

TRAINING NOTES



Roadmarching and Performance

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EDITOR'S NOTE: This final article in a series of three provides information gained from a study of the factors that are most important in determining road marching performance. The first article, "The Soldier's Load: Planning Smart"

(INFANTRY, January-February 1990, pages 8-11), offers guidance on the various factors a commander must consider when planning the operational loads his soldiers will carry. The second, "Load Carrying Ability Through Physi-

cal Fitness Training" (INFANTRY, March-April 1990, pages 33-36), details a physical training program designed to improve our soldiers' ability to carry loads on road marches.

For centuries, commanders have been concerned about their soldiers' ability to march with heavy loads, and over those centuries a soldier's load has increased about three-fold. Fortunately, though, the distances a soldier has to cover today are relatively short when compared to the long marches of ancient times.

While current technology permits soldiers to transport larger burdens on the battlefield, two road marching realities remain unchanged: First, carrying a heavy load is physically and mentally exhausting; and second, it often results in injuries that can limit a soldier's ability to perform his mission. Commanders must be aware of these facts and take steps to reduce their negative effects as much as possible.

Not much is known about the way road marching with heavy loads affects the basic task performance of soldiers. As is often the case, in the absence of such in-

formation, many commanders overestimate their soldiers' ability to march with heavy loads and still perform mission tasks. They base their estimates upon pride and the unquantifiable "toughness factor" that all commanders tend to see in their men. Unfortunately, when it comes to strenuous road marches, this kind of confidence is misplaced, and it often sets the stage for mission failure. The physiological realities of fatigue do affect performance, and a commander can seldom overcome those effects by a mere desire to do so.

The soldiers of the 2d Battalion, 17th Infantry, 6th Infantry Division (Light), recently participated in a study to determine the physiological and psychological effects of marching with a heavy load.

The soldiers were required to carry 75 pounds in their rucksacks (the unit's winter tactical load) over 20 kilometers in the shortest possible time. They

marched in BDUs (battle dress uniforms), Kevlar helmets, and boots of their own choice, and they carried the standard load carrying equipment with protective masks and their M16 rifles. The total weight of each man's equipment averaged 103 pounds (46 kilograms).

The march route consisted of open roads (paved, gravel, and dirt). Three-fourths of the route was flat while the rest was moderately hilly. The weather conditions were excellent with a partly cloudy sky and a temperature of 44 degrees Fahrenheit. Each soldier was instructed to complete the march individually and as quickly as possible.

The soldiers who participated were experienced infantrymen who were well-trained and highly fit. They averaged 21 years of age, 169 pounds, 69 inches tall, and 16 percent body fat. Their scores on the Army Physical Fitness Test averaged 55 push-ups, 67 sit-ups, and a time of

13:18 for the two-mile run.

Nevertheless, it became readily apparent after the first hour of marching under such a heavy load that the soldiers were fatigued and that, despite constant urging from their leaders (who also marched with the same loads), they were finding it difficult to focus on the mission. They took frequent rest stops after the first hour, and the number and length of the stops increased as time went on.

The average finish time for the soldiers was 5 hours and 24 minutes, an average of 2.4 miles per hour, which is considered good under the circumstances. Of the 335 soldiers who began the march, 323 (96 percent) marched the entire distance. (Less fit troops with less competent leaders would not have performed as well.)

Immediately following the march, within a 30-minute period, the researchers collected performance data on the soldiers for weapon firing accuracy, arm power, and leg power. Weapon firing accuracy was determined by target hits and distance from center of mass, arm power by a grenade throw for distance from a kneeling position, and leg power by vertical jump height. These figures were then compared to the soldiers' baseline performance on these same tasks under rested conditions, which had been collected one to three days before the march.

The data collected on weapon firing accuracy revealed a 25 percent decrease in the soldiers' ability to hit a stationary target at 25 meters and a 33 percent decline in accuracy (distance from target center) following the march.

The soldiers also showed a significant decline in arm power: The distance they could throw a grenade declined an aver-

age of three meters per man (10 percent) from pre-march performance. Surprisingly, there was no major change in leg power as determined by the vertical jump. (The results of the performance tests conducted after the march compared with those obtained before the march are shown in the table.)

There are several explanations for the erosion of marksmanship skills after the road march, most of them physiological—trembling as a result of muscle fatigue, elevated heart rate, decreased strength, and the like. Since the time between the completion of the march and the weapon firing was less than 10 minutes, the soldiers had little time to recover physically from their strenuous effort.

MENTAL STATE

In addition, the members of the research team collected psychological and injury (number and type) data after the march and compared it to information they had collected before the march. This data revealed a significant decline in psychic vigor and an increase in mental fatigue.

Research studies have suggested that such changes in mental state can also affect physical performance, especially in technical skills. In this particular situation, the change in the mood of the soldiers was probably equally important in the marksmanship decline—they were simply too mentally fatigued to concentrate on shooting well.

Although the injuries that resulted from the march were minor, 81 (24 percent) of the 323 soldiers who completed the entire 20-kilometer march were found to

have some type of physical ailment that impaired their physical abilities to some degree and required medical attention. As a result of the march, 13 soldiers (4 percent) were issued profiles for a total of 44 lost or limited-duty days.

While these statistics in and of themselves are acceptable, the vast majority of the battalion's soldiers would have been hard-pressed to engage a hostile enemy in battle or to repeat a similar march the following day.

Blisters were the most common injury. Although the soldiers had been forewarned to take care of their feet, had marched with "broken in" footgear, and had received constant leadership attention during the march, 69 percent of them developed blisters as a direct result of this single march. This is somewhat surprising since all of the participants were light infantry soldiers, experienced at road marching, and in excellent physical condition.

The high percentage of blisters was most likely due to the heavy weight the soldiers carried and the speed at which they moved. (The sweating of the feet softens the skin, the friction of the soft skin inside the boot causes the layers of skin to separate, and fluid then fills the space between the layers, producing the blister.) Although blisters are only a minor medical concern, they do affect a unit's mobility for days after they occur and, in this case, would have incapacitated the battalion as a footmobile fighting force.

The results of this study indicated, then, that injuries will occur even in the most seasoned troops as a result of a single road march with a heavy load. Further, while most injuries related to this kind of road march will not immediately incapacitate a unit, they can reduce its combat effectiveness and limit its mobility for a considerable time following the march. And these are factors that commanders must consider both in their immediate operational planning and in estimating the effects a single road march with a heavy load will have on future operations.

Commanders can take two basic approaches to reduce the fatigue and injury associated with loaded road marching:

PERFORMANCE TEST COMPARISONS			
	PRE-MARCH	POST-MARCH	% CHANGE
MARKSMANSHIP			
Hits (out of 10)	7.3	5.5	-24.7
Distance from center of mass	28.4	37.7	-32.7
HAND GRENADE THROW			
Distance (meters)	28.0	25.1	-10.4
VERTICAL JUMP			
Height (centimeters)	45.0	44.5	-1.1

First, they can plan each road march wisely. This involves reading the battlefield with respect to mission, enemy, troops, terrain, and time (METT-T). Once they understand what must be done and what is involved in doing it, they can factor load, distance, and speed considerations into the mission equation.

Second, they can train their soldiers properly for road marching with heavy loads over long distances. Properly trained soldiers will be less fatigued, will perform their critical tasks better, and will suffer fewer injuries in the process.

Smart training for road marching with loads entails both general conditioning and road march training. A program such as the one described in the second article in this series (INFANTRY, March-April 1990, pages 33-36) can be used as a starting point and adapted as needed.

The most significant physiological factor associated with loaded road marching is muscle mass, which is related to strength. Generally, the more muscle a man has, the stronger he is and the better able to road march. Units that anticipate frequent road marching as a result of their mission should make strength training (building muscle mass) a major part of their physical training program. It is recommended that light infantry units conduct intensive strength training activities at least two or three times each week.

Cardiovascular fitness is also important for both endurance and recovery, and several sessions each week should be devoted to its improvement.

Flexibility, another important component of general physical fitness, should be part of any physical training program designed to improve load carrying ability. Soldiers with good flexibility have fewer low-back problems and may be less susceptible to musculoskeletal injury. The key here is to have a balanced PT program that will condition soldiers when they are not road marching.

In addition, the exercise principle of specificity suggests that the best way to improve performance on a task is to perform the task itself, and road marching is no exception. Research indicates that units with solid all-round physical conditioning programs can maintain their road marching proficiency by marching only

twice a month.

Units that go overboard in conducting road marches with loads quickly reach a point of diminishing return when injury rates increase without a corresponding increase in road marching ability. And commanders who demand that their soldiers conduct "rucksack runs" only demonstrate their lack of knowledge about physical training and their disregard for the physical well-being of their soldiers. The constant jarring of rucksack runs stresses the body, especially the lower limbs, frequently leading to stress fractures and joint instability. Rucksack runs are not smart training for improv-



ing road marching ability.

Proper road march training should be just that—road march training—not a demonstration of physical toughness. A unit that requires quarterly road marches of 12 to 25 miles, for example, can verify that it is capable of a one-time movement. But these marches, without a sound PT program and frequent road marching to support it, become merely evaluations and often do more harm than good.

Road marching should not be scheduled more than once a week, even in the most foot-bound units. A wise program of road marching with loads should concentrate on developing marching endurance while at the same time keeping the decrement in mission skills to a mini-

mum. Such a program should concentrate on short marches of four to six miles that end with the soldiers performing mission-critical skills. As the soldiers adapt to the training, the load and the speed can be increased and varied.

A realistic goal for road marching with loads in light infantry units is to work up to carrying 45 percent of body weight 10 miles in four hours. At the end of a march, the soldiers should be able to perform critical soldier skills to Skill Qualification Test standards. Such a program will enable a unit to increase its mission capability with little risk of injury.

The key to success for missions that require road marches with loads is simple: Have the soldiers carry the lightest possible load for the shortest possible distance, especially when enemy engagement is probable.

A commander must base his load plans on METT-T and must allow enough time following any road march for the soldiers to regain their strength and replenish their mental and physical energy reserves before going into combat. Recovery time after road marching should be at least one-third of the time spent marching. Failure to plan for this recovery period only sets the stage for possible mission failure.

Finally, and perhaps most important in lessening the negative effects of road marches with loads, is the quality of the training that will prepare soldiers to carry the loads they will need to move on the modern battlefield.

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