a nutritionally mediocre grain at best. Most muesil is coated in sugar (or sugar substitutes). Bran Flakes are high in fibre but otherwise act as an anti-nutrient.

2 Some chains have taken measures to eliminate/reduce their usage of hydrogenated oils due to consumer pressure.

If the food has to have "added vitamins", it is almost certainly because it possesses none to start of with.

Children's breakfast cereals are even worse, and so utterly diabolical that it is little wonder Britain faces an increasing obesity epidemic. The child would be no worse off having a Mars bar than a bowl of Frosties for breakfast!

Typical breakfast cereals are extremely high in sugar, contain no essential micro-nutrients (other than what has been artificially added), have a high glycaemic index, are highly processed, and not particularly filling.

Have home made porridge, yoghurt, eggs, fruit, high quality wholemeal/seeded bread, etc.

**In a nutshell**, if you want to limit your chances of becoming overweight/obese as you age (or enable you to lose weight), limit your chances of suffering/dying from most Western degenerative diseases, and maximise your overall health and energy:

1. Eat **unprocessed** as much as possible.
2. Avoid/limit **soft-drinks and alcohol**.
3. Avoid/limit **sugar** intake, **sugar substitutes**, and beware of **hidden sources**.
4. Avoid consumption of **hydrogenated fats**.
5. Many "low-fat" or "healthy" meals/products are **not healthy at all**.
6. Avoid/limit typical British **breakfast cereals**.
7. Always check the nutritional information of any and all products.

# 4 Intake guidelines

## 4.1 Overview

If we expend precisely what we consume, our overall body weight remains identical. If we consume more than we expend, we gain weight. If we consume less than we expend, we lose weight.

Whether or not the weight gain is mainly due to fat or development of lean muscle tissue depends on quality of diet, level of overall daily energy excess, and whether that is the result of a regular hard exercise regime or sedentary lifestyle.

Whether or not the weight loss is due to loss of a fat and an improvement in body composition or mainly due to a loss of lean muscle tissue again depends on quality of diet, level of overall daily energy deficit, and whether it is the result of a regular hard exercise regime or crash diet.

Essentially:

1. Weight loss or gain should be very **gradual**. A 500 kcal daily deficit (or around a maximum of 15% of total energy intake) is the sensible maximum for weight loss. For someone attempting to gain weight, the intake difference should probably be even smaller than this (unless some is drastically underweight/anorexic etc.).
2. If the change in weight (up or down) is not accompanied by regular exercise, most of the changes are likely to be down to an unfavourable change in body composition due to a gain of

fat rather than muscle, or a loss of both muscle tissue and fat tissue.

3. Protein requirements are slightly elevated (in terms of relative consumption) when changing weight (up or down).

## 4.2 Part A – Energy requirements

To *lose* weight we need to gradually expend more energy than we consume. Therefore, let us aim for the sensible guideline of a deficit – shortage – of 500 kcal per day, yielding a deficit of around 3500kcal per week. This equates to a weight loss of close to 0.5kg per week, or 2kg per month. Attempting to obtain a larger deficit than this would be counterproductive as one would unduly be slowing the metabolism down and likely to lose muscle tissue in addition to fat.

We need to calculate our daily energy requirements to achieve this 500 kcal daily shortage. RMR stands for **Resting Metabolic Rate** and it equates to the amount of energy needed to support basic life functions and represents the energy consumed *completely at rest* during the course of a 24 hour period. Energy required is therefore:

(RMR + Activity + Exercise kcal expended) – 500 kcal = Target kcal energy intake

To *gain* weight we follow the same principle, except this time aiming for a 500 kcal daily excess. (there are some provisos though, which will be detailed below):

(RMR + Activity + Exercise kcal expended) + 500 kcal = Target kcal energy intake

When we do exercise, or indeed any low level activity (cleaning, walking around park, even standing) that raises the metabolism above that required whilst resting (i.e. lying down), we increase our energy demand. We need to take account of this energy in our overall requirements. To precisely calculate the exact amount of energy required during a full 24 hour period would require a person to permanently be connected to a laboratory gas/exchange respirator in order to to measure their exact metabolic response. Obviously this is impracticable, but fortunately there are well established formulae that have been extensively tested and are acceptably accurate[3].

### 4.2.1 Step 1. Calculate survival calories to support your RMR[4].

Make sure you have access to a *accurate* set of scales (use commercial scales at the gym, or doctor's surgery, or a set you have verified to be of good accuracy), and **weigh yourself in kilograms**.

Calculate your RMR calories based on the following tables:

**Male**

| Age | Factor |
|---|---|
| 10-18 | (bodyweight × 17.5) + 651 |
| 18-30 | (bodyweight × 15.3) + 679 |

3The use of modern technology such as heart rate monitors and activity monitoring devices will of course help us to increase our accuracy considerably because these then allow us to accurately take account of our *actual* daily activity and *actual* physiological demand of exercise sessions.

4 The tables/formulae that follow are adapted from Anita Bean's *Complete Guide to Sports Nutrition (2003).*

| | |
|---|---|
| 31-60 | (bodyweight × 11.6) + 879 |

Example for a male weighing 80kg:

Aged 16: (80 × 17.5) + 651 = **2051** kcal.
Aged 25: (80 × 15.3) + 679 = **1903** kcal.
Aged 45: (80 × 11.6) + 879 = **1807** kcal.

**Female**

| Age | Factor |
|---|---|
| 10-18 | (bodyweight × 12.2) + 746 |
| 18-30 | (bodyweight × 14.7) + 496 |
| 31-60 | (bodyweight × 8.7) + 829 |

Example for a female weighing 65kg:

Aged 16: (65 × 12.2) + 746 = **1539** kcal.
Aged 25: (65 × 14.7) + 496 = **1452** kcal.
Aged 45: (65 × 8.7) + 829 = **1395** kcal.

### 4.2.2 Step 2. Calculate your daily energy expenditure.

We need to estimate the amount of energy we burn through typical daily activity/movement. For some people, this might prove extremely problematic if they have highly variable work practices where no two days are alike in terms of their actual physical activity. However, the following table acts as a guide:

| Activity level | Multiplication factor |
|---|---|
| Sedentary; e.g. office worker; mostly seated, or stood still behind counter, etc. | **1.4** |
| Moderately active; e.g. retail assistant covering a large floor; warehouse operative; regular brisk walking, regular movement, etc. | **1.7** |
| Very active; e.g. postal worker delivering entire round by foot; building/farm labourer; busy/proactive personal trainer (☺); essentially physically active throughout entire day. | **2.0** |

Calculate your activity induced calorie requirements by multiplying your RMR by the factor in the table above. Let us use our 25 year old 80kg male example listed above in step 1 (1903 calories), and let us assume he works in a call centre, and travels there by bus (i.e. almost completely sedentary). This works out at the following:

1903 × 1.4 = **2664** kcal.

Assuming this person does no exercise, this is the approximate amount of calories they could eat on a daily basis and not gain or lose weight.

However, a person's metabolism generally slows as they age, and most especially if they do not exercise regularly, and *in particular* do strenuous resistance/weight training across large muscle groups. This is because, in the absence of highly muscular training, muscle tissue atrophies (wastes away) with age.

This is the origin of "middle age spread". Someone, who perhaps has never been overweight, continues to eat exactly the same diet, the same amount of food in their 40s as they did in their 20s. This is quite natural – we get psychologically accustomed to eating a certain fixed amount of food in order not to feel hungry. Even assuming their job and daily activities remain the same (unlikely; as people become more economically affluent they tend to buy/use a car more; as they move up the work chain into management they are more likely to end up sat behind a desk…), they find themselves starting to slowly gain weight.

It is fairly clear to see this reflected in the numbers produced by the formulas.

At age 45, this same 80kg male, assuming all else is equal, will now have the following daily requirement:

1807 × 1.4 = **2530** kcal.

134 calories difference – about a slice of bread or so. That doesn't sound much until you realise that over the full course of a year that equates to a whopping **48,910** calories. So if we assume this person ate exactly the same diet as they had always done, they would find, middle aged, that the same diet that hadn't caused them to gain any weight in their twenties is now causing them to gain more or less *a full stone a year*!

Conversely, let us assume this same individual who works in a call centre has been promoted to a team leader and must now spend their entire working day busily moving around the call centre floor to assist/cajole/motivate their work team. They spend their entire day walking and moving around instead of being seated. Now, we can estimate their daily activity calories as the following, aged 25:

1903 × 1.7 = **3235** kcal.

Or at 45:

1807 × 1.7 = **3071** kcal.

A difference of 571 and 541 calories respectively – a huge difference, pretty much an entire modest lunch/meal.

Regular daily activity, and strenuous exercise is the only way to a) Prevent/slow your metabolic decline; b) Substantially increase your energy expenditure.

### 4.2.3 Step 3. Estimate your calorific burn due to exercise.

This is especially difficult since the calories expended during exercise depend on many factors, in

particular your oxygen consumption and EPOC (excess post-exercise oxygen consumption), body weight, fitness level, biomechanical efficiency, together with the metabolic effects due to to muscle breakdown/systemic fatigue post-exercise during recovery. As a rough guide, calories expended can vary anywhere between 250-1000 kcal per hour. A lot of gym equipment provides a calorie estimate based on you entering your body weight and then monitoring your overall power output into the machine. As a general rule, people nearly always tend to **overestimate** their calorie burn as they tend to assume they have worked harder than they in fact have. Here are some very approximate estimates:

| **Exercise, intensity** | **Kcal/hour** |
|---|---|
| Aerobics/crosstrainer, easy/moderate | 350-450 |
| Aerobics/crosstrainer, hard | 550-750 |
| Cycling, easy/moderate | 250-400 |
| Cycling, hard | 500-700 |
| Running, easy/moderate | 600-700 |
| Running, hard | 800-1000 |
| Rowing machine, easy/moderate | 400-500 |
| Rowing machine, hard | 650-850 |
| Resistance/Weight training, non-circuit, strength | 250-400 |
| Resistance/Weight training, circuits, continuous | 600-1000 |

Heavier individuals expend more, lighter individuals less.

A far more accurate figure can be yielded by a modern heart rate modern with all your physiological data input into the device. Since every exercise session is different, and since it all depends, crucially, on how hard you are *actually* working, giving reliable figures is very difficult.

For the motivated individual, working *hard*, an approximate estimate of around 500-700 kcal per hour in the gym is a reasonable guideline. For, probably, far more realistically, the average gym individual who is "semi-motivated" and breaks into a light sweat it is perhaps wiser to assume a figure of around 400 kcal per hour. Individuals who come and sit on the exercise bike and watch TV for an hour without breaking into a sweat or getting out of breath may expend less than 300 kcal!

The "elite athlete" (and/or "psychotic", depending on your viewpoint!) who is extremely fit and is able to sustain an entire hour (or longer) with their heart rate at a continuous very high level may be able to expend as much as 1000 kcal an hour (or more). Such a figure is certainly realistic for, say, the Tour de France professional cyclists tackling one of the mountain stages…

Whilst you can obviously calculate your exercise on a daily basis and thus accordingly modify your daily calorie intake, it is simpler and more useful to estimate it over a week and divide by seven to get the daily average – after all, the metabolism does not operate in fixed discrete 24 hour intervals like some sort of mechanical machine.

Let us suppose our example call centre worker does four hours, four one hour sessions, of exercise a week. Two sessions are spent on the cross trainer at a moderate-to-hard level; 550kcal/hour. Two

sessions are spent weight training, more strength orientated, working hard but with reasonably generous rest periods; 400 kcal/hour. This yields:

2 × 550 + 2 × 400 = **1900** kcal.

expended per typical week of exercise. Therefore, dividing by seven, this yields an additional average of 271 kcal per day.

So, for our original example of a 25 year old male weighing 80kg who is sat down and sedentary all day, his maintenance calorie intake is now:

2664 + 271 = **2935** kcal**.**

In principle then, noting the above qualification regarding metabolic decline with age (which would be mitigated by regular resistance/strength training and intense exercise), 2935 calories is the approximate amount of calories this individual **could consume on a daily basis and remain identical in weight**.

### 4.2.4 Step 4. Putting it all together

To lose weight, we need to deduct 500 kcal (or, alternatively, no more than 15%) of the total calories from our maintenance figure above.

To gain weight, we need to add no more than 500 kcal per day.

**The more gradual the weight loss/gain**, the better and more efficiently your body can accommodate the change, and when combined with an appropriate exercise/activity regime, the more likely it is to result in a p**ositive alteration to body composition** rather than simply a weight change. Gaining weight too fast by taking in too greater excess of calories, even in conjunction with a heavy exercise load will still result in unnecessary fat gain rather than gain of lean muscle tissue.

The reverse applies, even more seriously, to weigh loss – lose weight too fast and you simply lose lean muscle tissue (the metabolically most active part of your body) and down-regulate your metabolism, thus creating a self-defeating cycle.

For highly trained individuals (i.e. those that have accrued many years of intensive strength/fitness training) this general principle – of *gradual* change – applies even more strongly as the the fitter the individual, the less scope there is for so-called "beginner's gains".

## 4.3 Part B – Homoeostasis and "real" versus "apparent" changes. A cautionary note.

The body is evolutionarily designed to maintain homoeostasis – i.e. it prefers to stay, by and large, the same, and is only designed to gain **fat** with ease – since fat was traditionally *survival critical* in a way that muscle tissue is not. 10,000 years ago, having a layer of body fat was the only thing that stopped one freezing to death when facing a protracted winter in a dark cold cave. The body is **not** designed to gain muscle easily, naturally. This is because building new/lean muscle tissue demands a large amount of resources. It will be reluctant to do so unless the stress/stimulus is repeatedly applied. In actual fact, in an energy scarce environment (i.e. the one we are evolutionarily adapted to deal with) being

large and heavily muscular is a liability rather than asset as you require more calories just to sustain basic functions. Hence why gaining significant amounts of lean muscle tissue is hard: your body is simply not designed to.

Trained individuals therefore need to be realistic as to actual likely gains of lean muscle tissue per year. After a number of years training, a drug-free individual is probably doing well to add even an additional kilogram of actual lean muscle per year. Piling in lots of extra calories (even if in the form of protein; calories, ultimately, are still calories) to get "bigger" will actually add little in the way of extra muscle mass and instead simply lead to additional body fat (which will then have to be lost later; unnecessary extra work).

Fortunately, even more significant than muscle tissue for overall strength and fitness is your central nervous system and endocrine (hormone/chemical system). This means that even with minimal obvious changes in the "hardware" (i.e. apparent muscle size) one can continue to achieve significant performance enhancements.

Positive adaptations to phenomena such as mitochondria (oxygen/energy centres in cells), muscle density (myofibril rather than sarcoplasmic hypertrophy), rate coding (muscle fibre activation sequences), tendon strength, central nervous system inhibition ("wow, this feels lighter than it used to"), etc., all can yield significant increases to performance yet might yield little visible difference on the scales (or indeed mirror). Following this analogy, these are changes to the body's "software".

**Bottom line: weight is only one component. Appearance is only one component.** An extremely muscular looking individual, though almost certainly stronger than most untrained individuals, may be deceptively weak in relative terms (it all depends on *how* they have trained). Conversely, someone who does not look especially strong (and especially so if they are carrying extra body fat) may be extremely strong if they have a highly trained nervous system and exceptionally dense musculature. Obviously, ideally, someone can be both extremely muscular and superlatively strong if they have trained intelligently over many years at a very high level: they can make "full" use of their actual muscles, as they have developed both "hardware" *and* "software" together. An Olympic class gymnast is a visibly striking example of this balance.

## 4.4 Part C – Macro-nutrient distribution.

All food consists of some proportion of carbohydrates, fats and protein. Many types of individual food may almost entirely consist of one macro-nutrient group (e.g. olive oil is almost entirely fat). A *meal* therefore consists of a mixture of food groups such that we have a balanced mixture of carbohydrates, fats, and protein. Every meal, ideally, should possess all three macro-nutrient groups.

### 4.4.1 Carbohydrates

For an active individual who trains regularly, carbohydrates are recommended to make up around 60% of your total calorie intake.

Using our example 80kg call centre worker again who trains 4x per week, whose daily maintenance calories we calculated at 2935, we can calculate the amount of carbohydrate to eat (there are 4 calories per gram of carbohydrate) on a 60% basis as follows:

2935 × 0.6 = **1761** kcal.

1761 ÷ 4 = **440g.**

In other words, the formulae are as follows:

**(Total intake calories) × 0.6 = (Resultant carbohydrate calories)**
**(Resultant carbohydrate calories) ÷ 4 = (Target carbohydrate intake in grams)**

### 4.4.2 Protein

Protein requirements depend on the amount of tissue broken down due to the severity of the muscular demands placed on them; in particular, strength training using heavy weights, or high volumes (i.e. many sets) causes more significant micro-trauma to muscles than, say, moderate aerobic training. Overall load/work is the key factor. For most individuals, such as the example individual who trains four times a week with two sessions that are more strength orientated, the established recommendation of 1.6g/per kg bodyweight is perfectly adequate.

As a general rule, 1.5g-2.0g of protein per kg of bodyweight is ideal for virtually all athletes with the possible exception of elite strength athletes (i.e. Olympic class weightlifters, etc.). It is not necessary to consume more than this and there is no evidence that very high protein intakes confer any additional benefit – just an increased food bill and extra work for your kidneys (hence make sure to always drink plenty of water on a daily basis regardless of what you eat!).

For our 80kg example, at 1.6g/kg:

1.6 × 80 = **128g**.

Or, eating a more protein rich diet, at 2.0g/kg:

2.0 × 80 = **160g**.

Expressed as a proportion of total energy intake (again, protein equals 4 calories per gram), we therefore see that they make up the following percentage intake for example individual:

(128 × 4) ÷ 2935 = **17%.**

Or, based on higher intake:

(160 × 4) ÷ 2935 = **22%.**

In other words, the formulae are as follows:

**1.6 × (bodyweight in kg) = (Target protein intake in grams)**

or

**2.0 × (bodyweight in kg) = (Target protein intake in grams)**

For the higher bound. To work out as percentage of overall calorie consumption:

**((Target protein intake in grams) × 4) ÷ (Total intake calories) = (Protein % of total calories)**

### 4.4.3 Fat

Fat makes up remaining percentage intake as expressed in terms of total calorie requirements.

For our example 80kg individual eating 60% carbohydrates and 17% protein (at 1.6g/kg protein) that leaves 23% of calories to come from fat (or 18% on the higher protein diet).

Fat possesses 9 kcal per gram. Therefore, for our example individual with 2935 daily maintenance calories, we can work out their fat requirement, in grams, as follows:

(0.23 × 2935) ÷ 9 = **75g**.

On a higher protein consumption they would need to eat slightly less fat:

(0.18 × 2935) ÷ 9 = **59g**.

So they would need to be sure to be eating lean cuts of meat/fish/protein sources in order to keep overall fat intake down.

The formulae in general terms:

**100% - (% Carbohydrate intake) - (% Protein intake) = (% Target fat intake)**
**[(% Target fat intake) × (Total calorie intake)] ÷ 9 = (Target fat intake in grams)**

### 4.4.4 Intake summary

Putting everything together for our example individual, who:

1. **Is aged 25.**
2. **Weighs 80kg.**
3. **Has a sedentary job.**
4. **Exercises 4x per week, burning approximately 1900 kcal per week.**

We get the following daily requirements:

| | Maintenance diet | Weight loss diet | Weight gain diet |
|---|---|---|---|
| **Total calories** | 2935 kcal | 2435 kcal | 3435 kcal |
| **Carbohydrate** | 440g | 365g | 515g |
| **Protein** | 128g (1.6g/kg) | 128g (1.6g/kg) | 160g (2.0g/kg)* |
| **Fat** | 75g | 62g | 68g |

* For gaining lean muscle mass when attempting to increase overall bodyweight, the higher protein intake of 2.0/g is recommended.

Needless to say, on either the weight loss/gain plans, these intake values will need to be recalculated and adjusted every 2-4 weeks as your bodyweight – and therefore resultant macro-nutrient – values change.

## 4.5 Part D – Understanding & Decrypting Nutritional Information

### 4.5.1 Overview

Under UK law, all commercially sold food products must list – or the manufacturer must be able to provide, when requested – officially certified nutritional information. Typically this will always be listed per 100g of product, and usually, also per "serving" – slice, portion, parts, etc.

Learning how to read this information correctly is important – and in particular, "decrypt" the information – as often manufacturers will try to present a more favourable profile than the food actually has. This information is the actual truth of the matter. It reveals the stark facts. As such, whatever claims are made in the marketing blurb, promotional material, and front of the packet are revealed in their actuality by what the numbers state.

### 4.5.2 Analysing the information

Here is an example, taken from the data for a mainstream brand of wholemeal pre-packaged thick sliced bread:

| Typical Values | Per 100g | Per slice |
|---|---|---|
| Energy | 1010 kJ | 444 kJ |
| Energy | 239 kcal | 105 kcal |
| Protein | 10.5g | 4.6g |
| Carbohydrate | 37.7g | 16.6g |
| of which sugars | 4.3g | 1.9g |
| Fat | 3.8g | 1.7g |
| of which saturates | 0.5g | 0.2g |
| Fibre | 6.2g | 2.7g |
| Sodium | 0.40g | 0.18g |
| Salt | 1.00g | 0.45g |

**Energy** is usually listed in both kilojoules and kilocalories. Calories are the preferred convention for everyday use. In actuality, a "food calorie" is actually 1000 calories, hence why correctly rendered it should be written with the suffix *kcal* and is technically a kilocalorie. For convenience in everyday language though, it generally just referred to as a "calorie", even though this is not scientifically accurate.

We can see here that the product provides 105 kcal, 105 calories, per slice; or 239 per 100g – so we can deduce that each slice is approximately 40g of product. From a strict energy point of view, the average sedentary women could probably eat somewhere around 15 slices per day and maintain weight (in practice, such a nutritionally limited and unbalanced diet would cause major problems in

the long run).

It provides 4.6g of **protein** per slice, so it is a reasonable/moderately good source of vegetarian protein. It is worth noting that even top quality meats and fishes – popularly understood to be predominantly "protein" – generally provide around 20-30g of protein per 100g of actual meat/fish by weight; the rest of the weight is made up from fats, indigestible bulk, and overwhelmingly, water. Protein provides a slow digesting form of energy that primarily must be broken down in the outer and inner intestines to extract the amino acids that help to rebuild muscle and other tissues.

It provides 16.6g of **carbohydrate** per slice, so we can see that the bulk of the energy in this product comes from carbohydrates, as you would expect in a starchy product. Importantly, from this 16.6g, only 1.9g "of which [is] sugar[s]"– not too bad; to do better from bread, realistically, you would have to be prepared to bake your own. The nutritional information will generally always provide you with the sugar breakdown "of which sugars". This figure is critically important, as the objective is to keep this figure low most of the time. We want most of our carbohydrate calories to come from **starches** which are slow digesting, and cause a gentle insulin response, rather than **sugars**, especially refined sugars such as added to most manufactured modern foods. Insulin is the hormone that your body produces from the pancreas to transport sugar, released into the bloodstream from your stomach, into storage sites in the liver and muscle tissues (in the form of glycogen). Starches break down slowly, so only generate a gradual "slow release" form of energy and gentle insulin production. Sugars break down quickly and generate a very strong insulin response, and correspondingly cause fluctuating energy levels as blood sugar first spikes then drops very quickly. Excessive glycogen (irrespective of whether it was originally sugar or starch) that cannot be stored in the muscles or liver ultimately has to be stored as adipose fat tissue. As repeatedly stated, eating **too much in general** is what causes someone to put on excess fat, regardless of the particular vagaries of their diet. Refer to section 2.2.3 above for details of the sort of carbohydrates you should be consuming for the bulk of your calories.

**Fat** is 1.7g per slice, so fairly low. 0.2g is saturated. Within wishing to go into excessive and unnecessary detail here, saturated fat *per se* is not bad for you. Too much – in the form of eating a diet skewed, for example, with the poor quality processed meats and processed savoury products full of poor quality vegetable oil, etc. – is a problem. In general, you want a good balanced ratio between all three of saturated, polyunsaturated, and monounsatured fats. Refer to section 2.2.2 above for details of the sort of fats you should be aiming to consume.

**Fibre** is 2.7g per slice. Fibre is the predominantly indigestible component of food, the "bulking" material in food that your body cannot break down and extract any energy from. Your body can extract some limited energy from "soluble" fibre, but insoluble fibre actually expends more energy on digestion than your body would ever get out (negative calories, in effect). It helps with "digestive transit" by effectively adding bulk to your stools and keeps your intestines healthy by acting rather like a crude pipe-cleaner, of sorts, for want of a better analogy. It also makes a meal more subjectively filling, by literally adding more bulk as it passes through your stomach and into your intestines. This is good for appetite control (the same principle applies to the age old wisdom of drinking a glass of water before a meal to control appetite; it fills the stomach). Fibre intake should ideally be at least 20g and more per day, and obviously increase in proportion to increases in energy intake. By eating plenty of fruit and vegetables (see 2.3 Micro-nutrients (vitamins & minerals); and again by choosing the best carbohydrates listed in 2.2.3 above) you will obtain perfectly enough fibre for ideal gastrointestinal health.

**Sodium** is 0.18g. **Salt** is generally speaking around **2.5x** whatever the sodium figure listed is. Sometimes a product may only list the sodium value. The sodium is the sodium chloride component of salt. Make sure you multiply by 2.5 to get the actual salt content from the sodium value if it is not listed. Keep salt low, in an ideal world less than 5g per day. This is hard though, with the modern diet – you need to avoid adding any table salt to meals, unless cooking absolutely everything from scratch, and limit processed and ready made foods and foodstuffs. This bread is therefore pretty high in salt. Having two slices, then putting, typically, some salted butter or spread on top, then whichever topping – you can see you're already probably getting more than 2g of salt from a single, fairly modest sized, meal/snack. You lose essential salts through sweating, hence why sweating is very good for the body. It is good for the skin, as it releases toxins and exfoliates, and it helps prevent excessive mineral build-up in the tissues. Profuse sweating is therefore a mechanism – though not an excuse – for managing salt intake.

### 4.5.3 A typical ingredients listing

Ingredients will always appear in order of their proportionate content in the food. In other words, the ingredients that make up the bulk of a product appear first. Here is a listing from a major pre-packaged confectionery product by way of example:

```
Wheat flour, Milk chocolate (27%) [Sugar, Cocoa butter, Cocoa mass, Dried
Skimmed Milk, Dried Whey, Butter Oil, Vegetable Fat, Emulsifiers (Soya Lecithin,
E476), Natural Flavouring], Sugar, Vegetable Oil, Glucose-Fructose Syrup, Fat
Reduced Cocoa Powder, Calcium Carbonate, Raising Agents (Sodium Bicarbonate,
Ammonium Bicarbonate), Natural Flavourings, Salt.
```

It should, hopefully, be fairly obvious that this is not a healthy product, so consequently should make up only a small part of your diet, a "treat". A few notes:

There are a couple of refined sugars in here, by different names. Consumption of them should be limited: `Sugar, Glucose-Fructose Syrup`. Sugar goes by many different names; refer to the table in section 3.3.4 above. The product also has low quality fat in the form of cheap mass produced `Vegetable Oil` – this reveals itself in the fact that per 100g of product, 15.2g out of the 27.1g of fat are of a saturated nature. The `Butter Oil` is probably slightly better quality and will be in there to ensure that the product has a richer better flavour than would otherwise be obtained from the low quality vegetable oil.

It is reasonably free of anything artificial (not all "E numbers" are artificial or synthetic in origin) with fairly standard and innocuous bulking agents, thickeners, and flour raising agents. Also worth noting is the presence of `Dried Whey`. This is the **same** ingredient as goes into countless popular body-building protein supplements. It is standard bi-product of the dairy industry and has been a stable ingredient in the food industry for years before it became exploited in the lucrative sports supplement market. Whey, in general, is a bi-product (and indeed used to be a waste product!) from the dairy manufacturing and milk production. It is used as a bulking agent to add thickness and "filling" to standard foodstuffs and is fairly ubiquitous. It is neutral in taste. It is not a particularly expensive ingredient (though burgeoning demand from the sports supplement market has increased its value as a commodity) nor has it any particularly special properties. Milk itself is a good quality source of protein and whey is simply a fraction of the milk. For this reason it is safe to say that most whey protein supplements are overpriced and under-deliver!

### 4.5.4 Dry versus "cooked" weight

Be **careful** when reviewing the data per 100g for grains such as pasta and rice as it common for the manufacturer to list the data of 100g of *cooked product* (again, this makes the product appear less calorie dense, generally a good selling point in the modern world…). Rice, pasta, and similar dried grains usually increase in weight by around 2-3x times when cooked as they absorb water. Always try to calculate from dry weights, as you can measure the quantity before you cook and know how much energy you are consuming. (Water, obviously, adds no calories). 100g of cooked pasta probably therefore will consist of something like 40g of dry pasta (depending on how *al dente* or not you like your pasta cooked…). If you measure out 200g of dry pasta thinking you are only consuming 200g worth of calories as measured by c*ooked weight* as listed on some packets, you will be in for a big shock!

### 4.5.5 Omega 3, 6 and 9 ratio

Related to concerns over the distribution of saturated, monounsatured, and polyunsaturated fat, we also have what is known as the Omega 3:6:9 ratio. Much in the same way that one should try to eat a balanced mix of saturated, monounsatured, and polyunsaturated fat, we should also try to keep the proportion of these Omega fatty acids in a rough balance. Due to various physiological changes in the properties of foods, in particular commercially produced meats and fishes, and high intensity grain production, the ratio in the modern diet has skewed unfavourably towards 6 and 9. We really just need to focus on increasing Omega 3 to bring the ratios back in line as we get sufficient 6 and 9 from a typical diet. Supplementing with Omega 3 is therefore beneficial, provided it is a high quality fish oil free from impurities or good quality flaxseed oil.

Focusing on eating the better quality fats and protein sources as listed in sections 2.2.1 and 2.2.2 will help to address this ratio. Once again, poor quality foodstuffs tend to predominate in fats from Omega 6 and 9 sources. Good quality fish is the best source of Omega 3, particularly "oily" fish like mackeral, salmon, sardines, etc. Vegetarians should supplement with regular consumption of cold pressed flaxseed oil (do not attempt to fry or cook with it!).

More important than overall quantity of fat consumption (although taking into account the effect it has on energy intake) is the overall quality and profile of our fat consumption. A balanced fat profile that has a good mix of monounsatured, polyunsaturated and saturated fats all of good quality, similarly balanced in terms of Omega 3, 6, and 9 is the key to a healthy diet with respect to fat consumption.

## 4.6 Part E – Special diets and provisos

### 4.6.1 "Alternative diets"

The internet is awash with "alternative" diets and special dietary regimes. Bookshops have shelves of books proposing alternative dietary strategies, and in particular, offering radically different macro-nutrient distributions as opposed to that presented here.

Paleolithic/low-carb diets are one such example. The fact of the matter is that there is no one such "paleo" diet. Stone age man ate a huge variety of different diets as human civilizations are enormously varied and emerged in radically different environments. Inuit Eskimos traditionally eat a diet

composed almost entirely of fish and seal, with the result that their diet is almost exclusively fat/protein. The Mesoamerican civilizations in Central America ate a diet based heavily around Maize, Tapoica, and Quinoa – i.e. extremely carbohydrate rich. Bottom line is the body is extremely good at adapting to any particular diet as long as certain basic requirements in terms of nutrients and energy intake is made.

Ultra low fat diets are pointless in that fat is actually your bodies preferred energy source for low-energy daily activity and basic survival.

Fundamentally, if you eat a **healthy** diet you can deviate a fair distance from these sports science recommendations and still get good results. Everyone's body is different. Everyone possesses different gut fauna and micro-biome – therefore no two humans process any particular food identically.

### 4.6.2 Basic guidelines

1. Exceeding 3.0g per kg bodyweight of protein per day is not particularly recommended and doesn't confer any additional benefit. Around 3.0g/kg is the amount recommended for elite Olympic weightlifters or other similar elite strength athletes training 3x per day six days per week. The average non-elite athlete does considerably less then 18 strength training sessions per week! Consequently the average athlete does not need such a high protein intake to achieve maximal results based on their training load. If you do eat a very high-protein diet, the protein sources should be top quality and you must drink large amounts of water throughout the day.
2. If you eat insufficient carbohydrate, you will get poor glycogen restoration in the local muscle and liver stores, and find it difficult to sustain vigorous, intense exercise, especially on consecutive days – particularly of a more "cardio" or steady state nature. For this reason, going onto an ultra low carbohydrate regime is **not** recommended except for those in special circumstances (e.g. a competitive bodybuilder cutting down a few weeks prior to a competition to a [potentially harmful in long-run] ultra-low-level of body fat).
3. Fat is not such a great evil, in fact it provides a stable energy source that prevents strong fluctuations in insulin production. Provided the fats are of **good** quality, fats will not make you fat any more than anything else – it is overall energy intake that causes someone to either lose or gain weight. Fats are simply more energy dense per gram than either carbohydrate or protein, hence why they can contribute to excessive energy intake.

Above all, avoid extremes and avoid fads! Any diet that proposes miracles, requires strange supplements, strongly deviates from the guidelines that have been established empirically by sports scientists studying top athletes, or departs from fundamental features that nutritionists have established for human health, is likely to be inadvisable.

Eat fresh, eat high quality, eat unprocessed, and eat as much natural variety as possible.

# 5 Meal plans & examples

Suggested/example meals/food plans to create that follow the principles outlined above.

## 5.1 Breakfast

- 3 eggs (preferably organic, but at least free range), poached, on wholewheat toast with butter. Drizzle over olive oil or similar. Variations: Add cheese (from an unprocessed block [e.g. mature cheddar], not plastic coloured cheese that is already sliced!) to make meal even more filling. Or add baked beans (don't go to excess; baked beans contain a lot of added sugar). Or add both if you're feeling really hungry!

- Porridge. Made from whole oats (jumbo are best!), not the pre-packaged "instant" type. Bring to a simmer in a pan with whole milk or water (or both). Flavour with a pinch of salt (as the Scottish do!) or with natural honey to sweeten (as I do!).

- Whole Greek yoghurt. Chop up a selection of whatever fruit you like for flavour. Some cured meat as an aside.

- 4 egg omelette with side salad. Banana. Apple.

## 5.2 Lunch / Dinner

- Roasted sweet potato, selection of grilled/fried/baked/boiled vegetables (e.g. tomatoes, peppers, broccoli), piece of steak cooked medium-rare. Drizzled over with olive oil.

- Piece of lightly cooked salmon on bed of green vegetables with a quinoa. Drizzle over with olive oil.

- Roasted chicken leg on bed of brown rice with onions, peppers, and green beans.

- Strips of chicken breast lightly fried with selection of parboiled vegetables, on a bed of lentils and chickpeas.

- Pork stir fry with Chinese vegetables (beansprouts, mange tout, bamboo shoots), peppers, and buckwheat noodles.

- Vegetarian stew made with chickpeas, butter beans, pinto beans, swede, carrots, onions in a beef stock.

- Pollock in a curried tomato based sauce with onions, peppers, broccoli, okra. Serve with side dish of new potatoes.

- Chilli con carne with red kidney beans and pinto beans on a bed of white rice, with broccoli as an aside.

## 5.3 Snacks

- Fruit. Yoghurt. Nuts. Cooked/cold meat (beware salt content on prepared meat though).

- Make a small "meal" such as mains above but with small quantities.

## 5.4 Water

- Drink at least 2 litres of water per day, spaced throughout the day, in **addition** to plenty of water before/during/after workouts. Being dehydrated in the short term during a workout (if workout is only an hour or so) is not really a problem provided you ensure to properly rehydrate afterwards, but generally speaking, try to stay well hydrated at all times and drink plenty, though not to excess. (It is possible to *over* hydrate. Don't force liquid down yourself if you don't feel at all thirsty. Be sensible. Listen to your body! If you listen correctly, you'll find yourself wanting to drink regularly and comfortably throughout the day in any case…).

## 5.5 Recipes

- Stuck for ideas? http://www.bbc.co.uk/food/recipes/ has literally thousands of recipes (approximately 15,000 at time of writing), so just give them a go and apply the principles listed above when selecting meal recipes, or modify the recipe accordingly.

## 5.6 Worked examples

Here are some concrete examples of daily food intake based on all the principles outlined above. Note that although carbohydrates and proteins possess approximately 4 kcal per gram, and fat 9 kcal per gram, for various technical reasons (such as indigestible fibre content) these energy densities are not absolutely *exact* once they are part of an actual food – they are very close though. There will therefore be a slight variation in the actual figures from the food versus standardised formulas, but the difference is sufficiently small for it not to be a concern. As long as we get **close**, that will be sufficient. As described throughout this document, getting absolutely exact figures for the body's metabolism is impossible in practice and, fortunately, not necessary in practice.

### 5.6.1 80kg active man requiring 3500 kcal per day to build muscle

**Calculate carbohydrate requirement:**

60% carbohydrate = 0.6 × 3500 = 2100 kcal. In grams: 2100 ÷ 4 = 525g

**Calculate protein requirement (higher bound of 2.0g/kg):**

2.0g protein/kg = 2.0 × 80 = 160g protein. In calories: 160 × 4 = 640 kcal.

**Calculate fat requirement:**

3500 – carbohydrate calories – protein calories = 3500 – 2100 – 640 = 760 kcal.

In grams: 760 ÷ 9 = 85g.

So, in summary, the daily requirements are:

**Carbohydrate:** 2100 kcal / **525g**

**Protein:** 640 kcal / **160g**

**Fat:** 760kcal / **85g**

Here is an example eating plan that would take this person sufficiently close to these macro-nutrient values:

| Food | Calories (kcal) | Carbs (g) | Protein (g) | Fat (g) |
|---|---|---|---|---|
| **Breakfast** | **686** | **68** | **27** | **28** |
| Thick sliced wholemeal bread, 4 slices | 400 | 66 | 15 | 4 |
| Two whole eggs, poached | 140 | 2 | 12 | 8 |
| Natural butter, 20g | 146 | 0 | 0 | 16 |
| **Lunch** | **1026** | **175** | **49** | **18** |
| Pasta, 200g uncooked weight | 714 | 157 | 27 | 3 |
| Cherry tomatoes, approx 12 tomatoes | 44 | 8 | 0 | 0 |
| 1 red pepper | 21 | 6 | 1 | 0 |
| Extra virgin olive oil, 15ml | 135 | 0 | 0 | 15 |
| Grilled tuna steak, fresh, 70g | 98 | 0 | 20 | 0 |
| Green beans, 50g | 14 | 4 | 1 | 0 |
| **Dinner** | **1269** | **195** | **84** | **24** |
| Brown basmati rice, 200g uncooked weight | 668 | 136 | 19 | 6 |
| Red split lentils, 100g uncooked weight | 304 | 56 | 24 | 1 |
| Extra virgin olive oil, 15ml | 135 | 0 | 0 | 15 |
| Chicken breast fillets, no skin, 125g | 145 | 0 | 40 | 2 |
| Broccoli, 50g | 17 | 3 | 1 | 0 |
| **Snacks/throughout day:** | **559** | **98** | **10** | **17** |
| Green apple (average size) | 95 | 25 | 0 | 0 |
| Greek natural yoghurt (full fat), 125g | 181 | 8 | 6 | 14 |
| Two bananas (average size) | 210 | 54 | 2 | 0 |
| Satsuma (average size) | 36 | 9 | 1 | 0 |
| **Totals:** | **3534** | **534** | **169** | **84** |

### 5.6.2 60kg sedentary women requiring 1500 kcal a per day to maintain body weight

Following same process as above, but based on 1.6g/kg bodyweight protein intake, for this individual:

**Carbohydrate:** 900 kcal / **225g**

**Protein:** 384 kcal / **96g**

**Fat:** 216kcal / **24g**

Here is an example eating plan that would take this person sufficiently close to these macro-nutrient values:

| Food | Calories (kcal) | Carbs (g) | Protein(g) | Fat (g) |
|---|---|---|---|---|
| **Breakfast** | **481** | **74** | **16** | **13** |
| Whole rolled oats, 100g | 356 | 60 | 11 | 8 |
| Whole milk, 150ml | 96 | 7 | 5 | 5 |
| Blueberries, 50g | 29 | 7 | 0 | 0 |
| **Lunch** | **490** | **79** | **39** | **4** |
| Buckwheat noodles, 100g uncooked weight | 330 | 72 | 10 | 2 |
| Haddock fillet, 113g | 96 | 0 | 23 | 1 |
| Broad beans, 80g | 64 | 9 | 6 | 1 |
| **Dinner** | **425** | **34** | **32** | **17** |
| Boiled new potatoes, 75g | 108 | 25 | 3 | 0 |
| Mange tout, 80g | 26 | 3 | 3 | 0 |
| Turkey breast fillet, 150g | 156 | 6 | 26 | 2 |
| Extra virgin olive oil, 15ml | 135 | 0 | 15 | 0 |
| **Snacks/throughout day:** | **105** | **27** | **1** | **0** |
| Banana (average size) | 105 | 27 | 1 | 0 |
| **Totals:** | **1501** | **214** | **88** | **34** |

The above example graphically illustrates why the average sedentary Briton – whether male or female – struggles to maintain a healthy body weight. If you do little exercise/activity, the amount of calories you need to sustain your weight is pretty low, and exceptionally easy to exceed – especially if you want to enjoy a few food treats that are less healthy! A packet of crisps, a chocolate bar, a glass or two of wine on a semi-regular basis, and those extra calories, on top of what is a pretty low allowance, will soon add up.

### 5.6.3 85kg moderately active man requiring 2800 kcal per day to lose weight

Let us assume this 85kg individual needs around 3300 kcal per day following their typical daily/weekly regime to *maintain* weight. Aiming for a sustainable 500 kcal daily deficit – which would cause a weight loss of around 2 kg/month (i.e. approximately a stone every three months) – and therefore 2800 calories per day, at 1.6g/kg protein intake, this yields:

**Carbohydrate:** 1680 kcal / **420g**

**Protein:** **544** kcal / **136g**

**Fat:** **57**6kcal / **64g**

Here is a eating plan that would get close to these targets:

| Food | Calories (kcal) | Carbs (g) | Fat (g) | Protein (g) |
|---|---|---|---|---|
| **Breakfast** | **538** | **48** | **27** | **22** |
| Thick sliced wholemeal bread, 2 slices | 200 | 33 | 2 | 8 |
| Two whole eggs, scrambled | 140 | 2 | 8 | 12 |
| Natural butter, 20g | 146 | 0 | 16 | 0 |
| Grapefruit, ½ medium fruit | 52 | 13 | 0 | 1 |
| **Lunch** | **933** | **119** | **23** | **77** |
| Quinoa, 150g uncooked weight | 571 | 104 | 7 | 21 |
| Two chicken legs, skin removed | 312 | 0 | 16 | 52 |
| One red pepper | 16 | 8 | 0 | 1 |
| Broccoli, 100g | 135 | 0 | 0 | 15 |
| **Dinner** | **1151** | **200** | **22** | **42** |
| Cooked kidney beans, 100g drained weight | 105 | 18 | 1 | 7 |
| Salmon fillet, 100g | 239 | 0 | 14 | 28 |
| White rice, 200g uncooked weight | 766 | 172 | 7 | 6 |
| Carrots, 100g | 41 | 10 | 0 | 1 |
| **Snacks/throughout day:** | **157** | **54** | **0** | **1** |
| One banana (average size) | 105 | 27 | 0 | 1 |
| Red grapes, 100g | 52 | 27 | 0 | 0 |
| **Totals:** | **2779** | **421** | **72** | **142** |

# 6 Fundamental physiological facts

A summary of a few basic facts and points worth underlining that are nevertheless commonly forgotten!

## 6.1 You cannot violate the fundamental law of thermodynamics.

Following the law of *energy conservation*, overall:

- Expend more than you consume → Get lighter/smaller.
- Consume more than you expend → Get heavier/bigger.
- Expend what you consume → Stay the same weight/size.

**REGARDLESS** of **WHAT** it is you eat.

## 6.2 In the LONG term...

- If you eat a lot and don't exercise much/have low activity, you will become overweight and will not be athletic/muscular/lean. Even those with a "fast metabolism" will eventually find as they age that they start to get "middle age spread". You will be jeopardising your long term health.
- If you don't eat much and don't exercise/have low activity, you will be thin, skinny, weak and unfit and lacking any muscular development. You will be jeopardising your long term health even if you are "slim".
- If you don't eat much and try to exercise a lot, you will struggle to gain muscle tissue, will not become athletic and will not be able to support a large training load. You will also be at high risk of injury.
- If you exercise a lot (productively/sensibly) and eat a lot (good quality/balanced) you will be or eventually become muscular, athletic, lean and fit. Most importantly, you will be maximising your long term health.

## 6.3 General tendencies...

In general, the vast majority of individuals will tend to:

- OVERESTIMATE calorific burn of exercise.
- UNDERESTIMATE calorific intake from food.

Burning 500 kcal, let alone 1000 kcal is **hard work,** no matter how fit you are. Unless you have the luxury of spending all day out hillwalking, where by sheer virtue of spending many hours out rambling you'll almost inevitably accumulate a large calorie burn (unless you're doing a tour of country pubs...), if you are going in the gym to do some exercise, it is a a lot easier to get sucked into just doing your "usual" and con yourself into believing you have worked harder than you actually have. Make sure to give yourself a reality check: Are you soaked in sweat? Are your muscles burning? Have you pushed yourself or just cruised for an hour? Unless the answer to these is an affirmative "yes", you may well not have done anywhere near as much as you think you have.

By contrast, eating 1000 kcal is the easiest thing in the world, even for someone with a small appetite. Most people with an "average" sized appetite would have no problem polishing off 1500+ kcal on a takeaway pizza, and on a late "night out" with alcoholic drinks and takeaway, sipping up several thousand calories is perfectly straightforward for most.

## 6.4 The body as a Complex System

Notwithstanding what is stated above (which still applies **in general**), it must nevertheless be mentioned that the body is a complex system in the most literal mathematical sense of the term. It is not simply a set of inputs and basic outputs. The complexity and sheer number of "inputs" and "outputs" in the human system is so mind bogglingly complex that the best one can do is provide a guide and train the individual to become self-aware, in a sense, to become more "intuitively" aware of their requirements. Moreover, this vast number of "inputs" and "outputs" are all related to each other

in an extremely complex manner, such that small alterations in a few inputs can have dramatic and unexpected effects that are not casually or proportionally obvious on outputs. Hence why performance enhancing drugs are a bad idea – one is messing with a system of such immense complexity that you are groping around in the dark, as it were, in terms of long term permanent effects.

No one can provide "exact" numbers regarding energy intake and expenditure – it is impossible outside a laboratory and even within one stretches the limit of all available technologies. You have to get to know your own body. For example, when someone eats, say, 1000 kcal, it is not just a simple matter of 1000 kcal "in". Many factors affect what happens to the chemical system of your body. Specifically, the following is a short-list – far from exhaustive – of significant factors that affect your body at all times:

1. The "thermogenic" effect of food. This is the amount of energy expended actually digesting the meal. This will in turn depend on many factors, such as your gut fauna and micro-biome environment.
2. The state of your endocrine system. Stress produces adrenaline and cortisol, and also effects other levels of hormones. The levels of these hormones profoundly effect the biochemical reactions occurring throughout your body. To further complicate the situation, it is not a simple matter of the *level* of particular hormones; it is a matter of the dynamic processes of *interaction* amongst them all. Hence why, under different circumstances, awry levels of particular hormones can actually have *opposite* effects; high cortisol levels, for example, can make someone both waste away and gain weight. It depends on the cycles involved. So, in general, factors like someone's work environment and how stressful they find their job, or at home, will make a big difference to what happens to your body.
3. Sleep, and in particular, *quality of sleep* is probably of equal importance to what exercise you do. You *gain* your fitness improvements when you recover, when you sleep, not in the actual workout itself. It has a profound effect on the production and regulation of the hormones throughout the body and physiological adaptations to exercise.
4. Thermogenesis to maintain body temperature. Your body burns a significant amount of energy to stay warm. The temperature of the environment effects your calorie requirements. Colder environments place a greater demand on the body to stay warm.
5. Biomechanical efficiency. One of the features, perhaps annoyingly for some, is that as you get fitter your body gets more efficient. This means that over an easy 3 mile walk, say, the unfit person will actually burn more calories than the fit person. Your body can do more with less. Hence why the exercise demands need to increase in line with increases in fitness. The same hour of exercise at a certain level on a machine that might have burned 500 kcal in an individual may end up causing them to burn significantly less six months later, if, as a result of getting considerably fitter, they now find that same hour at the same level far less work with lower resultant heart rates.
6. Training is neurological *and* physiological. You need to be training your mind – that is, actively *engaging* with whatever it is you are doing – in order to get good results. The neurological stimulus and other inputs to your *central nervous system* are what cause the "software" of your body to "rewire". If the muscles and skeleton are the "hardware", then, following this analogy,

the hardware is only as good as your "software". Strength, for example, is as much about nervous system *inhibition* as actual muscle size (though, naturally, the dimensions of the muscle cross-section do significantly effect the potential force production). Both factors – "hardware" and "software" – need to develop if you want to experience significant fitness gains and see a change in your body. Without the motor skills, you cannot utilise the muscles fully, which means you cannot execute the exercise optimally, which means you cannot maximise your results. Most of these motor skills, are, once again, rewired whilst you *sleep* rather than during the actual training session itself...

7. Metabolic demands of exercise. *After* you exercise, your metabolism is raised above its baseline value. The extent, and time, that it remains raised depends on a variety of factors. Generally speaking, resistance or heavy strength training will have a greater metabolic effect than more "cardio" type activity. But it depends on the intensity. It depends on fitness and your response to the exercise. An extremely strenuous "cardio" workout could have significant metabolic demands. Short of taking repeated blood samples post-exercise in a laboratory, it is nearly impossible to provide exact estimates as to the overall effect this will have on calorie consumption and the production of specific hormones in your body. A rule of thumb is that strenuous resistance training can raise your metabolism approximately 10% above baseline for 24 hours post-workout.

# 7 Useful technology/Exercise Aids

## 7.1 Myfitnesspal

The website Myfitnesspal (www.myfitnesspal.com) has a comprehensive database of UK food products from most of the major supermarkets and common foodstuffs. It is well worth using as you can accurately log everything you eat. This is advisable to do, even if only for a few weeks or periodically rather than on a permanent basis, as it will make sure you are familiar with actual portion sizes, the correct quantity of food, and that you are continuing to eat appropriately. Used in conjunction with the guidelines above, you can use it to help ensure you eat the correct quantities of carbohydrates/fats/protein.

Since all of the entries have been submitted by users, it is important to double check the values the first time you add a regular foodstuff, as some of the entries are incomplete or inaccurate (i.e. might list calories but be missing fat, protein, or carbohydrate values). Do not take it as gospel.

## 7.2 Interval timer/Gymboss/Impetus

Using some type of timer for your workout – regardless of whether you are doing "cardio" or more of a resistance/weight training workout – is strongly recommended as, when used in conjunction with a sound training program, it brings focus and intensity to your workouts and acts as an aid to concentration. A basic stopwatch or wristwatch is of course adequate, but there are some useful tools that allow you to specify your workout in advance: you can define work periods and rest periods, and set them up into complex combinations as you wish. In particular, there is nothing like a timer – start it when your workout begins, it stops when you are finished – that is counting down to bring real attention to your workout in a way that simply checking the time on your watch periodically doesn't match. It acts as a gentle nudge to work harder.

They Gymboss (www.gymboss.com) is a standalone digital timer that allows you to create intervals and complex sets of intervals. It can clip to shorts/tops and also has wrist or arm attachments available.

Even more powerful are the various apps now available for modern smartphones. For Android devices, I can thoroughly recommend the **Impetus Interval Timer** (available on Google Play), which is free (no ads) or for a very small price can be upgraded to "pro" which allows you to import/export/edit all the timing presets (simple XML files) from/to/on a computer. It allows you to create anything from very simple timers/intervals up to extremely complex full "workouts". You can also set it up to output countdowns and sounds, or music as you wish to go with timing intervals.

There are many other options of course, and doubtless countless alternative apps for iPhone, Blackberry, Windows Phone or other smartphone platforms.

Find one that works for you; or simply use the inbuilt countdown timer that comes with just about any phone or basic digital watch. Either way, monitor your time in the gym and use it to bring focus; *intensity* and *quality* rather than simply *total* time spent is what really counts when executing a workout.

## 7.3 Heart rate monitors

A heart rate monitor is the only way to get a highly accurate assessment of actual calories burned during exercise. Note, however, it won't be able to accurately account for metabolic demands of heavy weight training (mentioned above), which might not burn significant amounts of calories during actual exercise but have a significant metabolic effect on the body as it is repairs the muscular damage over the subsequent 24-72 hours. Nevertheless, it does provide a far more accurate estimate than anything else, as it can adduce, from your heart rate, a measure of your oxygen consumption and thereby overall energy expenditure. From your heart rate variability it can also provide a good estimate of exercise intensity, and over the long term help to quantify fitness improvement.

I personally recommend the Suunto monitors (www.suunto.com), as despite being expensive, the actual watches are well built, the heart recording straps themselves are faultless and reliable (and have user replaceable components), and with the higher specified models all exercise data can be logged/analysed on their cloud based website Movescount. Polar monitors are also well established, but for whatever reason I had persistent problems with their newer fabric straps (unlike Suunto) which kept dropping/losing my heart rate reading so find I personally cannot recommend them. They work well for many other people and athletes though.

In conjunction with the various logging/training management software, they provide a good motivation and tracking tool to ensure you stay consistent with training.

## 7.4 Pedometers/Fitbit/activity trackers

Pedometers are available cheaply and can be a useful aid for increasing daily activity. Regardless of how sedentary your working job and how regular your exercise regime, there is little excuse not to

strive to reach around 10,000 steps *per day* in addition to your exercise regime through a few simple proactive measures in day to day life. *Regular low level activity is crucially important to general health*. 10,000 steps is around 1-2 hours of walking per day. This can easily achieved in small blocks throughout the day; pacing around the office, walking outside during lunch break, walking whilst in transit lounge at airport, walk up and down on platform, walk from far end of car park in supermarket, making extra trips up and down the stairs in the house, always using stairs rather than lift, etc., etc.

The Fitbit (www.fitbit.com) is a device that links up to a computer and uploads data onto the website and tracks all your step data to monitor day-to-day activity. It can be linked up to Myfitnesspal to accurately track your daily food intake. You can specify exercise session data into the site. You can use it to log the quality of your sleep. Overall, it provides – once properly calibrated – a very accurate measure of your actual day-to-day calorie expenditure and a useful long term log of overall daily/monthly/yearly activity. It can be linked to modern smartphones.

There are also other activity trackers now appearing on the market that offer similar features. Remember, the devices are only (reasonably) accurate provided they are *calibrated* properly. Default settings are not always accurate (my Fitbit grossly overestimated my calorie burn until I calibrated it, as because I walk very quickly, it thought I was running rather than walking, so calculated accordingly!).

If you use such a device, make sure to calculate baseline figures from the formulae listed through section 4.2 so that you have a reasonable starting point to assess the likely accuracy of any claims the device makes.

## 7.5 "Corrective" shoes versus "minimal" wear

Unless you have a **definite** physiological defect that can only be addressed with direct intervention (i.e. one leg significantly shorter than the other; you had an operation as a child, etc.) and that absolutely requires correction, be sceptical towards the benefits of "corrective" food wear. Generally, rather like the principles applied to food, the simpler and more authentic the footwear is towards the way your *foot is designed to work by nature*, the better.

*Most* problems in the foot and lower limb are due to problems in the musculature and soft tissues. Corrective *training* can, in *most* cases, restore natural function. Supposedly solving it with a piece of "high-tech" footwear is similar to "solving" shoulder pain by taking a paracetamol. You are masking the symptoms, not addressing the underlying cause. I have trained many individuals with various problems with their gait over the last two years, who have been sold various expensive inserts and footwear, and with correct training not only did all their underlying mechanical problems disappear, the "corrective" interventions actually started to *become the problem* and normal footwear or simply the bare foot once again felt extremely comfortable and "right" again – as nature intended. Of course, I am not claiming that *some* interventions are not necessary – simply that *most* probably are not. In particular, specific corrective intervention should be the *last resort* not the first point of departure, used only once all natural corrective training options have been exhausted.

The human gait is extremely complex and already perfectly designed. It is a marvel of engineering and

remarkably complex. Try not to interfere with it too much.

Minimal footwear like Vibram Five Fingers (www.vibrams.co.uk) and Vivo Barefoot (www.vivobarefoot.com) are great for strengthening up the muscles of the foot. If you aren't used to wearing barefoot/minimal footwear, *build up gradually*. The muscles in the foot and lower leg, weak from excessively supportive footwear, will be extremely deficient (even in highly active and fit individuals) and will take weeks and indeed months to strengthen up.

For traditional weightlifting, an Olympic weightlifting shoe with a heel and extremely sold/firm sole is still recommended as they confer a mechanical advantage during big lifts like squats. For the serious individual that intends to do a lot of weight training, they are a good idea and provide a solid base for lifting from. Looked after, they will last a long time. Obviously, do not use them for running, etc.!

Dedicated lifting shoes are expensive though, so a firm piece of minimal/flat footwear, or basic trainer is fine for most individuals. A pair of dirt cheap plimsolls are an ideal economical solution! Flat soled boxing boots are also a good economical choice. Fancy looking trainers, with very high heels, or worst of all, supposed "toning" trainers (that do nothing of the sort) which specifically interfere with the natural human gait and operation of the foot are very strongly discouraged. They can lead to faulty biomechanics in the long run. They are a marketing product designed to inflate prices and solve a problem that either doesn't actually exist or at best, merely exacerbate it. So, in actuality the cheap, basic, "neutral" trainers at £20-40 are likely to be far better for your foot that the "corrective" ones at £80-120. Try to avoid footwear that squashes the forefoot and toes together. Your toes, ideally, should naturally spread out rather than be compressed.

# 8 Sports supplements

The realm of sports supplements is so large and such a minefield that I will not attempt to provide anything other than a general summary here.

## 8.1 Do they work?

The BBC program Panorama recently recruited a team of academic experts from various top university departments in Sports Science to conduct a specific study of all major sports supplements on the market – protein powders, sports drinks, muscle building "aids" like BCAA, creatine, etc. In particular, they did an exhaustive academic literature survey: a review of hundreds of articles, across hundreds of journals in medicine, sports science, biology and related fields in an attempt to substantiate any of the claims that the supplement manufacturers were making about the active ingredients in their products.

They were unable to find *any conclusive* evidence *whatsoever.* None of the studies had evidence that demonstrably proved to a reasonably credible standard anything that provided a statistically significant, placebo controlled result indicative that any of the supplements **actually delivered what they claimed**. The only exception was creatine, which was shown to confer *some* limited benefit in *some* individuals. Moreover, when they went to the manufacturers and requested further substantive evidence, or cite surveys that substantiated the claims their products made, most were unable to offer

any adequate response.

In short, most "miracle" supplements either do not work or completely fail to deliver any extra benefits not already provided by normal food. The gains that people are getting from training are essentially down to them eating a good diet and training hard. Such supplements are also normally grossly overpriced as the ingredients contained within are often cheap and relatively low quality, despite claims on the packet (once again, learn to read the truth revealed by the ingredient listing).

## 8.2 Key points

- Protein powders do not deliver anything that normal food does not already provide in a superior form. Protein powders *are* convenient though, so if making/preparing additional snacks/meals is simply not feasible, they do offer a benefit as something to neck down "on the go" in a very busy work environment and a better alternative to munching on a load of biscuits. However – which is better? 30g of supposedly high-tech whey protein isolate with some tapered "protein matrix blend" or a small salmon steak? The simple facts are unequivocal. The piece of fish is something that has grossly superior nutrition on every conceivable parameter, and by such a vast margin that a comparison is almost insulting to the fish. It is simply less convenient to eat, and less "sexy" as it does not have the same high-tech "miracle" claims. The reality is that the gigantic muscle clad bodybuilders on such tubs of protein built their disproportionately large muscle mass by eating huge quantities of *real* food, training religiously (sometimes 2-3x day), and, crucially, by taking anabolic steroids and hormone manipulators. The steroids and other drugs allow them to recover and support a training load that would be simply unworkable for a non drug assisted individual to achieve. A non drug assisted individual would simply not get sufficient recovery and restoration between workouts to support the tremendous training load. Meanwhile, the protein powder simply provided a convenient source of extra calories (such training demands require a huge amount of calories to sustain) and, in particular, a way for them to earn them a good living through their product endorsements. Used as a *supplement*, such powders are fine. But they offer nothing that you could not achieve by simply replacing them with extra real food instead. Whey protein, after all, is actually just a bi-product from the dairy industry that used to be considered a "waste" product. Do not mistake the results they actually offer with the results obtained from habitual use of steroids and other such inadvisable drugs.
- Same applies to carbohydrate powders (and meal replacement powders, and all other hybrid powders etc.). Rather than neck a load of maltodextrin (common ingredient in sports drinks; essentially sugar), dextrose (also effectively refined sugar), or waxy maize starch (nothing other than cornflour!), you could equally well have a sandwich with some jam if you want some pre-workout meal one hour before that two hour cycle ride, for example. You can also make a superb natural "sports drink" by diluting 1/3 pure fruit juice to 2/3 water; cheaper and much healthier.
- Taurine, caffeine, and other pre-workout stimulants *do* work inasmuch as they get make you more alert and *work harder* in your workout. Inasmuch as they achieve this, they will yield a benefit. Note, however, that a good basic strong coffee has been proven to be a highly effective pre-workout drink to provide that caffeine rush. Do not overuse such natural stimulants; at best they'll become ineffective, at worst you'll become hypertensive and increasingly dependent on them. Psychology, ultimately, plays the biggest role in psyching yourself up for a hard

workout.

- "Green" and vegetable powders. You could buy these freeze dried powders, and questionably derive some benefits – it is not clear how much "goodness" survives the freeze drying process. Or you could simply eat the real thing, actual fruit and vegetables, spend less money, and get definite established benefits. Ultimately, they are a convenience and a short cut. They are not a substitute for actual fruit and vegetables. Similarly, there has been no real established evidence that "antioxidant" powders really do anything valuable either. There is little point spending money on something that has no established benefit (and tastes vile).
- Never underestimate the placebo effect. It has been proven time and time again to make a significant difference. The mere act of belief changes the effectiveness of anything you put in your mouth.
- **All** *actually* truly effective "supplements" are classified drugs, or new "grey zone" drugs that have yet to be classified, or dubious hormonal manipulators. Such drugs and substances *do* effect your physiology. They can and do confer a strong exercise or muscle building benefit (Lance Armstrong successfully used them to win seven Tour de France titles before being caught...). They can, when abused, also seriously jeopardise your long term health and cause irreversible damage to your internal organs. You are experimenting with a hugely complex system: you are "playing with fire". If you care about your health, do not take the risk. If you plan to compete in a sport you need to avoid them if you wish to compete on an honest basis (the only basis one should compete at anything in, for that matter). *All natural supplements*, therefore, necessarily have very mild or best minute effects. If they *actually* did anything physiologically significant, they would become a regulated, classified drug that could only be legally obtained from a practising pharmacologist. This is the simple fact of the matter. If you wish to be healthy, avoid all drugs and focus on real nutrition. Natural supplements can be nothing more than that; a *supplement* to a good diet of real food. You can add natural supplements to your diet if you wish, but do not expect any dramatic difference for your money. Supplements sell at inflated prices because they sell the dream of some "quick fix". Results take time. Results take patience. Real, very significant results take years of hard, hard, hard work. This is the simple basic fact of the matter. It is a truth that no one wants to hear in this era of "results yesterday" and 5 minute fixes. There are NO short cuts. Anyone that tells you anything else is selling you dreams and being deliberately dishonest (probably in order to fill their own pockets). Be patient, eat clean, look after yourself, work hard and you **will** get the results you're after!

# 9 Psychological gambits

## 9.1 The 90/10 rule. *You are what you eat, but...*

...that does *not* mean you need to be an angel. Unless you have a genuine aspiration to become an elite athlete, with all the incredible long-term sacrifice and upheaval involved, you do not need to eat a perfect diet. Incidentally, even top athletes do not eat a perfect diet all of the time, all year round (Chris Hoy admitted to getting a little chubby between his gold medal successes in successive Olympics!). Life is for living. Food (and drink) is one of life's great joys.

All you need is a moderate level of discipline, together with a willingness to be honest with yourself. Whilst results are obviously dependent on effort and commitment, we do not need, nor should we desire – since it is not sensible or psychologically healthy – perfection. Provided you eat, or try to eat, according to a 90/10 rule – 90% of all food/drink calories in that are "good" versus 10% "bad" – you will still almost certainly get the results you desire. Try to eat an excellent diet 6 out of the 7 days a week and allow yourself some treats one day a week, for example. Or alternatively, allow yourself that chocolate biscuit (or two) but limit them, rather than wolfing down the whole packet, etc. The point is, have those "treats" but apply some self-restraint.

## 9.2 Want it? Earn it!

Rather than deny yourself, "earn" your treats. If you are desperate for that blow-out Indian takeaway, then have it, *occasionally* – and *earn* it by doing an additional *hour*, or *additional* workout, in the gym that week. As always, be realistic; eating well over 2000 calories in a single meal is really *very* easy (particularly eating out in a restaurant with alcoholic drinks involved), so assuming you are eating as normal the rest of the day, an *extra* 20 minutes on a cross-trainer is *not* going to come close to making up the difference. You are going to need to put a much bigger additional effort than that! This is where this principle can become abused; if you *are* going to "earn" it, then make sure you actually *do*, rather than just put in just a few extra minutes of exercise in order to justify to yourself a poor set of dietary choices (especially if, inadvisedly, you start to use this as a regular habit; as soon as it has become regular, it is no longer an *occasional* treat...!).

However, used occasionally, this method of "putting in the extra effort" carries two benefits: not only have you "earned" your luxury (and consequently can enjoy it with no sense of "guilt"), you'll also have increased your training load and your body will make use of the restoration from the extra calories (alcoholic calories excepted...). In fact, used sparingly, this will do you a lot of good, as it important to really enjoy yourself from time to time!

This is a drastically different mentality to the *denial/guilt* cycle people commonly get sucked into. Change into the different framework of alternative healthier choices (where possible/most of the time), or otherwise the *enjoy/earn* principle.

Eating Fish & Chips (for example) once a week and staying (or becoming) lean/trim/fit is perfectly straightforward, and indeed, reasonable, if you are willing to put a bit of effort in and become accountable – and above all, realistic – with yourself. By the same token, however, if you are training hard but drinking three pints of lager every single day, then even with the best will in the world you are not very likely to get good results. You will not be able to continually "earn" these off (not to mention the long-term health damage associated with habitual alcohol consumption).

To paraphrase Aristotle, famous above all as the "common sense" philosopher par excellence: *moderation in all things*.

Definitely *have* your treats and enjoy them, *earn* them where possible, but do *not* go crazy or slowly slip into poor habits! Follow this principle and you will have success with training goals whilst still

thoroughly enjoying food and life.

# 10 Conclusion

The information and basic principles contained in the above sections should provide everything necessary to know *what* to eat, formulate a dietary regime, and make informed choices about food products – irrespective of whether your goal is general health or sports performance. The diet of an elite athlete is not much different from that required for an average individual; only the quantity of food required changes (greater calorie intake), together with an increased *relative* demand for protein (though probably less so than some people might assume; you do not need to be necking "protein shakes" every two hours!).

If you want to optimise your diet and enable you to effectively exercise, follow the following steps:

1. From the lists provided, determine which foods you *like* and can *afford* to eat on a regular basis that will provide the best nutritional regime your budget and palate can accommodate. If you don't like many foods, develop your palate!
2. Learn basic cooking skills. A few skills go a long way. Buy some cooking books or try out some recipes. You don't need to become a culinary genius. You just need to have a few fundamentals. The better your cooking skills, the better you can make food taste, and in particular allow you to create superior tasting meals *without* having to always resort to increasing fat/sugar content.
3. Work out, based on the formulae provided, what your *idealised/projected* energy intake should be so you know how *much* you should be eating. Be realistic and honest with yourself. Make sure your figures are as accurate as possible; it will only ever be an approximation but you can still get adequately close enough in practice.
4. Keep a food log/make an eating plan. Even if you only do it temporarily or periodically, it is a useful exercise as it will almost certainly cause you to eat better as you become more *aware* of what you are *actually* eating. Make sure to log *everything* you eat or drink!
5. Review your diet every once in a while and recalculate everything as your bodyweight and/or lifestyle changes – your eating will always need to reflect your current situation.