

Strength, Size, or Power?

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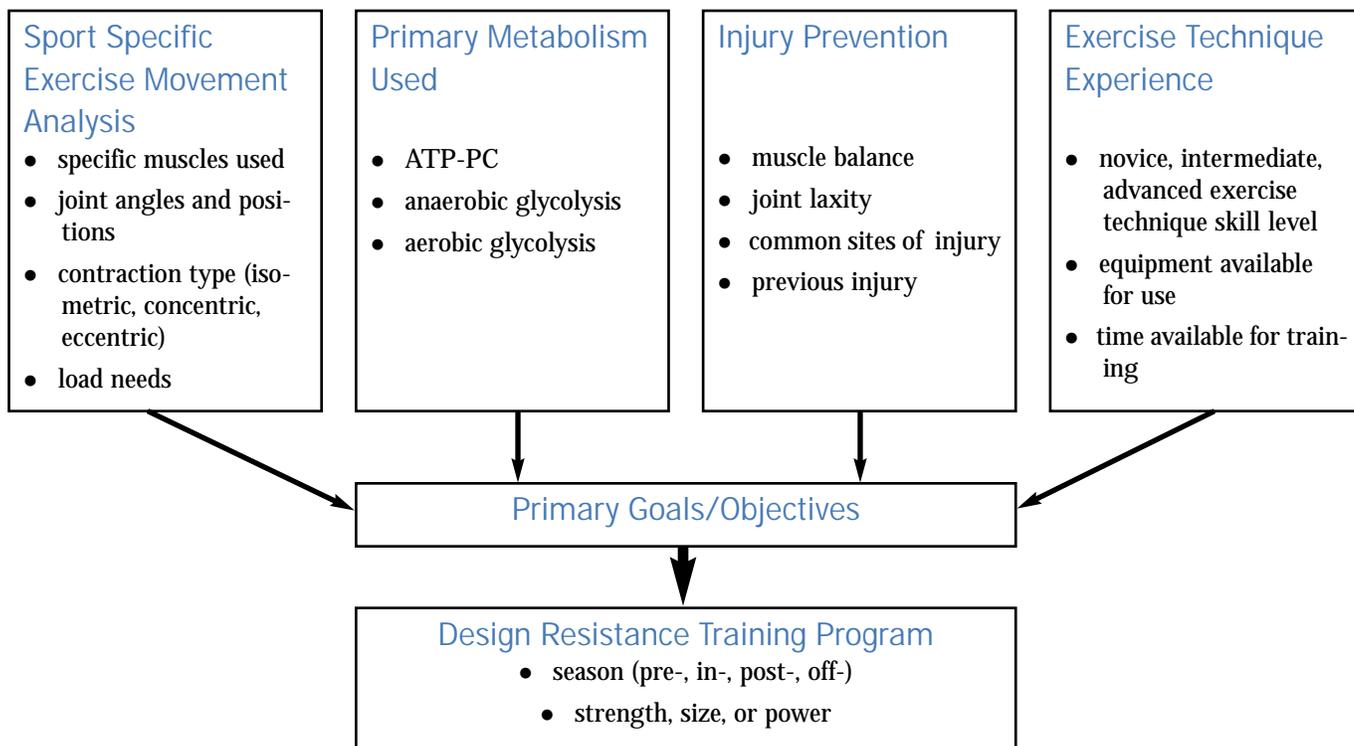
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hich one are you training for —strength, size, or power? First, let's identify what each of these are. Strength is the ability to produce or generate force. Size, also referred to as hypertrophy, is the growth or enlargement of muscle. Power is the ability to produce or generate force quickly, which is a function of time and/or speed of movement. There are specific differences in training for strength, size, or power, even though at times there may be some overlap in your training related to your sport.

Strength

Strength, in some form, is involved in every sport. It is important to develop a general base strength, and then enhance the general strength with sport specific strength training. The strength training exercises selected should follow specific movement patterns and muscle actions that are involved in your sport. Muscular balance should also be considered when strength training to avoid injuries, especially not having one muscle or group of muscles significantly stronger than another. Strength training uses concentric (tension in a muscle as it shortens), eccentric (tension in a muscle as it lengthens) and isometric (tension in a muscle when the length does not change) muscle actions to produce strength gains. This type of training emphasizes the force produced and increases the activation of the neuromuscular reaction to build strength. One can become stronger without getting significantly bigger using this type of training. The

Figure 1: Needs Analysis for Identifying Primary Goals



Modified and adapted from Baechle and Earle¹, and Fleck and Kraemer⁴.

movements that are most important to your sport should be emphasized early in the workout in order to focus on the skills most similar to the sport movement before the muscles become fatigued. Strength training uses heavy intensities of work, with low repetitions, moderate to high number of sets, with moderate to long rest periods (see Figure 2).

Hypertrophy

Hypertrophy training is best represented in the sport of bodybuilding (see photo). However, this type of training can also be used with beginning lifters to increase muscular development, with athletes that want to go up a weight class (in sports like boxing and wrestling), or with athletes such as football linemen and shotputters who will benefit from an increase in mass. Hypertrophy training uses a variety of exercises including isolation exercises with concentric and eccentric movement patterns using a variety of joint angles. Muscle groups that the athlete wants to emphasize are targeted first or very early in the workout. Hypertrophy training uses moderate to high intensities of work to the



point of muscle exhaustion, with high repetitions, and back-to-back sets of exercises for the same muscle group, with short rest periods (see Figure 2). Hypertrophy can be used as part of the beginning phase of an off-season (2 - 4 weeks) and pre-season (1 - 2 weeks) training program in a year-round training program. If you want to get big, but you are not as concerned about absolute strength or power, then hypertrophy training is for you. If muscular strength and power are your primary concerns, then hypertrophy training should be kept to a minimum.

Power

Power training is used to cause an increased speed of movement and explosiveness in muscles generating a force; therefore strength and velocity need to be emphasized in this type of training. Power exercises help to enhance the nervous system and the coordination of muscle actions to become faster, smoother and more precise. There are many ways to train for power using concentric and eccentric exercises; plyometrics (an exercise where the muscle is loaded eccentrically followed by and

Figure 2: Summary of Training Types and Variables

Training Goal	Load (% 1RM)	Repetitions	Sets	Rest between Sets
Strength	≥85	≤ 6	2 - 6	2 - 5 minutes
Power				
Single-effort	80 - 90	1 - 2	3 - 5	2 - 5 minutes
Multiple-effort	75 - 95	3 - 5	3 - 5	2 - 5 minutes
Hypertrophy	67 - 85	6 - 12	3 - 6	30 seconds - 1.5 minutes

Modified and adapted from Baechle and Earle¹.

immediate concentric contraction, also known as the stretch-shortening cycle), and isokinetic exercises involving changes in the speed of movement through a motion with a constant resistance. Power training typically involves exercises that employ multiple joint movements (i.e. running, jumping, Olympic-type exercises such as the power clean, hang-pulls, snatches, push press, etc.). These exercises are performed early in the workout before other strength exercises. Power training uses high intensities of work, with low repetitions, moderate number of sets, with moderate to long rest periods between sets (see Figure 2). In order to improve power production, a base level of strength needs to be in place to increase performance and decrease risk of injury. Power training can be done year round. However, more emphasis may be placed on power toward the end of the off-season and during pre-season training because it prepares the body to respond and react in a way to mimic sports movements closer to the actual speed of performance.

Identify Primary Goal

In order to determine which one of these resistance-training programs is correct for you, identify your primary goal by evaluating your needs and objectives (See Figure 1). Even though you may have more than one goal, it is best to focus on one goal at a time. For example if you wanted to increase your size and strength, focus on hypertrophy first for a time (i.e. 4 - 6 weeks) and then switch to focus on strength (i.e. 4 - 6 weeks) after size has been developed. (Remember that hypertrophy and strength overlap—you cannot completely separate the two.) This gets into an area of training called periodization, which involves manipulating workouts in calendar time periods for specific goals and objectives³. A general seasonal guideline is indicated in Figure 4. So focus on your goals, know what you are training for and why you are training.

Figure 3: How to Test One Repetition Maximum (1RM)

1. Warm up with a light resistance that allows 5 - 10 repetitions easily.
2. Rest for 1 minute.
3. Estimate a warm up load that will allow 3 - 5 repetitions:
 - 10 - 20 lbs (5 - 10%) for upper body
 - 30 - 40 lbs (10 - 20%) for lower body
4. Rest for 2 minutes.
5. Estimate a conservative near maximum load that will allow 2 - 3 repetitions:
 - 10 - 20 lbs (5 - 10) for upper body
 - 30 - 40 lbs (10 - 20%) for lower body
6. Rest 2 - 4 minutes.
7. Add load:
 - 10 - 20 lbs (5 - 10) for upper body
 - 30 - 40 lbs (10 - 20%) for lower body
8. Attempt 1RM.
9. If successful, rest 2 - 4 minutes then repeat step 7 and 8. If unsuccessful, rest 2 - 4 minutes then subtract:
 - 5 - 10 lbs (2.5 - 5%) for upper body
 - 15 - 20 lbs (5 - 10%) for lower body
 and then go back to step 8.
10. Continue increasing or decreasing the load until 1RM can be completed with proper exercise technique. Typically this should be accomplished in 5 testing sets.

Figure 4: General Sport Season Training Focus

Sport Season	Actual Sport Practice Emphasis	Resistance Training Emphasis	Resistance Training Frequency	Focus of Resistance Training
Pre-Season	Moderate level	Moderate level	3 - 4	Sport-specific (strength, power, endurance) movements are emphasized.
In-Season	High level	Low level	1 - 2	Maintenance of pre-season goals.
Post-Season	Variable level	Variable level	1 - 3	May include a variety of any type of sport or movement skill. Also known as an active rest period with no specific training.
Off-Season	Low level	High level	4 - 6	Progression from hypertrophy and muscular endurance training to strength and power (specific to and dependent on sport).

Modified and adapted from Baechle and Earle¹.

Figure 5: A Sample Program Differentiating the Types of Training

Exercise Selected	Hypertrophy Training (load x repetitions x sets) (exercise order)	Strength Training (load x repetitions x sets) (exercise order)	Power Training (load x repetitions x sets) (exercise order)
<i>Lower Extremity</i>			
Back Squat	75 x 10 x 5 1	90 x 4 x 6 1	75 x 5 x 5 3
Dead Lift	75 x 10 x 5 3	90 x 4 x 4 2	75 x 5 x 3 4
Leg Press	67 x 12 x 4 4	90 x 4 x 6 3	No
Quadriceps Extension	67 x 12 x 4 2	85 x 6 x 4 4	No
Hamstring Curls	67 x 12 x 4 5	85 x 6 x 4 5	No
Calf Raise	75 x 10 x 6 6	85 x 6 x 6 6	No
Clean	No	No	80 x 3 x 4 1
Snatch	No	No	80 x 3 x 4 2
<i>Upper Extremity</i>			
Bench Press	75 x 10 x 4 1	90 x 4 x 6 1	75 x 5 x 5 2
Overhead Press	67 x 12 x 3 2	85 x 6 x 5 2	No
Bent-over Row	75 x 10 x 4 4	90 x 4 x 6 3	No
Lat. Pull-down	67 x 12 x 3 5	85 x 6 x 5 4	No
Biceps	67 x 12 x 4 6	90 x 6 x 4 5	No
Triceps	67 x 12 x 4 3	90 x 6 x 4 6	No
Wrist Curl	67 x 12 x 3 7	85 x 6 x 2 7	No
Push Jerk	No	No	80 x 3 x 5 1
	Rest 1 minute betw. sets	Rest 3 minutes betw. sets	Rest 5 minutes betw. sets

Performing a four-day split routine with upper extremity on Monday and Thursday, and lower extremity Tuesday and Friday. The exercises selected on this table are not all inclusive. This program is a sample of how to manipulate the load, repetitions, sets and exercise order to obtain the desired training results. Some exercises are performed in one type of training, but not necessarily in other types of training. A percentage of the 1RM is listed for the load. When “no” is next to an exercise, it would not typically be performed for that type of training session.

Designing the Program

Once a training program has been selected, one must design the actual program. To determine the intensity of each exercise you need to determine your one repetition maximum (1RM) (see Figure 3). From the 1RM, your weight load for a particular exercise is calculated based on a percentage of the 1RM. Your workouts will be designed based on the calculated weight loads. After training for a while (when the exercise becomes easier to perform, or when repetitions are completed with additional repetitions), it will become necessary for the intensity to change. A conservative method of increasing the weight load is the “2-for-2 rule.” This suggests that when an athlete can perform two or more repetitions over their assigned repetition goal in the last set of the exercise for two consecutive workouts, weight should be added to that exercise for the next workout.² Using this rule will help to keep the training workouts progressing and maintaining intensity as strength, power and size are improved. A sample program differentiating the types of training is shown in Figure 5.

Summary

There is a specific use for training strength, size and power in sport. Knowing your sport and your goals will help to determine what you should focus on in your year-round training program. Hypertrophy for muscle growth, strength for generating force, and power for generating force with speed. For more information and direction in this area contact a local Certified Strength and Conditioning Specialist.

References

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About the Author

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