Resistance training exercises can be categorized into four types: explosive exercises, cross-body exercises, compound exercises, and isolation exercises. Correspondingly, when it comes to using resistance exercise, there are four primary foundational training approaches: Olympic-style lifting, functional training, powerlifting, and bodybuilding. Each of these approaches focus on a different type of resistance exercise. Explosive exercises (e.g., barbell clean) are often the training focus of those who follow an Olympic-style lifting approach. Cross-body exercises (e.g., standing single-arm cable press) are commonly associated with functional training. Compound exercises (e.g., barbell bench press) are often the training focus of those who follow a powerlifting-style approach. Lastly, isolation exercises (e.g., biceps curls with free weights or on a machine) are commonly used for bodybuilding.

This article seeks to demonstrate that for the purposes of improving general health, fitness, and functional capacity each of the four types of resistance exercise should not be looked at as mutually exclusive. Rather, they should be viewed as complimentary training components because each type of resistance exercise offers unique benefits the other types may lack.

EXPLOSIVE EXERCISES
Explosive exercises (e.g., Olympic-style lifting variations and medicine ball throwing variations) involve a coordinated effort of the entire body to summate force, which is the sum of the total force of individual muscles added together, in an explosive manner. Explosive exercises are useful because athletic movements, from throwing a punch to sprinting and jumping, do not just come from power generated in one specific area of the body, but rather come from the combination of all the individual muscles producing power in a smooth, coordinated sequence. Explosive exercise applications are designed to use as many muscles in a sequential and explosive manner as possible to obtain maximal force.

A unique benefit of explosive exercise applications is that they closely match the force production patterns of fast, ballistic, sporting-type actions, which require a triphasic muscle firing pattern. The triphasic muscle firing pattern involves alternating bursts of activation in agonist (muscles responsible for bringing about movement) and antagonist (muscles responsible for stopping or slowing down a movement) muscles (4). It follows a sequence of activity that begins with an agonist burst, followed by a burst of the antagonist muscles, and followed again with another burst using the agonist muscles. Although slow movements produce a single continuous activation of only the agonist muscles, research has shown that a triphasic muscle firing pattern of burst-like muscle activation occurs when the same movements are performed at fast speeds (1,2,7).

The principle of specificity dictates that training methods should match the desired training effect (4). The triphasic muscle activation pattern has been shown to be present during fast,
ballistic movements. Incorporating fast, ballistic exercises into the training program is recommended in order to maximize the potential to safely and effectively perform a variety of explosive, athletic movements (4).

The programming implications of the above suggest that explosive exercise applications may enhance the ability to summate force, in an explosive manner. These exercises also potentially refine the triphasic muscle firing pattern involved in high-speed actions. Using a variety of these exercise applications and in various directions is advised since power is direction specific.

CROSS-BODY EXERCISES
The anatomical characteristics of the human body dictate that it commonly functions in a crisscross manner, with the arm and shoulder on one side linking diagonally through the torso to the hip and leg on the opposite side. Since these cross linkages are such a foundational aspect of human function, terms such as the serape effect and the posterior oblique sling have been used to describe some of the specific, key muscular relationships involved in performing cross-body actions (5,11). However, when the entirety of the muscular relationships responsible for the variety of cross-body actions the human body is capable of performing are taken into account, the interaction between these different anatomical relationships can collectively be called the body’s “x-factor.”

Cross-body exercises are exercise applications that are specifically focused on providing loading in which these x-factor linkages are used, therefore adding more specificity. These exercise applications utilize single-arm loading or off-set loading (e.g., two unevenly loaded dumbbells) movements from various stances.

Although traditional compound exercises, such as the barbell squat and the barbell bench press, can help strengthen the entire body, they are not ideally suited for improving the coordination of the body’s x-factor linkages. This is because these linkages are usually used when standing, or in environments when the body is rotating, resisting rotation, or dealing with an unbalanced load.

This is highlighted in the research comparing the single-arm standing cable press (a cross-body exercise) with the traditional bench press (a compound exercise) (8). The results of this study showed that the single-arm standing cable press performance is limited by the activation and neuromuscular coordination of torso muscles, not maximal muscle activation of the chest and shoulder muscles (8). In other words, the limiting factor when pushing an off-set load from a standing position is the stiffness of the torso muscles and their ability to maintain body position and to coordinate the hips and shoulders while stabilizing the forces created by the extremities.

The unique benefit cross-body exercises offer is the consistency between these exercise applications and the force generation and neuromuscular coordination patterns that commonly occur when movement involves the body’s x-factor linkages. It is worth noting that as powerlifters use “assistance exercises” to improve the target movements in the sport of powerlifting, cross-body exercise applications utilize this same wisdom to improve in the target movements of sports.

COMPOUND EXERCISES
Compound exercises are multi-joint movements that involve several muscle groups. These exercise applications primarily consist of conventional strength training lifts such as squats, deadlifts, bench presses, chin-ups, rows, etc. Unlike cross-body exercises, compound exercises do not necessarily reflect the force generation patterns of specific athletic movements. However, in comparison, compound exercises tend to create a more ideal environment for stimulating increases in general strength and recruitment of motor units, along with overall improvements in muscular hypertrophy, bone density, and connective tissue strength (2,7,8,12).

ISOLATION EXERCISES
Isolation exercises are single-joint movements that focus on individual muscle groups. These exercise applications primarily consist of classic bodybuilding exercises such as biceps curls, triceps extensions, shoulder raises, leg extensions, and leg curls. These exercises focus on developing improved control, strength, and hypertrophy, while also contributing to overall muscle balance, physique development, and connective tissue strength.

A benefit isolation exercises offer is highlighted by the research that supports the fact that hamstrings activity is low during compound exercises such as the squat and the leg press (3,10). This led the author of one study to conclude that “the squat is not an optimal exercise for training the hamstrings.” This evidence is further validated by another study, which found significant increases in muscle hypertrophy of the quadriceps from squats, but found no changes in hamstrings muscle growth from baseline (12). This highlights the importance of including isolation exercises for overall development and strength in addition to the other types of exercise.

A MIXED APPROACH TO RESISTANCE EXERCISE PROGRAMMING
Additionally, when it comes to developing the hamstring musculature, a study compared the stiff-legged deadlift and the lying leg curl (where movement originates at the hip versus the knee) to investigate whether these exercises will result in differential activation of the hamstring muscle complex (9). The researchers used surface electromyography (EMG), which measures the electrical activity of muscles during exercise, to record muscle activity of the upper lateral hamstrings, lower lateral hamstrings, upper medial hamstrings, and lower medial hamstrings. The results showed that the lying leg curl elicited significantly greater activation of the lower lateral and lower medial hamstrings compared to the stiff-legged deadlift. This demonstrates that different regions of the hamstrings can be regionally targeted through exercise selection.

These results demonstrate that a comprehensive hamstring exercise program should incorporate at least one exercise where movement is focused at the hip joint (such as the deadlift or other compound exercises) and one exercise where movement is focused at the knee joint (such as the leg curl or other isolation exercises) as each offer unique but complimentary training benefits.
RESISTANCE EXERCISE PROGRAMMING—A MIXED-TRAINING APPROACH

The research study discussed in the cross-body section, which compared the standing single-arm cable press and bench press, also showed that horizontal pushing forces when performing the standing single-arm cable press are limited to around 40.8% of one’s bodyweight, rather than of one’s bench press (8). In other words, the heavier the body is, the more horizontal and diagonal pushing force is possible from the standing position due to having more mass to push from. It is important to note that this is not to assert that getting a stronger bench press does not help standing pushing performance, because it can help. These results demonstrate that having more weight can help to improve performance by giving the individual a greater platform from which to push against the opposition as well as better stability to avoid getting knocked over or off-balance.

For example, putting on 20 lb of muscle mass for an athlete or client may allow more horizontal and diagonal pushing force from the standing position. This can be achieved for this individual by implementing a mixed training approach by incorporating compound exercises, like the bench press, along with isolation exercise applications, as both of these types of resistance exercise create a more ideal training environment for hypertrophy gains than explosive and cross-body exercises.

CONCLUSION
Improving general health, building muscle, and increasing functional capacity requires several different resistance exercise components because no single type of resistance exercise will ever be able to address such multifaceted demands fully. A mixed approach to resistance exercise programming that utilizes all four types of resistance exercise may provide superior training results when compared with exclusively using only one type of exercise. The amount of time spent on each type of resistance exercise per workout and throughout a training week should be manipulated in the program based on which physical qualities are most desired. This is done by designing the exercise program so the client or athlete is spending the most amount of their training time and energy performing the exercise type(s) that create the training environment that most closely reflects their training goals.

REFERENCES


ABOUT THE AUTHOR
Nick Tumminello is the owner of Performance University, which provides practical fitness education for fitness professionals worldwide, and is the author of the book “Strength Training for Fat Loss.” Tumminello has worked with a variety of clients from National Football League (NFL) athletes to professional bodybuilders and figure models to exercise enthusiasts. He also served as the conditioning coach for the Ground Control Mixed Martial Arts (MMA) Fight Team and is a fitness expert for Reebok. Tumminello has produced 15 DVDs, is a regular contributor to several major fitness magazines and websites, and writes a very popular blog at PerformanceU.net.