I have noticed a tendency among members of the CrossFit community to select heavy medicine balls for various exercises. We do this, I think, because we equate weight with strength and assume that if a 6-pound ball is good for an exercise, then an 18-pound one must be three times as good. However, the primary benefit of medicine ball work is not strength per se but **multijoint power through the summation of ballistic body segment forces**—of which strength is only one part. Agility, coordination, speed, dynamic flexibility, balance, and accuracy are equally in play when measuring the total horsepower generated in any ballistic assignment pulled from the CrossFit hopper of varied physical challenges one might need to perform.

**More drill, less instruction**

A good coach knows that a specific athletic skill is learned (discovered) and not taught. The coach's time and attention is spent on directing sufficient drill and repetition activity that allows the athlete to discover the aspects of the skill experientially. The coach may from time to time point out glaring errors in movement, but for all practical purposes the fine balance, agility, reflex transition points, and coordination—the important changes in the nervous system that constitute learning and skill—are discovered and incorporated through directed repetitive activity. The right lightweight medicine ball is a perfect tool for such drills. Keep it light and the drills are about practice and training. Go heavy and it becomes training only.

**Weight, velocity, and volume**

We must always be aware of two basic kinesiological principles. First, maximum horsepower is generated at one third of maximum torque. This principle applies to single- and multiple-joint movements, and it tells us that more is not always better when the training intent is to develop power. The second law of kinesiology to bear in mind is that the overload principle of exercise can be met either with velocity of movement or with weight—or with a combination of the two. All three overload mechanisms can be used to summon the desired number of motor units to perform a given task, with each mechanism having a different intent.
With medicine ball training, velocity or a combination of velocity and weight should always be the overload mechanism of choice. This is the mechanism of the Olympic lifts and their variations. Olympic weightlifting’s generation of horsepower through the bilateral summation of forces from ankle, knee, hip, posterior spine, shoulder, and elbow is unmatched, as all of the joints are working ballistically in the proper sequence at precisely the proper time. Medicine ball work can also provide excellent horsepower training, using many more combinations of force summation, as long as the load is not too great. When this is the intent, lighter balls should always be used. Where pure strength through less complicated movement is the only intent, heavier balls can be used as a strength-training implement.

Coaches, trainers, and physical educators are often baffled when an individual’s performance at a physical task does not correspond to expectations based on the measured strength levels of the body segments involved in the task. Failing to recognize the reason for the discrepancy, they continue along the same path of trying to develop greater strength. Though psychological and other complicated physical factors may partially account for the performance shortfall, the primary cause is often the insufficient generation of power through the summation of the forces involved.

The ability of an individual to capture the full potential power of all the joints involved by using them in the proper sequence at precisely the proper time is related to his or her command of the other general physical skills described in CrossFit’s definition of fitness. The more ways an individual can use and train these general physical skills, the easier it becomes to transfer them to new tasks. Good summation explains why a welterweight boxer who can bench only his body weight can deliver a knockout punch, or why a pitcher who can do only five bodyweight pull-ups can throw a 100mph fast ball. Poor summation explains why a 450-pound bench presser can throw the shot put only 45 feet. When these discrepancies are discovered, the first two examples should go into the weight room and begin a strength-training cycle that includes medicine ball assignments that incorporate the new strength as it develops. The bench presser, on the other hand, should curtail his strength training immediately and begin incorporating (“practicing”) multi-joint high-velocity medicine ball assignments to learn to apply his strength functionally. The weight of the ball needs to be heavy enough to visibly slow the intended motion but not so heavy that it distorts it or diminishes the prescribed volume of repetition.

The super wheel

We have developed a movement complex called the five-stroke super wheel that illustrates quite clearly the relationship between weight, velocity, and volume of work. The super wheel is a series of high-velocity core and shoulder girdle movements, where the movement changes every five strokes. (See super wheel video.) This medley of movements is designed to work the anterior trunk and shoulder girdle at all angles at high velocity and with quick transition time between movements. The weight used in the video is an 8-pound Dynamax ball, although a 4- or 6-pound ball is ideal. A larger, stronger trainee will move the ball at a higher velocity, reaping the same benefits, through the velocity/weight overload mechanism, as a weaker trainee moving it at a lower velocity. A heavy ball—say, 16 to 20 pounds—would diminish both velocity and volume and distort the intended motions. The super wheel can be done in 3, 5, or 8 strokes, depending on the dosage the trainee can handle without distorting.
Distortion

When I refer to distortion, I mean degradation in the structure, rhythm, direction, and intensity—the kinematics—of portions or the whole of a movement or repetitive cycles of movement. To a large extent, kinematics is as individual as fingerprints, but there are fundamental parameters of effective movement that we look for. Even when weight is added to a cycle of repeated movements, the last repetition should look substantially the same as the first.

Summary

With any assignment utilizing the medicine ball as weight and joint and stroke velocity as the mechanism of overload, the weight selected should be light enough so that the assigned volume can be completed at the highest stroke velocity without substantially altering the kinematics of the assigned motion. If you err on the side of light weight, velocity increase will ensure that you benefit from both the practice and training effects. If you err on the side of heavy weight and then fail in velocity, volume, and/or integrity of the movement, you are left with only a strength-training set. Train smart, and choose the right weight—not just the most “impressive” one—for the physical skills you need to develop.

Jim Cawley is the founder and coach of the Waterloo Track and Field Club in Austin, Texas, and for the past 20 years has been an instructor at Austin Community College and a private coach and consultant in youth and adult physical education. He is a three-time medalist in the National Masters Decathlon and national champion in the high jump, triple jump, and long jump. He is the Texas Senior Games champion in the 100-meter freestyle and 100-meter butterfly swim events and was fourth in the world in his specialty, the track and field decathlon, at the 1999 World Games in Gateshead, England. He is also cofounder of Dynamax Inc., the maker of CrossFit’s favorite medicine balls.