Scientific and practical approach to enhancing physical and functional fitness of cadets

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Abstract

Cadets in military and law enforcement academies are required to develop high levels of physical and functional fitness to meet the demands of their future duties. This review examines the scientific foundations and practical strategies for enhancing cadets' fitness. It discusses key fitness components (endurance, strength, power, agility, etc.) and training principles (specificity, progressive overload) that underpin effective cadet physical training. Recent evidence is reviewed comparing traditional physical training programs (emphasizing endurance and calisthenics) with more modern, functional training approaches that incorporate strength, agility, and power exercises. Findings indicate that combined strength and endurance training yields superior improvements in overall performance, and an evidence-based, well-rounded regimen can improve a broader range of fitness measures than conventional routines. Common challenges – such as risk of injury, training plateaus, and varying initial fitness levels – are addressed with recommendations including periodization, individualized programming, and use of qualified fitness professionals. A scientific yet practical approach to cadet training can better prepare cadets for the physical demands of service while reducing injury risk and improving overall readiness.

Keywords: physical fitness; functional training; cadets; tactical athletes; endurance; strength

Introduction

Physical fitness is a critical attribute for cadets in military, law enforcement, and other tactical professions. These professionals are often described as "tactical athletes" because they must possess a wide range of physical abilities, including strength, endurance, speed, agility, and coordination, in order to successfully perform occupational tasks (Haddock et al., 2016; Orr et al., 2013). Law enforcement officers, for example, may spend long periods performing sedentary administrative duties but must be prepared to suddenly engage in physically demanding tasks such as foot pursuits, restraining aggressive individuals, climbing obstacles, or carrying heavy equipment under stressful conditions (Dawes et al., 2017; Lockie et al., 2018). In such situations, a high level of physical fitness often becomes the determining factor in successful performance and operational effectiveness.

Similarly, in the military environment soldiers must frequently perform demanding tasks including long-distance marches with heavy loads, rapid sprints to cover, casualty evacuation, and transitions from rest to maximal physical effort (Knapik et al., 2012; Nindl et al., 2013). The ability to perform these tasks effectively is closely linked to the cadet's physical and functional fitness levels. Consequently, developing a high level of physical preparedness during academy training is essential for preparing cadets to perform the physical demands of future service (Orr et al., 2013).

Despite the recognized importance of physical fitness, achieving optimal physical preparedness in cadet populations remains a complex challenge. Modern armed forces and law enforcement academies are increasingly facing declining physical fitness levels among incoming recruits (Tomkinson et al., 2017). Global research indicates that aerobic capacity among youth has decreased over recent decades, while rates of overweight and obesity have increased (Tomkinson et al., 2017; Cohen et al., 2019). These trends make it more difficult for military and police organizations to recruit physically capable candidates, placing greater responsibility on academies to develop the necessary fitness levels during training.

Traditionally, physical training (PT) programs in military and police academies have focused primarily on endurance running and calisthenic exercises such as push-ups, sit-ups, and pull-ups. These activities were intended to develop general physical fitness and prepare cadets for standardized physical fitness tests (Nindl et al., 2013). While such programs are effective in improving aerobic capacity and muscular endurance, they may neglect other essential components of physical performance required for operational tasks, including maximal strength, explosive power, and anaerobic capacity (Haddock et al., 2016). For instance, the legacy U.S. Army Physical Fitness Test (APFT) assessed only push-ups, sit-ups, and a

two-mile run, emphasizing muscular and aerobic endurance while failing to evaluate strength and power capabilities necessary for combat-related activities (Nindl et al., 2013).

Recognizing these limitations, training paradigms within military and law enforcement organizations have increasingly shifted toward functional fitness approaches that better reflect the physical demands of operational tasks. One example of this shift is the introduction of the Army Combat Fitness Test (ACFT), which includes six performance events designed to assess multiple physical capabilities, including strength, power, anaerobic endurance, and agility (Haddock et al., 2016). Similarly, law enforcement academies have begun implementing evidence-based training programs that incorporate resistance training, agility drills, and high-intensity interval training in addition to traditional endurance exercises (Dawes et al., 2017; Lockie et al., 2018).

The primary goal of these modern training approaches is to develop well-rounded physical preparedness that directly supports operational performance while also reducing the risk of injury. Research shows that diversified training programs combining strength, endurance, and power development can significantly improve overall performance among tactical personnel (Orr et al., 2013). Consequently, integrating sports science principles with practical training methodologies has become an important focus in the development of cadet physical training programs.

Developing effective cadet fitness programs requires a clear understanding of fundamental exercise science principles and the physical capabilities necessary for tactical performance. Physical fitness is widely recognized as a multidimensional concept that includes both health-related components such as aerobic endurance, muscular strength, muscular endurance, flexibility, and body composition, as well as skill-related components including power, speed, agility, coordination, and balance (Baechle & Earle, 2008). Cadets must develop proficiency across many of these domains to effectively perform occupational tasks.

An effective training program should therefore target a wide range of physical qualities including aerobic capacity, anaerobic power, maximal strength, muscular endurance, agility, explosive power, flexibility, and appropriate body composition. To achieve these goals, training programs should be guided by several fundamental principles of exercise science.

The first principle is specificity, which states that physiological adaptations to training are specific to the muscles involved, the movement patterns performed, and the energy systems utilized (Kenney et al., 2015). Therefore, cadet training programs should incorporate exercises that closely resemble the physical tasks required in operational environments. For example, exercises such as loaded carries, sled drags, and obstacle course drills can effectively simulate real-world occupational tasks encountered in military or law enforcement settings (Orr et al., 2013).

Another key principle is progressive overload, which involves gradually increasing training stress to stimulate continued physiological adaptation (Baechle & Earle, 2008). Without progressive overload, the body adapts to the existing workload and performance improvements plateau. Progressive overload may involve increases in training volume, intensity, frequency, or exercise complexity.

Periodization is another important training concept that involves systematic variation of training loads and exercise modalities over time to maximize performance improvements and prevent overtraining (Bompa & Buzzichelli, 2019). Periodized training programs typically include phases focusing on different physical qualities such as endurance, strength, and power development. Research suggests that variation in training stimuli is essential for achieving optimal improvements in both aerobic and anaerobic performance among military personnel (Nindl et al., 2013).

Results and discussion

Recovery and adaptation also represent essential components of effective training programs. High training loads without adequate recovery can lead to overtraining, fatigue accumulation, and increased injury risk (Knapik et al., 2012). Cadets often experience demanding schedules that include academic responsibilities, military duties, and physical training, making adequate recovery particularly important. Proper sleep, nutrition, and recovery sessions such as mobility exercises and low-intensity activity can support physiological adaptation and reduce injury risk.

Another important theoretical concept in cadet training is concurrent training, which refers to the simultaneous development of endurance and strength within the same training pro-

Table 3. comparison of traditional cadet pt program vs. modern functional training program

Aspect	Traditional PT Program	Modern Evidence-Based Program
Primary Focus	Emphasis on aerobic endurance and basic calisthenics. Cadets spend significant time running long distances and doing body-weight exercises (push-ups, sit-ups, etc.).	Emphasis on all fitness components: strength, power, anaerobic and aerobic endurance, agility, flexibility. Workouts include weight training, sprint/interval work, agility drills, and functional movements.
Training Content	Long-distance runs, formation runs, calisthenic circuits (e.g., jumping jacks, push-ups, sit-ups), and occasional obstacle courses. Little to no dedicated strength equipment work; flexibility training is minimal.	Varied exercises each week: weightlifting (deadlifts, squats, presses), high-intensity circuits, shuttle sprints, plyometrics (jumps, medicine ball throws), agility cone drills, and traditional endurance runs. Includes dedicated warm-up, mobility work, and often job-specific drills (e.g., dummy drags).
Pros	Simple to implement; requires minimal equipment. Builds discipline and basic cardiovascular fitness and muscular endurance. Group runs and calisthenics promote camaraderie.	Develops comprehensive fitness relevant to job tasks. Improves strength and power (needed for lifting/carrying) in addition to endurance. Shown to yield broader performance improvements (more fitness domains improved).
Cons	Neglects certain fitness domains like maximal strength and explosive power. Training can become repetitive, leading to plateaus in improvement. May leave cadets underprepared for tasks requiring strength or quick bursts of effort.	Requires knowledgeable instructors (expertise in strength & conditioning) and equipment access. Higher intensity training carries injury risk if not properly supervised. Complex programming can be challenging to schedule within academy curriculum.
Observed Outcomes	Moderate improvements in endurance and muscle endurance; smaller or no gains in strength/power if those are not trained. In one study, a 12-week traditional program improved 6 out of 14 assessed fitness variables.	Significant improvements across multiple fitness measures. In the same study, a 12-week diversified program improved 10 out of 14 fitness variables, including agility and power that showed little change under traditional training. Cadets are better prepared for diverse physical tasks upon graduation.

gram (Fyfe et al., 2014). Earlier training models often emphasized either endurance or strength development; however, modern research indicates that combined training approaches produce greater overall improvements in physical performance among military personnel (Fyfe et al., 2014). By combining aerobic conditioning with resistance training and power exercises, cadets can develop the diverse physical capacities required for operational tasks.

Functional fitness has become a central concept in modern cadet training programs. Functional training emphasizes exercises that replicate real-world movement patterns and involve multiple joints and muscle groups (Haddock et al., 2016). Exercises such as sandbag carries, dummy drags, tire flips, and obstacle navigation help develop strength, coordination, and movement efficiency in ways that are directly transferable to tactical tasks.

Some academies also use screening tools such as the Functional Movement Screen (FMS) to evaluate movement patterns and identify potential risk factors for injury (Bonazza et al., 2017). Although research findings on the predictive validity of FMS remain mixed, movement assessments can still provide valuable information for designing corrective exercises and improving movement quality among cadets.

In summary, effective cadet fitness programs must integrate scientific training principles with the physical requirements of tactical occupations. Programs should be designed to develop multiple physical qualities through progressive, periodized training that incorporates both endurance and strength development. Such scientifically grounded programs can enhance both fitness test performance and operational readiness among cadets.

Translating theoretical principles into practical training programs, modern academies increasingly incorporate diverse training methods aimed at developing functional strength and overall physical preparedness. Traditional programs often relied heavily on calisthenics and endurance running performed in large group formations (Lockie et al., 2018). Although such

programs can produce short-term improvements in cardiovascular endurance and muscular endurance, research indicates that they may not adequately address the full spectrum of physical demands encountered in tactical occupations.

For example, a study of police academy training demonstrated that significant improvements in physical performance occurred during the initial weeks of training, but performance gains plateaued during later phases of the program (Lockie et al., 2018). This finding suggests that training programs must incorporate progressive variation in training intensity and exercise selection to maintain adaptation.

Evidence-based training programs increasingly incorporate resistance training, high-intensity interval training (HIIT), agility drills, and power exercises in addition to traditional endurance work (Dawes et al., 2017). Research comparing traditional training programs with evidence-based conditioning programs in police academies found that comprehensive training interventions improved significantly more physical fitness variables compared with traditional programs (Dawes et al., 2017).

Strength training has become a fundamental component of modern cadet training programs. Exercises such as squats, deadlifts, presses, and loaded carries help develop the maximal strength required for tasks such as equipment handling and casualty evacuation (Haddock et al., 2016). High-intensity interval training and circuit training are also widely used to improve cardiovascular fitness and muscular endurance simultaneously.

Flexibility and mobility training are also incorporated to improve movement efficiency and reduce injury risk. Dynamic stretching exercises are commonly used during warm-up routines, while static stretching may be included during cool-down periods to maintain range of motion (Kenney et al., 2015).

In addition, modern training programs increasingly utilize monitoring technologies such as heart rate monitors, GPS tracking devices, and fitness assessment tools to evaluate training loads and track performance improvements (Nindl et al., 2013). These technologies support a more data-driven approach to training program design.

Finally, injury prevention remains a critical component of cadet training programs. Proper exercise technique, progressive training loads, and adequate recovery strategies are essential to minimize the risk of musculoskeletal injuries during intensive training programs (Knapik et al., 2012). Many academies therefore adopt progressive training models in which foundational conditioning and movement skills are developed before introducing more advanced training exercises.

In practice, enhancing cadet fitness is about diversity and balance: mixing endurance runs with sprints and loaded marches; pairing push-ups and pull-ups with weightlifting; adding agility cone drills alongside long marches; and including recovery practices to keep cadets healthy. The next section provides a comparative look at traditional versus modern training approaches, highlighting how they differ in practice and outcomes.

To illustrate the evolution in cadet physical training, **Table 1** compares a traditional training model with a more functional, evidence -based model. This comparative summary highlights differences in training content, focus, and results as reported in recent studies.

As shown in Table 1, the traditional model centers on endurance and basic calisthenics, which has benefits in simplicity and aerobic conditioning, but it often fails to develop the high levels of strength and power that modern tactical roles demand. The modern functional approach, supported by recent research, addresses these gaps by including strength and high-intensity elements, albeit with greater complexity in execution. An example from a Brazilian Army cadet program supports this comparison: cadets who followed a sport-oriented training program (participating in various sports and strength activities) were found to have better performance in running, swimming, and calisthenics tests than those who did only the conventional training, although the traditional training group showed larger relative improvements in some tests due to their lower starting baseline. Both approaches can improve fitness, but *what* improves differs – comprehensive programs yield gains in a wider range of capacities.

In practical terms, many academies are now blending the two approaches, rather than choosing one exclusively. For instance, a weekly training schedule might include a long run and calisthenics day (traditional style) alongside a day of weight room training and a day of high-intensity circuits (functional style). This hybrid approach can capture the strengths of each: maintaining endurance and camaraderie from group runs while also building strength, power, and agility through targeted exercises. The com-

parative evidence suggests that such balanced programs are likely the most effective for preparing cadets.

Implementing a scientifically grounded fitness program for cadets is not without challenges. Below, we outline several key challenges identified in research and practice, along with recommendations to address them:

Injury Risk: Intense training can lead to a high incidence of musculoskeletal injuries among cadets. Studies have noted injury and pain rates as high as 48% in male cadets and 90% in female cadets during just the first 10 weeks of training. To mitigate injury risk, academies should incorporate injury prevention strategies. Recommendation: Begin with thorough fitness screenings and movement assessments to catch deficits in strength or mobility. Implement a gradual progression in training intensity (especially for load-bearing exercises and high-impact drills) and ensure cadets master exercise technique under supervision. Integrating strength & conditioning professionals or physical therapists into the staff can help identify at-risk individuals and adapt training (e.g. providing remedial strength training for those with low baseline strength). Adequate rest and recovery must be scheduled; recovery protocols like stretching, foam rolling, and minor injury treatment (ice, compression) should be taught as part of the program.

Training Plateaus: As noted earlier, cadets often make quick gains initially then stagnate if the program is not adjusted. A one-size-fits-all routine repeated over months will eventually fail to elicit new adaptations. Recommendation: Use a periodized training model where the program is divided into phases with varying focus (endurance, strength, power, etc.). Change up routines approximately every 6–8 weeks – for example, increase running speed or distance targets, introduce new strength exercises or heavier loads, or shift to more complex agility drills as basics are mastered. This keeps the body challenged. Regular mid-program testing can reveal plateaus; instructors should be prepared to modify the program based on those results, such as adding interval training if run times have plateaued or adding plyometrics if explosive power isn't improving.

Varied Fitness Levels: Cadets enter training with diverse backgrounds – some have athletic experience, others may be sedentary prior to the academy. A single uniform training pace can thus overtax some and under-challenge others. Recommendation: Employ an individualized approach where possible. This might include grouping cadets by initial fitness level for some activities (so more fit cadets can push each other, while novices build up more gradually) or providing supplemental "remedial" sessions for those who need extra help (e.g., an extra weight training session for those who struggle with strength tests). In the U.S. Army, for instance, special training interventions like the Cadet Athlete Physical Training Intervention (CAPTI) have been used to boost underperforming cadets through additional periodized workouts, resulting in improved fitness test pass rates. While resources may limit how much individualization is feasible, even simple measures like scaling run distances for different groups or offering alternative low-impact conditioning for injured cadets can help.

Resource and Knowledge Gaps: Not all training academies have staff certified in modern strength and conditioning methods, and some lack facilities like weight rooms or obstacle courses. In many places, PT is led by drill instructors or training officers who rely on the methods they experienced, which may be dated. Recommendation: Invest in instructor development and infrastructure. Departments should consider having at least one staff member with fitness certifications (e.g., CSCS – Certified Strength and Conditioning Specialist) to design safe and effective programs. Collaboration with sports scientists or local university kinesiology departments can bring in expertise. Moreover, relatively low-cost equipment (sandbags, battle ropes, cones for agility, etc.) can add functional training options without major facility overhauls. As one study concluded, law enforcement academies should modify and enhance traditional programs with input from strength and conditioning experts. Knowledge sharing between academies (through conferences or published fitness guides) can disseminate best practices.

Time Constraints and Multiple Demands: Cadets' schedules are packed with academic classes, drills, and other training (weapons, legal, etc.), leaving finite time for physical training. Overemphasis on PT could detract from other essential training, yet insufficient PT time makes it hard to reach fitness goals. Recommendation: Optimize training efficiency. Use high-impact training modalities like circuit training or HIIT, which can yield significant fitness benefits in shorter time spans. Incorporate physical activity into daily routines whenever possible

(for instance, encouraging cadets to do brief calisthenics during classroom breaks, or organizing sports games on weekends for extra conditioning disguised as recreation). Also, emphasize quality of training over quantity – a well-planned 45-minute intensive workout may be more beneficial than a poorly structured 90-minute session. Finally, integrate skills training with physical training when feasible: scenarios like grappling or defensive tactics training can simultaneously build fitness (strength/endurance) and practice job skills, addressing two needs at once.

By confronting these challenges with proactive strategies, training programs can significantly improve cadet outcomes. The overarching recommendation is to take a holistic, evidence-informed approach: treat cadets as athletes who require coaching, recovery, and progressive development, rather than relying solely on punitive or traditional methods. Continuous improvement of the program itself is key – collecting data on injuries, test pass rates, and performance allows an academy to refine its training year over year.

Conclusion

In conclusion, enhancing the physical and functional fitness of cadets requires a careful blend of science and practice. A scientific approach provides the guiding principles – specificity, progressive overload, balanced development of fitness components, and data-driven adjustments – that ensure training is effective and aligned with the real demands cadets will face. A practical approach ensures these principles are applied in the day-to-day training environment, accounting for resource limitations and the need to maintain cadet engagement and safety. The evidence reviewed indicates that cadets benefit most from diversified training programs that build strength, endurance, power, and agility concurrently, as opposed to antiquated programs that focus narrowly on endurance. By implementing periodized and comprehensive training regimens, academies can achieve significant improvements in cadet fitness across multiple domains and better prepare graduates for the physical challenges of military or law enforcement service.

Importantly, the pursuit of fitness should not come at the cost of injury; thus, modern programs place emphasis on proper technique, recovery, and individualized support for those struggling. When cadet training is approached as a professional athletic training program – with instructors leveraging best practices from sport science – the results can include higher fitness test pass rates, lower injury rates, and more tactically capable officers and soldiers. This review underscores that a "scientific and practical approach" is not only possible but necessary: science guides *what* to do and *why*, while practical wisdom guides *how* to implement it in a cadet academy setting. Through continuous assessment, adaptation, and commitment to comprehensive fitness, training institutions can ensure that tomorrow's officers are not only knowledgeable and disciplined but also physically ready to fulfill their duties.

References

Williams, A. G., Rayson, M. P., & Jones, D. A. (2002). Effects of basic training on material handling ability and physical fitness of British Army recruits. Ergonomics, 45(4), 267–279. https://doi.org/10.1080/00140130210121996

Korobeynikov, G., Korobeinikova, L., Raab, M., Xin, H., Baic, M., Matkarimov, R., … Gorachenko, A. (2026). Gender aspects of psychophysiological features of stress resistance in elite judokas. *Health, Sport, Rehabilitation*. https://doi.org/10.58962/HSR.1334

Majidov, R. R. ugli . (2026). Methods for improving balance maintenance mechanisms in young boxers. Eurasian Journal of Sport Science, 6(1), 31–35. https://doi.org/10.65149/eajss.2026.v6i1.a007

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