

The tactical athlete: optimising physical preparedness for the demands of combat

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INTRODUCTION

Modern military operations place unique and intense physiological and psychological demands upon the soldier. In order to help adapt to and cope with such demands, a high level of physical preparedness must be seen as a fundamental requirement of all military personnel.³ Indeed, the modern soldier needs to be more agile, more capable, more able to survive and more resilient than the enemy in order to ensure victory on the battlefield. Soldiers who are physically fit can be seen as a critical force multiplier. Not only do they demonstrate improved mission performance, but they may also be more resilient for both the physical and psychological demands of sustained military operations.^{25,61} Furthermore, physically fit soldiers may be less susceptible to injury and demonstrate better physical and mental health over the long term than less fit individuals.^{8,17}

Every soldier an infantryman first

Given the asymmetric nature of modern warfare and the growing limitations placed upon military resources including manpower, it can be strongly argued that every soldier must be viewed as an infantryman first, regardless of his/her role or trade. The primary role of the infantry soldier is to close with and engage the enemy in order to bring about his defeat via either dismounted or mounted close combat.² Given the extreme physiological and psychological demands of combat, it is clear that the modern soldier must be viewed and trained similarly to an elite level athlete, or – more specifically – a tactical athlete.⁵⁶

Like traditional athletes, the tactical athlete requires an appropriately designed physical

training programme which will optimise physical preparedness for the demands of combat. However, there are a number of noteworthy differences between the traditional athlete and the tactical athlete. Firstly, tactical athletes often have no scheduled start or end to an event as such; they require a continuously high baseline of physical preparedness. In addition, due to high tempo operational environments they must also cope with extended periods of physical activity with unpredictable periods of rest or recovery. Finally, the tactical athlete is also exposed to a multitude of acute and chronic stressors, which are both physically and psychologically demanding.

The occupational task demands to be experienced during combat operations are likely to be varied. Tasks can include

sustained patrolling at relatively slow speeds, over varying terrain, while carrying loads ranging from 48-57 kg.^{12,15,29,48} Contact with enemy forces can result in sudden and sustained physical demands such as rapid movement over short distances, negotiating obstacles, engagement of the enemy in close quarters combat, ammunition resupplies and - potentially - the extraction of casualties while under fire. This may then be followed by a period of recuperation in the field before being tasked to do the same again repeatedly over an extended period.^{12,14,15,16,45,48}

Negative impact of combat on physical and mental health

The very nature of sustained combat operations often involves soldiers being exposed to a multitude of stressors, which can negatively impact not only on their operational effectiveness, but also on their long term physical and mental health. Many factors have been demonstrated to

impair both short- and long-term physical and cognitive performance, including the following: heavy load carriage, exertional fatigue, sleep deprivation, poor nutrition, high calorific energy expenditure, inadequate recovery, exposure to intense psychological stressors and environmental extremes.^{9,24,39,40,41,44,57}

Castellani et al⁹ observed that 72-84 hours of sustained military operations resulted in decreases in body mass, combat-specific task performance, and cognitive ability, as well as impaired thermoregulatory function. These findings are supported by Nindl et al,⁴⁴ who demonstrated that eight weeks of intensive military training designed to replicate the demands of combat resulted in a significant reduction in maximal lifting strength, lower limb power and body mass. Furthermore, Lieberman et al^{39,40} established that sustained combat operation can result in a substantial degradation in cognitive performance, including vigilance, reaction times, marksmanship, mood states, memory and logical reasoning.

Table 1. Components of military physical fitness (adapted from Knapik et al³⁰)

CATEGORY	FITNESS COMPONENT	DEFINITION	EXAMPLE MILITARY TASK
Movement skills	Mobility	Range of motion achieved at a joint or series of joints	Freedom to move over, under or through varying obstacles
	Stability	Maintenance of equilibrium while stationary or moving	Maintenance of stable firing position
	Motor control	Ability to use the senses, such as sight or hearing, together with the body parts in performing motor tasks smoothly and accurately	Bringing a weapon system to bear and accurately engaging targets
	Speed	Ability to perform movements in any given direction as quickly as possible	Rapid movement between fire positions
	Agility	Ability to change the position of the entire body in space with speed and accuracy	Repeatedly negotiating obstacles
	Quickness	The ability to react to visual, auditory and kinaesthetic stimuli	Reacting to effective enemy fire
Strength	Muscular endurance	Ability to exert sub-maximal external forces for a short period of time	Repetitive manual handling tasks
	Maximal strength	Ability to generate a maximal external force	Standing from kneeling with heavy loads
Endurance	Power	Ability to exert maximal external force in the shortest period of time	Breaking down compound doors
	Aerobic capacity	Ability to maintain sub-maximal efforts for a sustained period of time	Sustained patrolling with heavy loads
	Anaerobic capacity	Ability to sustain maximal efforts for a short period of time	500m casualty extraction



Anecdotal reports from recent conflicts suggest that soldiers frequently exhibited negative alterations in body mass and physical performance as a result of sustained combat operations.^{12,15} However, to date only two studies have investigated the long-term effects of sustained military operations on soldier physical characteristics. Sharp et al⁵⁹ reported that a nine-month operational deployment of US Army personnel to Afghanistan resulted in a significant reduction in aerobic capacity, upper body power, body mass and fat-free mass. Interestingly, lifting strength and vertical jump performance was maintained over the period of the deployment.

Conversely, Lester et al⁴¹ demonstrated that after a 13-month deployment to Iraq, soldiers' body mass and strength increased, while aerobic capacity declined substantially. The authors suggested that the lack of change observed may have been due to the fact that the soldiers used in this study were not frequently involved in combat due to their unit's operational role. As such, these findings must be interpreted with caution.

Although future military operations remain relatively unknown, success will most likely be influenced by the physical capability and performance of the individual soldier. Therefore, it is clear that optimising the physical preparedness of the soldier is essential in order to enhance their overall operational effectiveness and minimise the likelihood of injury, defeat or even

death. The British Army defines military physical fitness as: 'The ability to respond instantly and effectively to the physical and psychological demands of combat over prolonged periods with the minimum of distress, and return to a normal healthy state once the demand ceases.'³ Similarly, the US 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.'¹⁶

Given the nature of these definitions, it is clear that the modern soldier requires a broad spectrum of physical capabilities in order to ensure optimal combat effectiveness. Table 1 gives the reader a brief overview of the various movement skills, strength, and endurance fitness components required by the tactical athlete, with practical examples of their application within the context of military specific tasks.

In addition to a high level of physical preparedness, the modern soldier must also be resilient to the psychological demands of combat. This requires a view of performance which encompasses the optimisation of the physical, cognitive and emotional traits of the soldier to create a more dominant warrior.⁸

Within this holistic view, resilience can be defined as the mental, physical, emotional and behavioural ability to face and cope with adversity, adapt to change, recover, learn and grow from setbacks.^{8,13,17} Without

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resilience, the soldier can easily become overwhelmed, by the various stressors which they may experience, resulting in a negative impact upon not only operational effectiveness, but also on long-term physical and mental health. Numerous studies have demonstrated the inter-related nature of physical fitness and mental resilience.^{58,62} As such, it can be contended that appropriate physical training may also confer psychological benefits, which enable soldiers to become more resilient to the mental demands of combat via a process of systematic stress inoculation.^{17,58}

Excessive focus on muscular endurance and aerobic capacity

Although it is clear that a broad spectrum of physical capabilities is required by the modern soldier, it can be strongly argued that for many years military physical training (PT) has been predominantly focused upon the development of muscular endurance and aerobic capacity. Indeed, traditionally, fitness within many militaries has been regarded as the ability to complete endurance-based activities, with little emphasis given to the development of either movement skill or strength fitness components.^{61,66} This focus upon the development of endurance fitness component has resulted in the neglected development of movement skills, strength and power,^{6,36,65} thus potentially impacting upon overall combat effectiveness.

Non-functional overreaching

Soldiers often judge themselves and others on their ability to withstand extreme endurance challenges which – when combined with poor nutrition, inadequate recovery, poor sleep hygiene and a host of other stressors – can result in the development of non-functional overreaching.⁵ The human body can cope with being placed into an overreached state without suffering any adverse effects. However, continued long-term exposure can result in decreased physical performance,⁵ an increased likelihood of musculoskeletal overuse injury,^{4,63} and potentially serious long-term physical and mental health consequences.⁵

It is highly questionable whether or not current military PT practices adequately prepare soldiers for the demands of combat.^{42,43} Indeed, reports from both commanders and soldiers alike support this contention, with many questioning the efficacy of current military PT methodologies and testing protocols in relation to the extreme physiological and psychological demands encountered during sustained combat operations.^{12,15,43} Furthermore, anecdotal evidence suggests that – more often than not – military PT is routinely ad-hoc in nature, with training geared towards the completion of mandatory, non-task-specific fitness tests, with an emphasis placed upon testing statistics rather than real world physical



performance.^{43,61} Finally, it has also been suggested that the nutritional, recovery and sleep hygiene behaviour of military personnel is at best inadequate, negatively impacting upon not only physical preparedness, but also long-term health and well-being.⁸

New direction for training required

Given the identified issues with current military PT practices, it is clear that a new direction is required in order to optimise physical preparedness, minimise the likelihood of injury and improve the long-term health and well-being of the modern soldier. In order to achieve these objectives, it is recommended that a flexible, evidence-based, PT programme be adopted. Such a programme needs to be grounded upon the fundamental training principles of specificity, overload, recovery, progression and reversibility.³⁶ In addition, it must allow for the concurrent development of movement skills, strength and endurance fitness components. Furthermore it must also include an element of military occupational task-specific training and be based upon a suitable model of periodisation, a model which organises training into systematic cycles of undulating intensity and volume: this is necessary in order to reduce the accumulation of chronic fatigue, mitigate the risk of overtraining and optimise subsequent physiological adaptations.³⁶ Finally, it must also be flexible enough to meet the fast tempo and ever-changing demands of unit training cycles and multiple operational deployments.^{1,37,59}

Numerous studies have established that periodised training programmes incorporating concurrent strength and endurance training can significantly enhance military task-specific performance, while also decreasing the likelihood of injury. In comparison to either strength or endurance training alone, concurrent training programmes have been demonstrated to improve load marching performance,^{19,23,31,34,35,55,65} material manual handling ability,^{23,34,65} and also lower body strength and power,^{1,23,59} as well as obstacle course performance^{19,23} and simulated casualty extraction timings.^{19,23,59}

Evidence suggests that concurrent training regimes may interfere with the development of maximal strength and power.⁶⁷ However, given that the tactical athlete requires a broad spectrum of physical capabilities, any potential interference effect on the

development of maximal strength and power can be seen as an acceptable trade-off due to the significant enhancement in military task specific performance observed as a result of concurrent training.^{1,19,23,31,34,35,55,59,65} Furthermore, careful and balanced programme design may help to minimise the impact of any potential interference effect.¹⁸

Daily undulation periodisation

The use of a daily undulation periodisation (DUP) has been proposed by several authors as being suitable for both team sports and military populations due to its inherent flexibility.^{24,37,47,61} DUP can be characterised by a daily, wave-like, alternation of training loads (intensity x volume) and/or training modalities dependent upon the focus of a specific training block within which sits the session.⁵² The fundamental basis behind DUP is that one can have a different training session each day, which provides not only a different physiological training stimulus but also allows for adequate management of acute fatigue between sessions.

In comparison to linear and non-periodised training models, DUP has been proposed to offer equal, if not greater, improvements in physical performance.^{20,21,22,33,54} The progressive overload of a given motor attribute during DUP is not achieved on a day-to-day basis as the training stimulus is too varied. As such, progressive overload is achieved during a subsequent training session with a similar focus. It can be argued that DUP may take longer to stimulate specific adaptive changes, due to an insufficient frequency of training on any given fitness component.^{11,50,51} However, the use of a conjugated block approach, incorporating DUP, may potentially offset this problem.

A conjugated block approach places an emphasis upon the highly concentrated development of a specific set of motor attributes during a given training block, while simultaneously maintaining other motor attributes albeit at a reduced training volume.^{27,28} The sequencing of conjugated training blocks is intended to build upon the residual training effects of previously developed motor abilities. Therefore, it is proposed that the use of DUP within a conjugated block model may provide a sufficiently adequate training stimulus in order to elicit the required physiological adaptations. Theoretically, a training programme based upon a conjugated

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block model incorporating DUP could be developed in line with a unit's yearly training plan and/or upcoming operational deployment cycle; this would help to optimise the physical preparedness of the soldier for a specific deployment.

Typically, a training block is divided into a series of training weeks which are defined as being either accumulating or unloading in nature. Accumulation training weeks can be characterised by a planned increase in the training load in order to provide a suitable training stimulus in line with the overall training block objective. In contrast, an unloading training week can be defined by a marked reduction in the training load, in order to reduce the accumulation of chronic fatigue, mitigate the risk of overtraining and optimise subsequent physiological adaptations. From a planning perspective, operational deployments can be viewed as the peaking phase of a training programme. Therefore, based upon identified time constraints and competing unit training demands, different training block configurations (3:1, 2:1, 1:1) can be easily adopted in order to allow for suitable windows of opportunity for training and recovery.

Hybrid/extreme conditioning programmes

Hybrid training or extreme conditioning programmes are extremely popular within the military due to their inherent variation, challenging nature and efficient use of time.^{10,32} In addition, hybrid training also has strong military cultural connotations, as workouts of the day (WODs) are often named in honour of fallen comrades as an act of remembrance. Hybrid training typically blends movement skill and strength and endurance fitness components into a single training session; WODs are often based upon the completion of a set amount of work or alternatively the completion of as much work as possible within a given time frame using consistently varied multiple joint exercises.^{10,32}

Several studies have demonstrated that hybrid training modalities can enhance military task-specific fitness.^{26,49} Indeed, hybrid training has been successfully incorporated within the physical training doctrines of both the Canadian and US militaries.^{7,49,53} However hybrid training may pose an increased risk of injury due to potentially poor exercise technique and/

or a loss of form due to excessive fatigue.³² Furthermore, hybrid training has been linked to the onset of overtraining syndrome and rhabdomyolysis.³² Nonetheless, hybrid training modalities offer a novel training stimulus which may enhance the overall physical and psychological preparedness of the modern soldier for demands of combat.

Military occupational task-specific training – commonly known as battle PT – is essential in order to provide the required element of specificity needed to ensure optimal physical preparedness to meet any likely mission requirement which may be experienced during combat. To coin a British Army saying: 'train as you fight'. Battle PT has been demonstrated to enhance combat-specific fitness measures.^{26,31,46,60} Examples of battle PT include sustained heavy load carriage, material manual handling, burden carries, simulated casualty extractions, fire and manoeuvre drills, combatives and obstacle courses. It is important to note that the intensity and volume of battle PT should be systematically increased until the likely demands of combat are replicated. In addition, the incorporation of mission essential equipment – including body armour, helmets, load carriage equipment and weapon systems – should be gradually introduced so that the soldier is able to meet the demands of the anticipated worst case and mission-related scenarios without excessive difficulty or exhaustion.

Physical and psychological preparedness

Based upon the literature reviewed, one can infer that a concurrent training programme based upon a conjugated block model incorporating DUP may optimise not only the physical but also the psychological preparedness of the soldier for the demands of combat. Such a programme needs to simultaneously develop movement skill, strength and endurance fitness components. In addition, it must also include hybrid training and battle PT sessions in order to provide the required element of task-specificity indicative of any effective training programme. Furthermore, the development of performance-enhancing behaviours – through appropriate educational interventions in areas such as nutrition, mindset, movement preparation, recovery and sleep – may also help to optimise the physical preparedness and long term health and well-being of the tactical athlete.⁸

'Operational deployments can be viewed as the peaking phase of a training programme'

Tables 2, 3 and 4 give an example of a 12-week training programme split into three, four-week training blocks designed to prepare the soldier for a specific operational deployment. Each training block progressively builds upon the last, with the training load gradually increasing. In addition, as the programme progresses, the overall emphasis becomes more combat-specific with the overall frequency of battle PT sessions increasing.

It should be noted that this is merely an example training programme and that the number and length of each training block will be dictated by the available training time. Furthermore, it should be noted that the sequencing of training sessions should not be set in stone. DUP's strength is its inherent flexibility. Therefore, daily training sessions should be adapted, based not only on a soldier's conditional readiness to train, but also on other conflicting unit training demands.

The demands of combat, combined with a lack of opportunity to train, dictate that the goal of PT during operational deployments should be to maintain physical preparedness. Furthermore, physical activity while deployed can be an important respite from the stresses of operations and an essential part of a soldier's routine.³

A continuous DUP approach utilising hybrid training modalities may be the best option while deployed, due to its adaptability to fit

around operational demands such as high mission tempo, fatigue and sparse base conditions. Upon return from an operational deployment, it is vital that a period of rest and recovery be implemented, in order to allow the soldier to recover and regenerate from the physical and psychological demands of sustained operations. This period should be characterised by low-intensity, low-volume active recovery modalities including both sport and adventurous training. This in turn will help the soldier to recover in preparation for future training and operational deployment cycles.

Summary

It is clear that military operations place unique and intense physiological and psychological demands upon the soldier. The overarching objective for the modern soldier should be to move further, move faster and fight harder than his enemy in order to bring about his defeat. Fundamentally, the soldier is a system: in order to optimise the effectiveness of that system, the soldier must be trained as an athlete, with as much time, effort and resources placed into developing the soldier system, as they would be with any other weapon system.

This article purposely does not go into depth regarding military fitness testing or specific training methodologies as its aim is to help drive a discussion on the development of

'Hybrid training modalities offer a novel training stimulus'





a holistic, evidence-based approach towards future military PT.

Policy makers, the chain of command, PT staff and the individual soldier must all come to realise the interdependent relationship between physical preparedness, overall operational effectiveness and long-term physical and mental health. Failure to do so will result in the soldier being ill-prepared for the demands of combat, ultimately impacting upon overall mission readiness, operational effectiveness, and general long-term health and well-being.

Table 2. Training Block One: Accumulation

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Week 1	Muscular endurance: lower body; 4 sets of 8 reps; rec 1 min	Aerobic training	Strength: total body; 5 sets of 5 reps; rec 2 mins	Anaerobic interval training	Muscular endurance: upper body; 4 sets of 8 reps; rec 1 min	Rest	Rest
Week 2	Strength: lower body; 5 sets of 6 reps; rec 2 mins	Movement skills/hybrid training	Muscular endurance: total body; 4 sets of 8 reps; rec 1 mins	Load carriage training: 6 km /20 kg	Strength: upper body; 5 sets of 6 reps; rec 2 mins	Rest	Rest
Week 3	Muscular endurance: lower body; 4 sets of 10 reps; rec 1 min	Aerobic training	Strength: total body; 5 sets of 7 reps; rec 2 mins	Anaerobic interval training	Muscular endurance: upper body; 4 sets of 10 reps; rec 1 min	Rest	Rest
Week 4	Active recovery	Movement skills/hybrid training	Active recovery	Movement skills/hybrid training	Active recovery	Rest	Rest

Table 3. Training Block Two: Transition

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Week 1	Strength: lower body; 5 sets of 5 reps; rec 2 mins	Anaerobic interval training	Maximal strength/power: total body; 6 sets of 2 reps; rec 3 mins	Movement skills/hybrid training	Strength: upper body; 5 sets of 5 reps; rec 2 mins	Rest	Rest
Week 2	Maximal strength/power: lower body; 6 sets of 3 reps; rec 3 mins	Load carriage training: 7 km / 25 kg	Strength: total body; 5 sets of 6 reps; rec 2 mins	Anaerobic interval training	Maximal strength/power: upper body; 6 sets of 3 reps; rec 3 mins	Rest	Rest
Week 3	Strength: lower body; 5 sets of 7 reps; rec 2 mins	Battle PT: obstacle course/combatives	Maximal strength/power: total body; 6 sets of 4 reps; rec 3 mins	Load carriage training: 8 km/30kg	Strength: upper body; 5 sets of 7 reps; rec 2 mins	Rest	Rest
Week 4	Active recovery	Movement skills/hybrid training	Active recovery	Movement skills/hybrid training	Active recovery	Rest	Rest

Table 4. Training Block Three: Realisation

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Week 1	Maximal strength/power: lower body; 6 sets of 2 reps; rec 3 mins	Movement skills/hybrid training	Strength: total body; 5 sets of 5 reps; rec 2 mins	Load carriage training: 9 km/35 kg	Maximal strength/power: upper body; 6 sets of 3 reps; rec 3 mins	Rest	Rest
Week 2	Strength: lower body; 5 sets of 6 reps; rec 2 mins	Battle PT: fire & manoeuvre drills/combatives	Maximal strength/power: total body; 6 sets of 3 sets; rec 3 mins	Movement skills/hybrid training	Strength: upper body; 5 sets of 6 reps; rec 2 mins	Rest	Rest
Week 3	Maximal strength/power: lower body; 6 sets of 4 reps; rec 3 mins	Load carriage training: 10 km/40 kg	Strength: total body; 5 sets of 7 reps; rec 2 mins	Battle PT: combatives/casualty extractions	Maximal strength/power: upper body; 6 sets of 4 reps; rec 3 mins	Rest	Rest
Week 4	Active recovery	Movement skills/hybrid training	Active recovery	Movement skills/hybrid training	Active recovery	Rest	Rest

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