

A Physical Training Framework for Reserve Personnel: A Rationalization and Recommendations

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ABSTRACT

RESERVE (PART-TIME) ARMY PERSONNEL TYPICALLY PERFORM OCCUPATIONAL AND OPERATIONAL TASKS AKIN TO THOSE OF THEIR ACTIVE-DUTY COUNTERPARTS BUT MAY HAVE LOWER FITNESS BECAUSE OF LESS PHYSICAL TRAINING. AS SUCH, RESERVE MILITARY PERSONNEL MAY BE AT A GREATER RISK OF INJURY AND HAVE PHYSICAL PERFORMANCE DEFICITS. TO IMPROVE FITNESS AND PERFORMANCE, TRAINING GUIDELINES SUGGEST 3 D/WK AEROBIC TRAINING AND 2 D/WK OF STRENGTH TRAINING, ALTHOUGH SOME DAYS MAY INCLUDE BOTH. AMONG RESERVE MILITARY PERSONNEL AWAY FROM THEIR UNITS, BOTH GENERAL AND OCCUPATIONALLY ORIENTED TRAINING COULD BE TRACKED USING COMPUTER APPLICATIONS AND/OR BY EVENING TRAINING IN GROUPS, WHICH MAY IMPROVE COMPLIANCE AND MOTIVATION.

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INTRODUCTION

Unlike full-time regular soldiers, reserve (part-time) soldiers typically have a primary employment outside the military (4,58) and may be considered nomads moving between civilian and military worlds (52). Often these reserve soldiers only become full-time when participating in training exercises or when called on for local or international deployment missions (58). Reserve soldiers are expected to perform the tasks equivalent to full-time soldiers of the same rank and occupational specialty and are considered force multipliers performing an integral role in the conflict (52). With operational deployments increasing in recent times (52,53), reserve elements now contribute to around 10% of Australian (52) and United Kingdom forces (4), and in the United States make up about half of personnel actually engaged in current conflicts (35,42). Strategically, the Australian Defence White Paper (8) has acknowledged the importance of integrating reserve and full-time personnel under the government approved plan, *BEERSHEBA*. As such, there is an increased requirement for reserve personnel to

perform at a level commensurate with their full-time counterparts.

A vital component to military capability is physical fitness of personnel. For example, load carriage is an ongoing requirement for military personnel, during training, on field exercises, and on deployments. To improve task performance while carrying load, physical conditioning and physical fitness are essential (26). However, reservists may present with lower levels of some elements of physical fitness than regular soldiers (58). For example, in the United States, a comparison of Arizona National Guardsmen with active-duty soldiers found that the guardsmen had more body fat, a lower directly measured $\dot{V}O_{2\max}$, but higher strength than active-duty soldiers (57).

One contributing factor to any observed lower levels of fitness among reserve members may be, depending on nation, their completion of less physical training, and training in general, during their military training (58). In the United States, reservists and National

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Guardsmen train together in Initial Entry Training and in Advanced Individual Training and thus receive the same physical training. However, in other countries such as Australia, there are notable differences in training. For example, in 2006, the Australian Army reserve recruit training course was only around one third the length of the full-time course (37,38). At 28 days, this course was two-thirds the length of the original 45-day reserve course (52). Furthermore, even during full-time training, the physical training for reserve personnel may be shorter in duration, with a more focused, time-critical, training program (52). Long-term, chronic military physical conditioning may therefore be limited in many reserve personnel.

A second issue is the lack of training oversight once the reservists leave their initial training. Generally, reservists can train during scheduled military activities (drills, field exercises, etc.), but outside these scheduled activities, there is typically no oversight of the frequency, duration, and type of physical training performed, or even of whether it is performed.

The result of less physical training is a lower level of physical fitness among reserve personnel. These less fit soldiers are at a greater risk of injury (22,28,44) and cardiovascular concerns (53). When this lower fitness level is coupled with the stress of operational duties, the risk of cardiovascular incidents may be increased, and this can significantly impact operational capability (53). There is also research to suggest that physical training is essential for mental health and that perhaps the lower physical fitness and activity levels typical of reserve personnel may assist in explaining the greater risk of mental illness observed in reserve veterans (4,19). It is essential that reserve soldiers are sufficiently physically fit to perform duties required of them when on occupational exercises and operations (50).

The potential for injury among less fit soldiers is a major concern. The Australian Defence Health Status Report

of 2000 (1) found that reserve soldiers had a 3 times higher incidence of injuries when compared with their full-time counterparts. Recent research has suggested that this gap has narrowed, although reserve personnel were still found to report twice the incidence of injuries reported by their full-time counterparts (45). Research by MacDonald et al. (33) found that anatomical locations affected by reported incidents, although similar, did differ slightly between reservists and full-time personnel. For example, although lower limbs were the leading site of injuries for both groups, they represented a slightly higher proportion of injuries in reserve personnel (reserve = 37%; full time = 31%). Of note, the study also found that, although reserve personnel sustained a slightly lower proportion of their injuries during physical training (reserve = 20%; full time = 25%), a much larger proportion of injuries sustained by reserve personnel arose from combat oriented training (reserve = 35%; full time = 18%) (33). When a soldier is injured in training or during combat operations other soldiers must assume a greater part of the mission, and resources are required for medical treatment (50).

LEVEL OF FITNESS REQUIRED

With the need to ensure that reserve soldiers are physically fit, it is appropriate to measure their levels of physical fitness. Reserve soldiers are judged on the same fitness criteria as full-time soldiers but the associated fitness tests are typically designed to ensure soldier health and general fitness, rather than ensuring their occupational readiness. Furthermore, these tests use minimum acceptable scores that are intended to represent the minimum health and fitness standard required of soldiers. The Australian Army Basic Fitness Assessment (13) and the US Army Physical Fitness Test (APFT) (21), as examples, use fitness tests that are of a general fitness nature. These tests consist of push-ups, sit ups, and a run. Push-ups and sit-ups are measures of muscular endurance, and runs measure aerobic capacity (21). Although studies have

shown low to moderate positive correlations between scores in the US APFT events and performance in occupational tasks such as lifting, load carriage, casualty rescue, and negotiation of obstacle courses (15,16), the ability to pass these general fitness tests does not ensure that reserve soldiers have the same physical capacity to perform required occupational tasks as their full-time counterparts (13). The general fitness tests are, however, a good indicator of general health relative to age- and sex-based norms, and therefore remain appropriate for that purpose.

Occupationally relevant fitness assessments are desirable and should form the precursor to any ongoing integration of reserve military with full-time military personnel. Standards like the Australian Army Physical Employment Standards—Army (PESA) present as a viable measure and option. The PESA standards are based on occupational requirements regardless of sex and age (9). On this basis, these requirements can also be considered to be independent of service type—be it reserve or full-time. The physical demands required to complete a given task will be the same for all personnel. For example, the weight of a box that requires manual transportation will not vary based on the soldier's service type, age, or sex. This is an important consideration, as there may be a temptation to reduce testing standards or modify assessments to accommodate lower fitness levels of reserve personnel. If the nature of the task will not change because of reserve status, then the nature of the occupational assessment should likewise not change. Furthermore, as lower levels of fitness are associated with an increased risk of injury during tasks with fixed workloads (22,28), lowering fitness standards for reserve soldiers is likely to heighten their potential for injury when performing military tasks. On this basis, if lower fitness and potential for injury are concerns, then the training and preparation must adapt to meet the

occupational need rather than changes being made to the assessment standard.

CONDITIONING

Providing conditioning programs to reserve personnel presents a challenge (47), yet the importance of optimal physical conditioning for reserve personnel cannot be understated, especially if they are being conditioned for deployment. Research suggests that during combat operations, noncombat activities often account for more injuries than actual combat (3,17), with the lower back typically presenting as the leading site of such injury (3,17,48,56). Potential reasons for these injuries include wearing of body armor and load carriage. Wearing body armor increases the physical demands of performing a given task (46) and has been associated with lower back injuries (49). One study by Roy et al. (48) identified lifting and carrying, dismounted patrolling, and physical training as the activities associated with injuries among soldiers on an operational deployment in Afghanistan. Thus, it is reasonable to expect that physical conditioning would be of benefit to improve tasks such as load carriage, lifting and carrying resilience, and fatigue resistance in dismounted patrolling (12,18,30,31).

NATURE OF CONDITIONING

The nature of the physical conditioning undertaken to improve various components of physical fitness (24) can be designed to facilitate 2 key outcomes (a) general health, fitness, and well-being, and (b) occupational capability. Poor general health and fitness have been associated with an increased risk of cardiovascular and metabolic disease and illness (2) and an increased risk of sustaining an injury during military training (34,43). As both of these factors would impact on Service Member availability, general health, fitness, and well-being are of particular importance to military forces. Research in tactical populations (including law enforcement and military) has noted that reserve personnel may have a higher fat mass than that of full-time personnel (5,57), may be

slightly overweight (based on body mass index [BMI]) (29), and may have lower levels of some aspects of fitness (5,6,57)—all factors associated with an increased risk of cardiovascular and metabolic syndromes (11). Furthermore, low levels of aerobic fitness have been found to be a leading factor associated with injury in tactical populations during training (22,34,40,43). A higher level of general health and fitness may aid in reducing the risk, and impact, of mental illness, which is greater in veterans who served as a reservist (4,19,41). General conditioning to increase overall health and fitness would benefit the reserve soldier and the organization as a whole. Some organizations perform fitness testing, and these assessments can be used as a surrogate to evaluate health and fitness and monitor the effectiveness of training programs to improve or maintain fitness.

The recommended requirements to maintain health and fitness in the general population are between 3 days (vigorous exercise intensity) and 5 days (moderate exercise intensity) of physical activity per week, with sessions totaling 75–150 min/wk depending on intensity (11). For neuromuscular conditioning, each major muscle group should be trained 2–3 d/wk (11). Given these guidelines, as a general estimate, reserve members would need to exercise at least 3 times per week for 50–60 minutes including anaerobic/aerobic exercise and muscle power/strength/endurance conditioning. These sessions could, for example, be comprised of an 8–10 minute warm-up, 15–20 minutes of neuromuscular conditioning, 25–30 minutes of moderate to vigorous aerobic activity, and a 5-minute cool down with the order of conditioning dependent on which component of fitness was to have the higher intensity. The higher intensity exercises should be performed after the warm-up given that muscle fatigue is known to increase the risk of injury and as such, higher intensity exercises should be performed before any cumulative fatigue or prefatigue (20).

Besides meeting general health and fitness training requirements, the additional need for task specific conditioning must also be considered. Given the specific nature of military occupations, task specific conditioning is a priority if reserve members are to be effectively integrated with full-time members. Load carriage presents as a prime example of a task specific requirement for both full-time and reserve personnel. During field exercises, soldiers may be required to carry loads of 47 kg, and these loads can increase to over 60 kg on combat operations (7,36). Conditioning for load carriage must incorporate both aerobic training, muscle strength training, and load carriage-specific conditioning (26,39).

Task-oriented conditioning is not new and has been found to have a positive impact on task performance and fitness in general (51). Four studies in the United States demonstrated that many traditional physical training activities can be replaced with task-oriented training without negative effect on general fitness development when compared with the traditional programs (14,23,25,27). Replacing some general health and fitness conditioning sessions with task-oriented conditioning can provide a measure of occupation-specific conditioning without detriment to the general health and fitness conditioning requirements of soldiers.

MOTIVATING AND MONITORING TRAINING IN RESERVE SOLDIERS

Australian Army Reserve personnel typically only attend military training on evenings once per week or on a number of weekends (10). US Army Reserve and National Guard personnel typically meet only on 1 weekend per month (54,55). For these groups, meeting recommended requirements of at least 3 physical training sessions per week is obviously not achievable during military training time. As such, providing reserve forces with the same conditioning stimulus as full-time forces and making such programs available to reserve personnel is a notable challenge (47). It is clear that reserve

personnel need to be exposed to the same optimal conditioning practices as full-time personnel. For example, specific load carriage physical training sessions are recommended to be conducted, at a minimum, every 7–14 days (26,39). Anaerobic/aerobic and muscular conditioning should be conducted 3 and 2 times per week, respectively, and are not only associated with lower injury risk but can also improve occupational task performance (24,32).

Considering these recommendations, there are several practical elements that must be considered when attempting to ensure that reserve personnel receive an adequate training stimulus. Again, load carriage presents as a prime example. While wearing combat equipment (including body armor) and carrying a weapon form part of the specificity of training for load carriage conditioning, this option will be restricted for reserve personnel when they are not training at Army training grounds. This is not only because of a lack of access to the specific equipment but also because of the fear and security concerns that could be caused by a camouflaged figure carrying a military pack and weapon (or mock weapon) and moving through a civilian area. A compromise may be cargo style civilian clothing, boots, colored backpack with load, and a clearly discernible commercial product to simulate carrying a loaded resistance in the hands (e.g., kettlebell, modified Olympic bar, etc.). Even if a specific load carriage exercise cannot be accomplished for some reason, specific aerobic and muscle strength training can still result in some improvement to load carriage performance, although optimal training would include a load carriage task (24).

Given the constraints on physically training reserve personnel, a program to monitor and motivate regular, systematic training of these soldiers should be considered. Monitoring is important—especially if remunerating the members or participation forms part of administration (e.g., promotion) requirements. However, without formal

attendance at a physical location, the ability to monitor compliance to physical training requirements may be more difficult. As such, there may be a need for the member to maintain a training logbook. If a training application on a mobile communication device could be devised, unit members could report the details of the training session immediately on conclusion. The application could have a form akin to those of traditional physical training logs and be linked to the member's unit training officer, who would manage compliance. If optimally designed, the application could feed into a master program that would display all personnel under the charge of the unit training officer and could provide outputs of compliance reports as needed (e.g., weekly, fortnightly, monthly, etc.).

Performance monitoring devices, which are becoming increasingly available and popular, may also be of benefit. Heart rate monitors, Global Positioning Systems (GPS), and similar smart technologies can be used to measure and record physical activity effort, distances covered, and other aspects of training sessions (e.g., speed). These devices can add an additional level of accuracy in reporting given that they would be more difficult to falsify.

To assist in maintaining motivation and a fitness mindset, community-training groups could be established whereby groups of reserve members all attend a local training facility or area together to train. Not only may this enhance motivation but it likewise has the potential to increase teamwork and cohesion. Through training in groups, unit reporting of physical training may also be improved, especially if a senior member is authorized to record and report attendance. To foster will-to-win, virtual competitions between community groups could be developed and encouraged.

Similarly, social media can be used to record and track individual training

and achievements. Individual progress could then be verified by objective testing conducted on training days, when personnel attend sessions with their unit. Such an approach may provide a healthy level of individual competition and motivation through membership in a group that allows for comparison and inspires fitness training by individual personnel. Additionally, these types of venues can be used to share training ideas and information.

CONCLUSION

Reserve and full-time personnel are typically required to perform tasks at a commensurate level. However, reserve personnel may not have the same level of chronic conditioning when compared with full-time personnel. As such, reserve personnel have been observed to present with lower levels of some fitness components, higher BMI, and higher levels of body fat when compared with full-time personnel. The downstream effects of these factors place reserve personnel at a greater risk of injury during military training and operations. Opportunities to mitigate this risk and increase the physical conditioning are hampered by many factors, including the competing commitments of part-time personnel and limitations in performing some forms of physical conditioning (like load carriage). Approaches like maintaining a log book on a digital application, the use of performance monitoring devices (e.g., heart rate and GPS), and community-based training groups (physical or virtual) may provide a means of monitoring the physical training of reserve personnel and provide a source of motivation through which to optimize their physical fitness. The effectiveness of these approaches on improving fitness and occupational performance has not been validated and research to this effect would be useful.

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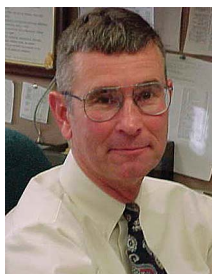
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