Introduction to Nutrition

The fundamental goal of any athletic nutritional approach is to support continued performance gains. Depending on the sport in question, performance-oriented nutrition may or may not be optimally supportive of health; however, nutrition for weightlifting can generally be accomplished with high food quality and does not require excesses of any particular macronutrient to the point of potential health concerns. Super-heavyweights are an exception in most cases because the remarkably great demand for total calorie intake reaches beyond what can be achieved in an entirely healthy fashion; in addition to this is simply forcing, in most cases, the body to carry significantly more mass than it was intended to, which in and of itself is unhealthy to some degree.

There are three fundamental components of nutrition: quantity, quality, and macronutrient composition. None can be neglected in the pursuit of optimal performance, but as specific goals vary during different periods of training over the long term, the importance of one may temporarily eclipse the others. The additional two elements to consider are macronutrient timing and supplementation (the latter will be addressed it its own chapter).

Quantity

Quantity is the simplest value to understand. It refers to the total amount of food being eaten in a given period of time, measured in calories, or more accurately, kilocalories (kcal). This gives us a measure of the amount of energy being taken in, and can be considered a kind of gross adjustment tool, the manipulation of which can produce the most dramatic changes in the body such as large degrees of weight gain and weight loss.

Quality

Food quality is a more nebulous value than quantity, with widespread

and occasionally vehement contention existing. The guiding principle in food quality is remarkably simple: natural foods are generally superior in terms of their support of basic health. This leaves meat, fish, eggs, vegetables, fruit, tubers, nuts and seeds, certain oils, and possibly certain dairy products as the types of foods that will ideally comprise the bulk of the athlete's intake.

A discussion of the depth required to fully explain the science behind this perspective is better left for more appropriate channels and those with greater expertise on the subject. The take-home point is that processed foods cannot compete with the nutritional density of natural foods, and often carry with them numerous potential health risks, even if performance and body composition metrics can be achieved with the lower quality foods. The quality of foods is what will supply required micronutrients, help prevent autoimmune disorders, and support long-term health.

To a great extent, food quality will also support athletic performance, but as health and performance diverge at times, so too will this relationship change occasionally to some degree. For example, a large serving of carbohydrates at a certain time (such as post-workout to replenish glycogen stores and aid in the recovery process) is far easier to achieve (and arguably more effective) with more processed foods (with a consequently higher glycemic index and rate of assimilation) that might normally be avoided for the sake of health.

Macronutrient Composition

The final fundamental element of nutrition is macronutrient composition: the relative quantities of protein, fat and carbohydrate that produce the total caloric intake. With the total quantity acting as our gross adjustment tool, macronutrient composition provides us a tool for generally more minor but potentially significant adjustments. We can consider macronutrient composition within a single meal or in terms of daily totals depending on the purpose.

Protein should be considered the first priority in terms of macronutrients, particularly for strength athletes. Recommendations for protein intake vary from extremely minimal to quite epic. The numbers on the lower end of the spectrum are put forth by most of the medical

community and government organizations and are reflections of absolute minimal intakes to support life, not optimal intakes to support athletic performance, health or longevity.

The recommended baseline for protein intake is 1 gram per pound (or approximately 2 grams per kilogram) of bodyweight (Zatsiorksy 1995). This is an arbitrary number in a sense, but its efficacy has been well demonstrated for many years in the strength training world. From this starting point, adjustments can be made as needed for each individual. Many will find they operate better with intakes twice as high at times (and even more during periods of weight gain). Experimentation is recommended without dipping below the 1g/1b/day baseline.

The quality of protein varies with its source. Meat, fish, eggs and high-quality egg and whey supplements will provide protein of the greatest bioavailability and amino acid profiles. The protein content of nuts and seeds, grains, and legumes is negligible in terms of both quantity and quality and these foods should not be considered legitimate protein sources that would act as substitutes for the previously listed sources. Soy has been pushed for years as a source of quality protein, but the claims are largely unfounded, and more research on soy's effects on health are producing frightening results; soy in any considerable quantity does not belong in the diet, with the occasional exception of fermented products such as soy sauce (ideally tamari, which is made without wheat). Supplemental protein will be discussed in more detail in the Supplements chapter.

Fat has been thoroughly demonized, but is not only not inherently a threat to health, but is absolutely necessary to support it. Mono-unsaturated fats should make up the bulk of fat intake. These will be supplied by foods such as nuts and seeds, avocado, and olive oil, and even by many meats (approximately half of the fat in beef is mono-unsaturated, for example). Poly-unsaturated fats such as vegetable oils should be used sparingly, particularly when using oil to cook at high heats, such as with fried foods. The poly-unsaturated fat is a very unstable molecule and is easily damaged, creating unhealthy substances such as trans-fats and lipid peroxides.

Saturated fat like that found in animal products should not necessarily be sought out in great quantities, but as a stable molecule among other features, it's preferable over poly-unsaturated fat. Saturated fat is widely associated with dietary cholesterol, which is widely associated with heart

disease. No research to date has conclusively demonstrated any causative relationship between fat or dietary cholesterol and heart disease, and more recent work is demonstrating that the relationship between cholesterol levels and heart disease risk is far from straightforward. This again is well outside the scope of this book, but the reader is strongly encouraged to do some homework if concerns about consumption of saturated fat and cholesterol exist. Keep in mind when encumbered by the fear of saturated fat and cholesterol that's been instilled in most of us that cholesterol is a structural component of every single cell in the body, and, among many other things, required in the production of steroid hormones (e.g. testosterone). It is absolutely essential to life, and the majority of cholesterol in the body is produced by the liver. This is why efforts to lower cholesterol levels through the extreme reduction of dietary cholesterol invariably fail—the body simply manufactures what it needs to take up the slack, just as it reduces production in the presence of adequate dietary cholesterol.

Omega-3 fatty acids are an essential fatty acid largely absent from most individuals' diets with the rare consumption of organ meats and only somewhat more common consumption of O-3-rich fish, although in recent years awareness has increased considerably and we are seeing more and more products with Omega-3 fatty acids, from Omega-3 supplements to eggs with added Omega-3 content. Omega-6 fatty acids are also essential, but their consumption is typically sufficient and often excessive relative to O-3s due to their natural presence in common foods such as meat, eggs and nuts; they are also pro-inflammatory. Few are willing to add organ meats to their diets and increase fish consumption adequately, so other sources of Omega-3s are usually necessary. Eggs enriched with O-3s are a wise choice since this will help balance the naturally high levels of O-6 in eggs; grass-fed beef is also higher in O-3s than grain-fed. Reducing O-6s is a better idea than increasing O-3s dramatically to improve the ratio.

In addition to supporting optimal health, fat can be used, due to its far greater caloric density relative to carbohydrate and protein, to supply a large quantity of daily calories if energy requirements are extremely high. That said, most athletes find it much easier to consume large quantities of carbohydrate than fat, as the former tends to be more palatable and actually often increases appetite, while the latter tends to be more satiating.

The third and final macronutrient is carbohydrate, which continues to be promoted as the cornerstone of great health as much as fat is vilified. This again is a subject demanding a venue other than this book for its due; suffice it to say claims of carbohydrates' role in health are often exaggerated. In fact, carbohydrates are technically the one of the three macronutrients not actually required to keep humans alive. This doesn't mean they are inherently bad or unhealthy, but that they, like the other two macronutrients, should be understood and used properly for each athlete's needs.

Carbohydrate requirements vary considerably among athletes and among periods of training. Low-repetition, high-intensity lifting is not demanding on glycolytic metabolism like somewhat more sustained, relatively intense activity is. With such training, carbohydrate intake can usually be kept relatively low with no negative effect on performance (note that this does not mean extremely low carbohydrate intake). However, with higher training volume or efforts at weight gain, carbohydrate intake will need to be increased. How much will vary, and experimentation will be important for each athlete. In any case, weightlifters will not have the carbohydrate requirements of endurance athletes or even those who engage in extended sprint-type efforts like football. Superheavyweights will generally require higher carbohydrate intakes simply to sustain their bodyweight.

Vegetables and some fruit should be the foundation of carbohydrate intake because of the micronutrient density. More energy-dense carbohydrate sources like tubers, corn products and rice can be added to fill out total carbohydrate need as determined by each athlete. Wheat products, if tolerated by the athlete, can also be added to fill out carbohydrate needs.

Macronutrient Timing

The timing of macronutrient consumption will have the least significant effect on performance, body composition and health relative to quantity, quality and macronutrient composition, but certain practices around training can be helpful. As with nearly all subjects in the realm of nutrition, much of the more detailed practices are largely speculative and certainly subject to individual experimentation—any such

experimentation should be clearly documented to allow accurate evaluation.

Pre-Workout: The pre-workout period will most often involve nothing more than the athlete's normal eating habits—a balanced meal of protein, fat and carbohydrate. Timing of the last meal before training will vary among athletes depending on what the meal is comprised of and how the athlete tolerates such foods with training, but typically 1-2 hours prior to training is optimal as this provides enough time for at least partial digestion and assimilation so that the athlete has energy for training but does not feel bloated or otherwise uncomfortable from eating.

For athletes attempting to gain weight, 20-40 grams of easily-digested protein (supplemental whey protein) 10-20 minutes prior to training may create a more anabolic environment and encourage greater muscle growth. Instead of or in addition to this, athletes may find similar results from a high dose of a branched-chain amino acid supplement, although this will often create GI discomfort.

Pre-workout energy supplements are also used commonly. Most contain at least some amount of caffeine and usually a collection of amino acids and other substances that may (or may not) help provide the athlete more energy or a feeling of alertness. This could be something as simple as black coffee to expensive pre-workout powders or drinks with incredible claims. Each athlete will respond differently to every pre-workout supplement, so experimentation is encouraged. However, as with all supplements, competitive lifters need to be very cautious about what they use as many stimulants or similar compounds are banned by WADA/USADA.

Athletes should also ensure they're adequately hydrated in preparation for training. An easy method is simply making a habit of drinking 8-16 oz of water on the way to the gym or during the warm-up. This may be accomplished with a pre-workout energy drink.

Peri-Workout: During the training session itself, nutrition should not be an issue in most cases. For particularly lengthy training sessions, the same quality food eaten throughout the day can be eaten during breaks in the session—deli meat, nuts and fruit are convenient. Carbohydrate-based drinks work well for some individuals, but are usually unnecessary except for cases of unusually large training volumes or people whose

blood glucose levels tend to drop dramatically.

Maintaining hydration will be the primary concern, particularly during the hotter months of the year during which athletes can lose significant quantities of water. In such circumstances, athletes may be well served by adding some kind of electrolyte mixture to their water (electrolytes are addressed in the Supplements chapter). For those attempting to gain weight, another dose of BCAAs in water or protein supplement can be sipped during the training session, provided the athlete has determined that neither causes gastrointestinal discomfort during training.

Post-Workout: Post-workout nutrition should aim to replace what has been used during training and assist the body in recuperating maximally. A common practice is to use a 3:1 carbohydrate to protein mixture. This ratio can be altered according to each athlete's needs with regard to carbohydrates and the volume of training: lower volume will require fewer carbohydrates. Fat intake in this meal should be minimal (as close to zero as possible) to prevent the slowing of digestion.

This post-workout meal can consist of whole foods such as a combination of grilled chicken and sweet potatoes, or it can be comprised of supplements like a combined protein and carbohydrate powder, or protein powder and a carbohydrate drink. The supplemental method is typically preferable, as it is digested and assimilated much more quickly, and athletes typically will not have much of an appetite immediately after training. In either case, this meal should be consumed immediately after the workout.

The post-workout meal can help encourage the anabolic processes in response to training. More recent research is suggesting that pre-workout protein might be more effective, but in most cases, both are advisable. A complete balanced meal should follow within 1-2 hours.

Planning Nutrition

To assemble this into practical application, first we need to know that protein and carbohydrate provide approximately 4 kcals per gram and fat 9 kcals. Next we need to determine the athlete's approximate daily caloric needs. To do this, we can use any number of formulas, none of which are ever remarkably accurate, or we can use a food journal to track food consumption and bodyweight for at least a week. Using online or

other resources, calorie content can be determined for the food in the journal and daily totals can be calculated, from which a daily average over the period of the food journal can then be calculated. This average will be the starting point for daily calorie consumption (This assumes bodyweight is presently static—weight loss, gain, and maintenance are covered in the next chapter).

Since we've made protein the first priority and defined a clear quantitative guide for its consumption, we can determine the baseline daily protein requirements of the athlete: 1 gram of protein per pound of bodyweight per day. So with an 85kg athlete, we would end up with a starting point of 187 grams of protein per day (748 kcal).

Next, we can calculate a baseline carbohydrate intake level. This should be done in consideration of both bodyweight and activity quantity and nature. The higher the activity level, and the higher the average repetitions per set, the higher the carbohydrate intake should be; for example, during periods of high volume training such as during preparation mesocycles, lifters will typically need higher levels of carbohydrates to support muscle and liver glycogen replenishment as well as the actual carbohydrate needs for fueling the workouts themselves. We can also modulate carbohydrate intake day to day to suit that day's training workload (Table 48.1). In this way, we can be sure to consume optimal amounts on average without excessive intake when unnecessary, maximizing the performance results and minimizing any potential negative effect on body composition (and even health).

Day/Training	Carbohydrate Intake
Rest Days	< 1.1g/kg/day (0.5g/lb/day)
Low Volume Workouts	2.2g/kg/day (1.0g/lb/day)
Moderate Volume Workouts	3.3g/kg/day (1.5g/lb/day)
High Volume Workouts	4.4g/kg/day (2.0g/lb/day)

TABLE 48.1 Optimal carbohydrate intake guidelines.
(Adapted from Israetel, Case, Hoffman, 2014)

For our 85kg lifter, this would look like:

Day	Carbohydrate Intake
Rest Day	< 96g/day (384 kcal)
Low Volume Workouts	187g/day (748 kcal)
Moderate Volume Workouts	281g/day (1124 kcal)
High Volume Workouts	374g/day (1496 kcal)

Next, we simply need to fill the rest of the total daily caloric needs with fat. By tracking intake with the food journal for 2 weeks during a period

of constant bodyweight, we can find an average number of daily calories for the athlete by adding each day's total calories and then dividing the sum by the number of days. We then know this is the caloric intake that will preserve the lifter's current bodyweight, and can make adjustments for weight loss or gain from this baseline.

We want to adjust daily caloric intake according to daily activity level in the same manner carbohydrate levels were adjusted, however, so we need to do a little math.

First, we add the protein and carbohydrate calories for each type of training day we have planned in a week. For example:

Day	Training	Protein/Carb
Monday	Heavy	2244 kcal
Tuesday	Moderate	1872 kcal
Wednesday	Heavy	2244 kcal
Thursday	Moderate	1872 kcal
Friday	Rest	1132 kcal
Saturday	Heavy	2244 kcal
Sunday	Rest	1132 kcal

This gives us a weekly total of 12,710 kcals, and a daily average of 1820 kcal (weekly total divided by 7 days). Next we use this average and our determined daily average from the food journal to create a multiplier by dividing the determined total by the combined protein/carbohydrate total. If we've determined through the food journal that our 85kg lifter needs about 2500 kcals/day to maintain his weight, we would divide 2500 by 1820, which gives us a multiplier of 1.37.

We can then use this multiplier with the combined daily protein/carbohydrate calorie number to get a total daily calorie number that is proportional to the carbohydrate intake, which we will likely then alter a bit to get rid of extreme fluctuations.

Day	Training	Protein/Carb	Total
Monday	Heavy	2244 kcal	3074 kcal
Tuesday	Moderate	1872 kcal	2565 kcal
Wednesday	Heavy	2244 kcal	3074 kcal
Thursday	Moderate	1872 kcal	2565 kcal
Friday	Rest	1132 kcal	1551 kcal
Saturday	Heavy	2244 kcal	3074 kcal
Sunday	Rest	1132 kcal	1551 kcal

This gives us an average for the week of 2493 kcal/day, which closely matches our desired total. If we want (or need) to reduce the range of extremes, we can simply move some of the calories from the heavy days

to the light or rest days. For example, we can knock 200 kcal off each heavy day, which gives us 600 total calories, which we can then split between our two rest days (300 kcal each), giving us 2874 kcal on the heavy days and 1851 kcal on the rest days. This will usually be preferred by athletes because it makes meal planning a little easier and tends to help with recovery on off days.

Finally, we can determine our daily fat intake by simply finding the daily difference between the total calories and the combined protein/carbohydrate calories and dividing by the 9 calories per gram that fat contains. For example, a moderate training day has a total of 2562 kcal and a combined protein/carbohydrate total of 1872 kcal, leaving a difference of 690 kcal, which, divided by 9, gives us 77 grams of fat.

Again, these figures are loose starting points and will more than likely need to be adjusted based on how the lifter feels and performs. For example, some lifters may want to increase their daily protein intake, which means they can simply remove the additional calories from their fat intake. Or an athlete who finds he or she feels better with a somewhat lower carb intake can make up the caloric difference by increasing protein and/or fat.

Depending on the nature and volume of training, and the athlete's individual recovery capacity, recovery may be better if rest day carbohydrates are not reduced as dramatically. This is more likely the higher the training volume is, and if the athlete trains late in the day and consequently consumes fewer carbohydrates after the workout to replenish glycogen before a low-carbohydrate rest day. In these cases, the carbohydrate intake can be balanced more or completely across all days of the week while maintaining the same totals.

Alternatively, if the food journal method of determining average daily calorie needs is not possible, such as in the case of changing bodyweight, we can get an estimate of average daily caloric needs using a rough BMR (basal metabolic rate) estimate and a multiplier based on activity level. This can be done with several online sources quickly and easily. Bear in mind this is very much an approximation, as it involves multiple steps of estimation and assumption, and not as accurate as the food journal method, which reflects the individual's actual metabolic activity —it is merely a starting point and adjustments will need to be made in response to weight and performance changes. Using the food journal to track bodyweight and performance for 2 weeks at the daily calorie intake

determined with this method will let the athlete know if this number is too high or low, and it can be adjusted accordingly.

This takes care of the quantity and macronutrient composition elements—these must simply now be fulfilled with food of the appropriate quality. It's easy these days to determine macronutrient and calorie quantities of any imaginable food with online sources, and to track daily consumption. Keep in mind that any supplements that contain calories (such as fish oil and pre-workouts) need to be considered in the daily macronutrient and calorie figures.

Water Intake

There should be no need to make a case for the importance of adequate hydration here—make it happen. Intake recommendations vary dramatically, and recently some have begun to lean toward lower quantities. A reasonable starting point is:

	

Bodyweight (kg) X 0.026 = L/day

or

Bodyweight (lbs) X 0.4 = oz/day

For our 85 kg (187 lb) athlete, we would end up with about 2.2 L (75 oz) per day. This is a baseline intake and doesn't take into account water loss during physical activity. Before, during and after any activity, water should be consumed according to the intensity and duration of the activity and obvious loss through sweat. For more accurate re-hydration, replace every kilogram of bodyweight lost during activity with 1 liter of water (or every pound of bodyweight with 16 ounces of water).

Bodyweight

Managing bodyweight is primarily a concern of competitive weightlifters, although most athletes will certainly have reason to control their weight within at least general ranges in order to optimize performance and body composition. There are three basic bodyweight scenarios: maintaining weight, losing weight and gaining weight. All three have the implicit goal of maximizing functional muscle mass at a given weight, which means achieving relatively low body fat levels. However, this does not necessarily mean weightlifters need or want to reach extremely low body fat percentages, and, in fact, extreme leanness arguably does not allow for maximal performance unless an athlete is naturally very lean.

Bodyweight can be controlled by both training and nutrition. However, training should be focused as much as possible on achieving specific athletic and functional objectives—that is, the training program should remain designed to elicit adaptations for improved weightlifting ability, and not diverge to any significant degree from this to achieve bodyweight changes. A minor exception to this would be in cases of bodyweight gain in which training may temporarily increase in volume and number of repetitions per set for certain exercises to encourage greater hypertrophy, supported by appropriate nutritional changes. Additionally, while training influences the nature of weight gain or loss to some extent (i.e. relative fat and lean mass levels), nutrition is what ultimately allows the most significant gains or losses.

A fundamental principle of bodyweight is the First Law of Thermodynamics: Neither matter nor energy can be created or destroyed. The two can be converted, but there is never any net change in the total quantity. What this means in terms of bodyweight manipulation is that weight cannot be reduced without a deficit of energy, and weight cannot be increased without a surplus of energy. No amount of heavy back squatting will make a skinny kid huge if said skinny kid fails to eat more energy and material than his body is using simply to survive—as remarkable as the human body is, it cannot create tissue from thin air. This would be akin to building an addition to a house without using any new materials or performing any work: impossible.

Likewise, no amount of physical activity will cause a reduction in

bodyweight if the individual is consuming more food energy than is being used in a given period of time. When evaluating a bodyweight plan, always return to and rely on this fundamental principle to guide your decisions.

The above said, it's unfortunately not such a simple equation—human metabolism manages to be remarkably complex and remains incompletely understood in the context of bodyweight and body composition even by experts in the field. The first complication is the second law of thermodynamics—entropy. Entropy is the transfer of a percentage of the energy during a chemical reaction to the realm outside the reaction—commonly this transfer is referred to as a "loss", but because, according to the first law, energy cannot be lost, it is simply being relocated, usually in the form of heat. Macronutrients ultimately provide different net calories because of the variation the efficiency of their metabolism. For example, protein has fewer usable calories per gram than carbohydrate because the greater number of chemical reactions required to use protein as energy result in a lower net amount of energy with the increased entropy (although this is a very small difference) (Eades M.R., Eades M.D., 2001). This of course does not alter the fact that a calorie is a calorie—it only forces us to consider calories in terms of net instead of gross. And it certainly does not change the fact that an individual cannot gain weight without a net calorie surplus, or lose weight without a net calorie deficit.

To complicate things further, it turns out that the basic energy balance equation that's relied on for most bodyweight recommendations is widely misinterpreted (Taubes, 2007):

Change in energy stores = Energy intake – Energy expenditure

This is commonly understood to mean that the change in bodyweight is entirely and exclusively a product of the relationship between calories consumed and calories expended. In other words, it's assumed that any increase in energy intake will cause an increase in bodyweight, and any reduction in energy intake will cause a reduction in bodyweight, because the equation has to remain balanced or the universe will fall apart.

However, real-world evidence demonstrates that the response to changes in caloric intake is not rigid and perfectly predictable. That is, a given reduction in calories does not necessarily produce the exact reduction in bodyweight predicted by the relevant mathematics in all

individuals.

Instead, the body apparently has a fairly well-established set point in terms of bodyweight and composition that it attempts to maintain—changes in energy intake will cause the body to make changes in its energy expenditure in order to maintain that set point. For example, if an individual increases his calorie consumption, the body will find ways to expend more energy through generally unnoticed processes that convert the excess energy to heat. This is why dieting of the basic calorie-reduction form fails so much—the dieter's body simply reduces its energy expenditure to match intake as much as possible (Taubes, 2007).

All this said, pursuit of bodyweight changes is not hopeless, just more complicated, and requires a bit more finesse. In the case of weight gain, it appears that the body can only increase its energy expenditure so much—this simply means that calorie surpluses will often need to be even greater than expected to exceed the body's ability to compensate. After an athlete lives at a greater bodyweight for a period of time, the set point seems to be adjusted upwards, making maintenance and further gains easier.

With regard to weight loss, the issue appears to be one largely of macronutrient composition and its effect on metabolic status. That is, management of proper hormonal levels, gut health and systemic inflammation coupled with a series of incremental calorie reductions rather than a single dramatic one, seems to be far more productive than extreme calorie restriction. Again, with time at a new bodyweight, the set point seems to be readjusted. In all cases, slower changes seem to be more effective than attempts at rapid ones.

Of course, each athlete will respond differently to any given change in caloric intake or macronutrient ratios, and each will need to be adjusted accordingly. Additionally, just as each athlete has a ceiling for certain performance characteristics determined by genetic factors, each athlete's genetics will largely control the rate of weight and body composition changes, as well as the ultimate states of each. No matter how precise an athlete's nutrition is, he or she may never achieve the level of leanness, for example, of another athlete. Again, just like training, nutrition can be used to reach each athlete's ultimate genetic potential, but never actually alter it. The actual alteration of genetic potential is the exclusive realm of pharmaceuticals.

Maintaining Weight

Bodyweight maintenance can range from requiring no work at all to being extremely troublesome. For those who maintain their weights without any thought, the only remaining issue is that of body composition.

The maintenance of bodyweight is simply a matter of balancing energy consumed as food and energy expended through metabolism. For those whose bodyweights fluctuate continually, the goal is developing consistency in eating and activity—to establish the body's set point at the desired weight and body composition and then support its maintenance.

The first step is to assess the current situation. A detailed food journal should be kept for at least a week and ideally two, describing accurate quantities of all food and any beverages, including water—daily weight fluctuations are often simply the result of varying levels of hydration. Online programs can be used to then calculate calories and macronutrients for each day. In this journal, records of bodyweight can be kept as well. Weight should be taken at the same time and under the same conditions every time. The typical recommendation is to weigh first thing in the morning on an empty stomach; however, we're concerned with bodyweight two hours prior to competition. This being the case, for the most accuracy, weight should also be checked at the same time every afternoon so both measurements can be tracked. The food and weight journal should be paired with the athlete's training records to provide a complete picture.

The first thing to look at is water consumption—1 lifter of water weighs 1 kg (and 16 ounces of water weighs 1 pound). Much bodyweight fluctuation can be attributed to inconsistent hydration, particularly considering most individuals are not extraordinarily disciplined with their water intake. If the food log shows large changes in water consumption that correspond with bodyweight changes—that is, lower water intake is associated with lower bodyweight and vice versa—the first step should be equalizing daily water consumption for a period of time and evaluating its effect on bodyweight.

If during a period of consistent hydration bodyweight does not stabilize satisfactorily, it will be necessary to make additional adjustments. Start by averaging the daily calorie totals from the food log to arrive at a baseline. From this, determine a daily calorie intake: if the weight

fluctuation tends to be heavy, start with 5-10% fewer calories than the average; if the weight fluctuation tends to be light, start with 5-10% more calories than the average. Attempt to hit this calorie number every day for a week and assess its effect on bodyweight. Continue making minor calorie intake adjustments accordingly until the desired bodyweight is reached and maintained. Be patient and give each intake level at least a week before adjusting. Again, this more deliberate approach is more effective than attempting dramatic changes, which will be resisted by the body through adjustments in energy expenditure and will not provide reliable responses.

Once the correct bodyweight has been achieved, more focus can be directed to improving body composition through macronutrient ratios and food timing. If the desired bodyweight requires unusually difficult food intake, whether too little or too much, the athlete should consider changing weight classes to allow living closer to a natural bodyweight if it will not negatively impact performance. That said, patience is important—over time, the body will adjust more to a given weight and maintenance will become less of a struggle.

Losing Weight

Losing weight is achieved by creating a calorie deficit while supporting healthy metabolic activity, largely through the management of relevant hormone levels, intestinal health and systemic inflammation. This is done primarily through incremental reductions in calorie intake, improvement of food quality, and lifestyle components like adequate sleep and stress reduction. Because of the body's natural reaction of metabolic adjustment, the more gradual the weight loss, the less of a negative effect on performance it will have. Sudden large calorie deficits will produce systemic fatigue and decreases in strength and stamina, will be psychologically taxing, and will typically result in less weight loss than expected.

Plan weight loss as far out from a competition as possible to allow continued successful training during the drop. Too often weightlifters are content to remain overweight most of the year and then struggle to lose significant amounts in very little time for competition, often unsuccessfully or with considerable detriment to performance. This

stress, performance reduction and potential failure can be avoided easily through better planning and weight management.

Our weight loss plan begins in the same way as our maintenance plan—we first need to record and find our average daily calorie intake over a week. From here, we'll drop this figure and consume the calculated number of calories consistently for 1-2 weeks, evaluate the progress, and readjust if necessary.

How much we drop the calorie level will depend on two things. First, is bodyweight constant, increasing or decreasing at present? Second, how quickly does the weight need to come off?

If bodyweight is constant and we have no time constraints, we may drop the calories by 10-15% or so for 1-2 weeks and monitor weight and performance. If the weight is dropping at a reasonable rate—probably around 0.25 – 1% of bodyweight per week—and performance has not been negatively affected to any degree beyond what is acceptable, this calorie level can be maintained until weight loss begins to slow. At that point, the calorie intake will have to be again dropped to account for the lower bodyweight. In this fashion, a gradual but steady rate of weight loss can usually be maintained with minimal disruption to performance.

If bodyweight is already dropping, the goal is either to maintain the current rate of decrease or accelerate it if and when necessary. In the same manner, calculate current average daily calorie intake and continue adhering to this level until progress slows, at which time calorie intake can be decreased another 10% or so.

If bodyweight is currently increasing, the initial calorie decrease will simply need to be greater. Depending on how quickly weight is increasing, this initial cut may be as much as 20%. Unusually large drops are not advisable because of their potential to cause counterproductive metabolic shifts and impact on performance.

If time for weight loss is limited, more aggressive calorie deficits can be created; however, it's important to keep in mind that the greater the deficit, the greater its impact on performance will be, and that there's no guarantee it will be successful because of the body's attempt to readjust. As much as possible, this situation should be avoided.

Last minute weight loss in order to make weight for competition (weight cutting) is covered in the Competition section.

Gaining Weight

While in theory gaining weight is no more complex than either maintaining or losing it, in practice it invariably proves difficult for a variety of reasons. Foremost of those reasons is that the discipline required by the pursuit of functional mass often surpasses that of even aggressive weight loss.

The fundamental principle of weight gain is merely the opposite of weight loss: create a surplus of energy and material while attempting to prevent compensatory metabolic adjustment by the body to maintain its set point bodyweight and encourage the accumulation of muscle mass over body fat. In cases of aggressive weight gain, simply consuming the necessary quantity of food is uncomfortable at best and seemingly impossible at worst. Contributing to the difficulty is the great importance of food quality and macronutrient composition. A great enough calorie surplus of any composition will produce at least some weight gain—but the role of additional weight is to provide additional functional capacity. The difficulty lies in encouraging the body not to simply increase its mass, but to do so through functional muscular hypertrophy—this demands the control of food quality and macronutrient composition, as well as factors like sleep quantity and quality, and creating a hormonal state that encourages lean tissue growth.

As is the case with weight loss, the longer the period of time over which weight is gained, the more the quality of the added mass can be controlled. There are limits to the rate at which the body's lean mass can grow, and reaching beyond these limits will unavoidably result in greater gains in body fat relative to muscle mass.

That said, weightlifting is a sport with broad weight classes and essentially no off-season, and often weight must be gained rapidly in order for an ascending lifter to remain competitive. In these cases, quality will take a back seat to quantity with the presumption that efforts will be made to improve quality once the lifter has settled into the higher weight.

For gradual weight gain, the process is in essence no different than gradual weight loss, the difference being only that the daily calories will be incrementally increased instead of decreased. Accurate record keeping is equally important—the same ease of self-delusion during weight loss applies to weight gain. Protein intake can be adjusted up to

as much as 2-3 grams per pound of bodyweight per day. How well this higher protein intake accelerates muscle gain seems to vary among individuals, but it has certainly never hurt. Carbohydrate intake should be increased as well as an easy, palatable way to increase total caloric intake, but also to support the increased training volume the athlete is likely undertaking in order to stimulate muscular hypertrophy. Fat intake can then be increased as needed to achieve the determined total daily caloric needs.

For more aggressive weight gain, the rules must be changed somewhat. The rule standing high above all is *eat more* . More than you ate before, more than what you want to eat, more than what you think you can eat. Quality and macronutrient composition are irrelevant until quantity has been taken care of. This is by no means intended to dissuade attempts to maintain quality and composition, but to more forcefully underscore the importance of a large and consistent calorie surplus. In other words, if the only options are eating fast food and eating little or nothing, the choice must be fast food, and more than is appealing. Always remember —if you're not uncomfortable, you're not eating enough, and if you're hungry, you're failing miserably.

With gradual weight gain, the body is allowed time to adjust to progressively larger quantities of food; with rapid weight gain, there is no such luxury. In order to mitigate this problem, foods with the greatest possible caloric density will become necessities. Fats will be instrumental considering that a given quantity has over twice the calorie content of the same quantity of either protein or carbohydrate. Nut butters, olive oil, and coconut milk are relatively easily stomached but extraordinarily calorie-dense. For those who can tolerate dairy, whole milk should replace its reduced-fat counterparts (and those who are lactose intolerant can still include whole milk along with lactase supplements). In the same vein is supplemental protein, which will provide an extremely helpful service considering the physical difficulty of eating enormous quantities of meat. This will be discussed more in the Supplements chapter.

Fitting in another meal in the middle of the night has been a successful tactic for many. Typically this meal is in the form of a shake consisting of supplemental protein, milk, nut butter, coconut milk, and possibly fruit. This can obviously increase the number of quality calories in a 24-hour period significantly, and will consequently be successful if eating

the rest of the day is in order. However, the quality and quantity of sleep, particularly during times of weight gain, is of great importance. Because of this, the recommendation is to prepare a shake and place it in the refrigerator. If the athlete wakes naturally during the night, he or she can drink the shake. If not, he or she can drink it the next morning. Intentionally disrupting sleep is potentially more detrimental than night feedings are beneficial. If an athlete is the kind of individual who can be awakened, drink a shake, and fall immediately back to sleep, this may not be an issue. But for some, a five-minute task can result in multiple hours of lost sleep.

Just as with weight loss, individuals will respond very differently during weight gain. That is, with a given calorie surplus, athletes will gain different amounts of weight of different qualities, according to genetic predisposition. Again—if no weight is being gained, not enough is being eaten.

Milk

Milk is commonly endorsed among old school strength coaches and athletes as the ultimate weight gaining food. There is no question that milk offers a generally easily consumed and inexpensive source of potentially enormous amounts of protein and calories, and consequently can help encourage rapid weight gain. Whether or not milk actually produces gains in muscle mass any better than the equivalent totals of quality protein, fat and carbohydrate is not as clear, but anecdotal evidence seems to suggest it may. In any case, its convenience and affordability is hard to beat.

Lactose intolerance can be managed with inexpensive lactase supplements. Raw milk is another option that will itself supply some of the needed lactase enzymes, as well as some colostrum, both of which will reduce the cost of supplementation for these two items. Whole milk with 100% of the lactose removed is also available.

The Superheavyweight

As has been alluded to previously, the super-heavyweight lifter (over 105 kg / 231 lbs for men; over 75 kg / 165 lbs for women) is somewhat of a special case in terms of nutrition. In essence he or she is eternally

attempting to gain weight, and doing so at an already very large body mass. This extreme demand on the body often necessitates more extreme measures.

Ideally the superheavyweight follows the same basic nutritional prescription as any other lifter; that is, a foundation of quality animal-source proteins, vegetables and fruits, and quality fats, but supplemented to increase caloric level with additional food of all macronutrient content, and likely a greater proportion of dense carbohydrate sources.

Carbohydrate is only slightly more energy-dense than protein in terms of net calories, and is less than half as dense than fat, by the gram, but it's invariably much easier to consume in great quantities, and its elicitation of insulin secretion appears to help with weight gain both by encouraging nutrient storage and promoting hunger. Because of this, for many superheavies, carbohydrate intake will typically need to be much greater (both in absolute and relative terms) than what would normally be considered necessary or healthy. However, being a superheavyweight is not an excuse to entirely abandon quality nutrition. The same foundation of quality food should remain in place, not be replaced.

Genetic Predisposition

As with all morphological changes in the body, genetic factors will affect an individual's ability to both gain muscular weight and to lose body fat. As a consequence, a great deal of variation among athletes will be seen even with identical protocols. Athletes must simply work with what they have and maximize gains underneath their genetic ceilings. With this in mind, expectations for gaining or losing weight or shifting body composition must be considered realistically, and nutrition must be altered to best suit each athlete.

Supplements

Nutritional supplementation is an enormous industry populated overwhelmingly with overpriced and ineffective gimmicks supported by inaccurate, cleverly manipulated, misunderstood, or occasionally non-existent science. There are, however, a few supplements that deserve discussion, experimentation, or recommendation. The following supplements are considered effective and useful to a degree that warrants at least educated experimentation.

Competitive weightlifters are encouraged to verify with the US Anti-Doping Agency (USADA), World Anti-Doping Agency (WADA), or the appropriate national organization the legality of supplements in and out of competition before beginning use. Ignorance of the rules is not grounds for immunity or leniency.

Additionally, competitive weightlifters need to be cautious about what they use as supplements are often manufactured in facilities and with equipment used for other supplements. This means that even a supplement that does not contain any banned substances in its listed ingredients may still produce a positive drug test result due to being contaminated by residue from other supplements. A few companies guarantee their products to be free of banned substances, and these products should be relied on primarily.

Protein

With the importance of quality protein and the difficulty of consuming large amounts of it in whole foods, as well as the need for rapidly digesting and assimilating protein post-workout, supplemental protein is commonplace in weightlifters' diets. The abundant use of supplemental protein means the availability of a wide range of type and quality. There are only three types of supplemental protein that should even be considered: whey, egg and casein. Each can be used in different situations primarily depending on the need for absorption rate. For example, whey is very rapidly absorbing and consequently ideal post-workout, whereas casein is more slowly digested, making it better (often in combination with whey) for other times of day.

Supplemental protein should contain precisely what the name implies: protein. There will typically be trace amounts of fat and carbohydrate in

any protein supplement, but it should be minimal because any added fat or carbohydrate will generally be of poor quality and better supplied by whole foods (An exception to this would be a combination protein and carbohydrate supplement intended for use post-workout as long as it's in the correct ratio for the athlete). Also look for supplements with no or minimal amounts of artificial sweeteners and unnecessary additives.

For athletes needing to consume unusually large amounts of protein, a hydrolyzed supplement will be a wise choice if not entirely necessary. Hydrolyzation breaks down the proteins into smaller peptides, making the supplement easier to digest. If hydrolyzation proves inadequate to prevent digestive trouble, additional digestive enzymes can help.

And don't forget to chew your protein shakes as you would solid food —you may feel silly, but this action helps fully stimulate the digestive process and improves the ultimate assimilation of the protein.

Vitamin D

Vitamin D supplementation is becoming more and more popular as increasingly individuals are being found deficient. Many of us spend the vast majority of our time indoors and as a consequence are exposed to very little sunlight. Vitamin D levels can be tested easily with routine blood work and supplementation can be based on the level of deficiency. Typically it will be recommended in cases of deficiency to start with a higher dose and step down to a lower maintenance dose after a month or so. Supplemental Vitamin D in cases of deficiency can have dramatic effects on energy, mood and recuperation.

Creatine

The effectiveness of creatine probably varies among individuals more than any other supplement. For 20-25% of the population, response is immediate and measurable. For many, there may be marginal results, but nothing remarkably convincing and possibly not worth the cost and hassle of taking it. And for a final group, there will be no apparent response at all, although bodyweight may increase slightly from water retention with no accompanying performance gains.

Creatine is inexpensive and certainly merits experimentation. While some athletes may not noticeably respond in terms of performance, creatine may decrease cortisol levels and oxidative damage, and taken at bedtime may increase growth hormone secretion during sleep. Because

of this, even non-responders may consider supplementation.

There is no need for a loading period—simply start with the normal dose of 5-10 grams/day in water or protein shakes. For larger athletes taking higher doses, the total can be split and taken at different times—typically pre- and post-workout, or post-workout and bedtime.

It appears the body may have a saturation point, after which it will reduce its own production of creatine to return quantities to below its natural level. Cycling 2-6 weeks on and 1 week off should help counteract this to keep the average level over time above normal. A simple and effective way to cycle creatine is to simply time it with training cycles; that is, during weeks of reduced intensity and/or volume, creatine use can be stopped, and then resumed with normal training. In any case, it's important to ensure use is timed appropriately for competitions, and should not be used pre-competition without previous experience.

Fish Oil

Available as either liquid or in capsules, fish oil provides the Omega-3 fatty acids that are essential to health, performance, and life itself, but are often largely absent in the typical diet. Fish oil has a number of beneficial effects with regard to performance, including increasing protein synthesis, reducing cortisol levels, increasing testosterone levels, and reducing inflammation.

The compounds in which we're interested are EPA and DHA, and how much is contained in the total amount of fish oil is the number with which to be concerned. For example, some fish oil supplements will have a combined total of 300 mg of EPA and DHA per 1000 mg serving, while others will have 600 mg of EPA and DHA in a 1000 mg serving. The former will often appear less expensive, but with a direct comparison of EPA and DHA content with the latter, the price gap will typically disappear.

A starting dose should be 1-2 grams of total EPA/DHA per day, ideally taken with fat-containing meals to improve digestion and absorption. After 1-2 weeks, the dose can be increased 500 mg – 1 g. This can be repeated until no further benefits are noticed or digestive discomfort appears. It's advisable to reduce excessive Omega-6 intake and other pro-inflammatory foods more than increase Omega-3 intake to counteract it; a top-end dose would be 4-6 grams daily. If any amount of

fish oil produces digestive problems, it can be accompanied by ox bile, which will help with the fat's digestion. Make sure to keep fish oil in the refrigerator or freezer to prevent untimely oxidation.

Multi-Vitamin/Mineral

Depending on the quality of food being consumed consistently by an athlete, it may or may not be necessary or beneficial for an athlete to take a multi-nutrient supplement. Generally a wise approach for athletes who eat well consistently is taking a multi-nutrient every other day or even less frequently. Athletes for whom food quality is inconsistent may take one more frequently. Keep in mind that repeatedly it has been shown that vitamin and mineral supplementation does not have beneficial effects beyond eliminating deficiencies. More recent research actually suggests that excessive intake can have negative effects on health.

Digestive Enzymes

For the rapid weight gain crowd, digestive enzymes can be the difference between success and failure. Typically in cases of quick weight gain, the sheer volume of food being consumed will exceed the body's ability to digest it adequately, resulting in anything from discomfort to serious GI distress. Enzymes are relatively inexpensive and will greatly improve the usability of the food being eaten. Take with meals.

Ox bile is an inexpensive supplement that will aid in the emulsification of fats and reduce fat-related digestive discomfort. It can be taken with high-fat meals and with fish oil as needed to improve digestion.

Branched-Chain Amino Acids

The branched-chain amino acids are luecine, isoleucine, and valine. Use of BCAAs appears to assist in muscle growth, although many claims of effectiveness are greatly exaggerated. Supplementation with large dose BCAAs is worth experimenting with during periods of mass gain. Some will find these large doses to cause GI discomfort and will need to reduce the dosage, although if the necessary reduction is dramatic, it's likely not worth continuing use. Some BCAA supplements are combined wisely with glutamine to improve muscle protein sparing and muscle growth response. Be sure to purchase as powder instead of capsules for better cost per dose. Often protein supplements will have additional BCAAs and/or glutamine included, which is a convenient way to

increase intake, although it limits the possible timing of ingestion.

Vitamin C

Vitamin C is an inexpensive supplement that can be helpful in a number of ways. As an immune function supporter, it can obviously help keep athletes healthy and training at full speed. It can also help lower cortisol levels, and for this purpose can be taken post workout and at bedtime. Supplements that contain bioflavanoids rather than only ascorbic acid are more effective in general, and in particular for adrenal function support. As mentioned with regard to multi-vitamin and mineral supplements, excessive consumption is not recommended. It may be a good idea to only add vitamin C during periods of extremely strenuous training when immune function will be the most susceptible to compromise, when around other people who are sick, or leading into a competition to help prevent becoming sick at that critical time.

Probiotics

Probiotic supplements encourage the proliferation and maintenance of the natural microorganisms that inhabit the human gut. This is a commonly underappreciated element of general health, and consequently athletic performance. Probiotics come in a multitude of forms, from pills to powder, or can be ingested as part of fermented foods if preferred.

Glutamine

Glutamine is an amino acid often used in large quantities, and often added to branched-chain amino acid supplements. Research has suggested it can increase growth hormone levels, improve protein synthesis, and improve immune system function. Like creatine and BCAAs, individuals seem to respond to glutamine supplementation very differently, some feeling significant improvement in recovery from training and others experiencing no noticeable benefit. Glutamine should be purchased in bulk powder form as beneficial doses will be multiple grams. Generally, it should simply be added to the lifter's post-workout protein & carbohydrate drink.

Glucosamine / Chondroiton / MSM

Glucosamine, chondroiton and MSM have all been demonstrated widely

to improve connective tissue repair and joint health, and are most commonly taken in combination with each other. Considering the abuse the joints will take when exposed to weightlifting over any extended period of time, this is a wise addition to the nutrition program.

Colostrum

Bovine colostrum is typically sold as an immune function supporter, but its effects at high doses on muscle growth have been demonstrated in at least a few studies and in much real world experience. The dosage required to elicit measurable lean mass gain makes colostrum an expensive supplement, but for those having trouble gaining weight, it's worth evaluating. Dosage in pertinent studies has been 20 grams daily; athletes can adjust for their bodyweights by using about 10% of bodyweight in pounds per day in grams, e.g. a 230-lb athlete would use 23 grams daily.

Caffeine

Caffeine is a substance that attracts as wide an array of opinions as any other. There is little argument regarding its ability to improve athletic performance in the short-term; the more contentious issue is its effects on long-term health, particularly its potential impact on adrenal function. As long as adrenal problems don't exist presently, dosing is appropriate, and caffeine is not relied on as a substitute for adequate quantity and quality of sleep, there is little concern.

Because caffeine's effects vary among individuals, it's important for lifters to have experience training while caffeinated before bringing it into a competitive situation. Keep doses reasonable—there will be a point at which more caffeine will fail to improve performance and instead begin disrupting it. Further, excessive caffeine use and the resulting high level of arousal during training can increase systemic fatigue and lead more easily to overtraining.

A wise approach to caffeine intake might be cycling. After a period of normal caffeine use, a significant reduction or elimination of intake for a week or two may provide time for the body to recover from any accumulated systemic fatigue that has developed from the greater degree of physical excitement experienced with caffeine use and reset caffeine sensitivity to a lower baseline. This back-off period may be particularly beneficial in the 1-2 weeks prior to a competition, with the reintroduction

of caffeine just prior to the event, and then in the 1-2 weeks following a competition when training will be less demanding and the body will need to recover. Experiment with this outside of competition first to gauge response, as it may be dramatically different than expected.

Electrolytes

During intense training in the summer months, athletes can lose considerable amounts of water, along with which will come electrolytes —sodium, potassium and chloride. Electrolyte replacement drinks or powders can be purchased, typically combined with sugar, which is fine if it's determined the athlete will benefit from this during or after training. To make an effective electrolyte solution without sugar if needed or wanted, add about a half-teaspoon of salt and half-teaspoon of potassium chloride (sold commonly as a salt substitute) to each liter of water.

Pre-Workouts

Pre-workout energy drinks are extremely popular for obvious reasons. The first concern with these supplements is the possible presence of banned substances—both as legitimate ingredients and due to contamination from other products. The second concern regards excessive nervous system fatigue due to frequent over-stimulation. Long term frequent use of stimulants results in much a greater systemic fatiguing effect from training that can create serious problems for a lifter, essentially accelerating the process of overtraining and even creating a state of overtraining from training that would otherwise not cause it. This is an instance in which the concept of minimal effective dose is important to keep in mind—use of stimulants for training should be judicious and prevented from becoming excessive. Additionally, it's a good idea to cease use periodically for a week, such as during periods of light training in a cycle, to give the body a chance to recover; this will also make the supplement more effective and lower doses when used again.