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THE 8 MAIN MOVEMENT PATTERNS—A PROGRAMMING FRAMEWORK FOR TACTICAL STRENGTH AND CONDITIONING

An effective tactical strength and conditioning program aims to improve soldier and first responder unit readiness, as well as reduce preventable injuries and attrition. This means helping soldiers and first responders build an all-around stronger and more adaptable body capable of performing at a higher level in any environment, not just in the gym.

Put simply, enhanced tactical performance comes from maximizing training transfer to the common soldier and first responder tasks. To maximize training transfer, this list of movement patterns is recommended to be used by the tactical facilitator to guide training every week. Similar lists of essential movement patterns have been published in the lay literature, and the purpose of this article is to tie these patterns to tactical performance.

1. Jumping and landing
2. Throwing and striking
3. Locomotion
4. Rotation
5. Pushing
6. Pulling
7. Knee bending
8. Hip hinging

The following will detail the rationale for making these movements the foundation of tactical strength and conditioning.

TACTICAL READINESS TRAINING – A MOVEMENT PATTERN CHECKLIST

Using these eight movement patterns as the basis of weekly training for soldiers and first responders provides a simple programming framework by specifying the main movements to focus on each week. Unless injury prohibits one from performing exercises in a given movement category, every week each soldier and first responder should do at least one exercise that represents each of eight movement patterns.

The tactical facilitator is advised to select (and deselect) exercises from each of the following categories based on each individual's current ability, fitness level, and medical profile, along with their current training environment and access to equipment.

1. JUMPING AND LANDING

It is important to note this category is jumping and landing, not just jumping. This is because improving tactical readiness is not only about the ability to jump across and over obstacles, but also to be able to more effectively tolerate landing.

The tactical facilitator should regularly incorporate a variety of jumping, hopping, and bounding drills in multiple directions because research indicates that power and agility are direction-specific (1). As for both men and women, the single-leg vertical, horizontal, and lateral jump tests measure mostly different leg power qualities. As a result, they should not be used interchangeably (1). Some sample exercises for the jumping and landing movement category include:

- Squat jump
- Box jump
- Broad jump
- Lateral bound
- Lateral hop

2. THROWING AND STRIKING

Checking this movement category off the training list means throwing medicine balls, hitting a heavy bag, or doing mitt work. If one is not able to perform medicine ball throwing drills either against a wall or into an open space (e.g., field or parking lot), one can simply do a few rounds on the heavy bag. Another alternative is to take a boxing, kickboxing, or mixed martial arts (MMA) class 1 – 3 times per week.

Although throwing a medicine ball is a different skillset than hitting mitts or a heavy bag, throwing and striking are grouped here into the same category because they have similar force-generation and neuromuscular coordination patterns (not because they load the specific skills required in any given sport). In that, both throwing and striking are related because power in both actions is initiated by the larger, stronger muscle groups in the central part of the body, whereas the smaller muscles of the extremities are used in fine movements and coordination (i.e., skills).

Throwing medicine balls and striking exercises involve a coordinated effort by the entire body (the individual muscles added together) to summate force explosively. Athletic movements—such as throwing a punch and throwing

equipment onto or over an obstacle—are driven not by power generated in just one specific area of the body, but by the combination of individual muscles producing power in a smooth, coordinated sequence.

Additionally, throwing and striking exercises involve fast muscle actions, which involve what is called a triphasic muscle-firing pattern (2,3,4). Whereas slow movements produce a single, continuous activation of the agonist muscles (i.e., the muscles creating the movement), research has shown that performing the same movements fast leads to a triphasic muscle-firing pattern of bursts of muscle activation (2,3,4). The triphasic muscle-firing pattern involves alternating bursts of muscle activation in agonist and antagonist muscles (i.e., the muscles that work counter to those muscles creating the movement). This sequence of activity begins with an agonist burst, which is followed 30 – 40 milliseconds later by an antagonist burst, which in turn is followed 30 – 40 milliseconds later by another agonist burst (2,3,4).

Various research findings indicate that the triphasic muscle-activation pattern is always present during fast movements (2,3,4). Therefore, the principle of specificity dictates that the tactical facilitator incorporate fast, ballistic exercises into training to maximize the potential of soldiers and first responders to safely and effectively perform a variety of fast athletic movements. In programming, the tactical facilitator should prescribe exercises each week to address each of the three pillars of power:

- Vertical or diagonal power
- Horizontal power
- Rotational power

The following are examples of throwing and striking exercises for each of the three pillars of power.

Sample Exercises for Training the Vertical or Diagonal Power Pillar

- Medicine ball vertical squat push throw
- Medicine ball rainbow slam

Sample Exercises for Training the Horizontal Power Pillar

- Medicine ball step and chest throw
- Front kicks or knee strikes (on mitts or heavy bag)

Sample Exercises for Training the Rotational Power Pillar

- Medicine ball rotation throw
- Boxing or kickboxing (on mitts or heavy bag)

3. LOCOMOTION

Locomotion can be simply defined as the ability to move from one place to another. Regularly training the locomotion category helps to improve tactical readiness that transfers into such common tasks as carrying ammunition to a fighting position or vehicle, ruck march, and infiltration. The following is a non-exhaustive list of exercise options to fulfill the locomotion category:

- Running/sprinting
- Skipping
- Shuffling
- Carioca
- Crawling
- Carrying
- Weighted sled pushing or pulling

It is important to note that some of the above exercises are performed with an additional external load such as carrying and weighted sled pushing and pulling. Other actions in the locomotion category (e.g., running, skipping, and shuffling) can be performed without the use of external load. Therefore, although all of the above actions require movement from point A to point B, different locomotion activities can last from a few seconds to several minutes depending on the external load and speed involved.

Incorporating a variety of locomotion activities, some performed slower using heavy loads and others performed faster with bodyweight only, instead of focusing primarily on one form of locomotion with the same speed and load, can aid in improving overall locomotion ability. This is because the principle of specificity dictates that the adaptations to training will be specific to the demands the training puts on the body (5).

4. ROTATION

The anatomical characteristics of the human body dictate that it commonly functions in a crisscross manner (6,7,8). More specifically, the arm-and-shoulder mechanism on one side links diagonally through the torso mechanism to the hip-and-leg mechanism on the opposite side (6,7,8). Consider for example, the motions used in walking, running, punching, and sports such as golf, tennis, baseball, etc. Such cross-body linkages are foundational to human movement functionality and thus are also a big part of athletic movement. For this reason, a variety of dynamic rotational exercises should be regularly incorporated into tactical strength and conditioning programs.

Two Basic Forms of Rotation to Incorporate Each Week into the Workouts

1. Horizontal rotation
2. Diagonal (high-to-low or low-to-high) rotation

It is important to note that anti-rotation strength exercises, such as the Pallof press, are isometric. Although isometric training certainly can lead to strength gains, the gains are relatively joint angle-specific to the trained position (9,10.11). Therefore, improving the body's ability to perform dynamic rotational actions requires dynamic rotational exercises such as:

- Cable rotation with hip shift
- Cable low-to-high chop
- Cable high-to-low chop
- Weight-plate chop

5. PUSHING

These exercises improve the ability to move something away from them, such as an object or opponent. This ability improves tactical readiness by preparing the body to perform such tasks as:

- Lifting soldiers; assisting a buddy to climb up a wall
- Employing progressive levels of force in person-to-person contact
- Moving obstacles
- Pushing an opponent away during person-to-person contact
- Pushing a disabled vehicle
- Getting to and from the ground during evasion and maneuver
- Reaching out from the prone position when shooting, taking cover, or low crawling

The tactical facilitator is advised to incorporate vertical or diagonal and horizontal pushing into their programming at least once each week. If vertical (i.e., overhead) pressing bothers one's shoulders, then sticking with diagonal pressing exercises, such as the angled barbell press or incline bench press, are effective options.

Sample Vertical Pushing Exercises

- One-arm dumbbell pverhead press
- One-arm band overhead press

Sample Diagonal Pushing Exercises

- Dumbbell incline press
- Angled barbell press
- Band incline press

Sample Horizontal Pushing Exercises

- Barbell bench press
- Dumbbell bench press
- Push-up

6. PULLING

Pulling exercises improve the ability to move something—such as an object or opponent—closer in order to better control it or hold it. This ability improves tactical readiness by preparing the body to perform such tasks as:

- Surmounting obstacles and walls
- Rope climbing, descending, or traversing
- Extracting a casualty from a vehicle and carrying them to safety
- Employing progressive levels of force in person-to-person contact
- Moving obstacles
- Developing the muscles that assist in load carriage

Although the upper-body pulling motion is the opposite of pushing, these two movements are often used together—for example, in actions such as sawing and punching (e.g., a one-two combination in which a left jab is followed immediately by a right cross). As with the pushing exercises, there are two specific types of pulling exercises to perform at least once each week as part of a comprehensive tactical strength and conditioning program: vertical and horizontal.

Sample Vertical Pulling Exercises

- Pull-up and chin-up
- Lat pulldown
- Banded wide-elbow lat pulldown

Sample Horizontal Pulling Exercises

- Dumbbell bent-over row
- Dumbbell off-bench row
- Cable or band one-arm row

7. KNEE BENDING

This movement category refers to the lower body and involves some type or combination of squat, lunge, or step where the torso remains fairly upright. Improving the ability to perform these fundamental human actions transfers into helping soldiers and first responders more safely and effectively lift heavy loads from the ground, such as equipment or personnel, and react quickly to direct and indirect fire.

There are three types of single-leg knee bending exercises: one-leg stance, split-stance, and lunging and stepping. Single-leg exercises do not have to mean only one leg is working at a time. It can also mean both legs are working while one leg is doing most

of the work, like when pushing a sled, which demands the lead leg gets most of the work on each step.

Some tactical facilitators may wish to make squatting its own movement category. This is not recommended because it can become a problem. Squatting is generally associated with the movement involved when performing the barbell back squat; however, not everyone is built to squat in that manner.

The conventional style of squatting is just one way to train the fundamental action of knee bending and it should not be put on a pedestal, so to speak. There are plenty of other ways to do knee bending exercises that better fit the individual based on body proportions and injury history.

Sample Double-Leg Knee Bend Exercises

- Barbell back or front squat
- Dumbbell or kettlebell goblet squat
- Band squat

Sample Single-Leg Knee Bend Exercises

- Single-leg knee tap
- Dumbbell step-up
- Band Zercher reverse lunge

8. HIP HINGING

Hip hinge exercises represent movements that can improve soldier and first responder readiness to safely and effectively lift and move heavy loads from the ground (such as personnel and equipment) and extract a casualty. Hip hinge exercises are to the lower body what pulling exercises are to the upper body. Like knee bending exercises, hip hinging exercises include single-leg and double-leg forms, and it is recommended to do both at least once per week. Any debate about single-leg versus double-leg exercise is like arguing about eating only carrots or only broccoli—in reality, each vegetable offers a unique flavor and provides a certain set of nutrients, so both should be included in a diet.

Research highlights that neither single-leg nor double-leg exercise is inherently or universally better (12,13,14). One study compared unilateral (single-leg) versus the standard bilateral squat training for strength, sprints, and agility in rugby players. Research found that Bulgarian split squats were just as effective as barbell back squats in improving measures of lower-body strength, 40-m sprint speed, and change of direction (12).

Yet another study found that although unilateral and bilateral training appears to affect muscle size adaptations similarly, and while both groups had increases in both unilateral and bilateral strength, the unilateral training group had the greatest strength improvements in unilateral strength and the bilateral training group had the largest improvement in bilateral strength (14). With the above in mind, tactical facilitators should incorporate both knee bending and hip hinging exercise options in different programs without obsessing over one variant.

Sample Double-Leg Hip Hinge Exercises

- Trap bar deadlift
- Barbell or dumbbell Romanian deadlift (RDL)
- Band hybrid deadlift

Sample Single-Leg Hip Hinge Exercises

- Dumbbell traveling RDL lunge
- Dumbbell single-leg RDL
- Band split-stance Zercher RDL

STICK TO THE BASICS

Tactical facilitators should avoid mistaking the fundamentals of strength training for the fundamentals of competitive weightlifting. With this reality in mind, one of the biggest things that separate a training program for weightlifters and a training program for soldiers and first responders is that, for tactical athletes, it is not about mastering specific exercises. It is about mastering the eight main movement patterns by utilizing a variety of exercises used to express those movements to ensure that the tactical athlete is all-around stronger and more capable. Even though exercises may change when developing new workout programs, the foundation of every program should be based on using the same eight main functional movements, but in slightly different ways by using different exercise variations in each program.

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