Advanced Physical Training for the Soldier – Athlete

Soldiers are Warriors. A Soldier on the battlefield is akin to professional athletes at the top of their game. Success in both professions demands physical performance optimization. The difference is that in order for a Soldier to optimize performance, he must possess the speed and mobility to get there, the strength and power to do the job and the endurance to complete the mission.

Physical readiness training (PRT) is a daily opportunity to build the valuable Soldiering skills of strength, power, speed and agility required to help Soldiers meet their mission. Providing emphasis on a variety of physical tasks enables commanders to observe the full physical readiness of the unit. It also allows an opportunity for more Soldiers to take pride in their skills. Soldiers excelling in different skills can boost unit and individual morale, inspiring Soldiers to take ownership of their own physical fitness.

The Army's current physical fitness program focuses primarily on muscular endurance and cardio respiratory fitness. It prepares Soldiers for the annual APFT, but does not optimize them for combat. These areas alone do not adequately address the operational fitness requirements of strength, speed, power, and agility. This manual compliments the US Army Physical Fitness School's Physical Readiness Training manual by providing a variety of advanced strength, mobility and endurance exercises and recommendations. Use it daily to help your Soldiers be successful and motivated Warriors. Army Strong!

In the most basic form of Soldiering physical success means having the ability to move, to acquire and to engage a target.

A Soldier must have the endurance to travel by foot to the objective (in some environments this involves several hours of uphill walking with a pack at altitude); the strength to defeat, move and climb over obstacles in his/her path; the mobility to skillfully maneuver on the objective and after extreme physical exertion, the stamina to control his/her breathing well enough to accurately fire a weapon at the target.

Battle Focused Training

The goal of any training program should be to accomplish the mission. In order to do this, you must take a good look at the unit's Mission Essential Task List (METL). Break down each METL task into the fitness categories below. This will allow you to design a fitness program aimed at improving the required tasks in your unit's METL.

An example of infantry METL tasks and the fitness skill required of each task:

Task	Muscular Strength	Muscular Endurance	Aerobic Endurance	Anaerobic Endurance	Flexibility	Mobility
Foot March	X	XXX	XXX	X		X
Climb	XXX	XX	X	XXX	XXX	XXX
Sprint to Cover	XX				X	XX
High/Low Crawl	XX	XXX	X	XXX	XX	XXX
Casualty Carry	XXX	XX	X	XXX	XX	XXX
Digging	XX	XXX	XX	XX	X	XX
IMT	XX	XX	X	XXX	XX	XXX
Run		XX	XX	XX	X	X
TOTAL	**15**	**17**	**11***	**17**	**12**	**18****

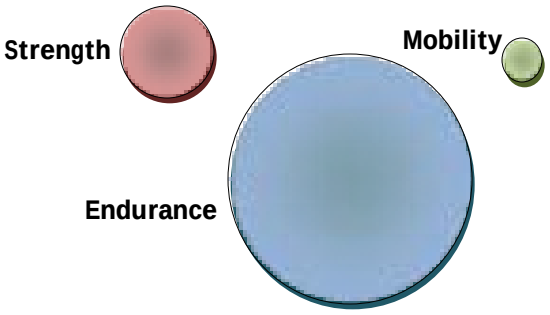
X – light

XX – moderate

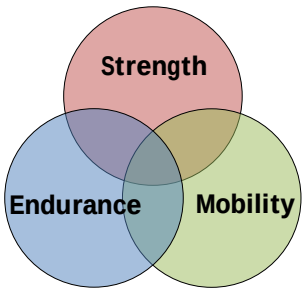
XXX - heavy

, **Note the above category with the highest METL demand is mobility, and the category with the lowest demand is aerobic endurance.

Current PT Focus:



Building the Soldier Athlete:



The definitions of the general components of the Building the Soldier Athlete Program are:

Strength - the ability to overcome resistance.
Endurance - the ability to sustain activity.
Mobility – the quality of movement (agility, balance, coordination)

Injury rates

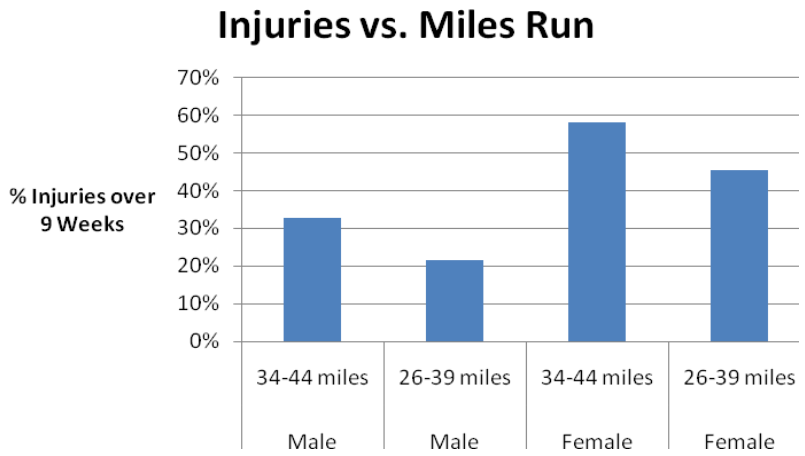
Risk Factors proven to make you more likely to suffer an injury include:

- Low Fitness Level
- Prior Injury
- Physical Inactivity
- Female Gender
- Over 25 years old
- Tobacco Use

Ways to reduce injury rates:

- Avoid over-training (see table below)
- Perform exercises that involve the entire body - e.g. agility drills
- Replenish nutrients within 1 hour of completing training
- Wear ankle braces for cutting activities if you have a history of a previous ankle sprain
- Wear mouth guards during contact activities
- Wear synthetic blend socks to prevent blisters
- Ensure that commanders take into account the various fitness levels of their Soldiers in order to balance risk of injury with training[1]

What the Research Tells Us About Overtraining



Soldiers who ran more (34-44 mi.) had more injuries than those who ran less (26-39 mi.).[2]

Gender	Miles Run over 9 weeks	Percent Injuries	2 Mile Run Time
Male	34-44 miles	33%	14.9 min
Male	26-39 miles	21%	14.8 min
Female	34-44 miles	58%	18.0 min
Female	26-39 miles	46%	17.8 min

The table above illustrates, a significantly lower weekly mileage resulted in slightly faster run times and a significantly lower injury rate.

Bottom line: **higher mileage produced more injuries but not faster runners**

The Basics of Fitness

Progression: To avoid injuries, the intensity and/or duration of any exercise program should increase gradually.

- Progress no more than 10% per week (weight, time, speed or distance for example).
- First increase the intensity, then the duration (go faster and then longer).

Regularity: An effective physical training program requires regular, quality training.

Overload: To achieve muscle development, it is necessary to exceed the normal demands on the body. This is not exercising to "muscle failure."

- "Muscle Failure," implies using a muscle until it no longer works and then relying on other structures such as ligaments, tendons, and cartilage to complete the exercise. These structures may then be injured, requiring medical treatment.
- "Muscle Fatigue" is a more appropriate term and condition. Once your muscle fatigues, you can no longer maintain proper form, then you must modify the exercise to protect the other structures. For example, after performing multiple push-ups, move to your knees to continue with proper form.

Variety: Adding variety to an exercise program helps avoid injuries while providing challenging training. Vary the type of exercise to include muscular strength, muscular endurance, aerobic endurance, anaerobic endurance, flexibility, and mobility.

Recovery: Recovery is the single most violated principle of exercise and is absolutely essential to minimize overuse injuries. There are two main ways to recover following a hard workout:

- Follow a hard workout with a rest day or easy day.
- Exercise a different body region or perform a different type of exercise the day after a hard workout (i.e. agility followed by endurance training).

Balance: Balance all of the principles of fitness to avoid poor training or risk of injury.

Specificity: Soldiers are athletes, and their sport is combat. To improve in combat it is important to incorporate these Soldier skills into every physical training session, and this guide illustrates how.

Principles of Physical Readiness Training

Army PRT is guided by the overarching principles of precision, progression, and integration. These principles ensure that all PRT sessions, activities, drills, and exercises are performed correctly within the appropriate intensity and duration for optimal conditioning and injury control.

Precision: Precision implies that the quality of movement is just as important as the weight lifted or repetitions performed. It improves physical skills and abilities and can decrease the likelihood of injury due to faulty movement. Precise execution standards in all PRT activities ensure proper development of fundamental movement skills.

Progression: Progression is the systematic increase in the intensity and duration of PRT activities. The proper progression allows the body to positively adapt to the stresses of training. If progression in intensity and/or duration is too rapid, the Soldier cannot adapt to the demands of training or recovery. This process leads to over-training or the possibility of injury. Phased training ensures appropriate progression.

Integration: Integration uses multiple training activities to achieve balance and recovery between activities in the PRT program. Warrior tasks often require a blend of strength, endurance, and mobility, and PRT activities are designed to challenge all three components in an integrated manner. For example, conditioning and climbing drills develop the strength, mobility, and physical skills to negotiate obstacles. Movement drills are designed to improve running form, movement under direct or indirect fire, and casualty evacuation. The drills and activities in PRT integrate essential Soldier tasks serving as a critical link in the chain of overall Soldier readiness.

Anaerobic vs. Aerobic Training

Anaerobic exercise is exercise intense enough to trigger anaerobic metabolism (without oxygen to muscles used). It is used in non-endurance sports to promote strength, speed and power and by body builders to build muscle mass. Muscles trained using anaerobic exercise develop differently when compared to aerobic exercise. This leads to greater performance in short duration, high intensity activities, which last from mere seconds to a maximum of about 2 minutes. Examples of anaerobic exercise would include sprinting, lifting, and jumping.
Initial recommendations for anaerobic training: start with a 1:2 work/rest ratio and after a few months progress to a 1:1 work/rest ratio. An example of a 1:2 work/rest ratio is an interval workout of sprinting 30 seconds and then jogging or walking for 1 minute (repeat 5-10 times).

Aerobic exercise includes lower intensity activities performed for longer periods of time. Activities such as walking, running, swimming and cycling are aerobic and require a great deal of oxygen to generate the energy needed for prolonged exercise.

Lactate threshold is the exercise intensity at which lactic acid starts to accumulate in the blood. Lactic acid is a byproduct produced when the muscles are using oxygen faster than one can re-supply the oxygen during breathing. A low threshold means the body is not using oxygen to the best of its ability and training to improve your threshold can be beneficial.

VO_{2max} is the maximum capacity of an individual's body to transport and utilize oxygen during exercise. We can train our Soldiers to increase both the VO_{2max} and the lactate threshold by including anaerobic training (intervals, speed and agility drills, and resistance training) in our physical training.

Performance Optimization: Many of our tasks as Soldier athletes require a combination of aerobic and anaerobic activities to optimize performance. However, most of our current PT programs focus primarily on aerobic training. Recent research demonstrates that in order to improve performance in activities such as individual movement techniques, operations in urban terrain and combatives, the training must include sessions that involve short (less than 40 second) bursts of anaerobic exercise with short recovery intervals (less than 30 seconds) between bursts. [3] Some of our most important tasks (including sprinting into a building or lifting a heavy piece of equipment) require anaerobic ability.

Training Intensity

Many athletes find heart-rate training beneficial to ensure proper intensity. Depending on your fitness level, the recommended aerobic exercise intensity is 65%-90% of your maximum heart rate (HRmax).[4]

Calculate your HRmax by using this formula: 220 minus your age.
Example: 30 year old

- HRmax is 220 - 30 = 190 beats per minute (bpm)
- THR for 65% HRmax is 0.65 x 190 = 123.5 bpm
- THR for 90% HRmax is 0.90 x 190 = 171 bpm

Myth-busters

Stretching

1. Myth: It is best to stretch before exercise- it helps you loosen up before you begin working out.

Fact: It is best to stretch dynamically before exercising and statically after exercising. Dynamic stretching exercises warm-up the muscles and body tissues by moving the body through the full available range of motion. Dynamic stretching can enhance power when performed before exercise.[5] An example of a dynamic stretch would be "The Bend and Reach." Stretching muscles statically (holding the stretch for more than 15 seconds) before exercise can actually decrease performance during power and agility activities. Current research recommends static stretching after exercise to help decrease the risk for muscular injuries.[6],[7]

2. Myth: You should hold your stretch for 10 seconds every time you stretch.

Fact: The latest research shows that stretching between 15 and 30 seconds provides optimal muscle lengthening. Stretching longer than 30 seconds and more than once per day provides no additional benefit to healthy (non-injured) individuals.[8]

3. Myth: Everyone should stretch to prevent injuries.

Fact: Only people who are less flexible than average and people of average flexibility need to stretch. People that are very flexible are at greater risk for injury if they include stretching in their exercise routine.

Fitness maintenance

Myth: When on a deployment or on an extended field problem, we often can't exercise as often or for as long. Therefore, it's best just to forego exercise altogether and pick up where we left off when we return home.

Fact: You can maintain your performance level for up to 90 days as long as you maintain your previous level of INTENSITY. If you must limit your exercise program for 3 months, it is best to exercise 15-20 minutes 1 to 2 times per week. The key is to maintain your level of intensity.

Foot type

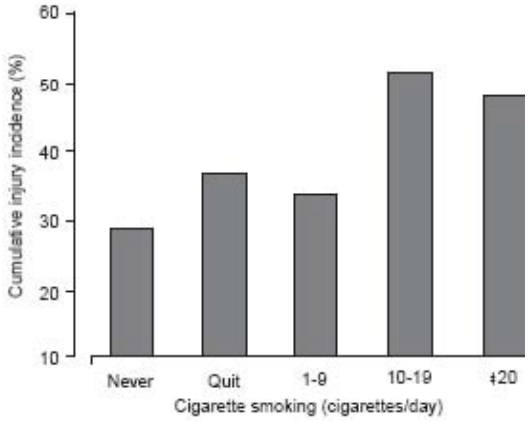
Myth: Flat footed individuals are at higher risk for injury.

Fact: The research is mixed in this area. Those with flat feet have a floppy foot and those with high arches have rigid feet. In both cases good running shoes are essential in order to provide some shock absorbability and decrease the forces that go through the lower extremities.

Smoking and tobacco

Myth: Smoking and tobacco use have no effect on rate of injury.

Fact: Smoking and tobacco use increase the risk for injury and prolong the time it takes to heal from an injury because nicotine prevents oxygen from getting to the injured muscles, soft tissues, and bones.[9]



Weight loss

1. Myth: Running 1 mile = walking 1 mile in terms of calories.

Fact: Running 1 mile burns more calories than walking 1 mile due to upward propulsion (time when both feet are off the ground) and heat production.

2. Myth: Exercising for a longer time at a slower pace is better for weight loss because you're using a fat-burning pace.

Fact: Exercising at lower intensities burns fewer calories and less fat overall than exercising at a higher intensity. In addition, with higher intensity exercise, your metabolic rate remains elevated throughout the day allowing you to burn even more calories. The metabolic rate is the rate at which your body burns calories to maintain itself.

Conduct of Physical Readiness Training

Training Phases

Similar to units going through the ARFORGEN cycle, the individual Soldier utilizes a phased approach to physical readiness training. Every stage plays a vital role in ensuring injury prevention and performance optimization. You can also think of phasing similar to an athlete's training cycle from preseason, to regular season, to playoffs and the post season.

Phase I – Recovery (RESET) – recover from deployment, block leave, injury, training, or prolonged absence from unit PRT (lasts 2-3 months). After prolonged periods of decreased exercise levels, PRT should consist of lower intensity programs that emphasize a gradual return to the basic conditioning blocks- strength, mobility, and endurance. This phase is similar to a sports team in the off season when returning to exercise in preparation for higher intensity preseason workouts.

Phase II - Conditioning (TRAIN) – build a solid foundation of physical abilities (lasts 4-6 months). This phase builds on the recovery phase by developing foundational fitness and fundamental movement skills by increasing the exercise intensity in the building blocks of strength, mobility and endurance. This includes performing essential physical skills associated with Soldier tasks. A variety of training activities with precise standards of execution ensures that bones, muscles, and connective tissues gradually toughen, rather than break. This phase is similar to a sports team in the preseason where conditioning intensifies in preparation for a "peaking" phase prior to the beginning of the competitive season.

Phase III - Ramp Up (READY) – prepare for assessment and validation just prior to deployment (lasts 3-4 months). This phase includes more demanding PRT activities that incorporate METL/mission tasks essential to a unit's success. These are the most intense and performance oriented exercise activities done in preparation for a prolonged deployment or FTX. Exercise options combine strength, mobility and endurance with the focus on attaining peak physical fitness. Example activities include individual movement techniques, casualty carries, obstacle courses, and combatives. **Caution**: To optimize performance, leaders must control for injuries while pushing the physical limits of their Soldiers. This phase is similar to an athlete's attempt to achieve top physical conditioning and form (attempting to "peak") just as the competitive season begins.

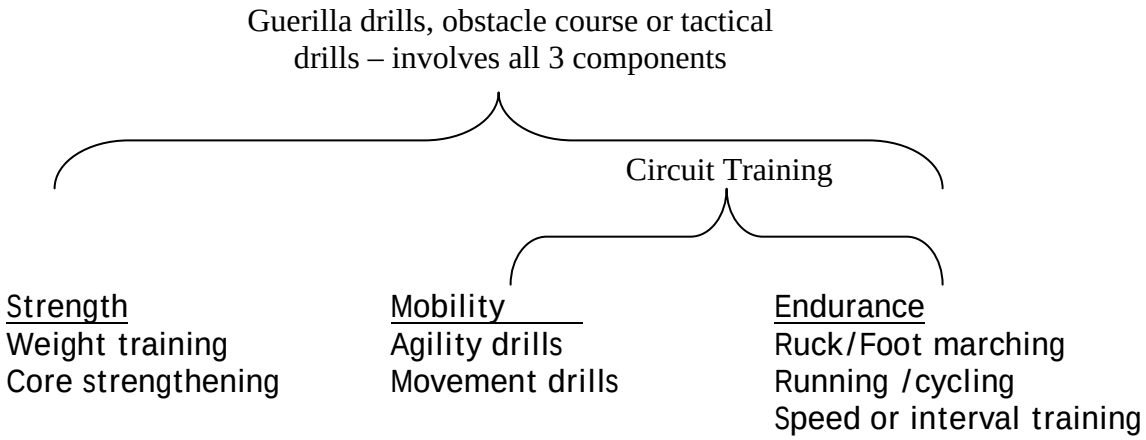
Phase IV - Sustaining (AVAILABLE) – deployed and/or performing combat missions (lasts 6-12+ months). This phase consists of Soldiers performing regular missions in a deployed environment. Depending on individual missions, some Soldiers are able to maintain fitness levels through the conduct of missions, while others lose peak fitness due to mission requirements, lack of time or unavailable fitness facilities. If possible, maintain exercise at least 1-2 times a week at the same intensity level. For further guidance, see the Myth-busters section of this manual and Appendix G. This phase is similar to an athlete that is competing in their respective sport and may not maintain peak fitness as focus shifts to the competition season.

PRT Development

Physical Readiness Training development should follow specific training guidelines and include the following three elements: Preparation, Activity, and Recovery. Optimal time for PRT is 75-90 minutes per session, with a minimum allotted time of 60 minutes per regular scheduled PRT session.

Preparation (10-15 minutes): conducted prior to all PRT activities
Activity (30-60 minutes): addresses specific goals in the areas of strength, endurance and mobility and takes up the majority of the training time

- Conduct a minimum of 2-3 strength & mobility days each week
- Conduct 2-3 endurance & mobility days (with at least one day of interval training) each week
- Alternate strength & mobility training days with endurance & mobility training days
- Sample activities include:



Recovery (10-15 mins): conducted after the completion of all PRT activities.

Potential Schedules

The new Physical Readiness Training Manual that replaces FM 21-20 has 12-month training schedules to assist leaders in developing programs that will optimize their Soldiers' performance. The following pages provide additional example schedules for PRT throughout the first three training phases. They provide additional ideas for leaders. Developing schedules well in advance and in conjunction with unit training calendars will maximize precious training time and resources.

Some activities require the use of additional facilities or equipment. PRT preparation and scheduling should include securing such resources or reserving training space just as units would do for any other training requirement or exercise.

Sample 4-Week Schedule for Phase I – Recovery (RESET)

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	Preparation	Preparation	Preparation	Preparation	Preparation
	Starter Intervals	Low-impact cardio	Movement Drills	Conditioning Drills	Sports
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 2	Preparation	Preparation	Preparation	Preparation	Preparation
	300yd shuttle run & 30:60s	Conditioning Drills	Last Man Up drills	Low-impact cardio	Foot march
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 3	Preparation	Preparation	Preparation	Preparation	Preparation
	Cone drills	Circuit Training	Starter Intervals	Pool – water aerobics	Release Run
	U Push/L Pull	L Push/U Pull	L Pull/U Push		U Pull/L Push
	Core strength	Core strength	Core strength		Core Strength
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 4	Preparation	Preparation	Preparation	Preparation	Preparation
	200m Turn and Burn	Combatives	300yd shuttle run & 30:60s	Low-impact cardio	Foot march
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery

Color Key
Preparation (warm-up)
Anaerobic Endurance
Aerobic Endurance
Strengthening
Core Strength
Combination Activities
Recovery (cool-down & stretch)

*Establish ability groups for running activities by administering a baseline APFT.

Sample Schedule for Phase II – Conditioning (TRAIN)

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	Preparation	Preparation	Preparation	Preparation	Preparation
	200m Turn & Burn	Low-impact cardio	Movement Drills w/ IOTV & stick	Circuit Training	Foot march
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 2	Preparation	Preparation	Preparation	Preparation	Preparation
	300yd shuttle run & 60:120s	Medicine Ball drills	Agility Ladder drills	Pool – lap swim or pool running	Terrain Run
	U Push/L Pull	L Push/U Pull	L Pull/U Push		U Pull/L Push
	Core strength	Core strength	Core strength		Core strength
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 3	Preparation	Preparation	Preparation	Preparation	Preparation
	Ability Group Run	METL Task PT	Quarter Repeats	Combatives	Foot march
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core Strength	
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 4	Preparation	Preparation	Preparation	Preparation	Preparation
	Movement drills & cone drills	Low-impact cardio	Release Run	Medicine Balls	Sports
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery

Color Key
Preparation (warm-up)
Anaerobic Endurance
Aerobic Endurance
Strengthening
Core Strength
Combination Activities
Recovery (cool-down & stretch)

* Establish ability groups for running activities by administering a baseline APFT.

Sample Schedule for Phase III – Ramp-up (READY)

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	Preparation	Preparation	Preparation	Preparation	Preparation
	Quarter Repeats	Circuit Training	Movement Drills w/IOTV & weapon	Medicine Balls	Foot march
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 2	Preparation	Preparation	Preparation	Preparation	Preparation
	300yd shuttle run & 60:120s	Log Drills	Hurdle drills	Low-impact cardio	Obstacle Course
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 3	Preparation	Preparation	Preparation	Preparation	Preparation
	Ability Group Run	Medicine Balls	Ladder Intervals	Pool – water aerobics	Foot march
	U Push/L Pull		L Push/U Pull		
	Core strength	Core strength	Core strength		
	Recovery	Recovery	Recovery	Recovery	Recovery
Week 4	Preparation	Preparation	Preparation	Preparation	Preparation
	Hill Repeats	Combatives	Movement drills w/IOTV, weapon & ruck	METL Task PT	Foot march
	U Push/L Pull	L Push/U Pull	L Pull/U Push	U Pull/L Push	
	Core strength	Core strength	Core strength	Core strength	
	Recovery	Recovery	Recovery	Recovery	Recovery

Color Key
Preparation (warm-up)
Anaerobic Endurance
Aerobic Endurance
Strengthening
Core Strength
Combination Activities
Recovery (cool-down & stretch)

* Establish ability groups for running activities by administering a baseline APFT.

Idea Book

The following pages consist of specific exercises to assist leaders in the development of PRT sessions. The book is organized with the Preparation Drills at the beginning; Activity Drills in the middle focusing on strength, mobility and endurance; and Recovery Drills at the end, just as they would be used in PRT sessions. The majority of the exercise pages were designed to be printed, folded in half, laminated, and put on a ring to use as exercise references during the PRT session.

Preparation Drills

Purpose: to prepare the Soldier for PRT activities
Objectives:

- ⇧ Body temperature
- ⇧ Heart rate
- ⇧ Flexibility of joints & muscles
- ⇧ Responsiveness of nerves & muscles

Note: Joint rotations and static stretches (e.g. long sit, groin stretch, etc.) are no longer recommended during the warm-up. The preparation drills provide sufficient joint range of motion and fully lengthen key muscle groups, eliminating the need for separate stretching exercises.

Preparation exercises are performed at the beginning of every PRT session and last approximately 10 minutes. The focus is always on quality of movement, not number of repetitions or speed of movement. A calisthenics cadence that is too fast will not allow Soldiers to achieve a full range of movement, and may not adequately prepare them for further exercises/activities.

Conduct the 10 preparation exercises in the order and cadence listed:

Preparation

#	Exercise	Cadence
1	The Bend and Reach	5 repetitions slow
2	The Rear Lunge and Reach	5 repetitions slow
3	The High Jumper	5 repetitions moderate
4	The Rower	5 repetitions slow/moderate
5	The Squat Bender	5 repetitions slow/moderate
6	The Windmill	5 repetitions slow/moderate
7	The Forward Lunge & Reach	5 repetitions slow
8	The Prone Row	5 repetitions moderate
9	The Bent-leg Body Twist	5 repetitions slow
10	The Push-up	5 repetitions moderate

If performing a running activity after the preparation drills, complete the warm-up with a slow, 2-3 minute jog.