Preparation for Cadets for the Physical Demands of Combat: PE 450
Army Fitness Development instructional techniques and strategies
for teaching/implementing specific exercises and stretches to
reduce lower back pain and injuries.

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Abstract
“The Army's basic mission is to train and prepare Soldiers, leaders, and units to fight and win in combat” (United States, 2012, p. 1-1). As explained in the Army's capstone training doctrine (ADP 7-0), time and resources do not exist for units to achieve and sustain proficiency with every possible training task. Therefore, commanders must identify the tasks that are the units’ critical wartime tasks by selecting an appropriate number of tasks their unit can accomplish (United States, 2012). One of the Army’s basic wartime tasks is physical readiness. The U.S. Army Training and Doctrine Command (TRADOC) has determined that baseline Soldier physical readiness would be most effectively measured if linked to Warrior Tasks and Battle Drills (WTBD), tasks and drills that proved over the last decade of war to be critical during Unified Land Operations (Slater & Stephanie, 2012).

The U.S. Army defines physical readiness as “the ability to meet the physical demands of any combat or duty position, accomplish the mission, and continue to fight and win” (United States, 2010, p. 2-1). The only method utilized by the U.S. Army for assessing a Soldier or unit’s ability to meet the physical demands of a combat environment is the Army Physical Fitness Test (APFT). Yet, the APFT only provides a measure of upper and lower body muscular endurance, and it does not contain mobility, strength, or anaerobic fitness components and focuses too much on endurance (Heinrich, Spencer, Fehl, Poston, 2012). It is a performance test that indicates a Soldier’s ability to perform physically and handle his or her own body weight (United States, 2012).

The focus of the U.S. Army is to continue to prepare Soldiers for combat, to be physically prepared for any environment. While fighting the War on Terrorism the Army’s average deployment rate was 12 months deployed, followed by 18 months at home, and ultimately the Army wants to have a rate of 12 months deployed, followed by 24 months at home (Mcilvaine, 2012). With such high rates of deployments, it is imperative that the Army’s physical fitness training be geared toward combat
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environments. Therefore, within the Department of Physical Education we can do our part in preparing future officers by implementing specific teaching strategies and exercises specifically designed to improve battlefield performance.

All of our USMA graduates will undoubtedly face a tremendous amount of environmentally rigorous physical challenges during a deployment. A general source of physical injuries to military personnel is related to lower back injuries (Sargent & Bachmann, 2010). Thus, this literature review will focus on doctrine and peer reviewed literature that focuses on the needs for incorporating specific physical training into PE 450 Army Fitness Development instruction that will prepare a future Army officers for a combat deployment and reduce the amount of back injuries amongst themselves and their Soldiers, which will increase the continuity within the unit; essentially making that unit more combat effective.

**Literature Review**

This literature review will systematically discuss the importance of integrating specific fitness training techniques in PE 450 Army Fitness Development and explain why USMA graduates currently are not prepared for the demands of combat. It will examine how the demands for combat are much different than the training at USMA and during their future home station training, and how this difference makes them more susceptible to back injuries. This review will discuss what causes the lower back pain in Soldiers, demonstrate how lower back pain is non-discriminative (male vs female, infantry vs aviation, young vs old) and how it affects combat effectiveness. Additionally, this review will discuss Soldier physical fitness, clarify Army doctrine that pertains to physical fitness, discuss the Army’s current physical fitness philosophy, and indicate the reasons why the Army’s current physical fitness standards are unable to prevent or improve back pain. Lastly, this review will consider the way ahead for implementing exercise programs that may be adapted by USMA graduates in order to improve overall physical health and minimize the prevalence of lower back pain within our Soldiers and attrition rates. High attrition damages the readiness of combat units by losing potential fighters and creates a waste of human and financial resources that were invested in the process of training. Furthermore, low-back and lower extremity injuries are the leading cause of the loss of training days in the American Army and their financial cost is enormous, estimated as high as 2 billion dollars per year (Schwartz et al, 2014).

**United States Military Soldiers and the Demands of Combat**

A review of literature shows that attrition in the Army from combat training is mostly due to low-back or lower extremity injuries. Low-back and lower extremity injuries account for 71.5% of all orthopedic injuries in our military and there is high similarity in orthopedic injuries types and rates between infantry and non-infantry units (Schwartz et al, 2014). Low back pain is understood to have a multifactorial etiology with individual characteristics (age, physical fitness), psychosocial factors (stress, anxiety and
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depression) and occupational factors (heavy physical work, bend and twist motions and vibration) implicated in its development; which makes the treatment of chronic low back pain difficult (Searle et al, 2015). Lower back pain is not discriminative and effects all Soldier, not just the “ground pounders”. As expected, back pain is a significant issue within the combat arms branches of the Army. In the Army aviation community and helicopter aircrew, there is a considerable body of scientific literature devoted to the problem, including epidemiologic and experimental studies addressing prevalence, characteristics, primary etiology, and contributing factors (Gaydos, 2012). Back Pain among helicopter pilots is a well-recognized problem, with prevalence ranging from 61% to over 80% (Orsello, 2013).

Back pain in rotary-wing aviators is not a new phenomenon and it is a big problem that has been identified and researched since the 1980s (Gaydos, 2012). Gaydos (2012) is a comprehensive review of back pain and the prevalence of lower back pain in military rotary-wing aircrew members. Back pain is a problem that is multinational with a prevalence range among aviators of 52-92% (Gaydos, 2012). Gaydos (2012) also shows that back pain has been an issue within Army aviation since 1984 with 73% of rotary-wing aviators reporting issues with back pain. Sheard, Pethybridge, Wright, & McMillan (1996) found a high 12-month prevalence of back pain among British Royal Navy rotary-wing aircrew (82%) versus a nonflying control group. Bridger, Groom, Jones, Pethybridge, & Pullinger (2002) also found a high prevalence of back pain (80%) over a one-year period among British helicopter pilots with back pain-related disability: interference with flying (66%), sleep (51%), and duties outside of the aircraft (32%).

The US militaries are in the process of opening previously closed combat military occupations to women. This will result in women engaged in occupations with high physical demands. Roy & Piva (2015) conducted a study that showed that rapid increases in occupational physical demands between garrison and deployment increased injury rates in female Soldiers. This proves that military units should gear physical training specifically towards their occupational requirements and incorporate a gradual increase in physical demands prior to deployment. As new combat MOSs open to female Soldiers, the number of women with physically demanding MOSs will increase to include female infantry, tankers, and artillery (Roy & Piva, 2015). With these changes it is important to note that physical occupational tasks for women will increase significantly. A female Soldier (like men) that can now occupy a more physically demanding MOS will be expected to wear heavier loads for longer period of times while conducting more physically demanding training. It’s imperative that we set them up for success and teach them now the importance of maintaining a proper physical program that can reduce the occurrence of lower back injuries.
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**U.S. Army Physical Fitness Standards**

As previously mentioned, the U.S. Army defines physical readiness as, “the ability to meet the physical demands of any combat or duty position, accomplish the mission, and continue to fight and win” (United States, 2010). Yet, the APFT only provides a measure of upper and lower body muscular endurance, and it does not contain flexibility/mobility, strength, or anaerobic fitness components and focuses on endurance (Heinrich et al, 2012). It is a performance test that indicates a Soldier’s ability to perform physically and handle his or her own body weight (United States, 2012). The only method utilized by the U.S. Army for assessing a Soldier or unit’s ability to meet the physical demands of a combat environment is the APFT.

Few studies have been performed to investigate the improvement in militarily relevant physical performance attributable to physical training programs, as Harman (2008) notes, others have been mainly limited to observing the effects of training on the speed of medium- to long-distance individual load carriage, rather than other common battlefield activities (Harman et al, 2008). In the U.S. Army, commanders are responsible for the training, performance, and readiness of their Soldiers. Physical readiness training is a commander’s program; therefore, commanders should employ the Army training management process specified in Field Manual 7-0. Soldiers in the Army require the basic battlefield physical performance requirements of speed, agility, and anaerobic endurance, in addition to strength. Thus, a program designed to improve battlefield performance must balance the types of training so as to achieve the most overall improvement within the limited amount of time the Army allocates for physical training (Harman et al., 2008).

**PE450 and Physical Fitness Strategies to Improve Back Pain**

It’s important to recognize that Lower back pain is one of the most prevalent health conditions and the most expensive which affect the developed world and it is also one of the most common muscular-skeletal conditions treated by physical therapists (Ibrahimaj, Seliu, & Sylejman, 2015). The United States military has already conducted several studies that demonstrate that intervention can be beneficial in limiting and reducing lower back pain. The U. S. Navy conducted a single blinded randomized clinical trial, subjects were drawn from a larger, prospective cohort of active duty service members seeking care for non-specific pain at a U.S. Navy Branch Medical Clinic. Outcome reassures included return to work, self-reported pain, function, and psychological distress. Subjects were randomly allocated to one of two study arms: a multidisciplinary reconditioning program or the current standard of care for low back pain. The intervention lasted 4 weeks with a 12-week follow-up. Subjects allocated to multidisciplinary care reported significantly lower perceived disability (p = 0.014) and less pain than those allocated to usual care at the end of the intervention period. All subjects returned to their usual duty following the conclusion of the intervention. The implementation of the intervention program was successful. Subjects in the
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A multidisciplinary program showed a clinically significant improvement in the perception of disability compared to the usual care group. This is an important finding since perception of disability is associated with long-term functional outcome (Campello et al, 2012). Additionally, based on the research published by the Navy’s safety center, Sather and Lillie (2012) suggest that individuals partake in specific exercises and stretches to improve lower back pain issues. The goal of the stretches and exercises are to introduce aviators to movements that may be used before and after flights to keep them pain free. The stretches range from Iliopsoas/Psoas, Seated Piriformis, and Open Chest Sequence. The exercises include, Wall Squats, Curl Ups, Side Planks on the Knees, and the Bird Dog (see Appendix A for a graphical depiction of stretches and exercises).

**Description of Proposed Strategies for Implementing specific exercises and stretches in PE 450**

A block of instruction in PE 450 that was specifically programmed for reducing lower back injuries could be implemented at USMA, before and during combat operations. A specific fitness plan will be beneficial in reducing the prevalence of back pain in all of the USMA graduate. This block of instruction would benefit men and women in our Army. As previously stated, the Army’s physical fitness program does not have specific training or testing for flexibility or strengthening of the core stability muscles. As other studies have shown (Heinrich et al., 2012), specific and effective physical fitness training can improve Soldiers’ flexibility and strength, which would lead to the reduction of lower back related health problems before and during combat operations of our Soldiers.

The current syllabus for PE 450 provides sufficient opportunities for instructors to implement a block of instruction on how to conduct exercises and stretches to prevent and improve lower back pain (Sather & Lillie, 2012). The instructors for PE 450 can demonstrate how to conduct: (see appendix A for diagrams)

- **Stretches**: Iliopsoas/Psoas Stretch, Seated Piriformis Stretch, Open Chest Sequence, Sciatic Nerve Stretch and Lumbar Extension Stretches: Angry Cat Stretch, Prone Press Up, Single Knee to Chest, Prayer Stretch or Child’s Pose
- **Exercises**: Wall Squats, Curl Ups, Side-Planks on the Knees, Hip Bridge, Bird Dog and Lunges.

If USMA graduates were to use the Army’s Physical Readiness Training (this is mandatory for all Soldiers) and include the above-mentioned exercises in their programs and conclude their physical training sessions with the above-mentioned stretches, they could reduce the prevalence of lower back pain and injuries.
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Appendix A

Lower Back Stretches and Exercise (Sather & Lillie, 2012)

**Iliopsoas/Psoas Stretch**
Correct: Head over shoulders, shoulders over the hips, knee over the ankle. Hold for 20-30 seconds. Change sides, repeat 3-5 times.

![Iliopsoas/Psoas Stretch](image)

**Seated Piriformis Stretch**
Correct: Lumbar neutral, head over shoulders, shoulders over the hips. Hold for 20-30 seconds. Change legs, repeat 3-5 times.

![Seated Piriformis Stretch](image)

**Open Chest Sequence**
This stretch activates the muscles of stabilization of the scapula, stretches the chest muscles, and decreases resistance in the complex shoulder joints.

Start with the arms/shoulders fully extended. Gently bring them back toward the body by squeezing the shoulder blades together. Next, bring the upper arms back so they are in line with the shoulders, keeping the elbows at 90 degrees. Maintain the elbows at shoulder height while rotating the arms posterior till the forearms are pointing up.
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Keeping the shoulder blades squeezed, gently extend the elbows, lowering the arms to the side. Repeat 3 times.

**Wall Squats**

Wall Squats are good training for appropriate movement patterns when having to squat - a movement we do not do nearly enough. The goal is to keep the knees over the shoelaces, hinge the hips posterior, and keep a slight curve forward in the lumbar spine (lumbar neutral). As you squat more deeply, the hips should continue to move back with the knees staying over the feet. If the hip capsules are tight, you will start compensating by shifting the knees forward, which results in a shift of the center of gravity. This will cause loss of lumbar neutral and deactivation of the core supporting musculature.

Correct: Lumbar neutral, hips hinge posterior, chest up, wide stance (at least shoulder width), feet flat, knees over the feet, engaged core. Start upright, squat until knees start to shift anterior or pelvis rolls posterior (causing lumbar spine to straighten), return to starting position. Keep hands in contact with wall.
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Curl Ups

The motion of the Curl Up takes place more in the thoracic spine (middle back) - not the cervical (neck) or lumbar (low back). The exercise is more of a challenge if you raise the elbows off the table. Once the abdominals are braced (like preparing to take a blow to the stomach), curl up and hold for 5-8 seconds before lowering. Be sure to breathe deep throughout the entire exercise.

Correct: One knee up, the other leg straight, hands under small of back, exhale to activate diaphragm (keep engaged but breathe normal), engage oblique’s, tuck chin to chest, curl up and down with smooth controlled movements. Shoulders should not touch mat during the exercise. At lowest point, shoulder blades should be 4-6 inches from floor. Perform as many as possible while keeping good form. Switch knees half way through the exercise.

Side Planks on the Knees

Side Planks can be performed on the knees or with the legs straight and feet on the table. It is best to start with doing the plank on your knees. When your form is perfected and endurance is sufficient, move to a full-length plank. This exercise targets the lateral and abdominal muscles. Movement from a rested position to the full plank should replicate a squat. The hips will move from extension to neutral. This is a far superior exercise when compared to twisting sit-ups. It has increased muscle activation, low spine load, and groove stabilizing patterns, which will carry over to upright activities.

Correct: Head, shoulders, hips, knees in line. Ensure that your hips are forward as the normal habit is to have them shifted rearward. Raise hips toward ceiling to activate down-side oblique. Hold in up position for up to 60 seconds. If fatigue sets in, lower to resting position. Repeat 3 times.
Bird Dog

The posterior core muscles (lumbar extensors), are conditioned with this exercise. Holding the Bird Dog position for 6-9 seconds, with abdominal muscles braced, will provide for best results. Adding more repetitions, rather than increasing holding time, will increase endurance.

Start with the hands under the shoulders, knees under the hips, lumbar spine in neutral. Extend one leg and the opposite arm. Hold for 6-9 seconds then lower the hand and knee, sweeping the floor with them. Raise them again for further repetitions. Do not progress to fatigue. Stop and take a short (10-15 seconds) break before starting on the opposite side.
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References


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