THE POLIQUIN PRINCIPLES

BY CHARLES POLIQUIN

Successful Methods for Strength and Mass Development

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INTRODUCTION

Whether they are corporate moguls, political leaders or Nobel Prize winners, in every walk of life there are individuals who have set themselves apart from others. Nowhere is this hierarchy of achievement so closely watched as in the world of sports. Thousands of books carefully chronicle decades of athletic bests. In 1912, Jim Thorpe, the winner of both the Pentathlon and the Decathlon at the Stockholm Olympics, was declared by King Gustav before the media of the day to be "the greatest athlete in the world." In the 1960s Muhammad Ali declared himself simply The Greatest, and ever since that day The Greatest is a title athletes in every sport aspire to.

In the shadow of every great athlete stands the strength coach. The achievements of these coaches are measured in gold and silver, yet few know their names. But as in every aspect of sports, bespeckled statisticians sit in moldy back rooms and comb the records to establish the "winningest" in the field of coaching. And in that world, The Greatest of contemporary strength coaches is Charles Poliquin.

Charles was born March 5, 1961, in Ottawa, Canada. He was the sixth of eight children and the only one to pursue sports. At age 14, Charles became one of the youngest ever to achieve a Black Belt. It was his karate instructor who first introduced him to weight training.

"One day I came to the dojo and I was the only who showed," recalled Charles. "My instructor couldn't see teaching karate to a class of one, so we spent the time lifting weights."

Charles never stopped lifting weights, and his career unfolded quite naturally from that point. He received his BSc degree in kinesiology and began coaching athletes before returning to his studies to earn a MSc in exercise physiology.

"I believe a college education is quite overrated," says Charles of his formal education. "That's the reason I don't put letters after my name—I don't believe it means anything."

Indeed, the most valuable education Charles achieved was on his own, outside the academic ivory towers. Early in his studies he realized that the majority of research in exercise physiology concentrated on aerobics. In order to find research on strength training, he had to turn to European journals and periodicals, particularly those from Germany. So Charles set about teaching himself German to complement the French and English in which he was already fluent.

One of the first research materials Charles tackled was Jurgen Weineck's book *Optimales Training*. The day he finished translating it he went to Canada's Sports Information Library only to find they had just received the French edition of it! Charles checked his own translation with the French version and realized he was doing a good job at translating—perhaps, he soon found, better than some others.

"Much of the important information in strength training comes from Europe, and what is available to English-speaking coaches has all been translated by a professional translator. However, the translator is rarely also a strength coach, and much of the information is misconstrued during the translation. Years of study and valuable techniques simply never make their way to English-speaking universities because of this!"

As Charles continued to study not the translations but the original texts of European research, his knowledge began to surpass that of his Canadian peers. He began lecturing at international conferences including those of the National Strength and Conditioning Association and Australian Collegiate Strength Coaching Council. His growing list of winning athletes created a rumor that Charles was being paid not by the athletes, but by the medals those athletes won, a rumor he says is not far from the truth. By the mid-1980s, when Charles retired from the collegiate coaching environment and began his studies for his master's degree, his reputation had already produced a waiting list of athletes anxious to train under his tutelage.

Today Charles is best known for his achievements with Olympic and professional athletes. He has coached 22 different Olympic sports and presently is the strength and conditioning coach for 120 world class athletes, including:

Myriam Bedard, Olympic athlete and World Champion in biathlon

Marc Gagnon, World Champion and Olympic medalist in short track speed skating

Natalie Lambert, World Champion and Olympic medalist in short track speed skating

Nine Olympic medalists in the Lillehammer Olympic Games

Charles' innovative methods are renown for getting results in months

that other coaches achieve in years. And if an athlete is fortunate to work with him for years, the results are truly phenomenal. For example, Cathy Millen, World Women's Powerlifting Champion, increased her bench press from 281 pounds to 407 pounds at a bodyweight of 184 after following Charles' programs for 24 months!

Speed and power are what make champions. Charles is known worldwide for producing faster athletes. Faster starts allowed US speed skater Casey Fitzrandolph to step many times onto the World Cup podium and also allowed Canada to win both overall world cup titles in bobsled in 1995. Kate Pace had the fastest start when she won the World Downhill Ski Championships in 1993. Charles' acceleration techniques have produced world championship medals in alpine skiing, biathlon, bobsled, cycling, judo, karate, rowing, swimming and speed skating.

His impact has also been seen in the increasing accuracy of shots and throws in sports from ice hockey to American football and basketball. Use of his leading-edge energy system training programs—along with improved nutrition and effective supplementation—has made Charles a legend in athletic recovery techniques. His expertise is credited with allowing National Hockey League star Gary Roberts to return to the game after being written off by medical doctors.

In the world of bodybuilding, Bill Phillips, Executive Editor of *Muscle Media*, was the first to recognize the value of applying Charles' methodologies to the field of strength and mass development. Charles was quickly adopted as the magazine's strength guru, and in each issue he contributes articles and his column, "The Poliquin Principles".

The reason Charles has become so popular in the world of bodybuilding is that his methods work, and work fast. "Bodybuilders aren't the only athletes interested in hypertrophy—athletes in many sports require gains in size and strength," explains Charles. "The big difference is most of my athletes only have 10-12 weeks to get results. Bodybuilders are used to taking years to gain the same degree of muscle size and strength, so to them, my methods seem more like miracles!"

In addition to achieving fast results, Charles also brings a systematic approach to training. "I think bodybuilders are getting tired of the Weider instinctive training method by which anything goes," says Charles. "Bodybuilders may dress like clowns, but a lot of them are smarter than many of the magazines give them credit for. I know this from the letters I receive. They are hungry for new information and convincing explanations of why they are being told to do something."

Now, with the publication of *The Poliquin Principles*, Charles brings his miraculous techniques to the world of strength and physique athletes. With this book Charles Poliquin provides the rationale behind his workouts and opens the door for a new age of intelligent bodybuilding.

Kim Goss
Strength Coach
Senior Editor, Dayton Writers Group

1

THE SCIENCE OF REPS, SETS AND WORKOUT DESIGN

A thorough discussion of the most basic elements of designing a workout

The Poliquin Principles brings you an intelligent approach to bodybuilding for faster, bigger gains. The first step to designing the perfect workout for you, is by manipulating your reps and sets. (Garrett Downing)

Different from magazines, which can be perused as easily from back to front as front to back, books are nearly always read from the beginning to the end. So I assume you are just beginning your indoctrination to my Poliquin Principles. If you're a strength athlete or a bodybuilder, and especially if you are under the age of 25, I suspect you're looking for the secrets to success in this first paragraph. I won't keep you in suspense for long. By the end of this chapter you will be considerably more sophisticated in your approach to training, and you will also be able to choose one of my workouts to fit your immediate needs. In this chapter I have included bodybuilding programs for the beginner, intermediate and advanced trainer, as well as a routine for weight loss without aerobics that utilizes the principles of my German Body Composition program. Throughout this book you will see the components of many other programs that I have shared to help you reach your training goals in the most efficient manner.

Having worked with elite-level athletes from a variety of sports, including bodybuilding and powerlifting, I have made it my specialty to find new ways to increase muscle growth and strength in the shortest amount of time. Sometimes this is through supplementation. Most often, however, it is through the manipulation of training variables you are already familiar with: sets, reps, tempo, rest, frequency, duration and volume. What I have learned in that regard is what you will learn in this book. And more.

▲ *Charles Poliquin works with athletes from more than 22 different sports. His diverse, hands-on experience and exhaustive research make him easily bodybuilding's most innovative coach.*

I am a full-time strength coach, not a full-time bodybuilder. Because of that, I have a slightly different vantage point from which I view the sport. I believe I have a slightly better view of things from here—at least a clearer one than some of the "mentors" in the sport.

I do not know of another sport that is as insular as bodybuilding. For decades the sport's information conduit has been virtually controlled by the Joe Weider empire. Its stars were the athletes Weider wanted to promote—but judging from the reactions of the crowd and contestants, the Mr. Olympia was fixed at least two times, once for Arnold and again for Arnie's sidekick Franco Columbu. However, Weider has so completely dominated the sport for so many years that he literally could get away with anything—and that's evident in the training information he perpetrates in his magazines.

In actuality, I have learned from informed sources that most of what Weider preached was actually penned by Bill Reynolds, who died of unspecified causes a few years ago. Bill was an extremely prolific writer, but his training knowledge was limited. Because of this, bodybuilders have been inundated with inadequate and sometimes inaccurate information. Since Bill's death, Weider has brought in, if not more informed editors, at least a larger variety of editors to provide more diverse viewpoints than in the past.

Of course, Weider is not all to blame. Nautilus guru Arthur Jones has to share the spotlight. I recall my indignation when reading his *Nautilus Training Principles: Bulletin No. 1*, in which he stated that bodybuilders must work to the point of momentary failure to "reach their individual limits of muscular size and strength very quickly." I agree that overload is essential for increasing maximal motor unit activation. Where I strongly disagree with Jones is when he said this overload "should be done in the performance of sets of at least 6 full repetitions and not more than 20 full repetitions." In fact, low reps are essential for achieving maximal growth.

Misinformation regarding exercise physiology is not confined to the bodybuilding community. Researchers in the US are limited by their environment. Untrained college students—so weak they could probably make significant progress playing Nintendo—are often used as subjects, and practical limitations usually require these studies to be completed within a few

months. In contrast, many of the studies in Norway, Finland and Germany use elite athletes spanning a four-year Olympic cycle. Other problems with American studies include poorly motivated subjects and no accountability for important training variables such as tempo and rest between sets.

Today, there is no excuse for mediocre and inefficient exercise routines. I have the utmost respect for bodybuilders for the effort and intensity they devote, but most of their training methodologies are scientifically unfounded! In the case of Mike Mentzer, it's safer to say they are the rantings of a lunatic. With a tremendous amount of new information now available to the strength athlete, I'm amazed by the prehistoric practices that permeate the sport of bodybuilding.

We know more today than ever. Even so, it's been my experience that information doubles every 18 months, and I find myself changing and adapting my own theories within that same time frame. Don't be surprised if you read something in this book that may contradict what I said in an article three years ago. That is the nature of knowledge: it grows. In this case, the knowledge I've gleaned is intended to help *you* grow.

You may also detect a bit of sarcasm in my tone. I believe it is better to laugh at the state of knowledge in the bodybuilding community rather than viciously decry it—so it's my intention to inform you, and also give you a few smiles along the way. With that, let's begin exploring one of the most basic aspects of weight training: repetitions.

▲ *Elite athletes, such as decathlon world record holder and Gold medalist Dan O'Brien, recognize the need to follow scientifically sound training regimens. Coach Poliquin predicts that top bodybuilders will begin applying more of the principles and knowledge from Olympic level sports to their own workout programs.*

The Science of Reps

The first question bodybuilders ask is "How much?" The second question, which influences the first, is "How many?" Common wisdom dictated 8-10 reps. But like that old adage about needing eight glasses of water a day (which, by the way, has never been scientifically proven) everyone accepts this "magic" number without questioning who arrived at it or how.

First of all, there is no magic number. As you'll learn, repetition protocols should change given the condition of the athlete, the nature of the exercise and the goal. Learning a little about the principles behind repetition prescriptions will give you a better idea of how to apply this to your own workouts.

The following general principles about rep selection are based upon prac-

tical scientific research and empirical evidence from my work with elite athletes. Thus far, I don't believe Weider has taken credit for discovering them—but then again, it's been a while since I picked up *Muscle and Fitness*!

Follow the Neural-Metabolic Continuum

The amount of weight you lift in relation to your one-repetition maximum (1RM) determines how much tension a muscle produces. And the preponderance of credible research and empirical evidence shows the level of tension imposed upon a muscle is critical for obtaining a strength or hypertrophy response.

The number of reps you select will influence all other loading parameters: sets, speed of contraction, rest intervals and even exercise selection. The bottom line? Strength researchers have found reps in the 1 to 5 range maximally increase strength with minimal gains in muscle mass, and reps in the 6-15 range maximally increase strength through muscle mass gains. (Table 1)

Extreme muscle mass is one of the primary goals in bodybuilding, but that doesn't mean bodybuilders should never perform low reps. Low reps are the only way to stimulate the development of Type IIb muscle fibers, which are the fast-twitch fibers that have the highest potential for growth. Another benefit of low-rep training is that when you come off a cycle of low reps, you will be able to use heavier weights. Heavier weights create a higher level of muscle tension, which in turn leads to a higher growth response. Mike Payette, a former Mr. Canada I trained who is now a professional wrestler, currently performs 40% of his exercises in the 4-rep range.

Let the Reps Dictate the Weight

"The number of reps you select will influence all of the loading parameters."

You must periodically force yourself to use maximal voluntary contractions to get results. Maximal voluntary contractions occur when you attempt to recruit as many motor units as possible to develop force. This is the physiological basis of what is commonly referred to as the *overload principle: If you do not apply overload to your muscles, there is no reason for your muscles to get bigger or stronger.* (The exceptions are beginners and rehab patients whose strength levels are so low that training to momentary failure is not necessary for optimal results. In fact, these individuals could make significant progress lifting rocks!)

When you plan your workouts you should determine the desired training effect and select a repetition bracket to suit that goal. If you want to gain size, you would select a weight that enables you to complete between 6 and 12 reps. If you can only complete five reps, the weight is too heavy. If you can do more than 12 reps, the weight is too light.

The need to allow the reps to dictate the weight is a problem with some computerized workout programs. Most computer programs determine what you should lift for each workout by taking a percentage of your 1RM in each exercise. However, the 1RM continuum varies greatly from one mus-

Table 1: Relationship between maximum number of repetitions, intensity and the training effect

(Poliquin, 1990)©

Maximum Number of Repetitions	% of Maximum	Training Effect
1	100.0	Relative strength
2	94.3	increases through
3	90.6	enhanced neural
4	88.1	drive.
5	85.6	
6	83.1	Optimal compromise
7	80.7	of maximal strength
8	78.6	and hypertrophy gains
9	76.5	Best hypertrophy
10	74.4	gains leading to
11	72.3	increased
12	70.3	maximal strength
13	68.8	Strength-endurance
14	67.5	gains and lower
15	66.2	hypertrophy gains
16	65.0	
17	63.8	
18	62.7	
19	61.6	
20	60.6	

▲ *Coach Poliquin has examined the training routines of bodybuilders over the past 40 years in reaching his present conclusions and recommendations. Shown here is 1982 Mr. Olympia Chris Dickerson at age 44.*

cle group to another, and as you can see from Table 2, different studies produce different results.

Table 2:
1RM continuum in the bench press according to various authors
(Poliquin & Léger, 1991)©

R.M.	Percentages (authors) (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2	95.0	95.0	94.0	97.4	96.6	95.0	96.4	94.4
3	92.5	90.0	91.0	94.9	92.6	90.0	93.3	91.8
4	90.0	86.0	88.0	92.4	89.7	87.5	89.9	89.2
5	82.5	82.0	85.0	89.8	87.0	85.0	86.4	86.9
6	85.0	78.0	83.0	87.6	84.7	82.0	83.9	84.7
7	82.5	74.0	81.0	85.5	82.0	79.0	81.3	82.6
8	80.0	70.0	79.0	83.3	79.7	76.0	78.8	80.6
9	77.5	65.0	78.0	81.1	77.5	73.0	76.9	78.7
10	75.0	61.0	77.0	78.9	75.5	70.0	75.0	76.8

(1) Landers, 1986
(2) McDonagh & Davies, 1984
(3) Rhoades & Wescott, 1987
(4) Berger in Viel et al., 1984
(5) Witt, 1984
(6) Feser, 1977
(7) Anderson & Harring (1977) in Sale & MacDougall (1981)
(8) Kennedy, 1980

Because so many factors affect your strength at any given time, plugging you into a computer-generated program based upon a one-rep max may compromise the quality of the workout. If you're sick, the weights will be too heavy; and if you're feeling great, the weights will be too light, leading to plenty of frustration.

Determine Muscle Fiber Composition

A muscle with a high percentage of slow-twitch fibers responds best to higher reps. The soleus contains predominantly slow-twitch fibers; therefore, repetitions in the 15-25 range may be needed to give sufficient time under tension for these fibers to hypertrophy. In contrast, the gastrocnemius contains predominantly fast-twitch fibers and responds best to lower reps.

One observation I've had is that sprinters and Olympic weightlifters often

have much better development of the hamstrings than bodybuilders. This is because the hamstrings are primarily composed of fast-twitch fibers; and to access these fibers, you must train them at a high intensity level. If a bodybuilder is making exceptional progress on his or her hamstrings using more than eight reps for this muscle group, I would attribute such growth more to pharmacological reasons.

▲ *A study of strength contrasts: Three-time Gold medal weightlifting champion Naim Suleymanoglu admires the biceps of Mr. Universe Ray Mentzer, who has an entirely different perception of heavy duty training.*

Arthur Jones claims you can determine muscle fiber type by examining how many times you can lift a sub-maximal weight. This is partially true. If two people have a 1RM for the Barbell Curl of 100 lbs, the person who curls 80 lbs only 5 times has more fast-twitch fibers than the person who can curl the same weight 10 times. Compared to the usual method of determining fiber type that involves taking painful muscle biopsies, Jones' test is extremely convenient for untrained individuals. However, you must understand that you can bias this relationship by making the body more neurologically efficient (with relative strength training methods) or less neurologically efficient (with aerobic work).

Consider Exercise Complexity

If an exercise involves multiple joints in a complex skill, such as the Olympic lifts, excessive reps will produce undesirable technical and motor-learning changes. When performing more than six reps in the power clean, for example, the relatively small rhomboid muscles would tire out first, causing a change in lifting technique. I saw an article by a football strength coach who recommended sets of up to 30 reps in the power clean. Since his team won a national championship, I concluded that a scientifically sound weight training program is only one variable responsible for success in collegiate football.

With the increased contributions of science to training methodology, the subject of selecting the appropriate number of reps for your workouts has become very confusing. And because science has not yet provided all the answers, we will continue to see much variation in training methods. Of course, tackling the subject of repetitions is only part of the solution. You also need to define and select the proper number of sets.

The Science of Sets

▲ *In addition to Coach Poliquin's revolutionary workout programs for strength and mass, he is highly acclaimed for his success at rehabilitating injuries. He's shown here stretching the hip stabilizers of Gary Roberts, one of his athletes.*

Let's start with a simple definition: *a set is a group of consecutive reps*. Going a step further, an extended rest period or a change of exercises signals the completion of a set. This means one *superset*, two exercises for different muscle groups performed in sequence, equals two sets. One *giant* set, three exercises for the same muscle group performed in sequence, equals three sets. Descending sets, in which virtually no rest time is taken between weight changes, equals just one set. Although some individuals endorse one-set training, when you apply the previous definitions, you often find their workouts contain extended sets. With extended sets, the total time the muscle is under tension contributes to the total volume that elicits a hypertrophy response.

Variables Influencing Set Selection: A Top-10 List

The overload principle suggests that stronger athletes need more sets, and real-life examples prove multiple-set systems produce faster and greater gains in muscle mass, strength and power. But there are many variables to consider in determining how many sets you should perform in a workout. Here are ten of them:

1. Number of reps selected

Most strength coaches believe there is a minimum amount of time the muscles must be stimulated for maximum size and strength gains. Consequently, when training with low reps, you must perform more sets to attain the optimal volume for strength development. This is illustrated in Figure 1.

2. Number of exercises per training session

The more exercises you perform, the fewer sets you need to achieve an optimal training effect for each exercise. If you add exercises to your workout without reducing the average number of sets per exercise, you would exceed the optimal time period to complete a workout.

Figure 1: Inverse relationship between reps and sets.

Reps	1	3	5	7	9	11	13	15+
Sets	High (5-12)							Low (2-4)

3. Training level

One or two sets per exercise are usually enough for beginners because their training level is low. But when we talk about training level, we don't necessarily mean chronological age; a 17-year-old could be considered advanced, and a 50-year-old could be considered a beginner.

4. Gender

At any given percentage of their maximum for one rep (1RM), a woman will perform more reps than a man. Take the arm curl, for example. At 70% of their 1RM, a woman should be able to perform 17 reps, while a man should only be able to complete 12. Also, because there is an inverse relationship between sets and reps, this difference in neurological efficiency means women should do fewer sets at a given intensity.

5. Nutritional status

With the availability of creatine monohydrate supplements, drug-free athletes can increase their volume of high-quality sets almost as much as those who use drugs that stimulate creatine storage, such as oxandrolone and methandrostenolone.

Furthermore, supplements that assist glycogen loading, such as chromium and vanadyl sulfate, may match some of the gains associated with glycogen-synthetase enzyme stimulation, such as the results from drugs such as oxymethonolone and testosterone suspension.

"One or two sets per exercise are usually enough for beginners because their training level is low."

6. Muscle size

The number of sets performed should be inversely proportionate to the size of the muscle mass trained. Small muscle groups recover more quickly than large muscle groups and can therefore handle more sets. Thus, you could perform more sets for the biceps than you could for the quadriceps.

7. Principle of individualization

Bodybuilders and strength athletes have reached high levels of performance using a variety of training philosophies. An overview of the present scientific literature reveals a similar diversity of programs leading to increased gains. Because everyone has a unique response to a given program, the number of sets should be individualized. Rick Well, a world record holder in the bench press, uses low sets in his training. Early 50s world weightlifting champion Doug Hepburn used high sets to achieve his own record performances.

8. Principle of quality over quantity

Even when you allow sufficient rest intervals to replenish the phosphagens, after a few sets the muscles will fatigue to the point where increasingly fewer reps can be performed before failure. This is what I call the *critical drop-off point*. The critical drop-off point occurs when you reach a 5-7% drop in performance, and it is at this time you should move to another exercise or bodypart. You'll know you've hit the critical drop-off point when you must reduce the amount of weight you're lifting to maintain the selected rep range or when you experience a drop of two to three reps from one set to the next.

The basic premise of the critical drop-off point, which I learned from discussions with Canadian sprint coach Charlie Francis, is "never increase the

quantity of stimulus at the expense of quality." It is pointless to perform sets in which the resistance is reduced so much that you don't train the appropriate motor units and don't create sufficient tension on the muscles to elicit gains. These additional "garbage sets" would also impede recovery by putting excessive strain on the nervous system and energy stores.

▲ *Lou Ferrigno and Arnold Schwarzenegger are credited with increasing public awareness of the sport of bodybuilding. Coach Poliquin is recognized for creating an awareness of the value of hypertrophy methods for improved athletic performance amongst coaches.*

9. Hormonal output and anabolic state

To maintain the quality of the training stimulus, you should not perform more than 30-36 sets per workout. I've seen better results when the total number of sets is kept between 20-25. Bulgarian weightlifting coach Angle Spassov and US weightlifting coach Dragomir Cioroslan believe training sessions should not last over one hour, and 45 minutes would be even better. The bodybuilders I train respond best to brief workouts. Former Mr. Universe Andre Charette made his greatest progress on two 40-minute workouts per day, whereas Mike Payette made his best gains training only once a day for about 52 minutes per workout.

10. Muscle composition

Muscles that are inherently fast-twitch respond best to more sets. Muscles that are inherently slow-twitch respond best to fewer sets. Thus, you can perform more sets for the hamstrings (fast twitch) than for the soleus (slow twitch). Also, muscles not normally subjected to intense loading in daily activities (such as the neck flexors) respond better to fewer sets.

Prescriptions for Increasing Muscle Mass and Relative Strength

One of the most controversial topics in resistance training is the optimal number of sets you need to increase muscle mass. There are the low-set proponents like Dorian Yates and the Mentzer brothers and the high-set proponents like Arnold Schwarzenegger and Anthony Ditillo. Both camps are right! What counts is the proportion of high-set and low-set work through a sound periodized approach to training. However, generaliza-

tions can be made. Table 3 contains set-rep prescriptions for increasing muscle mass.

Strength coaches often encounter the difficult problem of designing training programs to improve an athlete's strength without significantly increasing lean body mass. The type of strength they want is called relative strength.

TABLE 3: Loading parameters for hypertrophy
(Poliquin, 1991)©

Intensity	60-82%
Repetitions	6-20 RM
Sets	3-6
Rest Intervals	2-4 minutes
Concentric Tempo	1-10 seconds
Eccentric Tempo	4-10 seconds
Total Set Duration	20-70 seconds
Number of Exercises per Workout	6-12

Relative strength is especially important in sports that involve weight classes, such as boxing, wrestling and weightlifting. Athletes in these sports must be as strong as possible at the lightest bodyweight possible. It is also important to athletes who require strength without excessive muscle mass, like those in skiing, cycling, figure skating, gymnastics and bobsledding. Despite being relatively light, the skiers and bobsledders I coach often have leg strength comparable to elite weightlifters and bodybuilders. Felix Belzcyk and Cary Mullen are both World Cup medalists. Belzcyk weighs 191 lbs and Mullen weighs 200 lbs, and both have front squatted 352 for 3 reps. Ian Danney of the Canadian bobsled team has front squatted 451 lbs, and he weighs 180 lbs. (And we're talking about full squats, as in "leave a stain on the platform.")

"Strength coaches often encounter the difficult problem of designing training programs to improve an athlete's strength without significantly increasing lean body mass."

The neuromuscular basis of relative strength training involves performing brief but maximal voluntary contractions to improve the neural drive to the muscles. The great voluntary effort associated with such training recruits the highest threshold motor units so as to make use of their greater strength and rate of force development. Near-maximal and maximal weights must be used. Table 4 contains set-rep prescriptions for relative strength.

TABLE 4: Loading parameters for relative strength
(Poliquin, 1991)©

Intensity	85-100%
Repetitions	1-5 RM
Sets	5-12
Rest Intervals	4-5 minutes
Concentric Tempo	1-4 seconds
Eccentric Tempo	3-5 seconds
Total Set Duration	under 20 seconds
Number of Exercises per Workout	6-12

Of course, this is a book about bodybuilding. Rela-tive strength training produces minimal increases in size, so emphasizing these methods, although occasionally good for variety, are not something a bodybuilder should use often.

The Science of Workout Design

Understanding the science behind reps and sets will allow you to tackle a rather complex approach to training called *periodization*. Don't worry, there is no test at the end of the chapter.

Periodization is basically a workout plan. It takes into consideration all the variables of training to achieve a specific goal. By the time you finish this book, you should be able to sit down and write yourself a workout that spans a period of time, and utilizes the best information available to plan your reps, sets and volume according to your desired goal. That is periodization.

Why do we need to write out workouts? The classic movie Chariots of Fire tells the true story of two runners, one from Scotland and one from England, who had the talent and determination to achieve Olympic glory. The story contrasts their lives and their radically different approaches to training. The Scottish runner was an idealist, and he ran as he thought best for each day, allowing the purity of his spirit to guide his training. He had no use for a training log book. The English runner used only training methods supported by scientific research, and planned each and every detail of his workout months in advance. He needed a training log, a day planner, and could really have used the latest Microsoft spreadsheet package.

"Few American bodybuilders have used periodization because most prefer a 'quick-fix' solution."

The runners in *Chariots of Fire* exemplify the philosophical difference between the traditional, instinctive approach to training and the new science of long-term planning called periodization. Ten years ago few bodybuilders talked about periodization. But in their quest to reach the highest level of physical perfection, today's bodybuilders have taken a keen interest in what strength training authorities have been practicing for years: periodization.

The Forgotten Element

Few American bodybuilders have used periodization because most prefer a "quick-fix" solution. In contrast, periodization is used more by European bodybuilders, but I also believe that a lot of pro bodybuilders come to periodization indirectly. In other words, they will vary their training methods but don't have a systematic method—you might call this approach "shotgun periodization". Schwarzenegger varied his training, but did so in a micro fashion. He didn't map it out like athletes do in other sports.

There are some individuals who hold the opinion that if you use steroids, you don't have to worry about overtraining and careful planning of your workouts with periodization—just train hard. Although steroids will enhance recovery, using a periodized program would allow a person to

make even better progress. An example of this is Ben Johnson. Yes, he was caught on steroids. But at the drug inquiry, experts testified that Johnson was taking only about six percent of the drugs that his competitors were taking. Johnson could attribute much of his progress to sound training with excellent coaches such as Charlie Francis.

Although Europeans were first to embrace periodization, not every periodization program will be effective for bodybuilding. One of the more bizarre training plans to hit the bodybuilding scene was inspired by the training principles of Bulgarian weightlifting coaches. It made a few people rich, and had endorsements by Tom Platz (after he retired) and other top bodybuilders. My question is, "How many great bodybuilders have come from Bulgaria?" The answer is, "None." Bodybuilding in Bulgaria has been considered an anti-government activity—it probably carries the same status as being a member of the Ronald Reagan Fan Club.

Another even more bizarre bodybuilding plan is called the Heavy Duty training system—that is, simply train hard, train brief, and you should make progress virtually every workout. A training system is only as good as the time it takes you to adapt to it. So Heavy Duty will work, but only for two to three weeks. Also, the system defies any law of neurophysiology. You can't tell me that doing one set of a biceps exercise will knock off the entire motor unit pool of Type I, Type IIa, and Type IIb fibers—it's physiologically impossible.

"Periodization has been shown to be a valid application in other sports, and it's time that bodybuilders began to use it as well."

I believe the reason Heavy Duty works for a brief time is that most bodybuilders are grossly overtrained. One thing that we have learned from periodization is the process of tapering. Only when volume is reduced can athletes show their true potential. In other words, fatigue masks fitness. Well, sometimes hypertrophy is masked by fatigue, so the bodybuilder who reduces his volume will grow. This means that the bodybuilder who gains ten pounds in seven days on Heavy Duty did so because he was grossly overtrained before he reduced his volume, so at last hypertrophy could take place. The thing is, such gains are short-lived. For most guys who've gained ten pounds through Heavy Duty, that's the only ten pounds they'll ever gain. After that, once they get addicted to that low volume, they can't make any progress.

There are also problems with the instinctive method, one which is quite popular among bodybuilders. By training according to how you feel, without a set model to follow, most people resort to what they are good at. That's fine, except for the fact that most people are lazy and their training will suffer. This philosophy also will not work to address muscle imbalances or weak points. For example, if a bodybuilder tends to have a slow-twitch make-up, he will resort to high reps and short rest intervals—but maybe what he needs to further his development is high intensity, multiple sets and long rest intervals.

Is there is a basic periodization model for a bodybuilder? Well, there is a model in the sense that most will stress a higher level of volume than of intensity at first. The nature of bodybuilding is such that you want to increase body mass as much as possible, so I think that's your best indi-

cator. The problem is that if you only did leg training you would only gain in the legs—your bodyweight goes up and you may not do very well because your calves look like pipe cleaners. For the young athlete, as far as training goes, it's much easier to assess these weak points. For the elite bodybuilder, his gross muscle structure should already be in balance (or he wouldn't be an elite bodybuilder), so it would be total lean body mass that makes a difference.

I predict that periodization, which in essence is nothing more than the careful planning of a long-term program, will eventually become more popular with bodybuilders because a lot of them are fed up at not making any progress. Periodization has been shown to be a valid application in other sports, and it's time that bodybuilders began to use it as well.

The Poliquin Workouts

Some strength coaches believe there exists a single perfect training program—a program that prescribes all loading parameters such as reps, sets, speed of loading, exercise selection and exercise order. The irony is that no matter how carefully you plan a workout, it may not work for everyone, and it definitely won't work forever. There always comes a need for change, and this variety of training stimulus is a common factor found in all athletes. There are no set rules on how many sets you need to perform. But if you respect the training principles examined in this chapter, you can design the best workout for you!

When I design periodization workouts, I like to work in six-week cycles. At the end of each cycle I evaluate the individual's weaknesses, and then map out the best way to bring the development in balance. For example, if arm development is weak, I determine if the biceps or triceps needs the most work, and include additional exercises that target those areas (such as those presented in my chapter on arms). At the end of six weeks, I evaluate and set upon another plan.

Of course, I know that some of you would prefer to give the Poliquin Principles a try right now, before you have to sit down and begin writing out your own routine or before you read through to the end of the book. For those individuals, I have written four workouts that rely on supersets. Some of the concepts may be unfamiliar to you—such as tempo. You may need to flip ahead a few pages before you can decipher these workouts, but most of you probably can begin immediately.

Poliquin's Beginning Bodybuilding Workout

This is a 3-week program, which you perform three days a week. Letters indicate exercises you superset.

EXERCISE	WEEK	SETS	REPS	TEMPO	REST (seconds)
A. Back Split Squat	1	3	10-12	20X	180
(Push backwards explosively)	2	3	8-10	20X	180
	3	3	6-8	20X	180
B. Varied Positions Leg Curl	1	3	8-10	401	120
(One set feet in, one set feet neutral,	2	3	6-8	401	120
one set feet outward)	3	3	5-7	401	120
C1. Seated Low Cable Row	1	3	6-8	303	90
(The handle is brought to the waist on	2	3	5-7	303	90
every rep. Use a triangle handle.)	3	3	4-6	303	90
C2. Close Grip Bench Press	1	3	6-8	303	90
(Grip is slightly narrower than shoulders)	2	3	5-7	303	90
	3	3	4-6	303	90
D1. Combo Crunch Low Cable Pull-in	1	3	20-25	101	60
(Both feet are in straps. Use plate for	2	3	20-25	101	60
extra upper body resistance.)	3	3	20-25	101	60
D2. One Leg Calf Raise	1	2	10-12	211	60
(Hold dumbbell on same side	2	3	8-10	211	60
as working leg.)	3	3	6-8	211	60

Poliquin's Intermediate Bodybuilding Workout

This is a 3-week program. The workouts divide the body in two parts, each trained twice a week. Refer to chapter 16 for information on performing Swiss ball crunches and to chapter 8 for information on performing step-ups.

EXERCISE	WEEK	SETS	REPS	TEMPO	REST
Day 1: Upper Body					
A1. Incline Dumbbell Press	1	4	9-11	311	90
	2	4	8-10	311	90
	3	4	7-9	311	90
A2. Close Parallel-Grip Chin	1	4	9-11	311	90
	2	4	8-10	311	90
	3	4	7-9	311	90
B1. Seated Close-Grip Row to Waist	1	3	10-12	311	90
(Parallel-Grip)	2	3	9-11	311	90
	3	3	8-10	311	90
B2. Leaning Away Lateral Raise	1	3	10-12	211	90
	2	3	9-11	211	90
	3	3	8-10	211	90
C1. Incline Offset Dumbbell Curl	1	3	10-12	402	90
	2	3	9-11	402	90
	3	3	8-10	402	90
C2. Close-Grip Bench Press	1	3	10-12	211	90
(elbows under)	2	3	9-11	211	90
	3	3	8-10	211	90
Day 2: Lower Body					
A1. Step-Up	1	3	10-12	302	90
	2	4	9-11	302	90
	3	4	8-10	302	90
A2. Seated Leg Curl	1	3	10-12	302	90
	2	4	9-11	302	90
	3	4	8-10	302	90

EXERCISE	WEEK	SETS	REPS	TEMPO	REST
B1. Back Step-Up	1	3	15-20	101	60
	2	3	12-15	101	60
	3	3	10-12	101	60
B2. Back Extension	1	3	10-12	221	90
	2	3	9-11	221	90
	3	3	8-10	221	90
C1. One-Legged Calf Raise	1	3	10-12	221	90
	2	3	9-11	221	90
	3	3	8-10	221	90
C2. Twisting Crunches on Swiss Ball	1	3	12-15	202	90
	2	3	10-12	202	90
	3	3	8-10	202	90

Poliquin's Advanced Bodybuilding Workout

This is a 3-week program. It is performed four days out of the week.

EXERCISE	SETS	REPS	TEMPO	REST
Day 1: Chest, Shoulders				
A. Low Incline Barbell Press	4	5-8	302	180
B1. Super-Slow Flat Fly	3	4-6	4:0:10	0
B2. Super-Slow Incline Fly	3	4-6	4:0:10	90
C. Incline Cable Crossover	3	6/6/6	401	90
D. Super-Slow Machine Laterals	3	4-6	4:0:10	120
E. Lean-Away Lateral Raise	3	20-25	201	120
Day 2: Back, Calves				
A. Bent-Over Barbell Row (Squeeze shoulder blades at top)	4	10,8,6,6	321	180
B1. Wide Parallel-Grip Chin (Squeeze shoulder blades when bar makes contact with neck)	4	8-10	321	0
B2. Sternum Pulldown	4	15-20	201	120
C. Rear Deltoid Machine	3	6,6,6	201	60
D. Seated Donkey Calf Press	3	for 120 sec.	201	90
Day 3 AM: Thighs,Abs				
A. Smith Machine Back Squat	5	12,10,6,4,25	301	180
B1. Lunge	3	15-20	201	0
B2. Step-up	3	15-20	201	60
C. Duck Leg Press	3	35-40	201	180
D1. Overhead Pulley Crunch	3	12-15	101	60
D2. Low Cable Pull-in	3	20-30	101	60
Day 3PM: Hamstrings				
A1. Seated Leg Curl	4	6-8	303	15
A2. Back Extension	4	8-10	303	15
A3. Lying Leg Curls, Feet Neutral	4	12-15	302	120
B. Barbell Semi-Stiff Deadlift (round back style)	4	20,15,12,30	201	90
Day 4: Arms				
A1. Standing Barbell Curl	5	10,8,6,4,4	501	90
A2. 10 Degree Close-Grip Bench Press	5	10,8,6,4,4	501	90
B1. Slow Flat Scott Pulley Curl	3	4-6	505	90

EXERCISE	SETS	REPS	TEMPO	REST
B2. Pulley French Press Machine	3	4-6	505	90
C1. Concentration Dumbbell Curl	3	6,12,25	201	60
C2. Lying Dumbbell Triceps Extension	3	6,12,25	201	60

Poliquin's German Body Composition Training

This is a 3-week program designed for weight loss. Because aerobic exercise can compromise muscular strength, this workout utilizes weight training to elicit weight loss. Letters indicate exercises you giant set. The workouts divide the body in two parts, each trained twice a week. Refer to chapter 16 for information on performing Swiss ball crunches and to chapter 8 for information on performing step-ups.

EXERCISE	WEEK	SETS	REPS	TEMPO	REST
Day 1 and 3					
A1. Dumbbell Lunge	1	4	15-20	20X	45
	2	4	15-20	20X	45
	3	4	15-20	20X	45
A2. Lat Pulldown to Sternum	1	4	10-12	321	45
	2	4	10-12	321	45
	3	4	10-12	321	45
A3. Lying Leg Curls, Feet Neutral	1	4	10-12	501	45
	2	4	10-12	501	45
	3	4	10-12	501	45
A4. Decline Dumbbell Triceps Extension	1	4	10-12	401	45
	2	4	10-12	401	45
	3	4	10-12	401	45
B1. Hamstring Leg Press	1	3	15-20	201	45
	2	3	15-20	201	45
	3	3	15-20	201	45
B2. One-Arm Cable Rowing	1	3	10-12	401	45
	2	3	10-12	401	45
	3	3	10-12	401	45
Day 2 and 4					
A1. Dumbbell Squat	1	4	15-20	201	30
	2	4	15-20	201	30
	3	4	15-20	201	30
A2. Pronated-Grip Front Lat Pulldown	1	4	10-12	301	30
	2	4	10-12	301	30
	3	4	10-12	301	30
A3. Dumbbell Semi-Stiff Leg Deadlift	1	4	10-12	402	30
	2	4	10-12	402	30
	3	4	10-12	402	30
A4. Seated EZ Bar French Press	1	4	10-12	302	30
	2	4	10-12	302	30
	3	4	10-12	302	30
B1. Low Pulley Abduction, Standing	1	3	10-12	301	30
	2	3	10-12	301	30
	3	3	10-12	301	30
B2. Seated Rope Rowing to Neck	1	4	10-12	211	30
	2	4	10-12	211	30
	3	4	10-12	211	30

2

THE SCIENCE OF TEMPO

Your lifting speed may be what's standing between you and better gains

The simplest advice on training speed is that you should lift the weight under full muscular control, pause in the contracted position, and lower the weight under control. However, subtle changes in lifting speed can make big differences in progress. (Matt McLaughlin)

For many, Mike Mentzer is the mentor of "Heavy Duty" training. For some, he is exalted for his revolutionary training concepts. In his own mind he is a great philosopher. I would like to add to that list that he is dogmatic, and in that regard his training methods, though valid for some, will not possibly work for all. He, as well as many other outspoken trainers, mistakenly underestimates the power of one component of weight training: speed of contraction.

The most widely accepted advice on tempo is that you should lift weights under full muscular control, pause momentarily in the contracted position, and lower the weight under control. This simple advice works in many situations. However, subtle differences in lifting speed can have profound results for athletes who are looking for above-average gains and performance.

Training speed is one of several components of weight training that has been oversimplified. Part of the blame rests on gym owners, who encourage slow, controlled movements in order to reduce their risk of weights getting tossed about out of control. Part of the blame also rests in the fact that most magazines promote the belief that tempo has only to do with aerobics and not weightlifting.

Lifting speed in performance of the Squat is very important for maximum safety and progress. (Branch Warren)

In certain instances, slow training is optimal. But not always. As you know, there is no single best way to train. The human body is an especially adaptive organism that responds to variables in training. Changing those variables is how we force the body to adapt, and one of those variables is training speed.

My research comes from my years of work with athletes and also many months perusing the long-term research from European as well as American exercise scientists. It has been based on the experiences of athletes from a variety of sports, including bodybuilders, Olympians (from the Olympics, not the Olympia) and world record holders. Perhaps in the future I will quote great philosophers like Ayn Rand, but for now I'd rather stick to what has been proven in the laboratory and the athletic arena.

Why You Should Care About Lifting Speed

The first thing you must understand to reach your ultimate goals is that lifting speed is extremely important. Let's say two guys decide to perform ten reps in the dumbbell row. One lifts slowly, up to the count of three and down to the count of six, and the other cranks on it like he was starting a lawnmower. Doesn't it make sense that they would achieve different training effects? Of course, and one reason is that although both are performing the same number of reps, the speed is affecting other variables. For a bodybuilder, one of these variables is "time under tension," that is, the amount of time the muscles must contract to complete a set.

To develop maximum muscle mass, the optimal time a muscle should contract during a set should fall between 20-70 seconds. This allows for a lot of variation, from sets consisting of one rep and lasting 70 seconds to sets involving 15 reps and lasting 70 seconds. This does not mean bodybuilders should not perform shorter or longer sets, but that the majority of their sets should fall within this range.

Reading Tempo Prescriptions

When I first began writing for *Muscle Media*, T.C. Luoma called to ask me what the numbers were in all of my workouts. He had no problem with 302

and 212—he assumed they were poundages. Until he found them on biceps exercises. When he ran across X01, he picked up the phone.

Tempo, the speed of your lift, is always expressed in three digits, a formula refined by Ian King, Australia's leading strength coach. The first digit is the lowering (negative) portion, the middle digit the pause (isometric) phase, the third digit the return (positive) movement. Using the Front Squat example below, 3 refers to the three seconds it should take the lifter to squat down; 2 refers to a two-second pause at the bottom; 1 refers to the one second it should take the lifter to return to the start. X is used to denote "as fast as possible." Rest between sets, which is also an essential component of a workout, is simply expressed in seconds.

"To get the appropriate training stimulus, you must prescribe the appropriate speed of movement for all aspects of the lift."

Tempo for Leg Strength

To get the appropriate training stimulus, you must prescribe the appropriate speed of movement for all aspects of the lift. As an example of how I achieve this, here is an excerpt from the training diary of Pierre Lueders, 1994 Overall World Cup winner in the bobsled. This is a three-week program that will definitely increase leg strength. At a bodyweight of 220 pounds, Pierre has power cleaned 352 lbs and did a rock-bottom front squat with 462 lbs!

EXERCISE	WEEK	SETS	REPS	TEMPO	REST (seconds)
Snatch Pulls	1	6	4,3,2,4,3,2	30X	180
(from floor)	2	6	3,2,1,3,2,1	30X	180
	3	6	3,2,1,3,2,1	30X	180
Front Squats	1	4	5-6	321	120
	2	5	4-5	321	120
	3	6	2,2,2,3,3,3	321	120
Russian Good	1	3	8-10	303	120
Mornings	2	3	6-8	303	120
	3	4	4-5	303	120
COMPOUND SET:					
1. Low Cable	1	3	10-12	101	90
Pull-ins	2	3	6-8	303	90
	3	3	15-2	101	120
2. Standing	1	3	15-20	111	90
Calf Raises	2	3	12-15	111	90
	3	3	10-12	111	120

The Cause for the Pause

While intensity is indeed used to sell magazines, Alex Acevedo knows it's an absolute must for continued progress.

The pause is an often neglected component of the speed of lifting. It's been shown in the bench press that pausing four seconds on the chest will dissipate virtually all the plyometric effect elicited in a heavy lift. In fact, in a bench press competition an extra second delay for the judges' clap could make a five-percent difference in the amount of weight lifted! In contrast, bodybuilders would want to make use of longer pauses in their training because the muscles must contract harder when the plyometric effect is reduced.

A lot has been said in bodybuilding magazines about intensity. A typical magazine cover has a profusely sweating bodybuilder (whose claim to fame is that he is the first one in his family to walk upright), arms pumped from a grueling set and ready to collapse under the last rep of a 300-lb biceps curl. The teaser reads as something profound like HIGH INTENSITY OR DEATH! Although such hype sells magazines, the fact is that intensity is determined not by the poundage but by how many muscle fibers are involved. Because more muscle fibers are involved in lifting heavy weights, the most intense sets would consist of only one repetition performed with the heaviest weight you could manage. Consequently, training with slow sets of ten reps should technically be called low-intensity training, but I guess the expression "High Intensity Training" is more marketable.

Lifting Speed for Maximal Strength and Power

For the development of maximal strength, slow-speed training performed with heavy weights has a definite advantage over high-speed lifting. Slowing down the movement increases both the duration of the stimulus and the levels of tension imposed on the muscle, factors that favor the development of strength and muscle mass. (High-intensity, slow-speed training, which would be indicated by exercise prescriptions such as 4 x 4-6 on a 4-1-6 tempo, will produce the following muscle-building effects: stimulation of the Type IIa fibers and increased muscle glycogen, CP, ATP, ADP, creatine, phosporylase, PFK, and Krebs cycle enzyme activity—all of which equate to more strength and muscle mass!)

Two recent studies have shown the superior value of varying speed compared to keeping the speed of contraction constant throughout a program.

"Here is a six-week superset arm routine, utilizing variations in tempo. Try it and you'll see how effective variety in tempo can be in eliciting strength and mass gains. Part two of the program is on the following page."

Accumulation Phase

EXERCISE	WEEK	SETS	REPS	TEMPO	REST (SECONDS)
A1. Scott Low Mid-Grip Pulley Curls	1	3	4-6	408	90
	2	3	4-6	408	90
	3	3	4-6	408	90
A2. Low Decline Close-Grip Bench Press	1	3	4-6	408	90
	2	3	4-6	408	90
	3	3	4-6	408	90
B1. Standing Mid-Grip EZ Bar Rev. Curls	1	3	4-6	505	75
	2	3	4-6	505	75
	3	3	4-6	505	75
B2. Lying Low Pulley Triceps Extensions	1	3	4-6	505	75
	2	3	4-6	505	75
	3	3	4-6	505	75
C1. Seated Incline Curls	1	3	6-4-4	303	60
	2	3	6-4-4	303	60
	3	3	6-4-4	303	60
C2. Triceps Pressdowns Pronated	1	3	10-4-4	303	60
	2	3	10-4-4	303	60
	3	3	10-4-4	303	60

A study by Urdang (1989) showed that to increase poundage at both high and low speed, training must be performed at both speeds. The work of Doherty (1989) states that low-velocity training produces greater increments in force production at low speed than high-velocity training. However, that study suggests that high-velocity training alone does not produce changes as great as does varying low- and high-speed training performed in sequence. This data supports the practice of training programs in which the speed of movement is varied over the course of the program for athletes attempting to increase strength at high speeds.

For elite athletes, the variation of training speeds may be more necessary to elicit a training response. Various world class athletes have reported enhanced performance from systematically planned variations in speed of

"Studies suggest that high-velocity training alone does not produce changes as great as does varying low- and high-speed training performed in sequence."

Intensification Phase

EXERCISE	WEEK	SETS	REPS	TEMPO	REST (SECONDS)
A1 Close-Grip Bench Presses	4	5	4-6	321	120
	5	5	4-6	321	120
	6	5	4-6	321	120
A2 Scott Close-Grip EZ Reverse Curls	4	5	4-6	321	120
	5	5	4-6	321	120
	6	5	4-6	321	120
B2 Seated EZ Bar French Presses	4	3	6-8	402	90
	5	3	6-8	402	90
	6	3	6-8	402	90
B2 Seated Hammer Dumbbell Curls	4	3	6-8	402	90
	5	3	6-8	402	90
	6	3	6-8	402	90
C1 Incline Offset Dumbbell Curls	4	3	8-10	201	75
	5	3	8-10	201	75
	6	3	8-10	201	75
C2 Rope Pressdowns on Incline Bench	4	3	12-15	201	75
	5	3	12-15	201	75
	6	3	12-15	201	75

contraction. For example, in hammer throwing, low-velocity work (i.e., slow-tempo deadlifts) has been beneficial for enhanced control of knee and trunk flexion during turns, and high-velocity training (speed-snatch) is taught to enhance power in the release of the throwing movement.

The key in power training for athletes is to keep the repetitions low (1-5), so that the high-threshold motor units are recruited. Training with higher reps (i.e., 10-12), even while concentrating on acceleration, would still access lower-threshold fibers.

Regarding isokinetic equipment, although it allows you to train at a specific speed, it does so at a constant rate. One of the principle components of power is acceleration, and isokinetic equipment does not allow you to accelerate the resistance. Consequently, long-term studies have shown that isokinetic training can actually reduce power.

The six-week superset arm routine on the previous page utilizes variations in tempo. Try it and you'll see how effective variety in tempo can be in eliciting strength and mass gains!

"For a bodybuilder, one secret to success is to manipulate training speeds to create maximum muscle tension."

Simple Advice

While strength training at higher speeds is specific to the movements that occur in most sports, this type of training must be performed only after obtaining a solid base of maximal strength. Telling a kid with biceps as big as his wrists to perform high-speed power cleans is not only potentially dangerous, but also is not an effective way to train. Eventually, many athletes could get great results from these types of exercises, but they must first develop a base with slow-speed work. And then they must continue to use slow-speed movements throughout their athletic careers to ensure continued progress.

For a bodybuilder, one secret to success is to manipulate training speeds to create maximum adaptation. In this regard, slow-speed exercises should be emphasized over fast speeds, because they make the muscles work harder by eliminating the use of momentum. However, as I've explained, slow-speed training should never be the only training speed employed. Muscles require a variety of stimuli for optimal results, and varying training speeds will provide much of the necessary variety.

As you proceed through this book you will come across an extensive assortment of routines for specific purposes. In each of these routines you will see a tempo prescription. Follow it. Counting through each phase of the lift keeps your concentration focused where it should be—on the components of the lift. You'll also begin to feel how slight variations in the tempo affect the exercise. In just a few weeks, you'll be able to see differences from varying your lifting speeds.

Now, go get big fast, but don't forget the slow.

3

THE SCIENCE OF REST INTERVALS

Grow, by doing nothing at all

No, that's not Dave Fisher dodging a bite from ex-boxing champ-ion Mike Tyson. He's actually engaging in one of the most important aspects of training, rest.

Having come from a background in collegiate and Olympic sports, I never cease to be amazed at what the bodybuilding world accepts as exercise gospel. Take for example Mike Mentzer's heavy-duty one-set method that he claims—in between conversations with the late Ayn Rand—to be the be-all, end-all solution to every training dilemma. Or any of Joe Weider's philosophies. Has anyone ever really been trained by the "Trainer of Champions" in any aspect of the sport besides posing next to his products?

Bodybuilding's insular community is wonderful for encouraging the kind of all-out effort it takes to build a champion physique. But it also alienates itself from much of the valuable information that is available. This alienation takes many shapes.

Much of the misinformation that permeates the training journals (with the exception of *Muscle Media*) can be attributed to these magazines' habits of fabricating the "champs'" routines and lifestyles. An editor of one of the biggest bodybuilding magazines on the market confessed that half the articles written on the stars' training routines were invented by himself or other editors. He said that for the meager $300 they were giving to the bodybuilder for the rights to publish the article, in most cases the athlete was not interested in sitting down for an interview and was most unwilling to

tediously write out a typical workout. The other factor regarding the routines in most bodybuilding magazines is ego. The average pro bodybuilder tends to exaggerate his workouts, usually as a cover-up for the use of anabolics. The end result is that even the most basic advice on reps, sets and rest in these publications is completely bogus.

Regardless of the reasons, the subject of rest intervals has largely been glossed over by the bodybuilding community. Rest is, by its very nature, a boring topic. For this reason I can assure you that many people cannot fathom a science about "doing nothing." Well, you'll be surprised at the amount of academic time spent studying how the body reacts to doing nothing between sets; and while it may not be as exciting as the cover of *Muscular Development*, understanding how rest intervals impact your growth will most definitely result in more efficient workouts.

"The average pro-bodybuilder tends to exaggerate his workouts, usually as a cover-up for the use of anabolics."

Rest Intervals: The Basics

The most important principle to consider about rest intervals and how they affect bodybuilding is that there is an inverse relationship between reps and rest: The more reps you perform, the lighter weights you must use and the less rest you need.

How much rest is enough? Most American exercise physiologists recommend a 1:5 work/rest ratio to train the ATP-CP system, which is the energy system involved in high-intensity muscular contractions. A 1:5 ratio means that whatever time it takes you to complete a set, it would take you five times as long to adequately recover from that set. However, not everyone is in agreement with the Americans.

Canadian exercise physiologist Normand Gionet believes that a 1:5 ratio does not provide sufficient recovery for the ATP-CP system and recommends a ratio of 1:12-18. Charlie Francis, who coached 173-lb Ben Johnson to a 420-lb bench press and many world sprint records (with minimal drugs), is also a strong believer in long rest intervals. He suggests a 1:20-30 ratio!

I am in full agreement with Francis because the nervous system cell takes five to six times longer to recover than the muscle cell. This means that even though energy stores may be nearly replenished by a 1:5-6 ratio, your nervous system has not recovered enough to effectively activate the fast-twitch fibers responsible for muscle growth. And if the nervous system cannot activate the fast-twitch fibers, what is the point of performing another set?

Although counting repetitions is a convenient way to determine work performed, it is more precise to consider how long it takes to complete a set. The amount of time it takes to complete a set is referred to as the "time under tension." As with reps, the longer a muscle is stressed, the less rest time is needed.

Because variety is an essential training principle, I believe it's also important to vary (i.e., periodize) your rest intervals. Despite the established cause-and-effect relationship of varying rest intervals, failure to vary rest intervals limits adaptation to the training stimulus. This concept has yet to be validated by science, but it has been my experience that it positively

favors the rate and magnitude of strength and size gains—especially with elite athletes.

In addition to reps and sets, there are several other factors to consider when determining rest intervals. Three I'd like to address are training experience, muscle mass and strength levels, and aerobic fitness.

TRAINING EXPERIENCE: Tolerance to short rest intervals with loads in the 60-80% range (6-20 reps) is a function of years of accumulated training. The lactate buildup resulting from this type of training is tolerated only by the well-conditioned bodybuilder. Therefore, rest intervals must be shortened only for the advanced trainee as lactate buildup will interfere with proper exercise performance. In fact, to prevent excessively high lactate buildup, I frequently alternate upper- and lower-body exercises in the workouts I prescribe.

MUSCLE MASS AND STRENGTH LEVELS: The bigger and stronger the trainee, the longer the rest interval should be. There appears to be a direct linear relationship between the length of the rest interval and the bodyweight of the trainee. Thus, Gary Strydom would need a longer rest period than Francis Benfatto, who is lighter.

"The bigger and stronger the trainee, the longer the rest intervals should be."

AEROBIC FITNESS: The more aerobically fit an athlete is, the shorter the rest interval should be—that's the theory. The problem is that the aerobically fit individual is normally weaker and usually has the physique of a prepubescent tropical fish breeder. It's also been my experience that these individuals (dare we call them athletes?) tend to rush between heavy sets to maintain a high heart rate. Apparently they have a hard time grasping the concept of resting for a long time between heavy sets to bring about neural adaptation. Unfortunately, a high heart rate by itself does not lead to maximal strength and mass gains—if it did, then Covert Bailey would probably be wearing shorts and a short-sleeve shirt in his infomercials!

Putting Theory Into Practice

A weightlifter or strength athlete must emphasize complete recovery, but a bodybuilder has two choices when selecting the rest interval: nearly complete recovery or incomplete recovery. To see the benefits of each, let's examine three types of training methods for an individual who can barbell curl 100 pounds 10 times on a 402 tempo (every rep would take 6 seconds: 4 to lower the weight, no pause, 2 seconds to lift).

METHOD 1: ADEQUATE REST AND CONSTANT WEIGHT: In this method a constant weight is used and you are given at least three minutes to recover, which allows almost all the energy stores to resynthesize by the end of every set. Assuming that your first set is a maximum effort, you will tend to fatigue two percent, or one rep per set after three minutes. Thus, a typical workout is shown at right:

Because the rest is more complete, this method enables you to use heavy weights on every set and therefore make more tensile demands of the contractile fibers. This higher tension leads to myofibrillar growth.

These longer rest intervals have also been associated with greater testosterone levels in experienced athletes performing large-muscle-group exercises.

METHOD 2: ADEQUATE REST AND DECREASING WEIGHT: In this method the rest interval is the same as in Method 1, but the weight is adjusted precisely from set to set to account for fatigue. A typical workout is depicted at right.

As with Method 1, the longer rest intervals increase the average amount of weight that can be used, but the decreasing weight increases the time under tension. Because hypertrophy is related to time under tension with optimal loading, this would be the optimal system to force myofibrillar growth.

"Longer rest intervals have been associated with greater testosterone levels in experienced athletes performing large-muscle group exercises."

On paper this method looks great, but how many gyms do you know of that have training implements that can be decreased two percent at a time? (MedX machines can do this with double weight stacks, but using only these machines would seriously limit your exercise choices.) In most gyms, if you're lucky, you can decrease weight by five percent. As a compromise, I recommend decreasing the weight by five percent every two sets, which would result in the following performance:100 x 10, 100 x 9, 95 x 10, and 95 x 9. This would change the average load to 97.5 lbs and the time under tension to 228 seconds.

METHOD 3: INADEQUATE REST AND DECREASING WEIGHT: In this method only 60 seconds' rest is allowed so that energy stores are not completely resynthesized by the end of each set. In this system

METHOD 1

- Set 1: 100 lbs x 10, rest 3 minutes
- Set 2: 100 lbs x 9, rest 3 minutes
- Set 3: 100 lbs x 8, rest 3 minutes
- Set 4: 100 lbs x 7, rest 3 minutes

which produces the following data:

- Average weight lifted: 100 lbs
- Total Reps performed: 34
- Time under tension: 204 seconds (34 reps x 6 seconds)

METHOD 2

- Set 1: 100 lbs x 10, rest 3 minutes
- Set 2: 98 lbs x 10, rest 3 minutes
- Set 3: 96 lbs x 10, rest 3 minutes
- Set 4: 94 lbs x 10, rest 3 minutes

which produces the following data:

- Average weight lifted: 97 lbs
- Total Reps performed: 40
- Time under tension: 240 seconds (40 reps x 6 seconds)

METHOD 3

- Set 1: 100 lbs x 10, rest 1 minute
- Set 2: 90 lbs x 10, rest 1 minute
- Set 3: 80 lbs x 10, rest 1 minute
- Set 4: 70 lbs x 10, rest 1 minute

which produces the following data:

- Average weight lifted: 85 lbs
- Total reps performed: 40
- Time under tension: 240 seconds (40 reps x 6 seconds)

you tend to fatigue at about ten percent per set (four to five reps). A typical workout is shown at right.

This option is often used by bodybuilders for the "pump" sensation that comes with it and is associated with high levels of growth hormone and lactic acid. It also increases the storage of glycogen and phosphagens and the associated enzymes for the metabolism of these nutrients.

As with the first two methods, this system creates hypertrophy, but not for the same reasons. While Methods 1 and 2 are great for creating hypertrophy by favoring growth of the contractile proteins, Method 3 promotes hypertrophy through energy substrate storage. It follows that for maximum muscle mass, all three methods should be used.

As you can see from the three examples presented, the bodybuilder should use both types of systems for muscle mass training: nearly complete recovery and incomplete recovery. The bottom line is that for optimal progress to occur in bodybuilding, you need to vary the rest intervals.

▲ *Varying rest intervals is necessary for bodybuilding progress. (Robert Harrop)*

4

THE SCIENCE OF TRAINING FREQUENCY, DURATION AND VOLUME

You want big gains and you're willing to put in the work— but will training six days a week do anything besides screw up your social life?

Time management is a business principle, but it applies equally well to success in training. Managing time means taking into consideration the frequency, duration and volume of training. (Craig Titus)

We live in a world where there are not enough hours to do everything that needs to be done. It's a world of compromise and sacrifice. Want to reach the top in business as fast as possible? Cheat on your taxes and backstab your co-workers. Want to spend more time hanging around with your buddies? Spend less time with your girlfriend and tell your mom you were called away unexpectedly on Mother's Day. And if you want to become a champion bodybuilder, forget about every productive aspect of your life and just eat, sleep and live bodybuilding—and don't forget that this started out as a healthy endeavor.

In the latter scenario, consider the possibility that although it's a rarity in our sport, it is possible to become a champion bodybuilder and still have a life.

Hmmmm, you say. Interesting concept...and while I won't tell you what to do with all the time you don't need to be in the gym (or suggest you begin reading Ayn Rand and studying philosophy), I will tell you how to best manage your time in the gym to produce maximum gains through the proper manipulation of the three most critical elements of training: frequency, duration and volume.

Time Management Principle 1: Training Frequency

To achieve maximum physical potential, most bodybuilders focus on providing the optimal amount of stimulus to the muscles. Train hard with forced reps. Train harder with negatives. Growl, grunt and scream—slap your training partner in the face and have him slap you back. Intensity has been the focus of today's bodybuilder, and there's no doubt that you have to train hard to get results. But intensity is only part of the growth equation.

Recovery is the other.

Optimal recovery requires good nutrition, preferably with supplements like HMB and creatine, and determining how much training your body can handle. If you spend too much time in the gym, you risk injury and overtraining. If your workouts are too brief or too infrequent, your muscles will grow slowly, or not at all.

One practical way to manipulate your recovery ability is to increase or decrease your training frequency, which I define as the number of training sessions performed per week. Although bodybuilders have discovered many effective ways to increase recovery ability, such as through steroids and improved nutrition, training frequency is often a neglected and misunderstood component.

Old-timers will remember articles about Dave Draper's workouts in *Muscle Builder/Power*. The Blond Bomber worked out practically every day and often performed 20 sets or more per bodypart. Most will also recall how much they admired such dedication to training. Draper's training methods were extreme and indisputably constituted a protocol that enabled him to become one of the best bodybuilders of his era. It's hard to argue with success, but that still leaves unanswered the question of whether or not Draper's training methods will also work for you. Let's find out.

▲ *In the 1970s Arnold advocated two hour workouts, sometimes twice a day. It may have worked for Arnold, but today's thinking supports shorter workouts of less than one hour.*

What The Experts Say

In the realm of track and field, coach Charlie Francis' intelligent approach to training enabled his athletes to excel at the international level. His success with such athletes as Ben Johnson (who, although busted for steroids, was still a phenomenal athlete) established his reputation as one of the greatest innovators in athletics. Even the East German coaches acknowledged his abilities—and these coaches usually don't praise anyone but themselves. Part of his success can be directly attributed to his finding the optimal training frequency for each of his athletes. Charlie's philosophy is that there is no point in going back to the gym if you are not going to make progress—in other words, if you are not going to do an extra rep or add more weight, you might as well stay home.

In the realm of competitive weightlifting, there are conflicting schools of thought on training frequency. For example, Rick Weil, a world record holder in the bench press, recommends one session per week per muscle group. At the other end of the spectrum we find Russian weightlifters who train up to 12 times a week. The Bulgarians, who for the past two decades have competed on a level equal with the Russians, have pushed training parameters even further—often training four to five times a day. The success of these various athletes indicates a debatable relationship between the actual number of training sessions needed to stimulate maximum levels of strength and hypertrophy.

It is common for competitive bodybuilders to perform multiple training sessions using a split routine (different muscles trained each day) or a split program (different exercises for the same muscle on the same day or successive days). Regardless of the system used, the training frequency for each muscle group is usually limited to three times per week. (Of course, if ergogenic aids are used—especially anabolic steroids and growth hormone—recovery ability is increased and more work can be performed.)

▲ *For most individuals, three to four days' rest between workouts for the same bodypart appears to be good advice. (Ronnie Coleman)*

Factors Affecting Training Frequency

The classic approach to training frequency has been to only perform three training sessions per week, on alternate days, for each muscle group. This equates to training each muscle group approximately once every 48 hours. Proponents of this training theory also believe that if muscle soreness interferes with performance during a subsequent workout, the intensity of the training was too high and should be adjusted accordingly. This is a simplistic approach, and one that can still be found in the theory segments of many personal training certification courses.

For most individuals, three to four days' rest between workouts for the same bodypart appears to be, generally speaking, good advice. For optimal progress, however, you must consider the principles governing training frequency—here are five of them:

1. Frequency is recovery dependent: Frequency is dependent upon your recovery ability at any given time. Failure to respect this rule may cause overtraining. You could lose strength and muscle mass and come down with a variety of ailments that include lethargy and recurrent colds. Most bodybuilders train too frequently because they do not know how to assess their recovery ability or because they take too literally the slogan, "No pain, no gain." However, provided you do an honest job and use the proper ratios of reps and sets, a frequency prescription of "twice per week, per muscle group" should work well. If you're a more advanced bodybuilder, one workout every five days is probably the optimal training frequency.

2. Frequency is muscle-group dependent: Large muscle groups recover more slowly than smaller muscle groups, and muscles with a high percentage of slow-twitch muscle fibers recover faster than muscles with a high percentage of fast-twitch fibers. These facts have many practical applications. For example, while the calves (predominately a slow-twitch, large-muscle group) may be trained two to three times a week, the hamstrings (predominantly a fast-twitch, large-muscle group) respond better with one to two training sessions per week.

"With my clients, I look at their training response in their workout diaries and increase or decrease their training frequency based on how fast they progress."

3. Frequency is exercise dependent: Exercises that involve a small number of motor units, such as calf raises and wrist curls, can be performed more frequently than exercises that involve many motor units, like squats. Exercises that involve a high percentage of motor units make greater demands on the central nervous system and therefore require longer recovery periods—it is not uncommon for powerlifters to rest ten days between intense deadlift sessions. Also, because multi-joint exercises involve more muscles, they can create enough of a stimulus to ensure that strength and muscle mass are maintained in the secondary muscle groups. This is why someone who bench presses three times a week can see significant progress in their triceps development by only performing isolation exercises for the triceps once a week—the triceps are being worked during the bench press.

4. Frequency is individualized: Frequency is dependent on work capacity. Some individuals can handle prodigious training volumes, while others can handle only minimal volumes. With my clients, I look at their training response in their workout diaries and increase or decrease their training frequency based on how fast they progress. For example, powerlifter Cathy Millen benches every five days, squats every seven days and deadlifts every ten days in a peaking phase. She is a world champion and holds the world record in all these lifts. In contrast, I have seen some IFBB pros like Joe Spinello and André Bilodeau make progress training twice a day with a four-days-on, one-day-off split. I have also seen pro bodybuilders who cannot train more than two days in a row without overtraining.

One of the major limiting factors in tolerating frequent workouts is the ability to load nutrients into the muscle cells, and this is probably mediated throughout a myriad of hormonal interactions such as with insulin, growth hormone, and IGF-1. I've also found that bodybuilders with a high percentage of fast-twitch muscle fibers can rarely train two days in a row without overtraining.

5. Frequency is repetition-bracket dependent: The greater the intensity, the more rest is needed between workouts. Because intensity is partially determined by the number of reps performed per set, more rest days are needed between training sessions emphasizing low reps. Thus, if you are using two to three reps per set, you may need four to five days' rest between workouts for the same bodyparts—or even as much as ten days! If you perform 15-20 reps per set, you can probably repeat the workout for that bodypart after 2-3 days.

Assessing Your Recovery Ability

Rather than thinking that only one frequency mode will suit you, realize that a variety of modes will stimulate greater growth. For example, here is a six-week plan for exercises that work the chest:

To paraphrase German philosopher Frederich Nietzsche: "What does not kill me, makes me stronger."

Weeks 1-2: **Twice a day, twice a week**

Weeks 3-4: **Once a day, twice a week**

Weeks 5-6: **Once a day, once a week**

This type of planned overtraining (also known as selective overloading) followed by more conventional training has become popular with many elite Canadian athletes. A more detailed example of this type of training approach can be seen in Table 1.

If you are not improving, change your training frequency. Because most bodybuilders train too much, first try experimenting with reduced frequency. One reason that a few bodybuilders make progress for several weeks on "heavy duty" programs is that they were so overtrained that the overtraining masked their true fitness level—and only when they reduced their training volume could hypertrophy occur.

There are not many bodybuilders who can continue to improve on a frequency of two to three times per week per muscle group while holding down a regular job and being exposed to other stresses of normal living. While anabolics will allow an individual to increase training frequency due to improved recovery ability, the majority of anabolic users are probably training too frequently and consequently limiting the ergogenic effect.

Table 2 provides several examples of training frequency patterns for those individuals with busy schedules and for those who have more time to train.

Table 1:
Alternation of training volume through manipulation of training frequency

(Poliquin, 1996©)

Exercise	Reps	Sets	Tempo	Rest
Weeks 1-2				
Monday and Thursday AM				
Wide-Grip Bench to Neck	8	4	302	4 min
Flat Crossovers	10	3	302	3 min
Monday and Thursday PM				
Cambered Bench Press	10	4	302	90 sec
Weeks 3-4				
Monday and Thursday AM				
Incline Bench Press	5	5	302	4 min
Dips	6	3	302	3 min
Weeks 5-6				
Thursday PM				
Bench Press	3	6	302	5 min

Time Management Principle 2: Training Duration

The next aspect of proper time management in the gym concerns the concept of duration. Duration can be defined as the time frame from the start of the workout to the finish of the workout, not including warm-up, stretch-

Table 2: Sample Training Frequency Patterns

Limited Time Approach

Option A

MONDAY & THURSDAY: Legs and Abs

THURSDAY & FRIDAY: Back and Arms

Comment: This leaves the weekend off. You have to trash the muscle fully so that super-compensation takes place a week later.

Option B

MONDAY: Chest and Back

WEDNESDAY: Legs and Abs

FRIDAY: Shoulders and Arms

Comment: This leaves the weekend off.

Option C

Week 1

MONDAY: Back and Arms

WEDNESDAY: Legs and Abs

FRIDAY: Back and Arms

Week 2

MONDAY: Legs and Abs

WEDNESDAY: Back and Arms

FRIDAY: Legs and Abs

Comment: I got this from Florida's Frank Calta, whose system is called "Rotation for Recuperation." On the first week a muscle group is trained twice, the next week once, and so on.

Unrestricted Time Approach

Option A

DAY 1: Chest, Biceps and Forearms

DAY 2: Thighs, Calves and Abs

DAY 3: Off

DAY 4: Back, Shoulders and Triceps

DAY 5: Off

Comment: Every muscle is trained every five days. You don't train more than two days in a row so that the nervous system has a chance to rest. That particular split is good for people with a high fast-twitch make-up.

Option B

DAY 1: Chest and Back

DAY 2: Thighs, Calves and Abs

DAY 3: Off

DAY 4: Shoulders, Arms and Forearms

DAY 5: Off

Comment: Every muscle is trained every five days. You don't train more than two days in a row so that the nervous system has a chance to rest. Some individuals may find that training chest and back the same day is too severe. Pairing agonists and antagonists would save time and allow for recovery of the central nervous system.

Option C

DAY 1: Chest and Hamstrings

DAY 2: Back and Shoulders

DAY 3: Off

DAY 4: Quads, Calves and Abs

DAY 5: Arms and Forearms

DAY 6: Off

Comment: Every muscle is trained every six days. You don't train more than two days in a row so that the nervous system has a chance to rest. A large bodypart is paired with a smaller bodypart. Many ectomorphs respond well to this format of training.

Option D

DAY 1: Chest and Hamstrings

DAY 2: Back and Shoulders

DAY 3: Quads, Calves and Abs

DAY 4: Arms and Forearms

DAY 5: Off

Comment: Designed for the individual gifted with enormous work capacity. Every muscle is trained every five days. If you are someone who can load nutrients very efficiently, you will make excellent progress with this option.

Tom Platz is famous for his jaw-dropping leg development, but he was also one of the smartest trainers of his decade. He was one of the first bodybuilders never to sacrifice quality for quantity.

ing, or cool-down. Duration is a result of the number of exercises, the number of sets, the duration of the sets (i.e., speed of movement x number of reps), and the duration of the rest periods.

A modern trend in strength development is towards decreased duration of training time, which has been referred to as the "Bulgarianization" of weightlifiting. This methodology of training has been endorsed by Russian, Romanian and Hungarian national weightlifting teams. It is often perceived as the "modern" way of training developed by Bulgarian National Weightlifting Coach Ivan Abadjiev, but it was already advocated as a superior form of training in the early 1950s by the American lifter Charles Ross.

"Workouts exceeding the one-hour mark have been shown to be associated with rapidly decreasing androgen levels."

Workouts exceeding the one-hour mark have been shown to be associated with rapidly decreasing androgen levels. This shift in androgens probably upsets the testosterone-cortisol ratio. Since this value is very strongly correlated to strength gains, one may infer that training under depressed androgen levels is counterproductive, since the catabolic effects of the glucocorticoids would negate the anabolic effects of the androgens. Apparently an hour pause is sufficient to allow the testosterone levels to return to normal. This is why modern strength training has evolved to multiple daily sessions rather than the grueling two-hour workouts popularized in the Arnold days.

From an empirical point of view, multiple sessions are associated with better recovery rates and enhanced concentration during the training sessions. Since maximal neural activation is essential for relative strength training, enhanced concentration would maximize the effectiveness of the training stimulus. However, you must consider that this type of multiple daily training workload may only be realistic for the full-time state-and/or sponsor supported athlete such as a Bulgarian weightlifter—and then, of course, there's the "creative" recovery means (read: drugs) available to those athletes.

Once your warm-up is finished, if your workout takes longer than one hour, you are making friends—not training! I've seen a few bodybuilders who were able to sustain full intensity for two-hour periods, but they reported better quality when shifting to shorter workouts. And more important is the fact that most of the pencil-neck geeks who don't grow, train for too long.

Time Management Principle 3: Training Volume

The third element in time management, and the one that brings the other two principles together, is volume. Volume in strength training can be defined as the total number of repetitions completed in a given time frame. For example, if you performed 3 sets of 10 on 6 different exercises in a workout, the volume of that workout could be described as 180 reps (3 x 10 x 6 = 180). This method of calculation is also commonly applied to a training week, month and year. To extend the above example, if 4 of the above workouts are performed in a week, the volume would be 720 reps (4 x 180). Over four weeks, the volume would be 2,880 reps (4 x 720), and over the year would be 34,560 reps (12 x 2,880).

Volume could alternately be described in terms of time spent on an exercise, time under tension, or number of sets.

This method of assessing volume has been used with great success in the sport of weightlifting. However, when attempting to apply this method to strength training for hypertrophy, certain problems may be encountered. For example, this method assumes that all reps are performed at an identical speed and at a similar metabolic cost.

"One of the most important principles about training volume is this: Volume of training is always inversely related to the intensity."

Contrary to what some bodybuilding authors have proclaimed, slow tempo does not increase the intensity of training but rather prolongs the duration of the training stimulus, thereby increasing time under tension, which leads to hypertrophy. If a 5-rep set is performed that involves a 6-second eccentric and a 6-second concentric contraction for each rep, the total time under tension is 60 seconds. That is similar in volume to a 15-rep set that includes a 3-second eccentric and 1-second concentric contraction (15x3 + 15x1 = 60 seconds). But if the reps method is used to assess the volume, it would appear that there was a significant difference between the two sets—5 reps compared to 15 reps.

Furthermore, the metabolic cost of strength training exercise is normally associated with the size of the muscle mass involved. Therefore, 300 repetitions in the squat does not equal 300 curls; rather, 300 squats are more equivalent to 1,200 curls. The reps method assumes that a repetition of any exercise is of an equivalent metabolic cost to a rep of any other excercise. This is more applicable to weightlifting, where the exercises are variations of the clean, snatch, jerk and squat. But in bodybuilding, where smaller muscle groups such as the biceps and triceps are trained with dozens of adjunctive exercises, the method no longer applies.

One of the most important principles about training volume is this: volume of training is always inversely related to the intensity. In other words, you cannot work intensely and in great amounts at the same time. Consequently, when the volume is high, the intensity is low and vice versa. For example when working with loads exceeding 90%, one rarely exceeds a workout volume of 20 repetitions per exercise. While working in the 60% range some trainees can easily do 10 times that volume (200 reps).

Another important principle is that for maximum hypertrophy, a greater volume of work is necessary. When analyzing the training volumes of elite bodybuilders vs. elite powerlifters and weightlifters, a greater volume of training is evident in the training of bodybuilders and is associated with a greater degree of hypertrophy. This increased volume comes mainly from a greater number of exercises to allow the recruitment of a greater selection of motor units, hence inducing hypertrophy in a greater number of fibers.

When designing a specific program for a hypertrophy phase, I recommend you measure your volume. If using the reps method of volume assessment, the average number of reps per workout may be about 200 repetitions. If using time as the indicator of volume, the length of the workout or number of training hours per week is used, for example, a 1-hour workout. If using the time under tension, 24 minutes might be reasonable (24 sets x 60 seconds = 24 min.)

Recent research has pointed to elevated levels of growth hormone in multiple sets training vs. single set training, which may prompt a more anabolic environment. Maximal strength training methods (85% of 1RM) with their high-intensity resistance but low volume of work do not elicit substantial hypertrophy. Higher volumes of work (six reps or more for multiple sets) are needed to ensure a critical concentration of intracellular amino acids to stimulate protein synthesis. However, this model has limitations since it assumes that all reps are performed at an identical speed and at a similar metabolic cost.

It would be nice to give you a simple answer on how often you should train, and there are several self-proclaimed bodybuilding experts who won't hesitate to oblige you. Too bad bodybuilding is not that easy and too many bodybuilders are gullible for get-big-quick promises. As you've realized from this short discussion, there are many variables to consider when determining training frequency, and there is no single, simple answer. Try the options I've suggested and see which work the best for you. For optimal results you must do your homework and decide how committed you are to achieving your goals. It's your choice!

Don 'The Ripper' Ross devoted his life to educating bodybuilders. His premature death in 1996 of a heart attack reminds us all not to overlook the healthy apsects of the sport as we strive for strength and size.

5

GET TENSE, GET BIG

Experience phenomenal gains in size and strength with the precise application of this key training ingredient

Champion bodybuilders learn quickly that increasing muscle tension requires hard work and the discipline to tolerate discomfort. (Alan Ichinoje)

Tension is usually associated with negative conditions such as high blood pressure, insomnia, digestive disorders, fingernail chewing, profuse sweating and offensive body odor. Excessive tension can also lead to depression and, on rare occasions, cause ex-football players to slash the throats of their ex-wives. Yet, in the world of physique training, that microcosm of existence that doesn't follow the rules of normal society, tension is a good thing.

In the bodybuilder's dictionary, the word *tension* can be found between *supersets* and *Vanadyl*, and is defined as "the degree to which individual muscle fibers are voluntarily activated." Increasing muscle tension requires hard work and the discipline to tolerate discomfort, thereby giving support to the axiom, "No Pain, No Gain." And judging by the physiques of aerobics instructors who strength train with unisex plastic dumbbells and oversized rubber bands, it's primarily the quality, not the quantity, of muscle tension that determines how big and strong you can become.

There are three basic ways to increase the quality of muscle tension when you lift and thereby improve the overall quality of your training: increasing the load, slowing down the tempo, and combinations of both methods. Let's take a closer look at each.

Option 1: Increasing the Load

The types of muscle fibers that significantly increase in size are called fast-twitch Type IIa and Type IIb, and for maximum development you need to train both types. Lifting weights between 90-100 percent of your 1-repetition maximum (1RM) produces maximum hypertrophy in the Type IIb fibers. Visual proof of this theory can be found in the physiques of legendary iron athletes like Roger Estep from powerlifting, and David Rigert and Victor Sots from Olympic lifting. These great world champions seldom did more than three consecutive reps in their training, but nevertheless possessed physiques that many competitive bodybuilders would envy. Another strength athlete with an impressive physique is British strongman Gary Tailor. Tailor has push pressed, behind-the-neck, 496 lbs for 6 reps (which converts into a max single of 600 lbs!) and has full squatted 683 for 3 reps without knee wraps or a super suit. At 5 feet 10 inches tall and a solid 297 lbs, Tailor's heavy weight training has unquestionably helped him look like one of the strongest men in the world.

▲ *Training with heavy weights is conducive to increasing maximal strength, size and improving intramuscular coordination. (Matt McLaughlin)*

Even though it will make you get bigger, training with heavy weights is generally considered more conducive to increasing maximal strength. This is because it's more effective for improving intramuscular coordination, which is the ability of the central nervous system to efficiently recruit motor units. Unfortunately, those who achieve impressive levels of hypertrophy with this type of training have been blessed with extremely high levels of Type IIb fibers. In fact, muscle biopsies performed on Finnish Olympic weightlifters showed that the hypertrophy displayed by these athletes occurred mainly in the Type IIb fibers.

If you prefer to use primarily low reps in your training but still want to add muscle mass, you must be aware of the following precautions:

A high number of sets (5-12) is needed to achieve sufficient growth stimulus. Because less mechanical work is performed with low-rep sets, the amount of contractile protein that is broken down is somewhat limited. Former East German strength experts Hartmann and Tunnemann's opinion is that optimal overload with low reps requires 8-15 sets in that intensity zone.

Although most of us have neither the time nor the desire to commit to so many sets per exercise, it's possible to perform this method with fewer sets by using modified drop sets described later in this chapter.

It's a longer process. Although weightlifters often display extremely well-muscled glutes, quads, traps and erector spinae, it takes them a considerable amount of time to achieve such development. Often the weightlifters you see on television have been lifting for ten years or more and are at the peak of their athletic careers. In the beginning stages of their careers their development was considerably less. In fact, the first several years of a weightlifter's training emphasizes technique rather than strength development.

Another problem with weightlifting training is that because it emphasizes low reps and heavy weights, development primarily occurs in the Type IIb fibers and not the Type IIa. This is because the nervous system of an advanced weightlifter is so well developed that it can bypass the recruitment of the Type IIa fibers. Although years of emphasis on training just the Type IIb fibers can certainly produce remarkable muscular development, for maximum muscular development a bodybuilder must also use protocols that will work the Type IIa fibers.

It's easy to burn out with this training method. Millions of dollars and countless hours of research have been devoted to studying overtraining. The type of overtraining that can occur with low-rep training, according to former Soviet Union strength expert Vladimir Zatsiorsky, manifests itself in insomnia, anxiety, depression, early morning fatigue, high blood pressure at rest, and an increase in the perceived rate of effort for a given weight. It's also possible that this type of training drains the adrenal glands, an effect that can be determined by testing the muscles that line the adrenals. I'm not saying that it's inevitable that you will overtrain using these methods, but that at the elite levels such training can be extremely complex.

▲ *The Barbarian Brothers (Peter and Paul) were known for the incredibly heavy weights they used, even with relatively small muscle groups such as the arms. In the 1980s their workout spectacles would draw crowds at Gold's Gym in Venice.*

Don Ross' legendary vascularity was a result of his high intensity training methods.

Option 2: Slowing Down the Tempo

This concept is a favorite of Arthur Jones, Ken Hutchins and Ellington Darden. Contrary to what these self-proclaimed bodybuilding authorities would have you believe, this training protocol is not an exclusively American discovery. Weightlifting coaching textbooks from Europe, published as far back as 1968, recommend slow-tempo protocols. And renowned German weightlifting coaches Spitz and Feser told me they often prescribed slow work for sets of six reps for their athletes who needed to increase their lean body mass.

One problem with slow-tempo training is that it primarily recruits lower-threshold motor units. Any stimulus to the Type IIb fibers will occur only on the last few reps of a set, if at all, and the recruitment is even less for experienced athletes. And if you're trying to run faster and jump higher, or if you are in a sport like weightlifting where bodyweight classes are used, you want to emphasize training of the Type IIb fibers. The Type IIa fibers will contribute little to the performance of these activities, and will most likely reduce performance by increasing your bodyweight.

Option 3: Combination Training

I believe the optimum solution to achieving maximum motor unit activation and muscle tension is to modify the training load during a set. To better understand this, let's look at a conventional set for a bodybuilder who can bench press 300 lbs (lowering the bar for a 4-second count) and perform 7 reps with 240 lbs. These are the loading parameters detailed in Table 1.

Now let's have the same individual perform a 7-rep set, but lift 300 lbs for the first rep, 285 for the second, and then drop the weight 10 lbs (5 percent) for every subsequent rep. In most individuals the difference between 1 and 2 RM and 2 and 3 RM is roughly 5 percent, while the difference narrows to about 2 percent between reps of 4 and 12 RM. The drop in resistance is most effectively accomplished by using two training partners who

will strip the bar at the end of each concentric contraction. With that background, Table 2 details the loading parameters for the set:

Table 1

Repetition	Load (lbs)	Eccentric Contr. Time (seconds)	Concentric Contr. Time (seconds)
1	240	4	1.2
2	240	4	1.2
3	240	4	1.3
4	240	4	1.4
5	240	4	1.4
6	240	4	1.8
7	240	4	2.3
Total	1680	28	10.6
Average	240	4	1.5

Table 2

Repetition	Load (lbs)	Eccentric Contr. Time (seconds)	Concentric Contr. Time (seconds)
1	300	4	2.1
2	285	4	2.3
3	270	4	2.5
4	260	4	2.8
5	240	4	2.8
6	230	4	3.1
7	220	4	3.2
Total	1805	28	18.8
Average	259	4	2.6

As you can see, the average load for the 7-repetition set is 7.4 percent higher in this protocol versus the first protocol, thereby creating a higher overall level of muscle tension. Also, the average concentric speed was slower in the second protocol (2.6 seconds vs. 1.5 seconds) because each rep represents 100 percent of momentary maximum strength.

One of the keys to ultimate overall gains in muscle mass is to select the appropriate combinations of muscle tension protocols. I should also mention that there are other ways to accomplish this—from impractical methods like EMGs, to the more practical lifting techniques and superset protocols developed by Jerry Telle. Muscle tension is a key training variable, and finding ways to achieve the most effective levels of tension requires considerably more thought than just using a specific number of reps for a set and following the advice from the gurus to "train hard, but brief."

"One of the keys to ultimate overall gains in muscle mass is to select the appropriate combinations of muscle tension protocols."

REFINING DROP SETS

Almost everyone is familiar with the concept of drop sets, in which you perform several sets of the same exercise, but with no rest between sets and with each subsequent set using lighter weights than the previous one. However, for best results you need to take into account how efficiently your nervous system recruits fast-twitch fibers.

Two of the primary factors that determine neurological efficiency are training experience and an individual's ratio of fast- to slow-twitch fibers. Beginning trainees, particularly women, tend to be less neurologically effi-

Natural bodybuilding champion Skip LaCour builds his Universe-winning physique without drugs!

cient than advanced bodybuilders, which means they are able to perform more repetitions with weights closer to their 1RM. For example, at 80 percent of their 1RM, the average bodybuilder will be able to perform about 10 repetitions, while an advanced bodybuilder would probably only be able to perform 3-5 reps. However, just because a person's nervous system is not efficient, that does not necessarily mean they are not strong. My colleague in Australia, Ian King, can smoke me in just about any lift for reps, but I get my revenge when we go for maximum singles.

Drop Sets for the Neurologically Inefficient Bodybuilder

Here is an example of how a bodybuilder who is neurologically inefficient should perform drop sets. The exercise is the Incline Press, and this bodybuilder's 1RM is 350 lbs.

All reps are performed on a 202 tempo. Aim for constant tension in those reps to recruit primarily the Type IIa fibers. You'll also notice that there is no pause between drops of weight; this is because this type of bodybuilder is more suited for muscular endurance.

Drop sets for the neurologically inefficient bodybuilder

1. Warm-up
2. 240 lbs x 12-15 RM
3. No rest, drop the weight 40 lbs
4. 200 lbs x 12-15 RM
5. No rest, drop the weight 40 lbs
6. 160 lbs x 12-15 RM
7. Rest 2 minutes, repeat steps 2 to 6, 1 to 2 times

Drop Sets for the Neurologically Efficient Bodybuilder

Here is an example of how a bodybuilder who is neurologically efficient should perform drop sets. Again, the exercise is the Incline Press and the bodybuilder's 1RM is 350 lbs.

Notice that there is a 10-second pause between drops of weight; this will allow this type of bodybuilder enough time to be able to activate the higher-threshold fibers.

All reps are performed on a 31X tempo; that is, a smooth descent of 3 seconds for the eccentric contraction, a pause of one second to eliminate the myotatic component, and an explosive contraction to tap into the high-threshold fast-twitch fibers. Even though the desired speed of the bar displacement is explosive, because of the high load the bar may not actually move that fast. But you must concentrate on accelerating the bar through the concentric range. (Of course, near the end of the movement you will decelerate to prevent injuries.) For long-range movements, such as the Squat and the Deadlift, you may want to use 4-5 seconds for the eccentric lowering.

A pause should be taken where leverage is favorable (i.e., lockout position in the Bench Press) so that the muscles can relax and the blood supply can be augmented. According to Australian strength and biomechanics expert Dr. Greg Wilson, this will permit you to access more of the high-threshold fast-twitch fibers.

Drop sets for the neurologically efficient bodybuilder

1. Warm-up
2. 265 lbs x 5 RM
3. Rest 4 minutes
4. 300 lbs x 3 RM
5. Rest 10 seconds while having partner remove 10 lbs from each side of the barbell
6. 280 lbs x max reps (normally 1 or 2)
7. Rest 10 seconds while having partner remove 10 lbs from each side of the barbell
8. 260 lbs x max reps (normally 1 or 2)
9. Rest 4 minutes

▲ *Drop sets are an effective way to develop the sought-after horse-shoe shape of the triceps. (Mick Sousa)*

6

THE KAIZEN PRINCIPLE

Borrowing from Japanese philosophy, this itty-bitty and usually overlooked principle can help you begin seeing gains with every workout!

The Kaizen principle is especially effective when applied to isolation exercises that work small muscle groups such as the biceps, triceps and deltoids. (Craig Licker)

"Give me something I can use—now!"

Such is the plea I hear from frustrated bodybuilders who expect to find detailed information in every article they peruse. Unfortunately, what most find instead is page after page of late-breaking gossip about a top bodybuilder's lucrative endorsement contract and the philosophical beliefs of a former Mr. Punyverse. But the truth is, few of us really care about that stuff or, for that matter, believe any of it! Most of us are seeking serious and useful information from the periodicals we read. Heading that list of most-wanted articles are those that give us a chance to try out a new, scientifically sound training or nutritional program that will help us achieve higher levels of size and strength. At least, that's the message I get from the bundles of mail I receive.

Anyone who is familiar with my theories on the science of training will know that something as seemingly simple as determining how many reps to perform is actually quite a complex subject. I realize that well-published bodybuilding authors like Ellington Darden make the process of designing workouts sound easy. Even if he were to publish a series of Darden's Bodybuilding Picture Books, available in large print, Darden's simplistic approaches only produce minuscule progress for anyone except the novice trainer. Regardless of where you are in the bodybuilding hierarchy, I'd like to introduce you to an effective training method that will improve the effectiveness of virtually any training program you use.

Too Much, Too Soon

Anyone who has been training for a long time eventually reaches a point of diminishing returns, making it difficult to produce even a five-pound increase in a particular exercise. For some reason you just can't seem to reach that next personal record, at least not as quickly as you expect and, hopefully, have become accustomed to. If your personal best in the Bench Press is 5 reps with 245, when you try 250 you get stuck on 4 reps for several weeks. Although the increase is only five pounds, it's still too much. The problem is even more pronounced—and frustrating—with exercises that use smaller weights. When working the external rotators of the delts, you may find that you can perform 10 reps with 10 lbs on one exercise, but when you increase to 15 lbs you can't even complete a single rep! And with selectorized exercise machines, often the only progression with heavier weights is by 10- and 20-pound increments, which means you may—seriously—be stuck on the same weight for months.

▲ *Regardless of where you are in the training hierarchy—whether hobbiest or serious competitor—small, incremental increases can reap large rewards.*

Excessive weight increases were a major problem in the sport of Olympic lifting when women began competing. In the early days of the sport the women had to follow the same rules as men, and the rules demanded that the athletes increase their weights by ten pounds between their first and second attempts. That may not seem like much, but it is when you take a closer look. If a female weighs 100 lbs and is trying to snatch her bodyweight in a competition (something that the self-proclaimed World's Strongest Man, Mark Henry, can't seem to accomplish), she would most likely start with 85 lbs for her first attempt. For her second attempt she would have to jump to at least 95 lbs, and then 100 lbs for her third. Considering bodyweight, that lifting scenario is the equivalent of an elite male weightlifter trying to snatch 300 lbs, going from 255 to 285 between the first two attempts, a jump that most lifters would concur is excessive.

Weightlifting federations eventually resolved this problem by allowing 2.5 kilo (5.5 lb) jumps between the first and second attempts. Also to the sport's credit, they allow world records to be broken by .5 kilo (1.1 lb) to enhance the sport's progression. As an analogy, can you imagine how the 100-Meter Dash, or for that matter any running event in track and field, would be affected if all world records had to be broken in increments of 5 seconds?

The Kaizen Method

In the Japanese language the word Kaizen means "constant and never-ending improvement." This word is used in all areas of Japanese life, whether it is relationships, learning judo, or improving the balance of trade. The point here is that the Japanese look for constant and gradual improvement. The Japanese believe that very small refinements made on a daily

basis will compound with interest to bring about in the long run progress that most people will envy. Interestingly, there is no equivalent in English for the word Kaizen.

By following the Kaizen philosophy, Japan progressed from being a war-torn country to a dominant economic power. Kaizen also describes the way in which the legendary Greek wrestler Milo of Crotona built his tremendous strength and physique. For you newcomers to the weight training scene, Milo purportedly carried a calf every day until it was a full-grown bull. Although the Milo story may itself be a bunch of bull, such an approach to training can help you achieve your goals. Pat Riley of basketball fame is another person who has used the Kaizen method to his advantage. Instead of asking his team for large increases in one aspect of the game, he asked every player to increase each skill level by only one percent. Multiply the number of skills by the number of players, and you can understand his secret of success.

"Applying the Kaizen method to weight training means that instead of making a jump of five pounds, you make a jump of just one pound."

Applying the Kaizen method to weight training means that instead of making a jump of five pounds, you can make an even smaller jump (such as by just one pound). This makes the weight both physiologically and (even more important) psychologically easier to handle. The Bigger Faster Stronger organization uses the idea of making personal records to help motivate kids, and their programs often promise that you can "Break ten personal records a week!" Although the BFS program is primarily marketed to high school kids, with the Kaizen method such results are possible at any age. And just think about this: imagine if you could increase the weight for reps by half a pound a week—in one year that would represent a 26-lb gain! Gets you psyched, eh?

You can apply the Kaizen method to your training by using a combination of kilo and pound plates, and the EZ bar solid collars. For example, 1.25 kg and 2.5 kg plates weigh 2.75 and 5.5 lbs respectively, and an EZ bar collar weighs about 1.5 lbs. If the base weight on the bar is 225 and your personal best for 1 rep is 240, you can apply the Kaizen method by increasing the weight in the following manner.

$$225 + 2(5) + 2(2.5) = 240$$

$$225 + 2(5) + 2(2.75) = 240.5$$

$$225 + 2(5.5) + 2(2.5) = 241$$

$$225 + 2(5.5) + 2(2.75) = 241.5$$

$$225 + 2(5) + 2(2.5) + 2(1.5) = 243$$

$$225 + 2(5) + 2(2.75) + 2(1.5) = 243.5$$

$$225 + 2(5.5) + 2(2.5) + 2(1.5) = 244$$

When Muscles Meet Magnets

The easiest way to apply the Kaizen method is to purchase magnetic add-on weights, such as the ones sold by Benoit Built, Inc. (1-800-877-3322). The idea was inspired when its inventor, Ken Benoit, injured his biceps doing a heavy dumbbell curl on a Scott bench. During rehabilitation Ken made the painful discovery that the standard 5-lb increase in dumbbells put excessive stress on his injured arm. By duct taping 1 1/4-lb weights to each end of a dumbbell, he was able to achieve a 2 1/2-lb increment that allowed him to progress in his rehab steadily and safely. Later on he came up with the idea of using magnetized plates to save the time and hassle of taping weights. The product was first used in gyms in the New England area and then mass marketed. At my request, Ken has now made even smaller magnetized disks so they can be used when training smaller muscles with poor leverage, such as the rear delts and the rotator cuff muscles.

▲ *Magnetic weights let you add very small increments to exercises such as the triceps press. (Darvin Hinkle)*

Another benefit of having these magnetic weights is that you can correct the weight of poor-quality weight plates. For example, if you have a 25-lb dumbbell that weighs only 23 lbs, you can add on a 2-lb plate to increase it to the standard of 25 lbs. Although two pounds may not seem like such a big deal, often a subconscious fear of injury occurs when you realize that your weights don't weigh accurately, a fear that may actually manifest itself in an injury if it disrupts your concentration when you lift.

There are other practical uses for the Kaizen method if you have access to the add-on magnetic weights. In particular, I'd like to discuss how they can be useful when using drop sets and wave-loading cycles, and even for modifying strength curves.

Drop Sets. With drop sets you perform as many reps as possible with one weight; then you immediately proceed to the next-lowest available increment and complete as many reps as you can with that weight. This process usually continues for at least one more set. This method exhausts a greater percentage of the available motor unit pool and gives you a great pump! The problem with performing stripping sets with dumbbells is that you must have access to several sets of dumbbells. With an adjustable dumbbell, this procedure could take several minutes, preventing you from properly using this technique. With the magnetic weights, all you have to do is peel off the additional weight, a process that takes about a second.

Another problem is that with certain exercises the normal five-pound drop in weight may be too much, allowing you to perform too many repetitions to achieve the desired training effect. This is especially true on the third and subsequent strip sets. Magnetic weights will enable you to use the exact amount of resistance to produce the optimal training effect.

Wave Loading. With a wave-loading cycle you work up to a maximum weight for a specific number of reps, back down in weight for one or more

sets, then work your way up to even heavier weights. Especially effective with elite athletes, this method allows you to handle heavier weights than you could otherwise. I saw an elite weightlifter use this method several years ago with Front Squats. On his first "wave" during the workout he barely completed 350 lbs, but after several of these waves he was able to lift 413 lbs! Although you would think that an athlete would be tired after such a first wave, what happens is the undulation in intensity stimulates the nervous system in such a manner as to allow heavier weights to be used as the workout progresses—so much for Mentzer's kooky idea of achieving maximum overload with just one set!

To show you an example of how this method is used, let's say a powerlifter can bench press 400 lbs. His wave-loading cycle might progress as follows:

First wave: 135x5, 225x3, 315x3, 355x2, 375x2, 390x1, miss 400

Second wave: 325x3, 365x2, 385x2, 400x1, miss 405

Third wave: 335x3, 390x2, 405x1

Now, enter the Kaizen Method. Using the magnetic weights, this athlete could have made a personal record of 400.5 lbs on the second wave, thereby psyching himself up for the 405 (or more) on the next wave.

Modifying Strength Curves. One of the problems I encounter in many exercise machines is that they often have poor strength curves. The Prone Leg Curl machine is one obvious example. For most of these units, the weight is easy to lift at the beginning of the exercise and virtually impossible to complete at the end of the range of motion. Electing to use the heaviest weight possible, most bodybuilders simply accelerate the weight at the beginning and use momentum to allow them to complete the movement. Thus, regardless of the weight selected, you only effectively overload one section of the movement. However, by adding a magnetic weight plate to the lever arm of the machine, you effectively make the exercise more difficult at the beginning but, as the lever arm passes neutral, gravity works to decrease the resistance on the way down. Let's say you are lifting 50 lbs on the leg curl and add a 5-lb magnetic weight to each end of the lever arm. On the way up the resistance is 60 lbs, and on the way down it's 40 lbs. Such a difference will effectively serve to modify the strength curve to be more in line with the natural strength curve of the hamstrings, enabling you to more effectively overload the muscle.

▲ *The Kaizen method is particularly encouraging for novice trainers so they can see incremental gains with every workout.*

The application of Kaizen will bring security to your training life, knowing that you are improving in some way every single training day. Don't worry about maintaining the quality of your workouts if every day you are working on improving them. Long live Kaizen!

7

BETTER RECOVERY THROUGH SCIENCE

A look inside the coach's personal pharmacological cupboard reveals his secrets to better recovery

◀ *To get the most from your high intensity workouts you need to give special attention to methods that enhance recovery. Today's advanced supplements and sports drinks should be a part of your recovery regimen. (Dave Fisher)*

It's easy to focus all your attention on the "work" of working out–the vein-popping effort, the sweat-drenched final rep and the pain of making gains. However, it's not until the weight is racked that the muscle begins to grow. The crucial recovery time that follows is often a factor overlooked and underrated in training, and the root cause of stagnant workouts and mediocre gains.

Today's most advanced thinking advocates short workouts. Nearly every expert agrees that the time in the gym must be less than an hour. The only point they disagree on is how many of these workouts you should have in a week or even in a day.

Research on hormonal response to exercise dictates that once your warm-up is finished and you have begun your first working set, you should leave the gym within one hour. The physiological rationale concerns the androgen fluctuation during the workout. Workouts exceeding the one-hour mark have been shown to be associated with rapidly decreasing androgen levels. This shift in androgens probably upsets the testosterone-cortisol ratio. Since this value is very strongly correlated to strength gains, one may infer that training under depressed androgen levels is counterproductive since the catabolic effects of the glucocorticoids would negate the anabolic effects of the androgens. Apparently, a one-hour pause is sufficient to allow the testosterone levels to return to normal. This is why modern strength training has evolved to multiple daily sessions instead of the two-hour workouts advocated so heavily in the 70s. Still, the academic work on this subject can be taken with a grain of salt–the in-gym fact is that most trainees cannot work out more than once a day or more than four times a week.

Photo: Irvin J. Gelb

▲ *Recovery is essential for growth to occur—a fact not wasted on Aaron Baker as he takes a rest between sets.*

There is also plenty of evidence that excessively long workouts are immuno-suppressive. That is, they lower the power of your immune system. This is why overtrained athletes are always catching colds and flus. It was shown in a recent Australian study that the groups of athletes most often affected with mononucleosis were triathletes, swimmers and rowers. It is well known in the sporting world that these athletes are submitted to prodigious volumes of work by their coaches.

The Need for Recovery

Recovery is essential for adaptation (growth) to occur. Muscles adapt and become stronger during rest periods, not during exercise.

Muscles must therefore be given time to recover from training. Depending on the training intensity and the athlete, two to ten days of recovery are necessary for tissue repair and protein synthesis. If training stimuli are too far apart, the overcompensation will fade away (involution). If training stimuli are too close, then overcompensation will not be allowed to happen and a drop in strength will result. Similarly, if maximal-intensity stimuli are overemphasized, a state of general exhaustion may occur. For this reason you should be careful not to increase stress during a workout that is too long; instead, alternation of high-and lower-intensity stimuli must be used to maximize overcompensation.

All stressors have both general and specific effects on the body. For example, a bodybuilding session will trigger specific adaptations in your body (larger and stronger muscle fibers and an increase of white blood cells). But these effects will also function as stressors and will trigger a general response from your body through various neural, hormonal and other biochemical means. If several stressors are imposed on your body, the total general effect may be too large for your systems to resist, and exhaustion may occur. The negative effects of multiple stressors is called *cross-sensitization*.

Supplements and Recovery

It is a known fact that one of the ways anabolics enhance the bodybuilding process is by decreasing recovery times. This chemical manipulation has not gone unnoticed by legitimate supplement manufacturers, who devote considerable research to isolating the chemical factors responsible for increased recovery. They have done quite well in this regard, in part because of the tremendous demand from all athletic endeavors to improve recuperation capacities. Here is my list of the top seven supplements that my clients and I use on a regular basis.

"One of the ways anabolics enhance the bodybuilding process is by decreasing recovery times. This chemical manipulation has not gone unnoticed by supplement manufacturers, who devote considerable research to isolating the chemical factors responsible for increased recovery."

1. Creatine: My exposure to a lot of world class athletes and coaches allows me to get cutting-edge information on supplements. In fact, I was aware of creatine's positive effects on muscle mass and strength six years before North Americans started using it. The first creatine I used was bought through a vet supply distributor in Australia back in 1987. This supplement is the one that has resulted in the highest percentage of positive response—out of the 600 or so athletes I have put on it, only three showed no improvements from it.

I have worked extensively with creatine, and I've found that to achieve the best results, you must load it properly. I have found that the best way to load is to mix pure creatine powder with a creatine transport system like Phosphagen HP (EAS) or Creatine Extreme from Champion Nutrition. At a bodyweight of 198 lbs, I take four servings of the HP daily mixed with five grams of creatine. That gives me 40 grams of creatine. I do this loading for five days. After this I use two servings of the HP a day, plus two more five-gram servings of the creatine powder. I put creatine in my water bottle for my workouts and in my post-workout cortisol shake. Regarding creatine powder, I have used the following quality companies, EAS, Pro-Circuit and SportPharma, all with appreciable results. Beware of the very cheap creatine.

I have also found that I respond better if I cycle off creatine every three weeks. At various times I may go off it for as long as eight weeks.

2. Carbo powders: My next supplement on the list is maltodextrin powders. I strongly believe that when properly used, carbo powders do more for the bodybuilder than protein powders. I have been using them since 1982, with nothing less than excellent success, long before they were mass marketed to the general public.

I use carbohydrate powders to lower cortisol levels after workouts and to increase the muscle glycogen levels. Male clients who have used my post-workout cortisol-lowering drink all report gains in lean body mass and improved recovery levels. Empirically speaking, I've found better results if I mix various brands of carbo powders, since they all have different glycemic indexes. I personally use Cytomax from Champion Nutrition mixed in with plain carbo powder that I buy from Pro-Circuit Nutrition. I use so much of it that I buy it in 35-lb tubs!

3. High-Quality Protein Powders: I prefer to change them around often so I don't develop an allergy to them. Since I have no stock in any company, here are some suggestions for some of my favorite protein drinks: Regeneration by Osmo, ProScore by Champion Nutrition and Myoplex by EAS. I use two to four scoops a day in a blender drink or as part of a meal. On workout days I mix two scoops in my post-workout drink.

4. Vitamin C: I use four one-gram tabs a day, plus Vitamin C powder in my workout drinking water for the following reasons:

- **Cortisol-lowering properties:** A high Vitamin C intake enables you to be in a positive nitrogen balance by shifting the testosterone/cortisol ratio.
- **General health:** One factor that bodybuilders overlook is health. If you are sick, you cannot train—so staying healthy is a secret to continuous gains. Monitoring the duration of your workouts to avoid impairing your immune system also pays a big dividend in health. While most people get two to three colds each winter, I get a cold once every three to four winters.

"Many North American athletes tend to score low in magnesium levels, particularly when they do a lot of strength and power work."

5. Multi-Nutrient Formulas: Again for general health purposes, I think it is critical for the bodybuilder to cover all nutritional bases. For years I have been using the Life Extensions tablets. A few months ago I tried the Super Nutrition Energy Caps, which contain a B-Complex, anti-oxidant multi-nutrient formula. I found them to be excellent. It is the only multi-vitamin formula where I could feel the difference after taking them.

6. Magnesium: Many North American athletes tend to score low in magnesium levels when we put them through blood tests, particularly when they do a lot of strength and power work. Modern agriculture techniques have limited the content of magnesium in everyday foods. It is estimated that 50-60% of the general population is deficient in magnesium.

Athletes who supplement with magnesium report a better tolerance to carbohydrates and improved sleeping patterns. Before extra magnesium supplementation, I would wake 20-30 times during the night. Now I enjoy restful sleep. I take two caplets a day of Magne-B6, a French product that has a high absorption rate. It is combined with Vitamin B-6 for increased absorption. Magnesium should not be taken at meals that contain a lot of

calcium, since magnesium and calcium compete for the same receptor sites. I also like the magnesium glycinate sold by Metagenics and the various magnesium citrate capsules available.

7. Post-Workout Drinks: The most important time to elicit positive adaptation in the muscle is immediately after a workout—unfortunately, post-workout recovery is often limited to shooting the breeze with the gym receptionist. Here is an excellent post-workout recovery drink for a 200-lb man:

Mix in a blender the following:

1.5 liters of ice water

100 grams of Cytomax

100 grams of maltodextrin
(use an amylio-pectin grade if you want a slower release)

5 grams of Phosphagen to replenish the creatine phosphate stores

40 grams of ProScore

1 tablespoon of safflower oil or flax seed oil.

In addition to this drink, I also recommend the following supplements: 500 mg of magnesium, 200 mg of Chromium Picolinate, one enteric-coated aspirin, 1,000 mg of Vitamin C, one anti-oxidant tablet. If you are insulin resistant (25% of North Americans are).

▲ *There are many factors responsible for great strength gains and muscle growth. Recovery is one of the most important and easiest to manipulate. (Craig Titus)*

8

TO SQUAT, OR NOT TO SQUAT?

Yes, that is the question, and finally here's the answer, along with some tips to spice up your leg training and keep you going and growing

◀ *Critical of the Squat? You better have some damn good reasons because all the scientific evidence points to this lower body exercise as being one of the best. (Ronnie Coleman)*

There is a sacred code among bodybuilding writers that with every mention of leg training they must use the expression "The Squat is the King of all lower-body exercises." That infamous line joins the ranks of other overused slogans such as "If you don't have the Squat in your program, you don't have a program," "If you don't squat, you don't know squat about leg training," and "Machines were made to keep geeks away from squat racks." Then of course there is the favorite of Dr. Squat (Fred Hatfield): "You can't fire a cannon from a canoe!" Fine, fine—we get the message.

The fact is, the simple deep-knee bend is unquestionably the single-most productive leg exercise you can perform. No other weight training exercise works as many major muscle groups as thoroughly or with greater intensity than the Squat. Additionally, because of the number of muscle groups involved, Squats burn more calories than any other weight training exercise and positively stimulate the cardiovascular system. Despite its versatility and effectiveness, the Squat still has its critics.

One outspoken critic of the Squat was 60s bodybuilding guru Vince Gironda, who established a reputation for knowing the secrets of achieving perfect symmetry in bodybuilding. Vince offered some interesting training concepts to the bodybuilding field, but his idea that squats widen the hips was not one of them. Squats work the quads, hamstrings and buttocks. It is a physiological fact that the major muscle of the butt, the gluteus maximus, does not have its origin or insertion at the hips, so when it develops it grows back and not out. From an empirical standpoint, all you have to do is look at the proportions of Olympic lifters, who devote as much as 25% of their training volume to squats, and you can see their hips are not wide. I prefer to scrutinize female physiques, and one woman who comes to my mind is Jamaican Olympic sprinter Marlene Ottey, a powerful squatter with amazingly elegant proportions. Her hips alone should allay any fears that squats make for blocky, mile-wide hips.

▲ *Air Force officer Tom Hood, a nationally ranked weightlifter and long-time disciple of the Poliquin Principles, demonstrates proper position for the Front Squat.*

Is the Squat Safe?

Another outspoken critic of the Squat was Keith Klein (not the *Muscle Media* nutritionist), who published a study with some questionable research methods which showed that squats could decrease knee stability and thereby increase the risk of knee injury. This study proved to be a great marketing tool for the manufacturers of leg extension machines. But the fact is that every legitimate study on this subject has shown that squats will improve knee stability and therefore reduce the risk of injuries. The National Strength and Conditioning Association has an excellent position paper on this subject if you want more information. Further, the data I've seen from Canada's national team of Alpine skiers suggests that regular squatting appears to reduce not only the number of injuries but also the length of time necessary to recover from injuries.

Several years ago I was hired to train the Canadian National Women's Volleyball Team. During my initial evaluations I discovered that all the players suffered in varying degrees from a type of overuse injury called jumper's knee. I believed that much of the problem could be attributed to an imbalance between the vastus medialis (teardrop muscle) and vastus lateralis (outer thigh sweep muscle) which developed by relying only on sport-

specific conditioning that doesn't take the legs through a full range of motion. One of the key exercises I used to correct this problem was the Squat.

Of course, if you perform the Squat it's imperative not to relax or bounce in the bottom position. When you relax, the knee joint opens up slightly, exposing the connective tissues to stress levels higher than their tensile strength. However, this does not mean that you cannot pause in the bottom position. It is perfectly fine to do this as long as you keep the muscles under tension.

Just when the knee controversy is finally ending, the anti-squat people are saying that the Squat is bad on the back. If someone has a back problem from squatting, it can usually be traced to poor form. For example, some aerobics instructors have their students perform squats with a tail-under posture to increase glute development (which it doesn't). Lifting with this posture places excessive strain on the ligaments and connective tissues of the back, especially when the athlete hits the lowest position of the lift.

Also, some trainers recommend squatting with a flat back, a form that is also often taught in aerobics classes. In *Facts and Fallacies of Fitness*, Mel Siff gives his perspective on that technique: "Keeping the back 'flat' is common advice in the gymnasium training environment, yet its validity is rarely questioned. Actually, a flat back devoid of any curvature is not only virtually impossible for a normal person to achieve, but it also reduces the ability of the spine to absorb or distribute shock and stress effectively. The healthy spine is meant to have several different curvatures, whereas the straight spine suggests the presence of a specific type of pathology."

Bad Squat Form. *Looking down and rounding the back are the primary reasons a person could develop back problems from squatting. Experts agree, injuries from squatting are due to poor form—not an inherent problem with the exercise itself!*

To protect the ligament structures of the back, always keep a slight arch in the lower back when you squat. This technique does increase the stress on the lumbar muscles, but a muscle can recover from a mild tear in 3 to 8 days, whereas a ligament strain requires at least 21 days. Also, many muscle injuries can be avoided simply by following a sensible training program.

As for upper back or neck injuries, these problems usually only occur when someone is using poor technique, such as looking down or looking up excessively. Also, some beginners find squats uncomfortable on the upper back area and may try to minimize their discomfort by rolling a towel around the bar. I strongly advise against this practice. The larger diameter of the bar can be harmful to the neck and increases the risk of the bar rolling down the back. As for overcoming the discomfort of having a naked bar on your back, work on building up your traps and realize that just as with a bicycle seat, most individuals will simply get used to it with time.

Finally, there should be no concern that the Squat will damage the heart. Although it's true that while performing the lift the Squat will temporarily raise blood pressure, the heart adapts to this stress in a positive fashion by hypertrophying the left ventricle. Interestingly, leg presses performed on a

45-degree angle will increase the blood pressure three times more than the Squat. Obviously, if you suffer from cardiovascular disease or if it runs in your family, you should consult an experienced sports medicine practitioner before engaging in a serious squat program.

▲ *Dave Dearth gives a helping hand to Carl Bullock on the Leg Extension. While it makes great drama in a photo, the Leg Extension has limited applications in serious leg training routines.*

Squatting Techniques

One of the common myths in bodybuilding is that there is one single way to perform an exercise. The truth is that in order to force adaptation for maximum growth, you should vary the types of squats you perform. The two most commonly used squats are commonly referred to as the bodybuilding squat and the powerlifting squat. With the bodybuilding squat the back is kept as vertical as possible and there is considerable forward movement of the knees. In the powerlifting squat there is considerable forward bending from the waist so that there is minimal forward movement of the knees. Also, to use more weight, powerlifters often do not squat as deeply as bodybuilders.

Which style is best? Neither and both. The fields of biomechanics and neurophysiology tell us that even slight variations of movement (i.e., how deeply we squat, bend forward from the waist, and move the knees) stimulate different muscular recruitment patterns. Therefore, to stimulate the most motor units, and therefore simulate more growth, bodybuilders will benefit from occasionally squatting like powerlifters. Conversely, deep squats will help a powerlifter because they will increase development of the hamstrings and vastus medialis (the teardrop-shaped quadriceps muscle that crosses the knee), thereby increasing knee stability.

While the previous two types of squats are most common, there is a third squatting technique used by many bodybuilders, the "squat 'til you puke" method. There is no reason to believe that an intense squat workout will always result in vomiting, even though this is a bizarre belief that is often promoted in hardcore muscle magazines and is discussed in detail in Samuel Wilson Fussell's controversial book *Muscle: Confessions of an Unlikely Bodybuilder*. If vomiting is a problem, you can usually avoid it by not eating too close to a squat workout, and by not consuming slow-to-digest protein foods.

If squats are the mainstay of your leg training routine and you want to increase the recruitment of the vastus medialis muscle, you have the choice of:

a) Using a specific foot position

b) Overloading the bottom position.

The foot position that will maximize the recruitment of the vastus medialis calls for placing the load over the arch of the foot. This is best accomplished by using a narrow stance and elevating and moving the center of gravity of the body forward by using something to elevate the heels.

Doing more work in the bottom position increases the recruitment of the vastus medialis muscle, since this muscle—along with the hamstrings—is responsible for getting you out of the bottom position.

Returning to the subject of developing the vastus medialis muscle, there are two techniques I use with Olympic athletes that you may want to use.

Cyclist squats: Olympic-level cyclists use these to attain world record performances in track events. In this variation of the back squat, you want to use a board to rest your heels on in a narrow stance (four to six inches between the heels). The best type of board for this is wedged, so that the pressure on your foot arch is minimal. The higher the wedge, the more recruitment of the vastus medialis you will get. You will also find that you will squat more upright when using the wedged board so less recruitment will occur in the gluteal muscles.

One-and-a-quarter squats: This exercise is one I've used in training Olympic skiers to offset their enormous development of the vastus lateralis muscles and prepare their knees for the lateral stress of skiing. Squat down for a five-second count until you hit bottom position, come up a quarter of the way at a slow and deliberate pace, go back down, then come up until your knees are just short of lockout. That one-and-a-quarter movement consists of one rep. Performing four to five sets of four to eight of the one-and-a-quarter reps will set your vastus medialis muscles to record growth.

Give a fair try to each one of these variations for six different leg workouts. I am sure you will be pleased with the results.

▲ *Most bodybuilders prefer to use a narrow foot stance when squatting. This position enhances quadriceps development. (Thierry Pastel)*

Squatting Alternatives

I believe that the Squat is unquestionably the most effective exercise for increasing muscle bulk in all the major lower-body muscles. I also believe that the Squat will develop overall strength and power, and is one of the most effective exercises to improve knee stability and rehabilitate knee injuries. The problem is, for some individuals the stress (or more precisely, compression forces) that the Squat places on the back makes it uncomfortable to perform the exercise for prolonged periods. Also, some people

get just plain burned out on the Squat and are looking for alternatives to keep their interest piqued. For these individuals, there are several devices that may provide the variety to keep your legs growing big and strong with minimal stress on the lower back—and without resorting to geek exercises like knee extensions.

▲ ***Effects of Smith Machine on the Knees.*** *The illustration on the left shows the shearing forces placed on the knee during a Smith machine squat. These are caused by the lack of involvement of the hamstrings. The illustration on the right shows how the force dissipates throughout the lower leg when performing a Squat.*

In regard to machines that attempt to duplicate the Squat, the basic problem is that many of them can reduce the pressure on the back and place significant stress on the knees. Take for example the ever-popular Smith machine. The Smith bar makes it possible to squat in a manner that allows you to lean back against the barbell, thereby supporting your back and minimizing hip extension during the exercise. What this does is take the hamstrings out of the movement. The hamstrings, however, are the muscle group that helps stabilize the kneecap. The result is unnaturally high shearing forces that try to pull the joint apart, as well as tremendous stress on the anterior cruciate ligament (ACL), one of the primary ligaments in the knee capsule that provides stability to the knee. For this reason I would discourage you from using the Smith machine, or at least only use it on an infrequent basis.

All the squatting-alternative devices have this factor in common: they displace the center of mass of the resistance in order to reduce the stress on the skeletal and/or muscular structures. Let's examine a few other alternatives to traditional squats.

Barbell Hack Squats. This exercise was brought to the bodybuilding world by Russian wrestler Georges Hackenschmidt. Make a note of that—few people know why a hack is called a hack. A very low-cost alternative to back squatting, the Hack Squat will promote top-level growth in the vastus medialis.

The Hack Squat I'm talking about is performed with a barbell, not the so-called Hack Squat machines. As in the Smith machine, because the back is stabilized in this exercise, the hamstrings are not recruited to stabilize the knee.

In order to perform a true Barbell Hack Squat you need a barbell and an adjustable rack to place the barbell at the optimal height for picking up and racking the bar. Your heels should be elevated by at least a two-by-four board so that you can squat with a straight back with your hips placed under your shoulders in the bottom position.

Set the two-by-four about four to six inches in front of the power rack. Set a barbell on the rack so that it's about four to six inches lower than your gluteal line. Standing with your back to the bar, grab the barbell, preferably with straps. Walk forward until your heels rest on the board. Initiate the squatting motion by allowing your knees to travel as far as possible forward without allowing your back to move. Once your knees have reached this point, lower your hips to the bottom position of the squat. Be sure to keep

an upright back. Do not allow your shoulders to round forward, and be certain your hips are under your shoulders in the bottom position.

Buffalo Bar. Some trainees will complain of the following when using a straight bar when squatting: sore wrists and shoulders, and uncomfortable pressure on the neck. The Buffalo bar is in fact just a very stiff, slightly cambered bar that makes squatting more comfortable for people who have a hard time supporting a straight bar. It provides a more comfortable variation of the back squat for those who are trapezius challenged (i.e., pencil-neck geeks, in politically incorrect English.)

The Buffalo bar is also great for high-rep squatting. Bodybuilding programs tend to work in cycles, with so-called revolutionary new programs evolving every five to ten years. One of these programs is high-rep squatting, often supersetted with pullovers to expand the ribcage. This method was first promoted in the 70s by *Ironman*'s founding publisher Peary Rader, and then by the late-great Don Ross in his many books and articles, and most recently by Randall Strossen of *Milo* magazine in his book *SuperSquats*. Although there is still no concrete evidence that the pullover will expand the ribcage any more than will breathing hard after exercise, for short-term purposes this can cause extreme soreness and serve as a nice introduction to non-bodybuilders about how hard weight training can be.

Supersetting pullovers aside, there is still some merit to high-rep squatting. The downside is that most bars will undulate when you perform multiple reps, which can hurt the tempo and place some jarring compressive forces on the lower back. Because the Buffalo bar is stiff, there is no undulation of the bar when doing fast, multiple reps. I recommend the bar for high-rep squatting, or even high-rep lunges. The stability also makes the bar ideal for the Good Morning exercise.

The Buffalo bar and the Magic Circle (below) can be purchased from IronMind Enterprises, Inc., P.O. Box 1228, Nevada City, CA 95959, tel (916) 265-6725, fax (916) 265-4876.

▲ *A wide array of bars and apparatus are available to help you enjoy the benefits of squatting, even if traditional squats are beyond your capabilities. These innovative bars also add variety to your squatting routines.*
(Robert Russo)

Magic Circle Squats. The Magic Circle came to life as the Douglass Frame. It was a rectangular frame draped over the shoulders with supporting harnesses. Later on, its inventor, James Douglass, further refined his invention by shaping it into a circle. The new design was popularized by then-publisher of *Ironman* Peary Rader, who sold it through his Body Culture Equipment company. It has been resurrected periodically by various authors, such as American weightlifting coach Carl Miller in the mid-70s, and by Randall Strosssen in the late 80s in his book *SuperSquats*. Compared to barbell squats, the Magic Circle lowers the center of gravity dramatically,

thus reducing the stress on the lower back. It is another favorite of those authors who endorse high-rep squatting for bulking up.

The Magic Circle is a toy that can be used for the home gym owner, but it will never become a popular item in a commercial gym because of the space it would take up to be a permanent station, not to mention the liability of squatting in a circle of steel with no safety supports. Plus, it takes time to get in and out of it. This is definitely for the home trainer with a good sense of balance.

Front Harness Squats. Manufactured by Power Atomic, Inc., the Front Harness Squat is strongly advocated by the Bigger, Faster, Stronger crew. It allows you to squat without struggling to hold the bar. Some people like to use the harness in the Smith machine, but as you've already learned, I hold a poor opinion of any work done on the Smith machine.

The Front Harness is good for people with weak rhomboids that limit their squatting poundages. People with large arms (over 18 inches) may still find it hard to use. The Front Squat Harness can be purchased for $149.99 from Power Atomic, Inc., including UPS shipping and handling, P.O. Box 271, Swampscott, MA 01907. Write for a brochure or call (617) 581-6929 and ask for Susan Silverman.

Manta Ray. The Manta Ray was designed originally for pencil-neck geeks to protect their upper vertebrae. Powerlifters who strain their shoulders or their brachialis muscles by doing scores of reps with low-bar squatting will benefit enormously by shifting to Manta Ray squats until their injuries recede. Says one of Montreal's top personal trainers, Denis Dionne, "It really helps a person to squat with an upright position." It is different than just a pad, as a pad will place unnatural stress on the neck.

"The Safety Squat bar was developed in Germany over 40 years ago and is very good for individuals who have encountered injuries in the lower back."

The Manta Ray provides at a very low cost (around $40) an effective variation for the back squat. By displacing the center of mass of the resistance, you change the motor recruitment pattern, thus fostering further adaptations in the squatting muscles. People with ample trapezius development will find it awkward to use at first. For these people, I would recommend only high-rep work with this device. Kim Goss, a former strength coach at the US Air Force Academy, said that most of his bigger linemen could not use it because it dug into their traps, and his was a program that emphasized power cleans. Because military schools don't produce big linemen, it would be even worse for other schools with big men. Perhaps in the future a larger size Manta Ray bar will be developed for these individuals. The Manta Ray can be purchased by calling Mark at 800-563-1000.

Safety Squat Bar. The Safety Squat bar was developed in Germany over 40 years ago, yet people in the US have claimed to have invented it about 15 years ago. Bobsled superstar Pierre Lueders has used this bar to improve his squatting poundages. It is very good for people who have encountered injuries in the L-5 vertebra region, as it lowers the distance between the center of mass of the resistance.

There are basically three ways to use the bar:

a) Holding on to the racks in front of you
b) Using locked arms, parallel to the ground in front of you, with the

fingertips brushing against the racks. This style ensures that your back stays as upright as possible

c) Holding on to the yoke.

There are some flexibility restrictions with this bar. Some people complain of pain in the wrists, elbows or shoulder girdle. However, the Safety Squat bar has many advantages. When using a straight bar, there is always a chance that you will lean forward or round your back, exposing the lower back area to serious injury potential. With the Safety Squat bar the center of mass of the resistance is lower and more in line with the midline of the body. This prevents the excessive forward leaning associated with straight-bar squatting.

In some instances, trainees have lost balance forward or backward, greatly compromising their safety. Once again, since the resistance is closer to the center of gravity, it is much easier to balance high loads. The padded yoke eliminates compressive forces by redistributing the load.

With the Safety Squat bar you can spot yourself if you get stuck in a position by simply pressing on your own quadriceps or pulling up on the racks since your hands are free to help you go through the sticking point. There are varying degrees of quality in the Safety Squat bars available, and I would recommend the one made by Jesse Hoagland (609-989-0211).

The Zane Leg Blaster. This device was first introduced to the bodybuilding world as the Moore Leg Blaster; however, it didn't begin to gain popularity until it was endorsed by Mr. Olympia Frank Zane. I guess nobody had ever heard of Moore. In a short time (and a few issues of *Muscle and Fitness*), it became known as the Zane Leg Blaster.

Whether it's called the Moore or the Zane Leg Blaster, it is still a toy. If you have access to it, it can provide variety to your leg workouts; but it is certainly not necessary to ultimate leg development. And, if it allows anyone to get down to full squats, all the better. Like the Magic Circle, it is more likely to be bought by the home gym fanatic than by the gym owner. Zane can be contacted at 800-323-7537.

▲ *Branch Warren, 1994 NPC Junior Nationals champion shows off the results of a diligent and intelligent leg training routine.*

9

THE PUNY HAMSTRING REVOLT!

How to enhance leg development
and sports performance
with optimal hamstring training

◀ *Dave Dearth displays extraordinary hamstring development. The hamstrings are to the thighs what the biceps are to the arms: Absolutely essential!*

Ask Gold medal decathlete Dan O'Brien what the most important bodypart in his weight training regimen is, and he won't hesitate in telling you, "Hamstrings." The hamstrings are absolutely essential to a track and field athlete's speed and dynamic power. Yet for most bodybuilders, the hamstrings fall in the don't-train-what-you-can't-see category. Unfortunately, the rest of us can see them, or the lack of them.

Elite-level bodybuilders know the importance of fully developed hamstrings where every detail of this powerful muscle group stands in relief. As a major muscle group it cannot be ignored. Yet good hamstring development eludes many bodybuilders. The reason, besides lack of attention, is that many trainees only know one or two exercises to work the muscles. Thanks to new information, and new equipment, that has all changed.

A properly designed hamstring specialization program can, in as little as 12 weeks, dramatically change the appearance of your legs. I'm not saying your thighs will touch when you're standing with your feet apart, but you'll have delineated muscle where none was before. What's more, such a program can increase your bodyweight 10 to 20 lbs and reduce your risk of injury—a must if you're using weight training to improve performance in another sport. Now that you understand the importance of this often neglected area, let's take an in-depth look at serious hamstring training. As Ben Grimm would say, "It's Clobbering Time!"

▲ *The hamstrings consist of three muscles. The primary muscle is the leg biceps. The Semitendinosus and Semimembranosus create the inner sweep across the hip and knee joint. (Matt McLaughlin)*

Functional Anatomy of the Hamstrings

The hamstrings consist of three muscles: the biceps femoris, better known in gyms as the leg biceps; the semitendinosus; and the semimembranosus. Understanding the functions of each of these muscles is the first step towards devising effective hamstring workouts.

Biceps Femoris: The biceps femoris enhances the outer (posterior) sweep of the hamstrings. Like its cousin the biceps bachii, and as its name suggests, the biceps femoris consists of two heads: the long head and the short head. The long head crosses both the hip and the knee joint and is therefore involved in extending the hip and flexing the knee. The short head only crosses the knee joint and thus is only involved in flexing the knee. Both heads help turn the foot outward (lateral rotation of the knee).

Semitendinosus and Semimembranosus: These muscles enhance the inner sweep of the hamstrings. They cross the hip and the knee joint, and are therefore involved in extending the hip and flexing the knee. They also help turn the knee inward (medial rotation).

Muscles That Assist the Hamstrings: The muscles that help the hamstrings flex the knee are the sartorius, gracilis and gastrocnemius. The muscles that help the hamstrings extend the hip are the glutes and erector spinae muscles.

Stuff I Hear About Hamstrings That Drives Me Crazy

1. Bodybuilders seem to believe that because some within their ranks possess incredible hamstrings, as a whole their sport has the "best hamstring development of all athletes." Wrong. Without question, the athletes who possess the best hamstring development are sprinters—just look at the development on these athletes the next time there's a track competition on TV. Robby Robinson has some of the best hamstrings in the bodybuild-

ing world, and it comes as no surprise that he also did lots of sprinting in his youth.

Sprinters achieve excellent hamstring development because the hamstrings are one of the primary muscle groups used in running. Sprinting also requires extreme force production and, because the athlete leans forward during the start of a sprint, the fast-twitch fibers of the hamstrings must contract with maximum intensity to propel the body forward. Bobsledders also have excellent hamstring development because not only do they sprint while pushing a sled that can weigh over 600 lbs! The hamstring development of Ian Danney, a 180-lb bobsledder I coach who can front squat 418 lbs for two reps, is equal to that of any professional bodybuilder's.

▲ *While popular, the leg curl is not the most effective exercise for the hamstrings. The effectiveness of the leg curl is improved when performed on a hump-shape bench. (Mike Ashley)*

2. "Leg curls are the best hamstring exercise." For knee joint integrity, most physiotherapists recommend a 66 percent hams-to-quad ratio—which means that the hamstrings can produce 66 percent of the force of the quadriceps. When our Canadian Olympic skiers performed only Half Squats, the average ham/quad ratio was 58 percent. After 11 weeks of Deep Squats it improved to 79 percent. (Incredibly, our best sprinters will have 125 percent, almost twice what physiotherapists recommend.)

A simple way to determine your ham/quad ratio is to test your maximal Front Squat, which ideally should be 85 percent of your Back Squat. If you want your ham/quad ratio assessed in a laboratory, make sure it's done on a Kin-Com machine. Not only is the Kin-Com machine the best available, it also measures eccentric strength.

3. "The Nautilus cam provides an ideal resistance curve for the hamstrings." Hah! During knee flexion the hamstrings express a force curve of a descending shape; that is, the muscle produces less force at the end of the movement. The Nautilus cam provides increased resistance and by overloading the weak points of the movement and underloading the strong points, you disturb the force production of the hamstrings and therefore increase the risk of injury. (Don't feel too bad, Arthur: the Keiser Leg Curl machine has an even worse pattern of overload for the knee flexors.)

Besides having the wrong force curve, the Nautilus Leg Curl machines I've seen have a flat surface that can aggravate or cause a low-back injury, especially if the individual using it stores a lot of fat on the abdominal wall.

This machine should have been designed with a "hump" shape to position the hamstrings in a better pre-stretch position.

4. "Hamstrings respond well to high reps." This is probably one of the biggest reasons why most bodybuilders do not have impressive hamstrings. Earlier I praised the hamstring development of sprinters. How far do sprinters run? Answer: Generally about 200 meters or less. How long does it take? About 21 seconds. Although the time under tension is short, these athletes show enormous hamstring development because the hamstrings are primarily composed of fast-twitch fibers and respond better to heavy weights and low reps.

Numerous studies on the relationship between maximal strength tests and the number of repetitions performed (at a given maximum) have shown repeatedly that the hamstrings are not gifted for reps. Although you may be able to perform 10-12 reps at 70% of your maximum on the Bench Press, you will probably only be able to complete 7 or 8 reps at the same percentage on the Leg Curl. If you use 15-20 reps per set on hamstring exercises—a repetition range often promoted by the Nautilus disciples—your training intensity would be approximately 50-55% of your maximum. Such a low intensity level would not provide enough tension for these numerous fast-twitch muscles to grow.

Step-Up.
Because the Step-up involves hip extension, it is very effective for hamstring development. The height of the step increases the effectiveness. It is also effective because it trains one leg at a time.

Ten Hamstring Training Tips

Now that we've explored a few of the untruths about hamstring training, let's examine training methods that will help you achieve optimal hamstring development.

Tip 1: Select exercises for both functions of the hamstrings. Magnetic Resonance Imaging technology (MRI) has demonstrated that Leg Curls do only part of the job in recruiting the hamstrings. For example, the Supine Leg Curl involves the biceps femoris, semitendinosus, sartorius and gracilis. The Semi-Stiff Leg Deadlift and the Good Morning involve the adductor magnus, adductor brevis, biceps femoris and semitendinosus. Therefore, your hamstring workouts should involve exercises for both the hip extension function (Good Morning and Semi Stiff-Leg Deadlift) and the knee flexor function (Seated and Prone Leg Curl).

Tip 2: Train one leg at a time. From testing on the Kin-Com unit, we found many top-level athletes with strength disparities between the two legs. It appears that the dominant leg of some athletes will often be as much as 20% stronger than the non-dominant leg—these athletes definitely need single-limb training to prevent injuries. (Incidentally, the dominant leg is not necessarily on the same side as the dominant hand; in other words, it is not because you are right-handed that your right leg may be dominant in the lower body.) Also, because of a neurological effect called the bilateral deficit, the hamstrings will contract harder if they are trained one leg at a time.

Tip 3: Stretch the hamstrings both at the hip and knee joints to facilitate recruitment. This means the knees must be extended and the hips flexed in the starting position. Thus, during the Standing Leg Curl, you would need to bend forward from the waist and start with the legs straight before lifting.

Tip 4: Stretch the quadriceps between sets of hamstring work. Increasing the range of motion of your hamstrings will increase the amount of muscle mass used during the exercise and therefore the effectiveness of the exercise. Stretching the quadriceps, which is the antagonist of the hamstrings, is one way to increase your range of motion because this will reduce muscle tension that can shorten the muscle.

Tip 5: Use eccentric training. Eccentric (negative) training refers to the lowering portion of an exercise, as opposed to concentric (positive) training, which refers to the lifting portion. The hamstrings respond well to eccentric work. Triple jumpers and long jumpers are known for their hamstring development. Besides the sprinting they do, they have to absorb high-impact landings, which prompts high levels of eccentric contractions from the hamstrings.

▲ ***Hamstring Function.*** *The hamstrings have two basic functions: extension of the hip and extension of the lower leg. It's essential to work both these functions in a complete hamstring program.*

Tip 6: Emphasize low reps and multiple sets. Because of the high fast-twitch composition of the hamstrings, there is little point in training with high repetitions. When you use more than 8 reps during hamstring exercises you are training below 70% of your 1RM (one-repetition maximum), an intensity level that will not create sufficient tension to elicit a hypertrophy and strength response.

Tip 7: Strive for balance between the medial and lateral heads of the hamstrings. The body never lies. To test if there is a head of hamstrings that needs remedial specialization, select a weight you can do for 6RM in the Leg Curl with your feet in the neutral position. As you reach muscular failure, your feet will rotate in one direction if there is a lack of balance between the two heads of the hamstrings. If they turn towards the midline of the body (medial rotation) your semitendinosus and your semimembranosus are too strong for your biceps femoris. If they turn away from the midline of the body (lateral rotation), your biceps femoris is too strong for your semitendinosus and semimembranosus.

Tip 8: If you have balanced hamstring development, vary your lifting position frequently. Variety is an essential requirement for maximal hamstring development because each exercise offers a unique pattern of overload. You probably have more hamstring exercises at your disposal than you think. Let's say that your gym has the four major types of Leg Curl units: Seated, Lying, Standing and Bent-Over Kneeling. This will give you an arsenal of 12 hamstring curl exercises: 4 machines x 3 foot positions (neutral, inward, outward) = 12 permutations.

Tip 9: Train the hamstrings first in your leg workout. There is plenty of

empirical evidence that muscles trained early in a workout make greater progress than the ones trained at the end of a workout. Joe Weider takes credit for naming this phenomenon the "Weider Priority Principle". For all I care, a lumberjack from Vladivostok could have come to the same conclusion.

Tip 10: Allow for plenty of recovery. The hamstrings have a high fast-twitch make-up, and thus take a long time for recovery. A 30-day hamstring specialization cycle for someone with great quads would look like this:

Day 1: Hamstrings (15-16 sets) and Calves (6-8 sets)
Day 6: Hamstrings (6-8 sets), Quads (3-5 sets), Calves (8-10 sets)
Day 11: Hamstrings (15-16 sets) and Calves (6-8 sets)
Day 17: Hamstrings (6-8 sets), Quads (3-5 sets), Calves (8-10 sets)
Day 22: Hamstrings (10-12 sets) and Calves (4-6 sets)
Day 29: Hamstrings (4-6 sets), Quads (1-3 sets), Calves (6-8 sets)

"The hamstrings have a high fast-twitch make-up, and thus take a long time for recovery."

Notice that the number of sets is significantly lower during the last two workout days of the cycle. Why? To comply with the unloading principle, if one lowers the volume after the third week yet keeps up or even increases the intensity, supercompensation (gains) will be of a greater magnitude than if the volume was kept constant. The exact physiological mechanism is not entirely clear, but it appears that it is of a neuro-endocrine nature. That is the same reason why people encounter a boost in muscle mass and strength when first embarking on a Mike Mentzer-type of training schedule.

Now you're prepared to turn your hamstring training around so the next time you turn around in front of the mirror, you're going to see the results of your efforts. One of the rewarding aspects of hamstring training is that the results become quite visible—this is really a monster of a muscle and when developed, is gratifying to show off.

Incorporate my Ten Tips into your routine and you'll immediately begin to see and feel the results. Keep in mind that optimal hamstring development requires more than just a few sets of Leg Curls at the end of your workout. To take your training to the next level of development, make training the hamstrings a priority in your training and work them as hard as you would your arms or chest.

A New Hamstring Bench

Although Arthur Jones missed the boat on coming up with the best way to train the hamstrings, the powerlifting world has revolted against puny hamstrings and has made an amazing contribution. In my ongoing search for new research and innovative equipment I ran across the Reverse

Hyper bench a few years ago while coaching our bobsleigh team in Innsbrück, Austria.

After coaching my athletes, I stayed at the gym to do my workout. The gym being busy, I shared the equipment with a couple of the local powerlifters who held a few National titles. These Austrian powerlifters swore by the efficiency of the Reverse Hyper bench at improving their deadlift and squat performances. Both athletes claimed it made a difference of between 35 kg (77 lbs) and 50 kg (110 lbs) on each of their squats and deadlifts. Even though I had seen it advertised in back issues of *Powerlifting USA*, I had never paid any direct attention to it. Since the Austrian athletes did not market the machine, I was intrigued, jumped on the machine and pumped away. The movement felt quite right; the glutes, hamstrings, and erector spinae were being trashed by the machine. After my workout, I went to inquire about it with the gym owner, a powerlifting coach.

This device is the brainchild of Westside Barbell Club owner and powerlifting coach extraordinaire Louie Simmons. This exercise has contributed to the building of many world records in the Deadlift and Squat. Louie uses it as a staple in deadlift training. To gain more insight into the possibilities of this training, I made a sojourn to one of the darkest, dankest—and also the most serious—iron pits in the US, Louie Simmons' Westside Barbell Club in Columbus, Ohio.

In the world of powerlifting, this is the home of champions. Close to two dozen record-holding weightlifters can be found there at any time. And make no mistake, this is a gym, not a health club. Not only are there no aerobics classes, the mere mention of the subject causes giant beads of sweat to fly off the jiggling jowls of these monster-sized men as they laugh in your face. No, the Westside Barbell Club is not usually a place to talk about looking good in your Calvin Kleins, or to welcome strangers with open arms and bussing. To my good fortune, someone had just benched 600-some pounds and still had blood spouting from his nose when I arrived, so everyone was in a very good mood.

All kidding aside, Simmons is highly knowledgeable and was most willing to share the background on his amazing bench.

The Reverse Hyper is performed by lying face down on the bench. Your entire torso must be supported, allowing upper thighs to hang at a 90-degree angle to your body. You perform the exercise by raising your legs until your feet are horizontal to the floor. This movement thoroughly isolates the hamstrings, and the last portion zeroes in on the glutes.

Simmons has used the Reverse Hyper to rehabilitate back injuries incurred over a lifetime of heavy lifting. While physicians recommended surgery to Simmons on several occasions, Simmons turned his back on the knife and used the Reverse Hyper to repair the damage and alleviate

Reverse Hyper. *This remarkable new bench provides a superior workout for the hamstrings, particularly the hip extension function. It's also great for the glutes and lower back.*

his pain. In addition to himself, Simmons claims more than two dozen people with back problems or herniated disks have used the machine without pain. The reason for this is the bench decompresses the disks when the weights travel to a position under the face.

While the machine is superior for physiologically targeting the hamstring muscles, it also builds up the glutes and the erector spinae very rapidly. In fact, the first time I trained on this machine back in Innsbrück, I did only 3 sets of 20, yet the pump I got on it—especially in the erector spinae—was so great I felt 3 inches shorter! The first workout Milos Sarcev did with me was a hamstring workout. After trying out 5 sets each on two different Atlantis leg curl machines, we hopped on the Reverse Hyper machine for 3 sets of 20 reps. Immediately after the workout Milos told me that he could feel it in the lower back and glutes but not directly in the hamstrings. By the next day, while he was limping his way through a back workout, he had definitely changed his mind. He walked as if he had been beaten up with kendo sticks on the hamstrings by a horde of samurai.

"Any athlete participating in sports requiring sprinting movements will improve their stride length dramatically with the regular use of the Reverse Hyper."

The Reverse Hyper machine can also be effective in improving posture and correcting abnormal pelvic tilt, an effect that can immediately give the illusion of a flatter abdominal wall. One of the consequences of having weak erector spinae muscles is the development of a posture in which the upper back is rounded, the shoulders droop forward and the chest is sunken. To maintain the center of gravity for this type of posture the pelvis is thrust forward, causing a distended lower abdomen. This condition is often referred to as a kyphosis-lordosis posture.

Athletic Applications of the Reverse Hyper

The glutes and hamstrings are essential to various forms of martial arts. Spinning back, spinning back kick, and hook kicks require powerful hip extension. Judo and jiu-jitsu practitioners will appreciate the benefits of this device in helping them do the hip extension movements in hip throws and sweeping movements. To quote judo coach John Saylor, "I have never found another exercise that strengthens the lower back as completely as the Reverse Hyper and yet has restorative capabilities at the same time." For jiu-jitsu, judo, sambo, and freestyle and Greco-Roman wrestling, not only does the Reverse Hyper improve pick-up throws and counters by strengthening the lower back, but the exercise itself closely duplicates these actions.

Those athletes participating in sports requiring sprinting movements (basketball, baseball, bobsleigh, etc.) will improve their stride length dramatically with the regular use of the Reverse Hyper. Butch Reynolds has used the Reverse Hyper in preparation for his world records in track and field.

The Reverse Hyper is also excellent for correcting the ham-to-quad ratio. Powerlifter Laudra Dodd scored a 60% ham-to-40% quad ratio at Ohio State University. This is the value that we look for when developing top-level sprinters in Canada. Results from Canadian sprinters at the last Olympics in Atlanta pointed out the veracity of this ratio.

Other Advantages

Simmons' bench allows you to train the muscles of the posterior chain in unison. The glutes, hamstrings and erector spinae form together what kinesiologists call the posterior chain. The posterior chain is mainly used to run at high speed, or to jump forward or vertically. For example, in the vertical jump the posterior chain contributes up to 80% of the power output. So don't waste your time on quad and calf development if you want rapid increases in your vertical jump.

The Reverse Hyper machine will allow one to work the posterior chain in a synchronized manner. Your back extensions would target the same muscle group but not in the same recruitment pattern. Another disadvantage of the back extensions is the dizziness associated with performing them.

The bench is plate loaded and allows the trainee to stack plates on the device so as to regulate the resistance in minimal increments, which is essential for consistent gains. Individuals ranging from the injured to world record holders can put on the machine the optimal resistance for their abilities.

"I would strongly suggest that you start off with sets of at least 20 reps per set because the soreness you will get when you begin using the Reverse Hyper is incredible."

Training on the Reverse Hyper

I would strongly suggest that you start off with sets of at least 20 reps per set because the soreness you get when you start off using this apparatus is incredible. Even the most advanced athletes will piss and moan the first few days after using it.

As you get more advanced on it, I would recommend sets that last an average of 10-20 seconds with fast, explosive concentric contractions and controlled eccentric contractions. Keeping that in mind, I would recommend that at the advanced stage, the concentric contractions be as ballistic as possible with eccentric lowerings in the 2- to 5-second range, depending on the number of reps chosen.

Because the hamstrings are of a fast-twitch composition, you need to train with low reps done in an explosive manner; therefore, the Reverse Hyper is exceptionally well suited for hamstrings.

The machine comes with two ankle belts: one long, one short. The long one is used to work with the feet wide apart, while the short one is used to work the legs when they are closer together. While Simmons has some ideas on the possible muscle recruitment patterns each belt specifically contributes, there are no strict EMG studies on their exact benefits. However, both belts are good, if one respects and understands the physiology behind the variety principle. I would recommend that you change the belt length every six workouts or so.

At this point, I know what you're thinking. No, I do not own stock in the Reverse Hyper; I just believe in it. If you're interested, the Reverse Hyper can be purchased through Dusty Parker by calling (216) 259-3369. Or visit his website at www.strengthcoach.com.

10

TURN THOSE CALVES INTO COWS!

If great calves are your wish, here is how you can sort through the training myths and command them to grow

Calf development is in large part determined by genetics. However, separating truth from fiction can go a long way in improving what Mother Nature gave to you.

In all the classical statues from Ancient Greece, the strongest and most powerful heroes always had great calves—and with good reason. The calves are the focal point of the entire physique. At all levels of bodybuilding competitions, from local shows to the Mr. Olympia, the calves are the first place the audience and judges look to evaluate the contestants. As a case in point, in his early years Arnold was just another also-ran bodybuilder, indistinguishable from any other competitor except that he was a few inches taller than most. Then, Arnold made calf training his number-one priority, and the rest, as they say, is bodybuilding and movie-making history. Off the posing dais and into the real world, fully developed gastrocnemius and soleus emit an aura of confidence that will ensure success in both business and the bedroom. To borrow from that famous pantyhose commercial, "Nothing beats a great set of calves!"

Yeah, right.

The truth is that although well-developed calves are an essential aspect of a symmetrical physique, they are not given much attention by the average bodybuilder. The calves are not a showy muscle and are often overshadowed by the muscles of the arms, chest and shoulders. And even if a person's calves are so pathetic that they can be sued by his upper body for nonsupport, the problem can easily be masked with sweats.

The REAL Reasons for Poor Calf Development

I agree with Dan Duchaine that the most important factors for calf mass are parents who bless you with long muscle bellies. The lower your muscle belly inserts on the bone, particularly the gastrocnemius, the better your bodybuilding potential. Turn-of-the-century French naturopaths had a saying: "Short tendons, big muscles." It's true.

▲ *Bill Pearl is an excellent example of great genetics. Few big men of his era came close to his symmetry and calf development is one reason why.*

If you have short muscle bellies and are into athletic activities other than bodybuilding, you'll be happy to hear that short muscle bellies are an advantage. A calf developed mainly near the knee area has a great moment of inertia, thus favoring faster leg turnover, and provides better leverage for jumping. In fact, I understand that movie about basketball hustlers was originally going to be titled "Men with Short Muscle Bellies in the Lower Leg Region Can't Jump," but it wouldn't fit on a marquee.

1982 Mr. Olympia Chris Dickerson and top bodybuilding pro Mike Matarazzo were born with great calves, and they did not have to labor at the calf machine. Further, there are many great bodybuilders blessed with enormous calves who probably couldn't tell you how to operate a Calf Raise Machine (or, for that matter, how to spell it). However, I disagree with Dan when he says that there is not much you can do about calf development. In my opinion, here are the primary reasons most bodybuilders fail to improve their calf development.

1. Giving up too soon. Many bodybuilders buy into the "Calves can't be built—you've got to be born with them" bullshit, and as such do not commit to consistent training. If a law was imposed in gyms that for every set of Biceps Curls you must also perform a set of Calf Raises, a year from now you would see the average calf measurement go up at least two inches!

2. Lack of stretch in performing calf raises. Most bodybuilders who complain of poor calf development use short, bouncy movements. Range of motion is critical to fully develop the calf muscles, which is why I recommend exercising the calves on blocks that are at least six inches high and slightly rounded. Rounding also makes the exercise more comfortable, as straight boards can dig into your arches. The absolutely best calf blocks are also covered with rubber so that you can do your calf training in bare feet for an even greater range of motion. Because many bodybuilders are not accustomed to working the calves through a full range of motion, for your next six calf workouts you should hold the bottom position for at least four seconds in order to relearn how to stretch.

3. Insufficient eccentric overload. Volleyball players and dancers are known for their superb calf development, and some exercise scientists suggest that it comes from jumping. This is partly true, but I believe the hypertrophy primarily comes from the landing portion of jumps. Studies in the field of biomechanics have shown the calves take a major portion of the load created dur-

ing the landing of a jump. Negative accentuated training, in which you raise with two calves and lower with one, is particularly good for calf training.

4. Bending the knees during straight-leg calf exercises. Bodybuilders who unlock their knees as they perform standing Donkey Calf Raises are basically cheating. To convince their poor egos that they are strong, they transfer the bearing of the load to the quads and glutes by bending the knees.

5. Blocked neural supply. An impingement of the nerve supply by a traumatized spine can block the neural output to the calf, forcing you to use loads that are not heavy enough to elicit a hypertrophy response. A simple spine-screening process and subsequent adjustments by a qualified health practitioner such as an osteopath or a chiropractor can often help your calves achieve additional levels of growth in just a few weeks.

6. Excessive connective tissue. If there is too much connective tissue in the calf region, there is no room for the muscle to grow. To resolve this problem, there is a surgical procedure available which entails opening up the fascia with a scalpel to allow the muscle room to hypertrophy. However, sportsmedicine pioneer Dr. Mike Leahy can accomplish the same results with his Active Release Techniques® Treatment, and can often achieve visible results after the very first visit!

▲ *Sergio Oliva was called the Myth because nobody could believe how big he was. In addition to his incredible back and arms, Sergio possessed awesome calves.*

Overcoming Sticking Points in Calf Training

Your calves can grow, but you must not only have the knowledge of how to train them but also the desire to endure the pain required to make them grow. For those willing to make a serious commitment to developing the calves, here are six practical tips (you can call them secrets if you like) that will vastly increase the effectiveness of your training.

1. Use the appropriate repetition protocols. How many reps you should perform in calf work depends on which exercise you are doing. In exercises where the knee is bent, such as Seated Calf Raises, most of the load is taken by the soleus muscles. The soleus is part of what kinesiologists call the anti-gravity muscles, that is, the muscles that fire when you are in the standing position. Muscle biopsies and autopsies have revealed that the soleus is composed of approximately 88 percent slow-twitch muscle, and therefore responds better to high reps. As such, performing sets that can be completed in less than 40 seconds won't do much for optimal development of the soleus. In exercises where the knee is straight, such as Donkey Calf Raises and Standing Calf Raises, the gastrocnemius handles most of the load. The gastrocnemius is composed of approximately 60 percent fast-twitch muscle, and responds best to sets that can be completed in approximately 20-40 seconds.

2. Pause in the bottom position. This simple trick will do a lot to promote growth in the calf muscles. After you have completed the eccentric (lower-

ing) part of every lift, pause in the bottom position before performing the concentric (lifting) part. The length of the pause should be one to four seconds (depending on the repetition bracket); and the higher the number of reps, the shorter the pause. To give you an idea of how this can work, for sets of 35-50 reps you may only pause 1 second at the bottom. For sets of 6-8 reps, the pause may need to be extended to 4 seconds.

▲ *The Dynamic Axial Resistance Device (D.A.R.D.) enables you to the work dorsi flexors of the lower leg very effectively. It can be obtained by calling 1-800-574-9060— I use it, and endorse it readily for calf training.*

3. Reduce lifting speed. Aim at taking five seconds to lift the weight and five seconds to lower it. Because you won't use momentum to help you complete the exercise, after six to eight reps at this slow tempo you will feel a significant build-up of intramuscular tension in the calf muscles .

4. Try unilateral training. If you have difficulty feeling the calf when training, you should find yourself in a new growth spurt once you start unilateral calf training. Experiment with Single Leg Calf Raises on the Standing Calf Raise Machine or Single Leg Calf Presses on the Leg Press. Concentrating your neural drive on a single limb will enable you to maximize the load on the calf muscle.

5. Perform Calf Raises on a Hack Squat Machine. Since both your body and the calf block are at a 45-degree angle, it will be easier mechanically to reach the top portion of the range. This effect will change the resistance pattern of the calf muscles, challenging the nervous system into new growth.

6. Train the muscles involved in dorsi-flexion. For maximum lower-leg development, all areas of the lower leg should be trained—and this includes the muscles on the front of the calf. When you perform these exercises be sure to pause in the bottom position for one to four seconds. Also, it's important to stretch the gastrocnemius and soleus muscles between every set of tibialis anterior work. Since the calf muscles are rather resilient to stretch, I would use the Standing Calf Machine to provide enough load to stretch the calf.

Whether or not calves will ever achieve the respect of other muscle groups is a question that I'm sure will be covered by other writers who can't think of anything else to write about. What I wanted to do was show those who want to develop bigger calves how to do it. Calf development probably won't change your life or get you the girl, but you'll be surprised—and perhaps even shocked—at how much they can grow.

"1982 Mr. Olympia Chris Dickerson and top bodybuilding pro Mike Matarazzo were born with great calves, and they did not have to labor at the calf machine."

Common Myths of Calf Training

Over the years I have come across some pretty ludicrous advice and theories about calf training. One explanation for this is that a lot of these articles are written by bodybuilders with great calves because they have the genetics for them. It's an interesting fact that true mesomorphs are born with naturally developed calves. Long-term kinanthropometric studies on over 40,000 Polish students revealed that to be born with great calves, more than any other anthropometric measure (i.e., shoulder width, wrist girth, etc.), means that you have an advantage towards building greater overall

muscle mass and strength throughout your life. Therefore, these same bozos who flood the information network with poor calf training advice do the same for other bodyparts as well. Regardless of the source, here are just a few of the myths I've heard about calf training.

MYTH 1: Because you stand and walk for several hours a day, your calves are accustomed to a lot of work. Therefore, you must perform high-volume calf work to shock them into growth.

REALITY: Other than a letter carrier or a grease-burger flipper at McDonalds, who else in our modern society does that much standing around and walking? It's true there is a relationship between volume and hypertrophy. But it's also true that one good calf workout consisting of 8 to 12 sets every 2 to 4 days should produce impressive calf development.

MYTH 2: Varying the foot orientation enables you to hit different parts of the calf muscles.

REALITY: Width of foot placement has more to do with calf recruitment than foot orientation. However, some MRI studies will show that turning the foot in or keeping it neutral during Donkey Calf Raises decreases the recruitment of the medial (inside) portion of the calves and increases recruitment of the lateral (outside) portion. In contrast, turning your feet out may increase the involvement of the lateral head and reduce recruitment of the medial head.

MYTH 3: Because the calves are so far away from the heart, it's hard to get a good pump because of the poorer blood supply.

REALITY: Any cardiologist or vascular surgeon who reads this will probably rupture their spleen with laughter. Although there is no physiological basis for it, this myth has been passed on to many generations of gym rats. The blood supply is ample enough, and the pump is dependent upon nutrient storage (ie., glycogen).

Chris Dickerson was lucky enough to have great genetics and a great coach when he won the Mr. Olympia. His coach was none other than Bill Pearl.

11

GET A CHIN-UP ON BACK TRAINING

If your upper back is not responding to high-tech exercises, it's time to return to the basics

◀*A wide back with mountains of muscle requires lots of hard work on heavy duty exercises such as Chin-ups. Just ask Aaron Baker!*

Isolation exercises such as Reverse Flys and the Upright Row are essential in the training of an elite-level bodybuilder. Only by performing a wide variety of exercises, each of which stresses the various muscle fibers from different angles, can bodybuilders refine their muscles to achieve an aesthetic, symmetrical physique. The primary goal of bodybuilders, however, is to pack on as much muscle mass as quickly as possible. For that, they must concentrate on the basics. For the upper back, the best bulking-up exercises—exercises that I consider essential for all bodybuilders—are chins.

Chins are exercises that many physique stars forget about or shy away from—perhaps because the exercises were associated with high school calisthenics classes or military training. But if you look at the physiques of male gymnasts, athletes who rely heavily on these exercises, you see that they possess a lot of beef on the chest, shoulders, and upper back. As a matter of fact, look into the backgrounds of many physique stars and you'll find high school gymnastics—particularly among female bodybuilders.

Although I don't mind an occasional pulldown exercise for the sake of adding variety to your workouts, I strongly believe that the Chin-up should be a key exercise for a bodybuilder. The effectiveness of chin-ups was clearly seen in the upper-back development of the gymnasts who medaled in the still rings at the Atlanta Olympics. Evidence is also available in the pictures of old-time strongmen who, despite the lack of pharmacological support and bootleg copies of Dan Duchaine's *Underground Steroid Handbook*, more often than not possessed tremendous lat development. Former Mr. America and circa 1980 strongman Mike Dayton (brother to my book editor Laura Dayton) held a world record for one-arm chins and often opened his show doing a hundred chins off the same ceiling girder he would use later to string his hangman's noose around. Going back even further into the history of the iron game, you can read about the magnificent upper bodies of the Greek Olympians—all thanks to chin-ups. Unfortunately, somewhere in the evolution of bodybuilding we got distracted, and the Chin-up has followed the way of the Full Squat and the Standing Military Press, only reappearing in bodybuilding magazines when the editorial staff can think of nothing else to write about.

▲ *Circa 1980 strongman Mike Dayton held a world record for one-arm chins. He often opened his strongman show performing a hundred chins off a ceiling girder.*

The fact is, the Chin-up is one of the best all-around exercises for the upper body, involving the latissimus dorsi, teres major, posterior deltoid, rhomboids, the sternal portion of the pectoralis major, the lower portions of the trapezius, and the elbow flexors. A chin-up specialization program will not only add impressive width and thickness to your back, but will also pack solid inches on your arms by promoting growth of your biceps, brachialis, brachio-radialis and pronator teres.

You only have to look at the arm development of Germany's Andreas Wecker and Italy's Yuri Chechi, Olympic gold medalists in gymnastics, to be convinced. These individuals are known not for their volume of training on the Scott bench, but instead for their countless chin-ups on the various gymnastics apparatus. And the Chin-up is not just for bodybuilders. A wide variety of sports require strength in these muscles, particularly sports that require powerful upper-body pulling actions, such as judo and wrestling.

I can already hear many lazy readers saying, "I'll just substitute pulldowns for chins." Sure, go ahead, but you won't get the same results. There are many neuro-physiological reasons why chin-ups are superior to pulldowns that I won't get into, but I can say for a fact that a great back can be built much faster through chin-ups than through pulldowns. Very much the same way that squats and deadlifts cannot be matched for lower-body development, chin-ups cannot be matched for upper-body development.

Okay, what about the Bent-Over Row—isn't that a great exercise for

upper-back development? Yes it is, but not the way it is commonly performed by most bodybuilders. The two biggest errors I see in this exercise are rounding the back instead of maintaining a good arch, and cheating so that instead of pulling with the lats, the legs are doing most of the work. As for the best grip to use and where to pull the bar, again a key training principle to development is variety: use wide grips, shoulder-width grips, pull to the chest and pull to the abdominal region.

There is a large variety of ways you can perform chins to emphasize specific areas. For example, you can get a tremendous biceps workout by performing chins with a narrower grip. In fact, if you include chins in your workout you may not need to perform specific biceps exercises!

One reason chins are so effective is that you have to move your entire bodyweight, and the stabilization required to do this (as opposed to using pulldown machines) involves more muscle mass. It's also more difficult to cheat when performing these exercises—for example, on the lat pulldown you can cheat by crunching forward with the abdominals. This is also one reason why the strength from chin-ups carries over well to pulldowns, but it often does not work the other way around.

▲ ***Bent-Over Row.*** *When used properly the Bent-Over Row is the single most effective barbell exercise for back development.*

Basic Training for Chin-ups

Let's begin with a few basic concepts. Chin-ups are performed with your palms facing you. When performed with your hands spaced shoulder-width apart, this exercise offers the greatest range of motion for the lats and biceps. Pull-ups are performed with your palms facing away from you, and one advantage is that they work the forearm muscles more and tend to put less stress on the wrists.

Regardless of the type of chin-up or pull-up you perform, your legs, torso and upper arms should remain in line with each other. Also, to achieve the fullest range of motion and thereby increase the amount of muscle mass recruited, at the start position your arms should be straight and your shoulder blades elevated. These exercises should begin with the combined bending of the elbows and squeezing of the shoulder blades, and full contraction of all the muscles at the end of the exercise. The breathing pattern is to inhale (or hold your breath) as you begin pulling and exhale as you lower yourself.

Wrist straps can be used if you find that your grip fatigues before your upper back. However, you should always perform at least one set of chins without straps to strengthen your grip. Also, an excellent way to improve your grip is to finish your chinning workout with one set performed on a thicker bar. If you don't have bars of different widths, simply wrap a towel or piece of foam rubber around the bar you normally use.

Performing chins requires a base level of strength. Women and heavier persons of both sexes may not have enough strength to perform multiple repetitions properly. I don't advocate the use of the Gravitron machine because it doesn't work the stabilizing muscles of the upper back. Instead, I prefer clients to develop adequate base chin-up strength by having a spotter assist them. Simply bend your knees and have the spotter lift your ankles with just enough assistance to allow you to clear the bar. Another way is to climb onto a bench so that you can start with your chin over the bar, and lower yourself slowly—performing these negative repetitions will eventually enable you to perform chin-ups in the normal fashion.

The variations are what make chins such an agreeable exercise. For example, narrow-grip chins with your hands about six inches apart will work the biceps brachii, while pull-ups with the same hand spacing will work the brachialis and brachio-radialis muscles. Also, performing the exercise with a V-handle (so that your palms face each other), will enable you to increase the work on your rhomboids and lower lat region.

To add more resistance you can have a spotter pull down on your ankles, or you can wear a chinning weight belt or hold a dumbbell between your ankles. What's great about these methods is that as you fatigue, you can reduce the resistance by releasing the weight (but please, not in the top position).

There is no such thing as a "best grip" for performing chins. Empirically speaking, the athletes I know with the best upper-back development use a variety of grips to recruit as many back muscles as possible. As for the difference between grips for chin-ups and pull-ups, remember that a pull-up is simply a variation of the chin-up. Chin-ups are performed with either a semi-supinated grip (palms facing each other) or with a supinated grip (palms facing your body). Pull-ups are chin-ups performed with a pronated grip (palms down), and chin-ups are performed with either a semi-supinated (palms facing each other) or with a supinated grip (palms facing you).

▲ ***Hand Position.*** *The Pull-up is performed with your palms facing you; the Chin-up is performed with your palms facing away from you.*

The most basic chin-up is the Supinated Chin-up, which offers the greatest range of motion for the lats and upper arms. Begin this exercise by grasping the bar with a supinated grip. Your hands should be spaced shoulder-width apart (or slightly narrower), and your arms should be fully extended with the torso in line with the upper arms.

Begin the ascent by drawing the elbows down and back, a technique that emphasizes the relatively strong muscles of the upper back and elbow flexors, and continue until your chin clears the bar. It's important during this portion of the exercise that the pulling and leaning-back actions be performed simultaneously. The legs should stay in line with the torso as much as possible, and there should be no flexion of the hips. At this point you lower yourself to the start position, fully extending your arms and elevating your shoulder blades. This last point is extremely important because to achieve a full range of motion, the upper arms and scapulae adductors must be stretched on every repetition. As for breathing, you should inhale when you start the exercise and exhale as you begin the descent.

Wrist straps can be used by those who have weak forearms and risk los-

ing their grip, or for trainees who find that their forearms are fatiguing before their upper back. However, for athletes other than bodybuilders, I prefer that straps are not used. In the real world of sports you need to use your lats without the help of crutches like straps.

Chin-up Progressions

Undoubtedly, the Chin-up requires a certain amount of strength. If you're a novice bodybuilder, or if you're returning to the weight room after an extended layoff, using a progression series I designed will help you quickly develop this minimum strength level. Using this type of progression I was able to increase the Women's Canadian National Ski Team's average number of chin-ups from zero to 12 reps in 11 weeks!

The first progression uses a spotter and starts by hanging from the chin-up bar with the knees bent. During the ascent, the spotter should support you by holding your ankles. If extra assistance is required during this phase, you can extend the legs against the spotter's base of support. Once you're able to perform 12 repetitions in this style with minimal assistance, you're ready to move on to the next progression.

In the second progression the same starting position is used, but this time only one ankle should be in the spotter's hands—the extra weight of the free leg will increase the overload on the muscles. When 12 repetitions can be performed with minimal assistance, you can move on to the next level.

In the third progression the exercise is performed in the same manner, but this time the spotter will hold you at the waist. As your strength increases, you will find that you require assistance only in certain parts of the exercise. At these parts of the movement your spotter should offer only enough assistance to help you clear the bar.

When you can perform the full range of movement without any assistance, you're ready to use additional resistance. An increase in overload is accomplished by using the following methods:

1. **Holding a dumbbell between the ankles**
2. **Wearing a power hook attached to a weightlifting belt**
3. **Wearing a chin/dip belt with weights attached to it**

▲ *Although everything about him was brutally huge, one of Lou Ferrigno's best bodyparts was his lats. He is shown here at the 1974 Mr. Olympia.*

Chin-up Variations

As gymnasts, wrestlers and judokas have proven throughout the years, there are many effective variations of this exercise that can boost your strength and back development. Here are a few:

Chin-up Variations

A. Narrow Parallel-Grip Chin-up
B. Narrow Supinated-Grip Chin-up
C. Subscapularis Pull-up
D. Sternum Chin-up
E. Narrow Pronated Pull-up
F. Mixed-Grip Chin-up
G. Mixed-Grip Chin-up II
H. Medium Parallel-Grip Chin-up

Narrow Parallel-Grip Chin-up. A narrow, parallel grip provides greater overload for the shoulder extensors, and many gyms are equipped with V-handles on their chin-up stations that are set six to eight inches apart. Focus on bringing your lower chest to the handles as you pull yourself up. This variation is for the advanced bodybuilder.

Narrow Supinated-Grip Chin-up. This variation increases the overload on the elbow flexors, and in fact, I consider it more of an upper-arm exercise than a torso exercise. In this chin-up the grip is supinated, and you leave only four to six inches between the little fingers.

Medium Parallel-Grip Chin-up. In this variation the chin-up handles are 22 to 24 inches apart and your hands are semi-supinated (palms facing each other). This hand position places the elbow flexors in their most effective line of pull, and therefore this is the type of chin-up in which you are most likely to be able to use additional resistance. You will also find that this grip creates the least amount of stress on your wrists, elbows and shoulders. Arthur Jones, of Nautilus fame, was a strong proponent of this hand position and used it in many of his machines.

▲ *Franco Columbu was renown for his exceptionally wide lat development. In this vintage photo from the 1974 Olympia, Tom Platz keeps an eye on the judges in the final moments of the competition.*

Sternum Chin-up. Popularized by Vince Gironda, this chin-up requires you to hold the torso in a layback posture throughout the entire movement. As you pull yourself to the bar, extend your head back as far away from the bar as possible and arch your spine. Towards the end point of the movement your hips and legs will be at about a 45-degree angle to the floor. Keep pulling until your collarbones pass the bar and your lower sternum makes contact with the bar and your head is parallel to the floor. You can use either a supinated or a pronated grip, and vary it from narrow to shoulder width, the latter requiring more strength.

I consider the Sternum Chin-up the King of Compound Exercises for the upper back. Not only does it create a great overload on the scapulae retractors, but it works more than just the lats. The beginning of the movement is more like a classical chin, the mid-range resembles the effect of the pullover motion, and the end position duplicates the finishing motion of a rowing movement. If you are an advanced trainee, especially if you are pressed for time, make the Sternum Chin-up a staple of your back routine.

Narrow Pronated Pull-up. With this pull-up you use a narrow, pronated grip so that the hands are spaced four to six inches apart. Because in this

anatomical position the biceps brachii have a rather ineffective line of pull, this grip increases the overload on the brachialis and brachio-radialis muscles. The Narrow Pronated Pull-up is another very effective upper-arm builder, particularly if your brachialis muscles are underdeveloped, and it tends to be easier on the wrists than the supinated grip.

Mixed-Grip Chin-up. Here's one you may have never seen before. In this variation you use a mixed grip: one hand pronated, one hand supinated. For example, on your first set, with the left hand use a supinated grip and with the right hand use a pronated grip—this variation places a greater portion of the load on the left arm. The stronger the trainee, the wider the grip. Make sure to perform an equal amount of work for both arms by reversing the grip on each alternating set.

Mixed-Grip Chin-up II. This is an even more advanced version of the Mixed Grip Chin-up and is performed by placing the support hand on the wrist of the working arm. The stronger the trainee, the lower the hand is placed on the working arm.

Subscapularis Pull-up. This is the exercise that Professor Mengele of Nazi infamy would prescribe if in charge of a bodybuilder's training. To perform the Subscapularis Pull-up you assume the starting position of the Wide-Grip Pull-up and pull yourself to the bar until your upper pecs make contact with the chin-up bar. This is where the fun begins. At the top of the movement you push yourself away from the bar and lower yourself under control, a technique that will shock your subscapularis muscles. Believe me, you will curse me for three days after you perform this one.

The Gymnast's Extended-Set Back Routine

"This routine is for the advanced trainee only and is inspired by the routines that Olympic gymnasts perform to condition their powerful backs."

This routine is for the advanced trainee only and is inspired by the routines that Olympic gymnasts perform to condition their powerful backs. You must be able to complete 12 shoulder-width supinated chins in strict form to do this routine.

1. **Wide-Grip Pull-ups: as many reps as possible**
2. **Rest 10 seconds**
3. **Medium-Grip Pull-ups: as many reps as possible**
4. **Rest 10 seconds**
5. **Medium-Grip Chin-ups: as many reps as possible**
6. **Rest 10 seconds**
7. **Narrow-Grip Chin-ups**
8. **Rest 3 minutes**
9. **Repeat steps 1 to 8 twice, cry and curse me!**

André "The Flying Squirrel" Routine

This routine is named after André Benoit, holder of the fastest start in Luge doubles at the Lillehammer Olympics, who could do wide-grip pull-ups with a 120-lb dumbbell for a set of 3 reps on a 401 tempo. It is reserved for people who can chin-up with at least 33% of their bodyweight as an additional load for 8 reps using a supinated, shoulder-width grip.

1. Sternum Chin-ups:
5 x 4-6 on a 601 tempo,
resting 4 minutes between sets.

2. Subscapularis Pull-ups:
3 x max reps on a 501 tempo,
resting 3 minutes between sets.

3. Negative Close-Grip Chins:
3 x 4-6,
resting 3 minutes between sets,
lowering the body for a 6- to 8-second count on every rep.
Use additional loads if possible.

"This routine is reserved for people who can chin-up with at least 33% of their bodyweight as an additional load for 8 reps using a supinated, shoulder-width grip."

Now that you understand why you should perform chin-ups and how to incorporate them into your workouts, you can rest assured that you will soon be able to achieve outstanding back development. Of course, you're bound to get stared at when you start performing these exercises and routines, but those looks of puzzlement will quickly turn to looks of admiration as your back begins to take on new and pterodactyl-like proportions!

12

SHOULDERS OF STEEL

If you want shoulders like boulders, you can't have a pebble for a brain!

◀ *Wide, fully developed shoulders add mountains of impressive muscle to a bodybuilder's physique. Unfortunately, most bodybuilders don't give them the attention and training they deserve. (Dave Fisher)*

With the possible exception of Howard Stern's "Fartman," the typical male superhero always possesses wide, full deltoids. In fact, while preparing for his role as Superman, Christopher Reeve underwent a strenuous weight training program that emphasized shoulder width to produce the much admired V-taper associated with his character. David Prowse, the weightlifter who trained him for the role, said that he had Reeve do minimal chest and trapezius work so as not to detract from his delt development—a strategy designed to make Reeve look more like a gymnast than a bodybuilder. It worked, and Reeve's Superman movies inspired many of us to "Fight for Truth, Justice and the American Way." Or at least do a few extra sets of delt work.

For a bodybuilder, interest in shoulder work seems to come only after a prolonged period of chest specialization. The primary reason is that the chest muscles develop quickly and receive considerable development from bench pressing, an unfortunate (and unnecessary) mainstay of the routines of most bodybuilders. In fact, it's rare to find a gym that doesn't have at least a dozen rookie bodybuilders whose misguided training methods make them look as if they have breasts instead of pecs.

When a bodybuilder consults me about training, the first thing I do is look

for the weak points in their physique. Then I develop a short-term plan, usually six weeks for experienced bodybuilders and four weeks for beginners, that addresses those weak points. I believe this is the best way to approach training for today's physique competitor. Although Tom Platz's freaky legs helped him place high in the Mr. Olympia over a decade ago, he would have had a more symmetrical physique (and might even have won the competition) if he had focused less on his legs and more on his upper body.

▲ *Samir Bannout, 1983 Mr. Olympia, knew the importance of good deltoid development. He is shown here pumping up his delts just before going on stage.*

Balanced development is also important because often a bodypart looks small when adjacent muscle groups are small. For example, increasing the size of your calves will give the illusion that your thighs are bigger than they actually are. (This effect also works in reverse—women will wear high heels so that their calves and their thighs look smaller.) In addition to making the waist look smaller, having well-developed deltoids makes the arms look bigger as you get more of a "3-D look."

The Keys to Shoulder Girth

Wide shoulders are a result of how much muscle mass you possess and of the length of the bones of your shoulders, which is technically referred to as the bio-acromial width. Although there is speculation that weight training can increase bone length, I haven't seen any convincing studies on this subject. Not even the prestigious Joe Weider Research Clinic has come up with anything—although I'm certain that as you read this, there are at least a dozen top-named pro bodybuilders and exercise scientists at Joe's laboratory evaluating data on this hypothesis. Seriously, by the age of 21 your shoulder bones will be about as wide as they're going to get, and there's probably nothing you can do to influence their growth beyond what will be obtained by having a diet that contains adequate amounts of calcium.

Although there is apparently nothing you can do to increase your bio-acromial width, there are ways (other than malnutrition) to decrease it. If you take anabolic steroids before age 21, you may in fact take away some of the growth potential because steroids can prematurely close the growth plates located in the bones. Injury that occurs from improperly designed workouts

could also cause the growth plates to prematurely close, but such injuries are rare and in my opinion cause an overreaction in many doctors and other medical people who don't understand weight training. After all, many weightlifters start lifting weights in pre-pubescence, especially in European countries, without suffering from these effects. Furthermore, the studies available on this subject conclude that two of the major causes of such injuries are poor lifting technique and use of maximal weights by individuals who are not adequately prepared to lift them. For more on this subject and on other injuries that could occur to youngsters who lift weights, I recommend the second edition of the excellent weight training textbook *Designing Resistance Training Programs* by Steven Fleck and William Kraemer.

The second factor to consider in widening the shoulders, and the one that is more under your control, is muscle growth. The deltoid is a muscle group with three heads: anterior (front), medial (side) and posterior (rear) heads—or in the case of Richard Simmons, the inferior, the pitiful, and the pathetic. To achieve that melon-like deltoid shape, you need to develop each head equally, and later in this chapter I will present several effective workouts to help you accomplish this. But first, I think it's important to take a close look at what most strength training experts (and self-proclaimed experts) consider the most basic shoulder exercise, the Military Press.

"To achieve that melon-like deltoid shape you need to develop each head of the shoulders equally."

A Pressing Question

The Military Press is a tremendous shoulder exercise for all levels of strength trainers. Because your elbows are flared out during the exercise, most of the work is done by the lateral head of the deltoids; the anterior deltoid works only at the beginning of the movement. The Military Press is also an excellent exercise for the serratus anterior because this muscle group pulls the scapulae upward. (By the way, if you do Pullovers to work your serratus anterior, you are wasting your time—Pullovers work the muscles antagonistic to this muscle group.)

One common story I hear from frustrated trainers is the reason they don't perform either the Military Press or the Behind-the-Neck Press is that it hurts their shoulders. The typical scenario is this: they start with the Behind-the-Neck Press, then when that exercise becomes too painful they switch to the Military Press, which in short order pinches so badly they try the Incline Press and finally the Bench Press. Eventually, even the Bench Press causes pain, and they are forced to regress to a geek routine of Lateral Raises. Let's take a closer look at the real cause of shoulder pain.

There are several reasons the shoulder can become injured from overhead presses like the Military Press. The first is lack of attention to training the external rotators of the humerus. These muscles need special attention to prevent injury. According to sportsmedicine guru Dr. Mike Leahy, a muscle imbalance between the prime movers of the shoulders and the external rotators is one of the major causes of shoulder injury. Although it means setting aside your ego and performing exercises that don't allow you to use heavy weights, a few minutes a week performing

Mohammed Makkaway was one of the most symmetrical bodybuilders of the 1980s, largely because of his excellent shoulder development!

exercises for the external rotators will do wonders for preventing chronic shoulder problems. (For a complete selection of exercises for the external rotators, refer to Chapter 14.)

Another reason many bodybuilders develop problems from overhead presses is muscle imbalances. If bodybuilders don't perform enough work for their upper-back muscles, particularly those that help extend the spine, they develop a humpback appearance that is more appropriate for primates. According to Paul Chek, bodybuilders with this type of posture put considerable stress on the shoulder capsule when they perform Behind-the-Neck Presses, a stress that can eventually cause permanent instability in the joint. Chek says this stress can also strain the upper-back muscle called the levator scapulae that, when strained, is responsible for causing that chronic "crick" in your neck that makes it painful to turn your head. So it's not that the Behind-the-Neck Press is such a bad exercise, but more to the point, you have to have good posture to be able to perform it correctly!

Another problem with overhead pressing is that most trainers simply don't know what the hell they're doing! The most common technical fault is not performing the exercise throughout a full range of motion, preferring instead to lower the weight only to ear level. Although you will get considerable triceps training out of this practice, you will get very little in terms of shoulder development, and this may contribute to the development of postural problems that can eventually cause injury.

Tips on Shoulder Workout Design

Unless you are a powerlifter or Olympic lifter, I really can't see the need to perform any isolation work for the anterior deltoid with exercises such as the Front Dumbbell Raise. The fact is that the anterior deltoids usually receive more than enough development from the high volume of chest work that most lifters employ—if they have even a moderate level of machismo—so additional work will probably result in overtraining. What

most bodybuilders need is to work very hard on exercises for the lateral and posterior heads of the deltoids.

Regardless of the exercises performed, one of the most confusing aspects of designing a shoulder workout (or any workout, for that matter) is determining how many sets and reps to perform. Powerlifters and Olympic lifters have built impressive shoulders using low reps for multiple sets, whereas there are plenty of bodybuilders who have achieved fantastic deltoid development by concentrating on high reps and fewer sets. I believe that the best approach is a combination of both methods, which means that you would perform periods of high reps, alternated with periods of lower reps.

If you need to get into a shoulder specialization program, you will have to cut back on the amount of work you devote to other bodyparts, particularly the chest muscles. And for maximum results, the shoulders should be trained first in a training session.

A Few Examples

First-time clients of mine are surprised about how little shoulder work I prescribe in my bodybuilding programs. This is because if you train properly in the major compound movements such as presses and chins, there is no need for direct deltoid work. However, if you've found that your shoulders need special attention, experiment with the following routines.

Pre-Exhaustion Shoulder Routine

This routine is particularly effective for bodybuilders who lack medial and posterior deltoid development. To maximize the pre-exhaustion effect, it is designed so that there is no rest between the first and second exercises of each superset.

▲ ***Seated Cable Row, shown near its completion.***
This exercise when performed to the neck is excellent for developing the muscles of the upper trapezius and rhomboids.

Exercise	Sets/Reps	Tempo	Rest Interval
Superset			
A1. Standing Lateral Raise	3/10-15	20X	none
A2. Cable Upright Row	3/10-15	20X	90 seconds
Superset			
B1. Bent-Over Lateral Raise	3/10-15	20X	none
B2. Seated Cable Rowing to Neck	3/10-15	20X	90 seconds

Notes: For the Standing Lateral Raises—note that I call these Lateral Raises rather than the redundant name Side Lateral Raises—you should maintain a 5-degree bend in the elbows. Also, concentrate on accelerating the dumbbells during the concentric contraction, not swinging the weights with the help of the lower back.

When performing the Cable Upright Row, grip the bar so that the thumbs are just outside your lateral thigh sweep, and only pull the bar until it is level with the clavicles. Also, if you find this exercise strains your wrists, try using the rope handle normally used for triceps extensions instead of a straight bar.

For the Bent-Over Lateral Raises, rest your forehead on an incline bench and bend your knees slightly to alleviate the stress on the lower back.

▲ ***L-Lateral Raise.*** *This exercise, from the Jerry Telle routine, requires good concentration. It's important to maintain a 90-degree bend in the elbows. Begin with palms facing each other, and finish in the position shown.*

Jerry Telle Routine

This routine is particularly effective for bodybuilders who lack medial deltoid development and have especially weak external rotators. It was designed by Jerry Telle, an innovative personal trainer and strength coach from Denver.

Exercise	Sets/Reps	Tempo	Rest Interval
Superset			
A1. L-Lateral Raise	3/6-8	202	none
A2. Arnold Press	3/6-8	303	90 seconds
Superset			
B1. Shoulder Horn Raise	3/6-8	303	none
B2. Muscle Snatch	3/10-15	102	90 seconds

Notes: Because of the more advantageous leverage associated with L-Lateral Raises, it's more effective to use a slower tempo of execution than you would when performing other shoulder exercises with dumbbells, such as the Standing Lateral Raise.

With the Muscle Snatch, you snatch the weight to forehead level and then press out the remainder of the motion. It's relatively easy to learn, but you should have an Olympic lifter or strength coach teach it to you. Also, it's not necessary to perform it from the floor; mid-thigh position is fine. If you can't get the hang of this exercise and can't find someone to teach it to you, substitute the Barbell Shoulder Shrug. However, don't roll back the shoulders

at the top of the movement—all it really does, at most, is put harmful stress on the acromio-clavicular joint.

Heavy-Light Pressing Routine

This method will improve both mass and strength in the motor units involved in pressing movements—but expect to experience some deep soreness from it. The rationale is that you knock off high-threshold motor units in the first exercise, and proceed to further exhaust the lower-threshold ones as you go through your routine. Also, by switching slightly the groove of the fundamental exercise as you go through the routine, you will be able to draw from a wider motor unit pool.

Make sure to rest four to five days between these workouts, and never perform this routine for more than four workouts in a row.

Notes: When using any of the Hammer equipment, consider that the leverages are such that you can often handle two or three times as much as you could in the barbell version of the same exercise.

Everybody wants wide shoulders, but bodybuilders need wide shoulders to set off the rest of their physique and give it balance. What's also good about shoulder training is that you don't have to dress like a superhero with tight fitting, tapered tank tops to show off your hard work—shoulders are very hard to hide. Superman showed us the way with his physique. The only question is, how did he keep his identity from Lois Lane for so long when she was surely intimately familiar with his fantastic shoulder development?

"This heavy-light pressing routine enables you to stress both the low- and high-threshold motor units for maximum muscular development."

Exercise	Sets/Reps	Tempo	Rest Interval
Superset			
Seated Dumbbell Press	4/4-6	501	3-4 minutes
Seated Front Press	3/6-8	302	2 minutes
Hammer Press Behind Neck	2/15-20	201	60 seconds

13

PUMPING AND PRESSING FOR PERFECT PECS

Break your bench barriers and pectoral sticking points with this "pressing" advice

◀*Craig Titus may be a controversial figure in bodybuilding, but everyone agrees that his physique is one of the beefiest. His chest development is one of his strongest points.*

After "How do I get pillows of pecs á la Arnold and Craig Titus?," the first question that arises in chest training is "Where do I set the angle of the incline bench?" Does a higher incline work the upper pectorals or primarily the shoulders? For that matter, is there really such a bodypart as the upper pectorals? And after trying most increments of the bench, the novice trainer most likely questions whether or not the adjustable levels are just a marketing gimmick.

To begin clearing up the confusion, in kinesiology the upper pecs are considered to be the clavicular portion of the pectoralis major, not a distinct and unique bodypart. When fully developed, the upper pectorals do give the impression of a deep rib cage and powerful posture.

As to the other questions, one study on chest training found that the Flat Barbell Bench Press was just as effective as the Incline Barbell Press for recruiting the pectoralis major. However, I've discussed this study in detail with experts in electromyography and neurophysiology, and there is concern about the methodology of the study. Their opinions, along with the empirical experience of bodybuilders, makes me suspect that the jury is still out on the matter of what is the single best angle to work the upper chest.

As far as being a marketing concept—the first 30 degrees of angle on most benches should not require pins, as they are virtually of no use.

My opinion is that a variety of angles are necessary to achieve maximum development. This is because each angle taps into different motor units, and the variety will be less stressful on the rotator cuff muscles.

The following routine, which Dan Duchaine helped me develop, effectively targets the upper pecs. It is quite intense, working the upper pecs from a variety of angles, and will cause considerable soreness.

1. **60-degree Incline Dumbbell Presses; do a set of 6-8 RM on a 302 tempo.**
2. **Rest 10 seconds (only ten seconds!) while lowering the bench 5-10 degrees.**
3. **50- to 55-degree Incline Dumbbell Presses; do a set of 6-8 RM on a 302 tempo.**
4. **Rest 10 seconds while lowering the bench 5-10 degrees.**
5. **40- to 45-degree Incline Dumbbell Presses; do a set of 6-8 RM on a 302 tempo.**
6. **Rest 3 minutes.**
7. **Repeat steps 1 to 6 twice more.**

If you have good muscular endurance, you should be able to use the same weights for every set. Otherwise, you will probably have to decrease the weight with each angle. Also, don't be concerned about having the exact angle of incline for each exercise—simply lower the bench a notch each set.

▲ *Arnold's legendary side chest pose was one of his trademarks. In this vintage photo training partner Franco Columbu looks on.*

Regardless of what angle the bench is set at, it's important to pay attention to head posture while pressing. In order to lift the highest load, the back of your head should make contact with the bench's upholstery—in fact, you should be pressing it into the bench. Pressing your head into the bench (as in doing a neck extension) will increase your strength by creating a neural response that activates the muscles used in the bench press.

Dips—The Forgotten Chest Builder

Although the Bench Press is considered the King of Upper Body Exercises, dips are an excellent way to work the chest, in addition to affecting the anterior shoulders and triceps.

Dips have gotten a bad rap for being hard on the shoulders, but like the controversy surrounding squats, there's simply no evidence to support this. More likely, the exercise is more work than most people want to exert and they're looking for an excuse.

There are two basic types of dips. The Shoulder and Triceps Dip emphasizes the anterior shoulder, all three heads of the triceps, and to a much lesser degree, the pectorals. The Chest Dip emphasizes the pectorals and the lateral head of the triceps.

In the Chest Dip your hands should be slightly wider than shoulder-width apart. As you dip, your elbows will be flared out and you will lean forward. Instead of thinking about pressing with your arms as you come up, try to focus on bringing your elbows together and squeezing your pecs. If your gym has a V-dip bar, the narrower part of the handles will be in front of you.

In the Shoulder and Triceps Dip, your hands should be about hip-width apart. You will stay upright throughout the entire exercise, and your elbows will be close to your sides. Again, if your gym has a V-dip bar, the narrower part of the handles will be positioned in front of you—always face the V.

▲ *When it comes to great chests, you might as well be reading the list of the world's greatest bodybuilders. Lee Haney certainly ranks toward the top of that list.*

With both versions, your wrists should be straight, in line with your forearms. This will minimize the pressure on your wrists. You can also perform all versions of dips with either a thumbless grip or with your thumb wrapped around the bar—it doesn't make a difference in development, but most people find one version more comfortable than the other.

If you cannot perform either version of dips throughout a full range of motion, use a spotter as you would with chin-ups, having the spotter lift your ankles. You can also develop strength by first performing negatives, in which you get into the start position, and then lower yourself slowly. Likewise, when this becomes easy, the spotter can pull down to make the exercise tougher. If you don't have a spotter, wearing a chinning weight belt, or holding a dumbbell between your ankles, increases the difficulty.

Chest Training and Machines

When I consult with athletic teams or individual clients about weight room design, I never suggest they purchase a Smith machine. It makes a great picture in a magazine, but there are many drawbacks to this piece of equipment.

▲ *Mike Dayton still relies on dumbbell work to build the versatile strength he needs to tear phone books and break handcuffs in his strongman shows.*

The shoulder operates in three planes. Because the Smith machine stabilizes the weight for you, shoulder stabilizers such as the rotator cuff muscles do not need to work hard when performing exercises on this device. This creates an imbalance in these muscles, predisposing the individual to injury.

As a therapist who has treated numerous weightlifting injuries, Paul Chek has identified what he calls a "pattern overload syndrome." He teaches in his seminars and videos that the Smith Machine Bench Press is one of the most common sources of shoulder injuries.

This is what Chek has to say about it: "People using the Smith machine get a pattern overload. The more fixed the object, the more likely you are to develop a pattern overload. This is because training in a fixed pathway repetitively loads the same muscles, tendons, ligaments and joints in the same pattern, encouraging microtrauma which eventually leads to injury. If Johnny Lunchpail always uses a Smith machine he always works the same fibers of the prime movers in the Bench Press: the triceps brachii, pectoral major, long-head of the biceps, anterior deltoids and serratus anterior. This will lead to repetitive stress syndrome types of injury."

Finally, because of the mechanics of the human shoulder joint, the body will alter the natural bar pathway during a free-weight Bench Press to accommodate efficient movement at the shoulder. The fixed-bar pathway of a Smith machine does not allow alteration for efficient movement of the joint, thereby predisposing the shoulder to harmful overload via lack of accommodation. In other words, the Smith machine is a training piece for dorks. If you are interested in training longevity, you are far better off sticking to the standard barbell and dumbbell exercises.

The Future of Pec Training: The Swiss Ball

One of the most exciting training methods available for chest training is the Swiss ball, which is used instead of a flat bench. The Swiss ball had its origin in the land of watches and gruyére cheese, where therapists have used it extensively in the rehabilitation process of their patients. Here are a few advantages of the Swiss ball:

1. The round surface allows you to lower the dumbbells over a great range

of motion, thus providing the pec muscles a much better stretch. It also enables you to lift up your rib cage to fully stretch the pectorals.

2. You will be forced to control your movements, because if your form gets sloppy you will probably end up a few exercise stations away, with the dumbbell manufacturer's logo permanently imprinted on your forehead.
3. The instability of the Swiss ball requires extensive recruitment of the body's stabilizers, which enables you to recruit more muscle fibers and become more resistant to injury. To help injury-proof their athletes, my colleagues André Benoit and Paul Gagné rely heavily on the benefits of the Swiss ball for chest training.

One exercise I really like with the Swiss ball for chest training is the Eccentric Incline Dumbbell Bench Press. This one is a beauty that I came up with while giving a seminar for personal trainers. What happened was someone in the audience asked me how to train the clavicular pecs eccentrically when training alone. So I came up with the idea of using the Swiss ball for it.

Here is how it's done: Press the dumbbells up in the flat bench position. Once your arms reach the extended arm position (near lock-out), keep your torso stable and lower your hips as much as possible. Since you are weaker in the incline press than in the flat press position, you use the strong leverage from the flat position to help you get the load up for the eccentric portion. Lift your hips and repeat the exercise.

▲ *Because so many bodybuilders are preoccupied with a great chest and Bench Press, they do not need to work the anterior deltoid. (Mick Sousa)*

Keys to Bench Press Success

Although the Bench Press seems like a simple lift to train for, to achieve optimum results you must consider all the variables that contribute to success. The first step, therefore, is to learn proper form from a qualified powerlifting coach. In the sport of powerlifting there is only one coach whose worldwide acclaim and accomplishments have rightfully earned him guru status, and that man is Louie Simmons, whose athletes have achieved the following "benchmarks":

√ Ken Patterson benched 728.5 lbs at 275 lbs for a world record
√ Doug Heath benched 407 lbs at 132 lbs, also for a world record, making him one of 15 in the world to bench over triple their bodyweight
√ 24 athletes who have bench pressed over 500 lbs
√ Only gym owner to have 3 lifters bench press over 600 lbs, all of them juniors!

Because I get a lot of letters from bodybuilders who are obsessed with improving their bench press, I thought I'd share some of Simmons' ideas on this topic. Simmons says that correct Bench Press form should be practiced on every rep, of every set, of every training session. In this regard, one of

his favorite teaching techniques is to tell his athletes to imagine pushing themselves through the bench—that is, pushing away from the bar. He says it's also important—and this has been proven by biomechanical studies on elite athletes—that you emphasize controlling the descent of the bar. In addition to giving you greater control of the bar path, lowering the weight slowly and under control at all points of the exercise will minimize the stress on the shoulders.

▲ *Even in historical photos of the sport, chest development is always apparent. This impressive side chest belongs to 1976 Mr. America Kal Szkalak.*

A major mistake that Simmons says most athletes make is that they train the bench press too often and too heavy. In fact, he believes that you don't have to perform the bench press to improve it. "The bench press itself does not stall," says Simmons. "When your bench press fails to go up, what is holding you back is a weak muscle—and the way to strengthen a weak muscle is with assistance exercises."

The secret, then, to improving your bench press is to determine which muscles are the weak link in your bench press, and then perform the appropriate exercises to strengthen them. "It should also be clear that the body is always changing; therefore, the training of the lifter should also change," says Simmons. To help his lifters adjust to their bodies' changing training requirements, Simmons has selected a base of 70 assistance exercises to improve the bench press, each designed to strengthen specific muscles. Among his favorite exercises are the following: Rack Lock-outs, Seated Half Presses in Rack, Cambered Bar Bench Presses, Close-Grip Steep Incline Presses, 4- and 6-inch Board Close-Grip Bench Presses, and Floor Presses.

When selecting exercises to work on an athlete's weak links in the bench press, Simmons pays special attention to the deltoids, triceps and upper back.

The Program

From a periodization perspective, Simmons likes to use mini-cycles lasting approximately four weeks. "For example, we may start the first weeks with rack lockouts. The bar is pressed for a range of four inches, and we work up to a max single. The next week, we drop the pins one inch, and for the third and fourth week we drop the pins another inch. That's one cycle." In the next cycle Simmons has his athletes perform Board Presses. The Board Presses are Bench Presses performed through a partial range, the movement being limited by a 2-inch x 6-inch board that a training partner holds on the athlete's chest.

Another aspect of his program is planning for variation in speed of contraction. "For example, on triceps work, one day they are done with a pause in the stretch position to build explosive strength by overcoming inertia. The next time we do triceps work in a continuous tension system, a key element for maximal strength development."

For assistance exercises, Simmons likes to emphasize one assistance

exercise for the bench press, performing 5-6 sets working up to a max single, and then finishing with high reps, often up to 15. Another favorite method, particularly for the triceps, is to pick 2 exercises and perform 4 to 7 sets, 5-8 reps, with very short intervals (as little as 30 seconds). He says this training method, which he calls the "incomplete rest interval method," fosters more fiber recruitment.

Simmons has his athletes work assistance exercises hard—just as hard as if they were the Bench Press itself. Simmons says, "It is crucial to strive for record performances in assistance exercises," and I heartily agree with him. When I was training Jud Logan for the hammer throw, he finished my 22-week cycle with one of the biggest power cleans in the country (440 lbs!), even though he only performed the lift for the last 3 lifts of that cycle.

Simmons has developed a holistic approach to strength development, taking into consideration all the major variables of training. Most likely, some of these training methods will work so-so for you, while others will be just the thing you need to break past your training plateaus.

Poliquin's Beginner Bench Press Specialization Workout

This is a 3-week program. Letters indicate exercises you superset.

EXERCISE	WEEK	SETS	REPS	TEMPO	REST
A1. Mid-Grip Bench Press	1	3	8-10	301	90
	2	4	6-8	301	90
	3	4	5-7	301	120
A2. Shoulder-Width Supinated Chin	1	3	8-10	221	90
(Pause is when chin clears the bar.)	2	4	6-8	221	90
	3	4	5-7	221	120
B. Back Squat	1	3	10-12	402	180
	2	3	8-10	402	180
	3	4	6-8	402	180
C1. Bent-Over Rows	1	3	8-10	301	90
	2	4	6-8	301	90
	3	4	5-7	301	120
C2. Incline Cable Fly	1	3	10-12	303	90
(Grip is about 15 inches wide.)	2	3	8-10	303	90
	3	4	6-8	303	120
D1. Standing EZ Bar Curls	1	3	10-12	302	75
(Make sure elbow flexors are stretched	2	3	8-10	302	75
fully in bottom. Wrists are neutral.)	3	4	6-8	302	90
D2. Decline Triceps Extensions	1	3	10-12	302	75
(Upper arms stay still. Emphasize a full	2	3	8-10	302	75
stretch of triceps. Elbows go short of	3	4	6-8	302	90
lockout.)					

Poliquin's Intermediate Bench Press Specialization Workout

This is a 3-week program, used four days per week. Following the three weeks, go back to your regular workout for 3 weeks. Return to this in weeks 7-9 and you will see noticeable improvements.

EXERCISE	WEEK	SETS	REPS	TEMPO	REST
Day 1: Upper Body					
A1. Mid-Grip Bench Press	1	6	6,4,2,6,4,2	402	90
	2	6	6,4,2,6,4,2	402	90
	3	5	5,3,5,3,5	402	120
A2. Semi-Supinated Chin-Up	1	6	6,4,2,6,4,2	402	90
	2	6	6,4,2,6,4,2	402	90
	3	5	5,3,5,3,5	402	120
B1. Incline Barbell Press	1	5	8,6,4,6,4	402	90
(Palms up, shoulder-width grip. Pause is	2	5	8,6,4,6,4	402	90
at 30 degrees of elbow flexion.)	3	5	7,5,3,5,3	402	120
B2. One-Arm Rows	1	5	8,6,4,6,4	402	90
	2	5	8,6,4,6,4	402	90
	3	5	7,5,3,5,3	402	120
Day 2: Lower Body					
A. Romanian Deadlift	1	3	10-12	302	180
	2	4	9-11	302	180
	3	4	8-10	302	180
B1. Dumbbell Step-up	1	3	12-15	30X	90
(Step-up up explosively)	2	4	10-12	30X	90
	3	4	9-11	30X	90
B2. Prone Leg Curl	1	3	8-10	311	60
	2	4	6-8	311	60
	3	4	4-6	311	60
C1. One-Legged Calf Raise	1	3	15-20	221	90
	2	4	12-15	221	90
	3	4	1-15	221	90
C2. Twisting Crunches on Swiss Ball	1	3	12-15	202	45
	2	4	10-12	202	45
	3	4	8-10	202	45

Poliquin's Advanced Bench Press Specialization Workout

This is a 3-week program, used four days per week. It can be used with the intermediate program above for a 6-week cycle.

EXERCISE	WEEK	SETS	REPS	TEMPO	REST
Day 1: Upper Body					
A1. Paused Bench Press	1	6	5,3,2,2,3,5	311	120
	2	6	4,3,3,3,3,4	321	120
	3	6	3,2,1,1,2,3	331	120
A2. Pronated Pull-up	1	6	5,3,2,2,3,5	311	120
	2	6	4,2,2,2,2,4	321	120
	3	6	3,2,1,1,2,3	331	120
B1. Press Behind the Neck	1	5	8,6,4,6,4	402	90
	2	5	8,6,4,6,4	402	90
	3	5	7,5,3,5,3	402	120
B2. Scott EZ Bar Curl	1	3	8-10	322	90
(Use palms up, shoulder-width grip.	2	4	6-8	322	90
Pause is at 30 degrees of elbow flexion.)	3	4	5-7	322	120
C. Triceps and Shoulder Dips	1	3	8-10	322	90
(Tuck elbows into sides.)	2	4	6-8	322	90
	3	4	5-7	322	120
Day 2: Lower body, Abs					
A1.Snatch Deadlift	1	3	8-10	404	120
	2	4	6-8	404	120
	3	4	5-7	404	120
A2. Kneeling Leg Curl	1	3	8-10	311	60
	2	4	6-8	311	60
	3	4	4-6	311	60
B1. Hanging Leg Raise	1	3	12-15	201	60
(Use elbow or wrist straps)	2	4	10-12	201	60
	3	4	8-10	201	60
B2. Swiss Ball Crunch	1	3	12-15	202	60
(Anchor feet to floor. Use plate for	2	4	10-12	202	60
extra upper body resistance.)	3	4	8-10	202	60

14

TWIST AND SHOUT!

How to keep your external rotators from putting a stop to your workouts

◀ *The phenomenal back development of Mr. Olympia Dorian Yates is just one of the reasons he is considered unbeatable.*

If you scan old issues of *Muscle Builder* you'll notice that physiques have changed radically over the years. Jack Delinger shocked the 1950s bodybuilding public with his awesome 50-inch chest. When Larry Scott's arms bulged past the 20-inch mark he made history. However, placed side by side with physique photos of today, the stars of yesteryear are just tiny pinpoints of light. Today's obsession with big, bigger, biggest has produced dimensions and cuts that are truly mind-boggling. Unfortunately, this preoccupation with developing big, showy muscles has resulted in many a bodybuilder overlooking some of the smaller muscles, especially the external rotators of the shoulders. Such an oversight has put an early end to many physique careers.

Dennis Tinerino's strong and healthy shoulders contributed to his success at bodybuilding and weightlifting. Tinerino won the first natural bodybuilding contest in 1979.

When I speak about external rotation of the shoulder, I'm referring to the motion of moving the biceps away from the body or backwards. When Pete Sampras follows through on a backhand, he's performing external rotation. When Cochise raises his hand to say "How!" to John Wayne, he's performing external rotation. Although many muscles are involved in these activities, the two most important ones are the teres minor and the infraspinatus. These muscles lie adjacent to one another, originate on the scapula and insert on the humerus, and comprise two of the four muscles known as the rotator cuff. From a biomechanical perspective, the teres minor and the infraspinatus help stabilize the shoulder and are therefore crucial for protecting this area from injury.

Muscle Media's Executive Editor Bill Phillips was a classic example of a bodybuilder who neglected his external rotator muscles and suffered because of it. The muscle imbalances he developed from incomplete training caused shoulder pain and problems with his benching. After starting an extensive program of exercises for the external rotators—coupled with some Active Release Techniques Treatment® from Colorado Springs chiropractor Dr. Mike Leahy—Bill was able to start bench pressing his original poundages in perfect form.

Injury prevention is only part of the benefit of training the external rotator muscles—these muscles can dramatically improve posture and enhance the physique. Interestingly, a lot of my clients report that they feel more comfortable in their dress shirts after training the external rotators. This improved fit is a result of their shoulder blades moving back into proper alignment. Plus, the added mass on the lateral borders of the upper back finesses the symmetry of the back. One reason Robbie Robinson possessed one of the best backs in the business was that he had an impressive, three-dimensional look—every single muscle that makes up the upper back structure was fully developed. Such a level of physical refinement set Robbie Robinson apart from

his competitors, and he deserves recognition for setting a standard that few have equaled.

Why Train the External Rotators?

To quote Dan Pfaff, trainer of Olympic gold medalist and world record holder Donovan Bailey, "There is a very fine line between physiotherapy and the training of the elite athlete." What he means is that when training high-performance athletes, special attention must be given to keeping the body healthy. When I design off-season workouts for athletes, my first priority is to correct the muscle imbalances that develop from all the specific training that occurs in the athlete's sport. Taking the example of an alpine skier, my first priority in the off-season would be to have him or her perform exercises to balance the quad strength developed from skiing.

Bodybuilders take pride in the fact that their sport requires its athletes to train every major bodypart. *Major* is the operative word here, and it has been my experience that the external rotators are among the most seriously neglected muscles in the typical bodybuilder's routine. The following are categories of bodybuilders who most likely need to pay special attention to the external rotators:

Anyone who does a lot of chest and back work. Almost any exercise you perform for the pecs and lats places a lot of work on the internal rotators, so the guys who always begin their workouts with the bench press are prime candidates for external rotator work. And, because their egos often discourage these same individuals from performing exercises that don't allow them to lift heavy weights, they seldom work the external rotators and thus commonly complain of myriad shoulder injuries.

Bodybuilders striving for the ultimate in back development. When the infraspinatus and teres minor are fully developed, the contrast between these muscles and the lats is amazingly amplified. When the bodybuilder hits a back double biceps pose, the deep etches between these muscles are visually stunning and give the look of muscle built on muscle.

Individuals who want to increase their bench presses. If the external rotators are weak, the prime movers of the upper body will shut down

Jack Delinger, 1949 Mr. America winner, was noted for his strength and huge chest. Sensible training methods allowed him to continue training well into his sixties.

when exposed to high levels of tension. When I design workouts to improve the Bench Press, the first area I emphasize is the external rotators—sometimes I even start workouts with these exercises! As for the effectiveness of this strategy, I've seen many athletes improve their Bench Press and Chin-up performances by as much as 15 percent in less than a month.

The external rotators are essential stabilizing muscles used in all upper-body exercises. (Scott Wilson)

Individuals with rounded shoulders. Strengthening the external rotators will help improve the posture of the shoulders, thereby reducing stress on the skeleton. Often, such poor posture is the result of working long hours hunched at a desk, especially a desk that is not ergonomically designed. Rounded shoulders also seem more prevalent in tall individuals, who often fall into the habit of rounding their shoulders to help them look down at the vertically challenged.

Athletes in sports where the lats or pecs are the prime movers. These sports include rowing, canoeing, swimming, baseball and volleyball. After many years of training, the bodies of these athletes adapt by progressively shortening the length of the pectoral and latissimus dorsi major muscle groups. For these athletes, part of their training must also include specific stretches for these muscles.

Based on the above prerequisites, the candidate most likely to need supplementary work on the external rotators is a Bench Press fanatic who plays volleyball and is employed as a computer programmer!

Essential Principles

To get the most out of training the external rotators, here are nine basic concepts you must consider.

1. **Exercise throughout a full range of motion.** Make sure that the muscles work through the full range of motion in all the exercises covered in this article—if you shorten the range of motion, there is no point in doing the exercises. When using dumbbells or pulleys, pay particular attention to lowering the resistance completely in the stretched position.
2. **Stretch the internal rotators between sets.** Between every set of exercises for the external rotators, stretch the pecs and the lats. You will find that you won't fatigue as quickly in the following sets, plus you will increase your range of motion.
3. **Perform relatively high reps.** Perform at least 6 reps per set for the external rotators, and in many cases up to 20 reps per set. The basic goal is to be certain that the muscles are loaded for at least 40 seconds but for no more than 70 seconds.
4. **Avoid high-speed movements.** The external rotators respond best to slow-to-medium speeds of contraction—that is, two to five seconds for each concentric and each eccentric contraction. Move the resistance smoothly at a constant speed throughout the entire range of motion.
5. **Provide sufficient variety in exercise selection.** If you have neglected these muscles for a long time, you should do at least two exercises for three sets each. Rotate the exercises every six workouts. After 10-12 weeks of specialized work for the external rotators, you may only need to perform 1 exercise during each training phase.
6. **Maintain correct head position.** You should always hold your head in the neutral position when performing exercises for the external rotators. The best way to ensure this posture is to be conscious of raising the bottom portion of the sternum.

Photo: Irvin J. Gelb

7. **Maintain correct wrist position.** When training the external rotators, keep the wrist in a neutral position to minimize the stress on the elbow.
8. **Apply gradual overload.** The teres minor and the infraspinatus are relatively weak muscles. Most of you will have to use five-pound dumbbells or the smallest plate on the pulley device when you first try these exercises. Because most gyms don't have intermediate dumbbells such as the 7.5 lb and the 12.5 lb, I recommend strongly that you invest in a set of PlateMates, which are magnetized micro-increment weights that come in 5/8-, 1 1/4-, and 3 3/4-lb sizes. These plates enable you to progressively increase the resistance on the muscles, thus bringing about faster strength gains.

   One expert in the field of rehab says you should not lift more than 20 lbs in any exercise for the external rotators—but like many strength researchers, he could not validate his rationale for such advice. In contrast, I have seen many clients use as much as 45 lbs without shoulder injury.
9. **Work the non-dominant arm first.** The number of repetitions you can perform for your non-dominant (and usually weaker) arm will tell you how many reps you should perform for your dominant arm. Thus, if you can complete only eight reps per set with your left arm, perform only eight reps with your right arm. As your left arm becomes stronger, you will be able to increase the workload on the right arm.

"The degree to which the external rotators are involved in shoulder movements depends upon the position of the elbow in relation to the torso."

External Rotator Exercises

The degree to which the external rotators are involved in shoulder movements depends upon the position of the elbow in relation to the torso. When the arm is abducted (i.e., lifted away from) and positioned high in relation to your waist, the infraspinatus is more active; when the arm is in front of you and low in relation to your waist, the teres minor is more active. Therefore, if you're going to train the external rotators properly, you'll need an arsenal of exercises. Here are the ones that I have found to be the most effective.

External Rotation with Low Pulley while Standing, Arm in Low Position

From a standing position, grasp a single handle on a low pulley and turn sideways. If your right hand is holding on to the handle, your left foot should be closest to the weight stack. The working arm should be abducted about 30 degrees to the torso. Rotate the working arm outward by pivoting only at the shoulder joint, and lower the weight by gently reversing the direction of movement. Switch sides and repeat with the other arm.

External Rotation with Shoulder Horn with Dumbbell or Low Pulley

This device is interesting, as it prevents any cheating when doing external rotator work, which is why I often prescribe this exercise to novices. The shoulder horn is available in four sizes, and it's important to use one that fits the width of your shoulders. There are two possibilities to pair with this device: a dumbbell or a low pulley. A dumbbell provides a good overload in the stretched position (the start) while a pulley permits an overload over a greater range of motion. The pulley version is more appropriate for the athlete who is especially weak in the contracted position.

External Rotation with Low Pulley, Arm in Front

The setup is the same for the exercise described above, except there is no support of the elbow and you must use a pulley as the means of resistance. This variation is more complicated, as you must control the movement by isometrically contracting the shoulder stabilizers. Pay particular attention when raising your sternum, as this technique is often compromised by rounding the shoulders. This variation offers the advantage of allowing you to have resistance for a greater range in the contracted position.

External Rotation with Dumbbell, Arm in Front (not illustrated)

For this variation you need support at the elbow, preferably on a padded surface—an adjustable incline bench is ideal. The working elbow should be resting on an incline bench; the bench should be set so that when your elbow rests on the upper ridge, the elbow is at armpit level. The arm should be at a 90-degree angle, and the foot furthest from the working arm should be placed in front. Make certain to start with a very light dumbbell; most men will need to start with a five-pound dumbbell. Lower the dumbbell in a rotary fashion using only the strength of the external rotators until the muscles are fully stretched. Start the concentric contraction smoothly; do not jerk the weight up or

use body English to get it moving, and do not use the myotatic reflex to get the weight back up (a fancy way to say "Don't bounce at the bottom position"). It's also important that at the end of the concentric contraction you do not go beyond the perpendicular position.

It is normal that in the stretched position the working shoulder rolls up and in. However, do not to allow the other shoulder to dip when you lower the dumbbell—this would reduce the eccentric training effect on the working shoulder.

External Rotation with Dumbbell, Arm Abducted

For this one you will need to support your triceps on a Scott bench. The height of the support pad should be set so that the top of the elbow is set below the elbow joint. As you lower the dumbbell during the eccentric contraction, make sure to achieve the greatest stretch and to keep your wrist in a neutral position.

External Rotation with Low Pulley, Arm Abducted

This exercise was popularized in Europe by Swedish bodybuilding expert Ove Rytter in his book *Effective Bodybuilding*. Sit in front of a low pulley and grab a single handle attached to the cable. Abduct the upper arm, keeping a 90-degree bend at the elbow joint, and lower the handle by pivoting only at the shoulder joint. Get a full stretch, and rotate the arm outward to come back to the original starting position. Concentrate on moving the hand back as far as possible to take advantage of the greater overload range provided by the low pulley. This variation offers the advantage of allowing you to have resistance for a greater range in the contracted position when the upper arm is in the abducted position.

Cuban Press

Also known as the Muscle Snatch, this exercise is often used by Olympic weightlifters to strengthen their shoulders in preparation for lifting record loads in the snatch. Al Vermeil, strength coach of the Chicago Bulls, uses it with his athletes to strengthen their rotator cuff muscles. This is a very humbling exercise. The best performance I have seen in this exercise was by a 198-lb man who could do 135 lbs for sets of 6—in contrast,

this athlete could also perform 5 perfect reps in the Behind-the-Neck Press with 308 lbs!

The starting position for this exercise requires you to hold a barbell with a grip that is wider than shoulder width. Upright row the bar until it reaches the lower portion of your sternum. After pausing momentarily in this position, rotate the arms outward until the forearms are perpendicular to the ground, then finish the movement by pressing the bar overhead. To complete the exercise, lower the bar in a pressing style until the upper arms are parallel to the floor, then lower it in a rotary fashion to the lower sternum and finally to the mid-thigh level.

Although training the external rotators won't make as dramatic a change in your physical appearance as a hard-core specialization program of squats, chin-ups or bench presses, developing these muscles is important. The exercises and training principles I've outlined will increase your training longevity, increase performance in pressing and chinning, and improve your posture. Not a bad payoff for such small muscles, but as they say, good things often come in small packages!

15

THE REAL ARMS RACE

The absolutely best way to build big, beefy arms

◀ *When you think of bodybuilding, the first thing you think of is biceps. This muscle group requires variety and a scientific approach to develop fully. (Lambert Boehm)*

The muscle group closest to the heart of a bodybuilder is not the pectorals, but the arms. No other bodypart exemplifies strength and muscular development like big, sleeve-splitting arms. Would Arnold Schwarzenegger be the box office sensation he is today if he couldn't flex those bulging biceps and T-Rex triceps? Where would Hulk Hogan be without those 22-inch "bone-crushing pythons"? Massive arms are essential to a bodybuilder, but it takes a smart approach to get them to fill out your shirtsleeves. To ensure that your workouts are on the right track, follow these seven principles of superior arm training.

1. Plan variety in your training

There's no such thing as a single, perfect workout. To continually shock your arms into growth you must experiment with a variety of workout programs, especially as you progress to the higher levels of arm development. Whereas beginners can make excellent progress by changing their workouts only once a month, advanced bodybuilders must alter some aspect of their program at least every two weeks—sometimes even every week!

Using a variety of exercises is especially important in arm training because each exercise targets a specific area. In the biceps, for example, Scott Bench Curls emphasize the first part of elbow flexion, Standing Cable Curls stress the mid-range, and Concentration Curls emphasize the end range.

Michael Francois displays an impressive double biceps pose.

Variety in your exercise selection is essential because the order of recruitment for motor units is fixed for a muscle during a specific exercise. This means that certain motor units within a muscle have a low recruitment threshold for exercise X and a high recruitment threshold for exercise Y. Variation in the order of recruitment for motor units supports the theory long argued by bodybuilders that full development of a muscle occurs only when it is exercised through all its possible movements.

There is a wide variety of arm exercises available to the bodybuilder. Curls can be performed seated, standing, inclined, lying or even kneeling. They can be performed with a variety of equipment: barbells, dumbbells, cables, EZ bars, parallel handles, Scott bench and Spider bench. Even the width and thickness of the grip can be changed to recruit different motor units and experience accelerated growth.

Changing the exercise also allows you to emphasize specific parts of the strength curve. How many times have you seen guys do both Standing Barbell Curls and Seated Dumbbell Curls in the same biceps workout? What a waste of time! Both exercises overload the mid-range of the elbow flexors strength curve. Scott Curls at a 45-degree angle overload the first third of the elbow flexors strength curve; Concentration Curls stress the top part of that strength curve. Table 1 shows how to vary your exercise selection by emphasizing various parts of the strength curve.

Table 1:
Exercises that overload specific areas of the elbow flexors force curve

(Poliquin, 1995©)

Low Range	Mid-Range	Upper Range
Scott Curls, 30-45 Degrees	Standing Barbell or Dumbbell Curls	Nautilus Curls
Atlantis Biceps Curl Machine	DAVID Biceps Machine	Spider Curls
Corbin-Gentry Curl Machine	Seated Dumbbell Curls	Compound Curls
Polaris Curl Machine	Standing Cable Curls	Various Concentration Curls
	Close-Grip Chins	Cybex Eagle Curls
		Incline Dumbbell Curls

Rope Triceps Pressdown. *This is also an excellent exercise to target all three heads of the triceps.*

2. Stress form, not weight

Due to impatience (and sometimes ego), the biggest mistake most people make in arm training is to sacrifice proper form for more weight. Because improper technique does not target the muscles properly, this error can slow progress and cause injury. Therefore, always stress proper technique in your arm training—and of course, it's a good idea to ask an exercise instructor to teach you the proper form of any exercise you've never performed before.

Improper technique in any bodybuilding exercise leads to snail's-pace progress and eventually to injury. Paul Chek says many bodybuilders perform arm training in a position of rounded (protracted) shoulders. This problem can be exemplified by putting a bodybuilder in a perfect posture and having him perform Dumbbell Curls with a weight he normally uses for a 10-rep set. By the second rep you'll see that he will go back to the rounded shoulder posture or will fail to raise the dumbbells beyond the 30-degree mark—this is because his strength levels have adapted to poor posture. The result is arm development without associated stabilizer strengthening, a condition that predisposes the shoulder to a repetitive stress injury.

For optimal training of the arm and shoulder complex, you must exercise with good postural alignment. Postural training is an especially complex subject and is certainly beyond the scope of this chapter. In elbow flexor training, the trainee should concentrate on keeping the elbow as close as possible to the ground at all times.

Lying EZ Bar Triceps Extension. *This exercise targets the long head of the triceps.*

3. Concentrate

One key to proper form is concentration, and enhanced concentration enables you to safely use heavier loads and maximize tension on the working muscles—factors that always lead to bigger gains. Here are some tips that will help you concentrate:

■ Always begin the set with the end in mind. You should have a clear picture of the goal you want to achieve. If you have problems with goal setting and time management, consult the following excellent books: *The Aladdin Factor* by Canfield and Hansen, *First Things First* by Covey, Merrill & Merrill, and *Life 101* by Peter McWilliams. Anthony Robbins may be a popular motivation guru, but after all the hoopla you will find that his material suffers from the "Chinese restaurant syndrome" (great satisfaction at first, but after an hour you are pissed off that your hunger was not satisfied).

▲ *Lou Ferrigno, in a movie still from Hercules, shows off one of the biggest arms in the sport.*

■ Always know how many reps you are going for. Counting the reps backwards (i.e., 6,5,4,3,2,1) is an effective trick to stay focused on the task to accomplish. When counting reps in the regular fashion, most people get anxious during the set about achieving the desired goal and forget about focusing on the set.

■ Focus on "feeling" the muscle, not just the weight. This is a favorite from heavyweight bodybuilding champion Jusup Wilcosz, an ex-Mr. Universe and training buddy of Schwarzenegger. If you have problems feeling an exercise, slowing down your movements will allow you to perform the task better.

■ Try Gingko Bolba. This herb has been associated with enhanced cognitive function—two to three capsules an hour before the workout will boost your focus levels. Combining it with the acetylcholine precursor DMEA appears to magnify its effectiveness.

4. Perform the most effective exercises first

You should always perform exercises that recruit the maximum amount of muscle fibers early in your arm training workout. For example, exercises that work the long head of the triceps should be performed after exercises that work all three heads.

A practical way to determine which exercises activate the most muscle fibers is by how much weight is used. Triceps Kickbacks, therefore, are obviously not as effective as Triceps Pushdowns or Close-Grip Bench Presses. You may also want to give pre-exhaustion a try, a training principle that was introduced to the bodybuilding world in 1968 by Robert Kennedy (not Arthur Jones) in *Iron Man*.

With pre-exhaustion, the agonist muscle is first pre-fatigued by a single-joint exercise; that muscle is then further exhausted by a two-joint exercise involving the same muscle group and additional muscle groups. For exam-

▲ *The showdown at he 1974 Mr. Olympia between Gentle Giant Lou Ferrigno and the Austrian Oak Arnold Schwarzenegger came down to an ultimate arms race.*

ple, you could pre-exhaust the long head of the triceps with the Lying Triceps EZ Bar Extension, and immediately follow it with a two-joint compound exercise that involves all heads of the triceps, such as the Triceps and Shoulder Dip. For the brachialis, you could pre-exhaust by supersetting Standing EZ Bar Reverse Curls with Incline Hammer Dumbbell Curls.

Finally, consider that isolation exercises that recruit few motor units are not as effective as compound exercises for optimal development of muscle mass. For example, Parallel Bar Dips and the Close-Grip Bench Press are more effective than the Dumbbell Triceps Kickback. This is not to say you should never perform these inferior isolation exercises, but they should not be emphasized as much as the compound movements.

5. Work all three heads of the triceps

When we design workouts, we tend to favor certain exercises over others. Because there are three heads to the triceps, it's easy to ignore one. From experience, the long head appears to suffer the most neglect. One reason is that, according to research in the fields of biomechanics and neurophysiology, the triceps respond only to high loads. Two of my favorite exercises for the long head of the triceps are the Overhead Dumbbell Triceps

Table 2:
The best exercises for targeting specific heads of the triceps

(adapted from Muscle Meets Magnet®)

Muscle	Exercise
Long head	Lying EZ Bar Triceps Extension
	Overhead Dumbbell Triceps Extension, with reverse grip
	Pushdown with straight bar and narrow grip
	Pullover with narrow grip and EZ bar
Medial head	Standing Barbell French Press
	One-Arm Triceps Pushdown, pronated
	Narrow-Grip Bench Press
	Dumbbell Kick Back
	Press Behind Neck
	Semi-supinated Standing Dumbbell Press
Lateral Head	Lying Dumbbell Triceps Extensions
	Standing Barbell French Press

Muscle	Exercise
Lateral Head	Pushdown, with straight bar and narrow grip
	One-Arm Triceps Pushdown, pronated grip
	Overhead, Bent-Forward Rope Extensions
	Narrow-Grip Bench Press
	Press Behind Neck
	Dumbbell Kick Back
	Semi-supinated Standing Dumbbell Press
All Three Heads	Decline EZ Triceps Extension
	Overhead Dumbbell Triceps Extension, neutral grip
	Overhead Dumbbell Triceps Extension with rotation
	Rope Triceps Pressdown
	Angled Bar Triceps Pressdown
	One-Arm Triceps Pushdown, supinated
	Parallel Bar Dips
	Bench Dips

Table 3: The best exercises for targeting the brachialis muscle

(Poliquin, © 1992)

Exercise	Notes
Standing Reverse Curls with EZ Bar	Vary grip from narrow to shoulder width
	Pause 2 seconds at 30-90 degrees of elbow flexion
Incline Hammer Curls	Vary angle of inclination of back rest usually 30-60 degrees
Scott Bench Reverse Curls	Vary inclination of support pad
	Vary working implement (EZ, SZ, Gaspari Bar)

Extension, using a reverse grip, and the Close-Grip Triceps Pressdown with a straight bar.

To work all three heads of the triceps, I find that the Triceps and Shoulder Dip is one of the most effective because you can use heavy loads. Also, it is a good idea to start your triceps training with an exercise that either targets all three heads or hits directly the long head of the triceps. Of course, if one of the other triceps heads is proportionally weak, you'd want to train that one first.

Table 2 illustrates how to target the specific triceps head you want.

The barbell curl is a staple in every routine, as demonstrated here by 1980s Olympia contender, Scott Wilson.

6. Emphasize the brachialis

The brachialis is the muscle shaped like a golf ball (or a grapefruit if you're built like Mr. Olympia Dorian Yates) that lies between the triceps and the biceps. Although it is involved in any exercise that flexes the upper arm, the brachialis often becomes a weak link in arm development. In fact, many bodybuilders have found that adding specific brachialis exercises to their workouts can increase their arm size by as much as one inch in a month!

When the forearm is supinated (palms up), the biceps have an effective line of pull. When the forearm is pronated (palms down), the biceps is rather ineffective at flexing the elbow. This is why you normally handle 28-34 percent less in Reverse Curls than you do in Regular Barbell Curls. When your forearm is pronated, the brachialis is primarily responsible for generating force. As such, the basic exercise for the brachialis is the Reverse Curl, which can be performed with a straight bar, EZ curl bar or dumbbells. Also effective are Hammer Curls.

Pausing for a two-second count at 30-90 degrees after initiating the Reverse Curls will further increase the involvement of the brachialis—but make certain to continue the upward movement in a controlled fashion. If you have to lean back or move the elbows out to complete the concentric range, the resistance is too heavy. In all brachialis exercises, make certain that your wrists stay in a neutral position. Bending them back towards you, or curling with them into a gooseneck position, decreases the recruitment of the brachialis muscle.

Table 3 lists the best exercises to overload the brachialis muscles.

Hand Positions. *(l-r) These are the three basic positions for arm exercises: Pronation, Supination, Neutral.*

7. Do more work for the long head of the biceps

Primarily due to poor exercise technique, the long head of the biceps is often underdeveloped in bodybuilders. It is most effectively worked when the elbows are aligned with the torso—or are slightly behind it. Two of my favorite exercises for this area include Dumbbell Curls, performed on an incline

bench, and Standing Barbell Curls using an Arm Blaster. Table 4 lists other effective exercises for the long head of the biceps.

"Primarily due to poor exercise technique the long head of the biceps is often underdeveloped in bodybuilders."

Table 4: The best exercises for targeting the long head of the biceps

(Poliquin, © 1992)

Exercise	Notes
Arm Blaster Standing Curls	Vary exercise by using dumbbells, EZ Bar barbell low pulley EZ bar handle or fat bar
Hammer Curls	Seated, standing or inclined
Incline Dumbbell Curls	Vary angle of inclination of back rest or grip (supinated and semi-supinated)
Lying Dumbbell Curls	Expect some soreness. Bench must be high enough for maximum stretch
Lying Pulley Curls	Prevents cheating

Poliquin's Arm Routine

This a routine I designed for top bodybuilder Milos Sarcev. Milos put an inch and a half on his arms in just a matter of weeks. Begin this pro-level workout by performing each of the four circuits in the manner prescribed. Perform this workout three times a week, for a total of six weeks.

Weeks 1-6

Circuit One: Bicep Curls, Staggered-Grip Set

Do the following steps:

1. Standing Reverse-Grip EZ Bar Curls 5-7 RM on a 321 tempo
2. No rest
3. Seated Hammer Dumbbell Curls. 10-12 RM on a 302 tempo
4. Rest 10 seconds
5. Scott EZ Bar Semi-supinated Curls with shoulder width grip as many reps as possible on a 202 tempo
6. Cry and curse me and my descendants for the 2 minute rest period.
7. Repeat steps 1 to 6 twice—you probably will have to drop the weight 5 lbs every new Staggered-Grip Extended Set

Circuit Two: Triceps Extensions-Presses Staggered Grip Extended Set (Triceps Trasher)

Do the following steps:

1. Lying Barbell Triceps to top of forehead 6-8 RM on a 221 tempo
2. Rest 10 seconds
3. Lying Barbell Triceps to chin 6-8 RM on a 301 tempo (A.M.R.A.P.)

4. Rest 10 seconds
5. Close-Grip Bench Presses (A.M.R.A.P.) on a 221 tempo
6. Rest 2 minutes, while surveying the Spandex scene
7. Repeat steps 1 to 6 twice—you probably will have to drop the weight 5 lbs every new Staggered Grip Extended Set

Circuit Three: Incline Curls, Staggered-Grip Extended Set

Do the following steps:

1. Incline Hammer Dumbbell Curls 4-6 RM on a 401 tempo
2. Rest 10 seconds
3. Incline Dumbell Curls 301 tempo (A.M.R.A.P.)
4. Rest 10 seconds
5. Incline Elbows-Out Dumbell Curls (A.M.R.A.P.) on a 201 tempo
6. Rest 2 minutes, while visualizing that post-workout drink
7. Repeat steps 1 to 6 twice, keeping the same dumbbells throughout the extended set

Circuit Four: Triceps Pressdowns Staggered-Grip Extended Set

Do the following steps:

1. Triceps Pressdowns, Close-Grip 8-10 RM on a 401 tempo
2. Rest 10 seconds
3. Triceps Pressdowns, Medium-Grip 301 tempo (A.M.R.A.P.)
4. Rest 10 seconds
5. Reverse-Grip Triceps Pressdowns (A.M.R.A.P.) on a 201 tempo
6. Rest 2 minutes, while visualizing that post-workout drink
7. Repeat steps 1 to 6 twice, drop the weight 10-20 lbs on the Reverse Grip Pressdowns to get the reps in.You can go home now and put some Traumeel on them.

Weeks 7-12

This is a workout consisting of three supersets. Perform it three times a week for a total of six weeks.

Order	Exercise	sets x reps	Tempo
A-1	Incline 45° Dumbbell Curls	4-5 x 5-7	501
A-2	Decline Triceps Extensions	4-5 x 5-7	501
B-1	90° Barbell Preacher Curls	4-5 x 5-7	501
B-2	Close-Grip Bench Press	4-5 x 5-7	501
C-1	Zottmann Curls	3-4 x 5-7	501
C-2	One-Arm French Press	3-4 x 5-7	501

Perform exercise A-1, rest 2 minutes, perform exercise A-2, rest 2 minutes, repeat the above. In this manner, you will get 5 minutes between sets for a muscle group, which is essential when you want to derive the full benefits from training with high loads. Note that the nervous system takes 4-5 times longer to recover between sets than do the energy stores. The benefits of maximal weights methods on the nervous system can be negated through rest intervals that are too short. Alternating triceps work with biceps work

will ensure that the muscular structure is balanced and will prevent cumulative fatigue buildup in the agonist muscles.

For those who aren't familiar with this exercise, Zottmann Curls work thoroughly all elbows flexors. Sit at the edge of a flat bench with a dumbbell in each hand, palms facing forward and arms fully extended. Curl the dumbbells with palms up, with the wrists extended down and back to prevent involvement of the forearm flexors. Once you reach the top, turn your palms down and lower the dumbbells with the wrists being in a neutral position. Keep your elbows glued to the sides of the torso during both the concentric and eccentric portions of the lift.

Weeks 13 to 18

Perform 3 Tri-sets of the following for 10-12 reps per set, with a 302 tempo. Perform this workout three times a week for six weeks.

1. Lying Triceps Extensions
2. EZ Bar Presses (lower bar to the bridge of the nose)
3. Kneeling Rope French Presses

"Alternating triceps work with biceps work will ensure that the muscular structure of the arms is balanced."

Perform 3 Tri-sets of the following for 8-10 reps per set, with a 302 tempo.

1. Incline Hammer Dumbell Curls
2. Wide-Grip EZ Bar Preacher Curls
3. Cable Preacher Curls

Superset the following for 3 sets of 15-20 reps tempo 201

1. Cable Palms-up Wrist Curls
2. Cable Palms-down Wrist Curls

Weeks 19-24

Make sure to do at least five 1- to 3-rep warm-up sets before beginning this advanced phase. If you are doing 135 lbs on the reverse curls and 315 lbs on the bench presses, your warm-up would look like this:

Reverse Curls: 40x3, 65x3, 85x3, 105x2, 120x1

Close-Grip Bench Presses: 135x3, 185x3, 225x3, 265x2, 295x1

Perform these four exercises three times a week for six weeks:

1. Standing EZ Bar Reverse Curls, six sets of 2,2,4,4,6,6 reps, tempo 421
   The two-second pause is taken at 30 degrees of elbow flexion. Bar is stopped for a full two seconds before completing the concentric range. That two-second pause has been shown to increase brachialis activation during elbow flexion. Do not swing the bar or flare the elbows to continue the range of motion. If you do so, the weight is too heavy.
2. Close-Grip Bench Presses, six sets of 2,2,4,4,6,6 reps, tempo 341
   The four-second pause in the bottom position negates all myotatic reflex, and creates tremendous intramuscular tension. Bar is brought to the lower sternum during the descent. Elbows go just short of lockout during the pressing movement.

3. One-Arm Scott 45-Degree Offset Dumbbell Curls, 3-4 sets of 5-6 reps, tempo 404

Place yourself on a Scott bench holding the dumbbell with an offset grip. That is, an asymmetrical grip where the thumb side of your hand is glued to the inside plate of the dumbbell. Start the movement in a semi-supinated grip (hammer grip) and curl the dumbbell in this fashion for about 40 degrees, then turn the palm up (supinate). Since you are holding the dumbbell asymmetrically, you will be forced to activate the short head of the biceps to complete the supination movement. Since the movement is done at a slow tempo, expect high intramuscular tension.

4. One-Arm Overhead Dumbbell Extensions, 3-4 sets of 5-6 reps, tempo 404

This is better known as the One-Arm French Press. It can be performed seated or standing. Lower the dumbbell behind the head and go for a maximum stretch. The elbow should be pointing directly at the ceiling.

Impressive arm size has always been of utmost importance in bodybuilding. Although appearing smooth by today's standards, 1968 Mr. America Jim Haislop sported incredibly large arm development for his day.

Advanced Techniques for Breaking Arm Size Barriers

I want to share with you some extremely effective workouts for the biceps and triceps to perform in the power rack. I developed this routine by combining ideas from articles by Anthony Ditillo and the late Don Ross, and this program works. Most intermediate bodybuilders will increase their standing curling poundages by 5 to 25 pounds and their Close Grip Bench Press poundages by 30-45 pounds in just 3-4 weeks using this training system.

This routine makes use of what exercise physiologists call "functional isometric contractions." In the early sixties this method was known in the iron game as "isometronics," which is a contraction of the term isometrics and isotonics (or, more properly, auxotonics).

With isometronics you take advantage of the joint-angle specificity of strength gains caused by isometric training. Thus, during every set performed in the power rack, you will do a functional isometric contraction after pre-fatiguing the muscle with heavy partial repetitions.

For both the biceps and triceps workouts presented here you will be working at three ranges—low range, mid range and top range. For each of these ranges you will select a weight you can move from the starting position to the pins placed at the end of range of motion. Here's how to do it:

1. Perform four to six partial reps in the normal fashion.
2. When you come to the end of the last concentric repetition, press the bar against the top pins. Press as hard as possible for 6-8 seconds, trying to rip through the pins! Do not hold your breath during the isometric contraction; instead, use a very brief cycle of breathing, alternating rapidly between short inhaling and short exhaling.
3. If you've performed this set properly, you should not be able to perform another repetition—if you can, the weight you used was too light.

The Isometronic Biceps Workout

"Do not be surprised if you're prone to intense shaking upon completion of the routine—this is evidence that your nervous system is shot."

The isometronic biceps workout involves nine sets of rack work: three sets of four to six reps of isometronics at three different ranges. Do not be surprised if you're prone to intense shaking upon completion of the routine—this is evidence that your nervous system is shot. Due to the severity of the stress this workout imposes, it should only be performed once every two biceps workouts.

Low-range Barbell Curl: Adjust the pins in the power rack so the barbell will travel for 45-50 degrees of your range of motion, starting from the bottom position (arms extended). At this angle the range is quite limited, so only lower the barbell for a count of two seconds. This exercise will improve the power of the start in all curling exercises.

Mid-range Barbell Curl: Adjust the pins so the barbell will travel for 80-90 degrees of elbow flexion. For this range, lower the barbell for a count of three seconds. For the Barbell Curl performed in the conventional manner, this is where most individuals encounter sticking points—functional isometric contractions will help you blast through it!

Top-range Barbell Curl: Adjust the pins so the barbell will travel for 130-140 degrees of elbow flexion. This is the hardest position to maintain proper ergonomics. As you fatigue you will have the tendency to lean back, a technique fault that creates trauma in the lower back that can cause injury. To prevent you from swinging the weight, you can have a training partner support you with their back against you. You will perform three sets of four to six reps of isometronics at this range, resting three minutes between each set.

Once you have completed nine sets in the power rack, finish off by performing any of the following (pause in bottom positions):

Option A

- 1 x 6-8 RM, Barbell Curl (full range), tempo 401
- 3 x 6-8 RM, EZ Bar Reverse Curl, tempo 402, rest interval 3 minutes

Option B

- 1 x 6-8 RM, Barbell Curl (full range), tempo 401
- 3 x 6-8 RM, Incline Dumbbell Curl, tempo 313, rest interval 3 minutes

Option C

- 1 x 6-8 RM, Barbell Curl (full range), tempo 401
- 3 x 6-8 RM, Scott Close Grip Curl, tempo 511, rest interval 3 minutes

Instead of the power rack training on your alternate biceps workout, per-

form four sets of four to six reps of Barbell Curls (full range), tempo 401, followed by option A, B, or C.

The Isometronic Triceps Workout

In this routine you will need two sets of pins, one for the start position and one for the end position. You will perform three sets of four to six reps of isometronics at each one of these ranges, starting from the bottom position. Rest three minutes between each set. Due to the severity of this workout, it should be performed only once every two triceps workouts, or about once every ten days.

Low-Range Close Grip Bench Press: Adjust the pins so that they are set a point where the bar will travel from an inch off the chest to four inches above the chest. This should be your weakest position; in fact, some 300+ bench pressers will have to start off with as low as 165-185 pounds! At this angle the range is quite limited, so lower the bar for a count of two seconds. You will find that training in this range will give you an explosive start off the chest in the Bench Press. Perform three sets of four to six reps of isometronics at this range, resting three minutes between each sets.

"Now, measure your arms and rejoice in the gains. You have just won in the real arms race!"

Mid-range Close Grip Bench Press: Adjust the pins so that they are set a point where the bar will travel from four inches off the chest—your previous set end position—to eight inches above the chest. For this exercise lower the bar for a count of two seconds. You will find that maintaining the groove in this particular exercise requires considerable mental concentration.

Top-range Close Grip Bench Press: Adjust the pins so that they are set a point where the bar will travel from 8 inches off the chest—your previous set end position—to 95 percent of lock-out. At this range you should be able to handle loads above your Mid-range Bench Press.

Once you have completed these nine sets in the power rack, finish off your routine by performing any of the following (pause in the bottom position):

Option A

- 1 x 6-8 RM, Close Grip Bench Press (full range), tempo 401
- 3 x 6-8 RM, Decline BB Triceps Extension, tempo 402, rest 3 minutes

Option B

- 1 x 6-8 RM, Close Grip Bench Press (full range), tempo 401
- 3 x 6-8 RM, Low Pulley Rope French Presses, tempo 221, rest 3 minutes

Option C

- 1 x 6-8 RM, Close Grip Bench Press (full range), tempo 401
- 3 x 6-8 RM, Parallel Bar Dip, tempo 311, rest 3 minutes

Instead of the power rack training on your alternate triceps workout, perform four sets of four to six reps of the Close Grip Bench Press (full range), tempo 401, followed by option A, B, or C.

Now, measure your arms and rejoice in the gains. You have just won in the real arms race!

16

IMPRESSIONABLE ABS

If you've been discouraged by following abdominal training programs that just don't work, get psyched up with a new twist on ab training!

◀ *Even in this double biceps shot, Garrett Downing's striking abdominal development is clearly evident.*

A defined, hard midsection sends out a powerful signal about the shape you're in. Abs of steel are perhaps the most sought-after bodypart of the hardbody generation—even beer commercials use actors with washboard abs! In spite of such attention to what appears to be a relatively small muscle group, it's not uncommon to hear the complaint that "no matter how much I work them, I just can't get my abs in shape!" Frustrated, we turn to abdominal crunch machines or Roman chair sit-ups and seriously consider buying one of those plastic gut-busting gadgets at our local sporting goods store.

The fact is, most of what we hear about abdominal training is untrue, and there is so much misinformation that it's difficult to separate fact from fiction—and from fraud. What expert do we believe—the professional bodybuilder, the physical therapist, or the "Personal Trainer to the Stars"? What a mess! But before you grind out another crunch or devote any more time, effort and money in search of the perfect waistline, understand that a little training knowledge can go a long way towards getting you those sought-after six-pack abs.

A closer look at conventional training

To design the perfect abdominal training workout, you need a basic understanding of the anatomy and physiology of the abdominals. This lack of basic information is why so many bodybuilders do not know which exercises are best for developing their abdominals or how to use them in a workout. Because studying anatomy is about as exciting as watching commercials for feminine hygiene products with your mom, I'll keep my references to this subject brief and practical.

The primary abdominal muscle located on the front of the torso is called the rectus abdominus, and it extends from the sternum to the top of the pelvis. When properly developed this muscle gives you that "six pack" appearance. As you lie on your back during sit-ups, this muscle can flex the trunk forward approximately 30 degrees, the angle at which the shoulder blades just begin to lift off the floor. At this point any additional movement is primarily caused by the muscles that flex your hips.

Most "ab roller" devices do a good job of working the first 30 degrees of motion of the rectus abdominus, and many of these devices enable you to increase the resistance with weights. But the anatomy of the rectus abdominus is such that your torso needs to bend backwards approximately 15 degrees to develop maximum tension in the abdominal muscles, although a further stretch may be better for spinal health. This requirement isn't possible with ab roller devices or, for that matter, most conventional exercises.

Hanging Leg Raise. *This advanced exercise allows you to work the lower abdominals throughout a full range of motion.*

As for the idea that ab roller devices are the ideal way to prevent neck strain, exercise scientist Mel Siff says that raising the arms to support the head causes a "reflex contraction" of the muscles behind the head to stabilize the shoulders. Siff says if you leave the arms alongside the body and simply slide them up the sides of the legs during sit-ups or abdominal curls, much of the problem with neck strain can be avoided.

When you train on a flat surface like the floor, you begin in a neutral position; and this restriction makes it impossible for you to get a full stretch of the rectus abdominus. For an athlete, if the rectus abdominus is not trained throughout its full range of motion, it will not be able to contribute maximum power in activities like throwing and kicking.

Another problem with starting from the neutral position is that the abdominals will not learn how to properly contract when you bend backwards—in effect, your abdominals become stupid! One reason many bodybuilders develop back pain from performing military presses or cheat curls is that their stupid abdominal muscles simply do not know how to protect the back.

Finally, training on a flat surface may increase the curvature in your lower back, placing many of the weaker structures of the lower back at a high risk of injury. Excessive lumbar curvature may cause your head and shoulders to move forward. This "forward head posture" can cause neck pain and tension headaches and make you look like a geek. Although osteoporosis is attributed to a loss of calcium and is most commonly associated with women, anyone can develop the posture of an osteoporosis sufferer from a poorly designed exercise program. In the long term, poor posture from improperly trained abdominals causes muscular back and neck pain and accelerates degenerative disk disease throughout the entire spine.

Abdominal exercises that work

One answer to flat surface training is the Swiss ball. Relatively inexpensive, these large, inflatable plastic balls are commonly found in physical therapy clinics, but unfortunately seldom in weight rooms. The Swiss ball requires you to exercise on a spherical surface, conditioning the abs through their full range of motion. Also, the instability of the Swiss ball makes this type of training ideal for athletes because it improves balance, an essential component of agility.

One of the best exercises to work the rectus abdominus on a Swiss ball is the Abdominal Crunch. As you lower yourself into the stretch position, your abdominals may shake as they attempt to maintain your balance—an effect you cannot experience with flat-surface training. As your torso stability improves with training, you can effectively increase the resistance by performing the exercise by holding a dumbbell across your chest. You can also hold weight plates across your chest, as suggested by Paul Chek, but they will restrict your range of motion and can be awkward when using heavy weights.

Swiss Ball Crunch. *The shape and instability of a Swiss ball allows you to achieve highly effective levels of stress on the abdominals. Swiss ball abdominal training is vastly superior to flat-surface ab training.*

The muscles on the lower region of the abdominals help maintain ideal postural alignment. They also keep the pelvis properly tucked in so that the lower portion of your abdominals doesn't bulge outward like a pouch. A great exercise for these muscles using the Swiss ball is the Reverse Crunch. This is performed just like a Reverse Crunch on the floor except your hips can drop below the neutral position at the start. For stability, when performing this exercise you must anchor your upper body by holding on to a sturdy object. To increase the resistance, hold a dumbbell between your feet; but if you do, I suggest you use a very light one—this is a very humbling exercise!

A bodybuilder doesn't want massive obliques but does need to train them enough to maintain ideal postural alignment. To work them, many

personal trainers recommend Side Bends on a Roman chair or hyperextension bench. However, these are advanced exercises and can seldom be performed correctly by beginners—you often see these individuals twisting their hips so that other muscles assist in the movement. With a Swiss ball you can adjust the position of the ball on the body to make this exercise ridiculously easy, or challenging enough for the strongest athlete by holding a weight plate on the chest.

A word of caution: because the range of motion is so much greater on a Swiss ball, during the first few weeks of training on them you should not work the abdominals to failure or perform multiple sets—you could easily pull a muscle. As you become accustomed to these exercises, you can increase the number of sets and begin adding resistance—and don't be afraid to pack it on.

Although Swiss ball training is considered the optimal training method, there are other ways to work the abdominals throughout a full range of motion. One is by exercising on "moon benches," which are benches that have a hump in the middle to increase the range of motion of the exercise. Although these are primarily used for pullovers, they are also ideal for abdominal crunches.

The Ab Bench enables you to comfortably perform full-range abdominal exercises with resistance. ▼

Taking this idea of the moon bench one step further, *Ironman* (1-800-447-0008, ext. 1) offers the Ab Bench. This relatively inexpensive unit has the pulley attachment built into the machine so that you don't need to set up in front of a lat pulldown or cable crossover machine—very convenient! Although the Ab Bench is good, for maximum development it's important to also include abdominal exercises like Reverse Crunches that require movement to be initiated from the hips. For advanced athletes the Hanging Leg Raise can be used for this purpose, but to ensure a full range of motion you must initiate the exercise by rolling your pelvis slightly backwards.

Another way to work the abdominals through a full range of motion is to use medicine balls, which have the benefit of increasing variety so that athletes can simulate the movements that occur in their sports. Unfortunately, to describe all the exercises possible with medicine balls this chapter would require as many pages as an entire issue of *Muscle Mag*. If you're interested in this type of training, Paul Chek (1-800-552-8789) has several excellent videos illustrating these exercises.

Knowing how to select the proper abdominal exercises is the first step to achieving optimal abdominal development. The next step is to determine the proper exercise prescription for reps and sets.

How many reps? How many sets?

Whether your goal is to build muscle or lose fat, the number of repetitions performed is a primary factor for determining the appropriate training effect. The Guinness Book of World Records has records for an astronomical number of sit-ups performed, and many schools still use the sit-up as a standard measurement of physical fitness (that is, those schools that still have a physical education program). This emphasis on the quantity not quality of training is evident in most Americans' approach to abdominal training—we've come to believe that the abs respond best to high reps. Although you would never consider doing sets of 50 reps for the biceps, it's no big deal to do that many reps for the abs—and besides, some people can perform 50 sit-ups without breaking a sweat!

To determine how many reps you should perform, you first need to understand the difference between tonic and phasic muscles.

Tonic muscles are designed for endurance and the maintenance of correct posture and are primarily composed of high-endurance types of muscle fibers called slow twitch. The small calf muscle known as the soleus contains a high percentage of slow-twitch fibers, making your calves ideally suited for helping you to walk long distances. Slow-twitch fibers respond best to higher repetitions and relatively low resistance. Phasic muscles are designed for short bouts of hard work, and are primarily composed of the strongest types of muscle fibers called fast twitch. The hamstrings contain a high percentage of fast-twitch fibers and as such are among the primary muscles used in sprinting. Fast-twitch fibers respond best to heavy resistance, and to use heavy resistance means keeping the reps low.

Because they are composed of primarily fast-twitch fibers (surprise!), the abdominals must be classified as primarily phasic, not tonic, muscles. Consequently, performing more than 15 reps per set on your abdominal exercises will probably reduce the effectiveness of the exercises.

▲ *Former Mr. America Joe DeAngelis' aesthetic and symmetrical physique is enhanced by his well-defined abdominals.*

If you're a beginner, as a general guideline use a resistance that allows you to comfortably perform about 15 reps for 1 or 2 sets. If you've been training your abdominals for at least a year, start working in the 8- to 12-rep range for at least 3 sets. After another year of training you can use weights that only allow you to perform as few as four reps per set—and because

there's an inverse relationship between reps and sets, you may perform as many as ten sets per workout. Unless you're a woman.

Because of neurological differences, women often need to perform more repetitions than men to achieve the same training effect. For example, if a man could leg curl 100 lbs once, he might only be able to perform 2 to 3 repetitions with 95 lbs. A woman who could leg curl the same 100 lbs, however, would probably be able to perform 5 to 8 repetitions. This neurological efficiency is trainable, however, and as a woman reaches her peak strength she will need to follow the same repetition prescription as a man follows.

In addition to reps and sets, tempo selection is also an important exercise variable, but unfortunately one that is often overlooked.

"Manipulating the tempo prescription enables you to perform different repetitions and achieve the same training effect—a fact very important in optimal abdominal training."

The tempo factor

Tempo is the speed at which you perform an exercise; and as you've learned in previous chapters, a tempo prescription comes in three basic phases: eccentric, isometric, and concentric. In the three-digit tempo prescription formula created by Ian King, the eccentric portion is the first number, the isometric is the second, and the concentric is the third.

Manipulating the tempo prescription enables you to perform different repetitions and achieve the same training effect—a fact very important in optimal abdominal training. For example, 5 reps of a 512 tempo prescription (5 reps x 8 seconds [5 + 1 + 2] = 40 seconds) has the same training effect as 10 reps with a 301 tempo prescription (10 reps x 4 seconds [3 + 0 + 1] = 40 seconds). Such precise exercise prescriptions ensure that the proper training stimulus occurs and adds variety to your workout, a much-needed component in exercise. As a general guideline, I adjust my tempo prescription so that a set is completed within 40 seconds.

Finally, when looking at the tempo prescription, consider that with Swiss ball or moon bench training the range of motion of most exercises is increased. Therefore, fewer repetitions would need to be performed on the Swiss ball version of an exercise compared to the same exercise performed on the floor.

The Use of Weight Belts

Today you see weight belts everywhere—from the postal worker to the pizza delivery man. As a fashion statement, these belts tell the world that you lift heavy. As a therapeutic device for weight training, they do more harm than good.

First, weight belts weaken your abdominal muscles. The abdominal and back muscles stabilize the spine and reduce the pressure on the disks by compressing the gases and fluids in the abdominal cavity. Although it's true that a weight belt will also do this, posture expert Paul Chek says there is only so much of this intra-abdominal pressure that your body allows—if it gets too high the blood flow to the heart stops! To prevent this excessive intra-abdominal pressure your abdominal and back muscles may need to relax when you wear a weight belt. Chek believes with

long-term use, this can weaken the muscles of the trunk and actually make you more susceptible to back problems.

Another problem is that weight belts accelerate degenerative disk disease. Weight belts restrict the natural motion of the lumbar spine. When you bend forward during exercises like the Squat, 80% of the movement of the back occurs in the first two disks of the spine. When you tightly cinch your belt, you force these two disks to absorb even more stress, a scenario that can accelerate the degenerative process in these disks!

Rather than preventing back injury, weight belts can actually increase your risk of developing back pain. In certain individual cases there may be some justification for using a weight belt when squatting or doing other heavy lifts. If in doubt, consult with the appropriate medical professional about it. If you are presently using a belt, you will probably have to gradually wean yourself from wearing it by using it for weights in excess of 80 percent of your IRM at first, then 2 percent more per month. You would also do well to perform additional work for the abdominal muscles so they will be able to provide the necessary support that the weight belt has been compensating for.

▲ *While weight belts are extremely popular, this fashion accessory may actually increase your risk of back injury. (Scott Wilson)*

Final thoughts

Bowling ball shoulders and baseball biceps may look impressive, but abdominal training is an essential for every athlete. The important question to ask is not if the abdominals enhance our appearance, prevent injury and improve performance—that's obvious. No, the question is not "Do we need great abs?" but "How do we get them?" Part of the answer is a good diet and exercise program that keeps bodyfat low. The rest of the answer lies in selecting more effective exercises and the correct choice of reps, sets and tempo.

As with the other chapters in this book, I believe the innovative ab exercises presented in this final chapter will have an incredible impact on the results you see from your effort. It has been my aim since page one to bring you the best and most effective programs gleaned from my years of experience. However, keep in mind that new information is always becoming available, and with it new innovations. I will look forward to continuing to be a conduit between you and the newest strength training technologies and methodologies.

CHARLES POLIQUIN

THE POLIQUIN PRINCIPLES

by Charles Poliquin

is the definitive book on strength and mass development for athletes and bodybuilders. Poliquin's unique training theories and exercise methodologies have had an international impact on athletic protocols. This book is the first comprehensive collection of Poliquin's innovative theories and strategies as they apply to muscle growth and strength.

Here's what Bill Phillips, Executive Editor of *Muscle Media*, says about *The Poliquin Principles*:

"There are a lot of self-appointed weight training 'experts' around today; in fact, there are literally hundreds. Many of them are full of hot air, to say the least. Charles Poliquin, on the other hand, truly is an expert.

In actuality, he's more like a magician than a strength coach—his weight training tricks are truly amazing.

After having the chance to train with him, one on one, and learn his Poliquin Principles, I've been able to increase the effectiveness of my workouts, which have resulted in significant gains in size and strength.

Coach Poliquin was even able to teach me how to not just 'work through' training injuries, but cure them!

After you have the chance to apply the advanced Poliquin Principles to your workouts, I think you'll be amazed by how 'prehistoric' your workouts have been!

I enthusiastically recommend The Poliquin Principles to every serious weight training athlete and bodybuilder. Coach Poliquin is one of only a small handful of weight training mentors that I believe truly deserves the title of expert."

BILL PHILLIPS