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Minimal Effective Dose Training

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Disclaimer: The views in this article represent Mark Christiani and do not reflect the views of the United States Army, United States' military, or O2X.

Abstract

Tactical professionals operate under persistent constraints, irregular schedules, sleep restriction, field training, and life's competing priorities. Despite these conditions, they must remain physically ready for the unpredictable demands of combat. Traditional high-volume training models often collide with these realities and can undermine military readiness through unnecessary fatigue. Minimal effective dose (MED) training offers a practical, evidence-backed framework that asks, "What is the necessary amount of stimulus required to drive or preserve a targeted adaptation?" This article translates MED principles into a field-ready model for military, law enforcement, and firefighting populations; reviews the scientific underpinnings for strength, hypertrophy, and conditioning; outlines interference management for concurrent training; and presents options for exercise selection, autoregulation, and progression.

Three real-world case studies show MED application during a range of situations. A two-day weekly template and a four-week progression are included, alongside adherence and recovery strategies tailored to high operational tempo (OPTEMPO) environments, with the goal to provide leaders and tactical professionals a concise, scalable approach to sustain mission-ready performance with limited time and bandwidth.

Introduction

Tactical athletes are expected to be good at everything and ready at all times. In 2015, after passing the United States Army's Ranger Assessment and Selection Program (RASP) and reporting to 1st Battalion, 75th Ranger Regiment, I experienced my first Multi-Lateral Airborne Training (MLAT). It ran two weeks on a reverse sleep cycle with physical training (PT) windows that were sporadic at best. The physical fitness standards did not move, but the clock did. That experience, more than any

coaching course, forced me to figure out what must be trained when time is limited. This question has followed me ever since: "How do we protect and, when possible, progress, fitness qualities when training time is minimal? In practice, this idea collides with field exercises, reverse sleep cycles, school schedules, administrative requirements, and family obligations. Minimal effective dose (MED) training provides a principled answer. MED does not mean easy or lazy; rather, it means targeted, time-efficient stimuli delivered with intensity and consistency so that strength, muscle mass, and endurance are maintained, or improved, while preserving limited recovery resources. The sections that follow reflect the way that the author programs for hundreds of United States Army Soldiers, when training time is limited. Thus, the following is not a thought experiment written in a quiet office but rather an observed method to improve fitness, and thus performance and lethality, for our warfighters.

"MED does not mean easy or lazy; rather, it means targeted, time-efficient stimuli delivered with intensity and consistency so that strength, muscles, and endurance are maintained . . ."

MED Defined

MED is the smallest amount of training that reliably elicits or maintains a desired adaptation to a specific fitness characteristic.¹ The concept sounds simple; the application is not. MED should be prioritized when operational tempo (OPTEMPO) compresses training windows, such as when job-specific tasks take over or when life events (paternity/maternity leave, schools, travel) constrain access to facilities and available time. It can even be used when individuals dislike training and compliance hinges on meeting people where they are, or when new trainees need early wins that build confidence without overwhelming them. In these settings, the question is not, "What could we do if time were unlimited?" Instead, the question is, "What must we do to protect the few adaptations that have the greatest carryover to mission tasks?"

To fully understand MED training, the reader should be familiar with the FITT Principle, popularized by the American College of Sports Medicine,² where FITT stands for frequency, intensity, time, and type. Regardless of the individual,



Shown above on the far left is the author graduating from the United States Army's Ranger School Class 2-16.

training modality, or training goals, everyone is applying the FITT principles in their program, whether they realize it or not. When it comes to training adaptations, the most important variable of the FITT principle is intensity. If one is trying to increase or maintain their fitness level, the intensity of their exercise program is the most critical aspect. Accordingly, intensity is the essential component for the application of MED training.

Additionally, a needs analysis (i.e., determining an individual's training status, history, injury profile, and goals) clarifies training priorities. For most tactical roles, the base of performance is conditioning. The environment dictates equipment and logistics. Done correctly, a garage gym and a sandbag will serve as well as a full rack if the plan is coherent. As available time dictates frequency and volume, the plan assumes that sessions will begin and end

inside forty-five minutes, including a warm-up, with the understanding that some weeks will allow only two exposures. Finally, reversibility must be acknowledged; meaning, fitness will decay when exercise stimuli are removed. MED preserves key adaptations through brief but targeted exercise exposures, reducing the fitness drop-off during constrained periods and allowing faster return to peak when the calendar opens again. It is critical to note that the training volume needed to increase fitness is not the same training volume needed to maintain a certain level of fitness.

MED Scientific Foundations

The literature offers encouraging guidance for low-volume, high-intensity work. For maximal strength, multiple investigations now suggest that trained lifters can increase one-repetition maximum with as few as three to

six working sets per lift per week, performed at intensities at or above eighty percent of one-repetition maximum (1RM) or a rate of perceived exertion (RPE) of 7.5 to 9.5 out of 10 (using the Borg CR-10; all subsequent references of RPE will be according to this scale).^{3,4} The most efficient rep range is between one and five repetitions, executed across one to three weekly exposures.⁵ This approach emphasizes neural efficiency and specific force expression while keeping volume, delayed-onset muscle soreness, and residual fatigue in check. When time and energy are scarce, a heavy squat or deadlift (DL) combined with a heavy press provides great return on investment for the least number of sets.



Shown above is a United States Army Soldier applying MED training by conducting heavy back squat repetitions.

For hypertrophy (i.e. muscular growth), conventional prescriptions call for ten to twenty or more weekly sets per muscle group to maximize

growth.^{6,7} This dosage prescription is neither necessary nor possible in the settings described here. Emerging evidence indicates that roughly four high quality sets per major muscle group per week can produce meaningful hypertrophy, especially in trained individuals who lift with one to two repetitions in reserve (RIR).^{8,9,10} Mechanical tension remains the primary driver for hypertrophy, and training to near failure increases muscle fiber recruitment when total volume is modest. In a MED context, multi-joint lifts (e.g., squat, DL, military press, pullups) should remain the backbone of the workout, with one or two strategic accessories (e.g., leg extensions, triceps extensions) added to accumulate four to eight purposeful, weekly sets for priority muscles without bloating the session.

For aerobic and anaerobic capacity, high-intensity interval training (HIIT) and sprint interval training (SIT) provide unusually large gains per minute invested. The Norwegian 4x4 protocol (four minutes of fast pace followed by three minutes of recovery pace for four sets) conducted at a hard but sustainable pace, can be completed in roughly thirty minutes and reliably improves VO_2 max (i.e., aerobic capacity).¹¹ Shorter, all-out sprints of twenty to thirty seconds, performed four to six times with long recoveries, target the anaerobic end of the spectrum and often expand VO_2

max as well.^{12,13} Zone-two steady work (i.e., low-intensity, steady state cardiovascular training), such as long, slow, distance jogging—while valuable for aerobic base and recovery (when time allows)—could be deprioritized during time-crunch phases without losing overall endurance capacity, provided that HIIT or SIT is implemented. For Service members and first responders, the choice of modality should reflect joint health, terrain, and test requirements. For example, bikes and rowers are joint-friendly, while runs and rucks maintain specificity for timed events.

MED Programming Principles

MED plans succeed or fail based on the presence or lack of clarity and consistency. Each plan should name the one or two primary lifts that relate the most directly to mission tasks, with the conditioning stimulus best supporting the mission and durability. Autoregulation is optimal. Using RPE or RIR, the tactical professional adjusts their loads to the day's readiness, aiming for heavy, good-technique lifts and heigh effort on their conditioning intervals. When the individual does not feel recovered, reduce their sets or intensity; and when their technique degrades, stop the set one to two reps earlier and move on to the next exercise. Cluster sets, such as breaking a set of five repetitions into smaller reps (e.g., two, two, and one), are highly

applicable when loads are high and time is short, as cluster sets preserve the bar speed (i.e., velocity) and quality of movement.

MED Case Studies

The following cases were selected because they are typical in tactical organizations and because the solutions were constrained by time, equipment, or motivation. Coaching notes document what was planned, what was executed, and what changed on the fly. The purpose is not to argue that these are the only paths to success but rather to show what is possible when MED principles are applied with discipline.

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The first case involved a soldier on paternity leave. He had ten weeks at home, could train only during brief windows, and needed to stay close to his newborn. Equipment consisted of a barbell, plates, and a stationary bike. Two sessions per week of thirty to forty-five minutes each were realistic. The plan's first day was centered around the DL and bench press, to be performed for three to five repetitions at an RPE of eight to nine across three working sets, followed by four all-out, twenty-to-thirty-second bike sprints

with three to four minutes of easy pedaling between efforts. The second day consisted entirely of the Norwegian 4x4 protocol on a bike. At the end of ten weeks, he returned to duty and passed his Army Fitness Test without decrement. Strength measures were maintained, and his conditioning improved modestly. The more important lesson was psychological, as the sessions were short enough to be predictable and sustainable.

The second case concerned an Army Reserve soldier who did not like training and had failed the two-mile run on the Army Combat Fitness Test (ACFT). She had two months to retest, disliked the gym, had limited appetite for long runs, and no PT requirement. Two weekly sessions were the ceiling. The solution embraced that constraint and met the individual where they were at the time. One weekly interval session consisted of four to six 400m repeats with 1:1 work-to-rest ratios, gradually progressing to six, then eight, repeats at improved paces. The other session consisted of a steady, one-to-three-mile run at an easy, conversational pace to improve tolerance. The soldier dropped four minutes from their two-mile time and comfortably passed the ACFT upon retest. More importantly, she did not have to add large amounts of volume (which could have increased injury risk) and, as a result, reported higher motivation. No one had ever told her she could

train for less than an hour per session to make improvements.

The third case involved a mixed-gender section of twenty soldiers (six males and fourteen females) training together three times per week for ten weeks. The unit wanted to raise ACFT's three-repetition maximum (3RM) trap bar DL scores without overhauling its program or displacing other job-specific work. Therefore, only one dedicated day could be earmarked for DL emphasis. Weekly sessions consisted of three to five sets of one to five repetitions at an RPE of eight or higher, with strict technique standards and minimal accessory exercises focused on the hinge pattern and trunk stability (e.g., Romanian deadlifts, good mornings, kettlebell carries). Over the cycle, the group's average ACFT DL score improved from seventy-eight points to eighty-five points out of one hundred, with an average increase of thirty-eight pounds in 3RM DL across the formation. The implication is straightforward for groups—one focused, intentionally executed strength exposure can move the needle when it is consistently present. Simply stated, lifting heavy one time a week can increase strength for Service members.

"The implication is straightforward for groups—one focused strength exposure executed with intent can move the needle when it is present consistently."



Shown above are numerous United States Army Soldiers applying MED training by conducting deadlifts and accessory movements aimed at increasing their Army Combat Fitness Test's Three-Repetition Maximum (3RM) deadlift scores.

The MED Template

In environments where two planned sessions are consistently achievable, the author has routinely witnessed hundreds of soldiers improve in fitness with the following template. The first session emphasizes the squat and the bench press, with the pull-up used as a vertical pulling, and it concludes with short, high-quality sprints. After a brief general warm-up and two or three progressive build sets for the first lift, the individual performs three working sets of three to five repetitions in the back squat at an RPE of eight to nine. The bench press follows for the same sets and repetitions at the same effort. Pull-ups are executed for three sets of three to five repetitions, adding weight when ability permits and regressing to eccentric lowers

when it does not. The session ends with four all-out sprints of twenty to thirty seconds on a run, bike, or rower, each separated by three to four minutes of easy movement.

The second session focuses on the hinge and the pull. The DL is performed for three working sets of three to five repetitions at an RPE of eight to nine, followed by a bent-over row for three sets of five to eight, and the standing overhead press for three sets of three to five, all at comparable efforts. Conditioning then pivots to sustained hard efforts. Many units prefer the Norwegian 4x4 protocol. Others favor a tighter, event-specific approach, such as four cycles of two minutes of fast pace followed by two minutes of walking, which matches AFT sprint-drag-carry pacing. Neither is preferred; the choice should reflect goals, equipment, and the athlete's individual status.

MED in Practice

MED is most valuable when calendar pressures limit training time. In those phases, the aim is not to cram more work into fewer days but to instead preserve the adaptations with the highest carryover to mission tasks. The practical rule is, space the sessions by roughly seventy-two hours whenever possible, Monday/Thursday or Tuesday/Friday, so the body gets time to rebound. Real life will force deviations. When shifts stack or a field problem collapses the

week, adjust on the fly by maintaining intensity and cutting volume; keep the heavy sets and the high-quality conditioning intervals, while cutting accessory exercises first. Lastly, end the session the moment excess fatigue sets in and impact the quality of the movement. This is how you protect the stimulus when noise is high.

MED is a way to complement, not duplicate, what is already being done in training. If the training week is dominated by long, foot-march events, then additional, low-dose cardio in PT would be redundant at best and counterproductive at worst. The aerobic stimulus is already present in the field. Use MED sessions to hit what the calendar is neglecting—strength and anaerobic capacity. When a cycle flips and the unit is indoors or on ranges with minimal locomotion, the emphasis can tilt back toward a modest aerobic touch—short, efficient 4x4-minute work, while heavy lifting is maintained.

"MED is a way to complement, not duplicate, what is already being done in training."

The seventy-two-hour guideline is a preference, not a law. If an event forces back-to-back training days, keep the first session strength-dominant and move the high-impact conditioning to the next window or to a non-impact modality. If fatigue signals are high (i.e., if

there is sleep debt, joint irritation, or persistent soreness) reduce sets rather than intensity, or convert a top set into a small cluster set by building in breaks between reps. When the calendar opens, expand gradually, add a set to the main lift, add a single sprint rep if quality holds, or extend one interval by a minute. When the calendar tightens, reverse the process while keeping the heavy anchors and intent intact. Across these fluctuations, the standard for success is not perfect adherence to a spreadsheet; it is maintaining the capacity to lift, carry, sprint, and recover when time is scarce. MED provides the structure to do exactly that; meaning, hard, efficient sessions separated by as close to seventy-two hours as the mission allows, aimed at the fitness qualities that the week's training is not already providing.

MED Consistency

Fitness characteristics decay during periods of inactivity, maximal strength slips as neural efficiency and coordination fade, aerobic capacity declines as central and peripheral adaptations regress, and repeat-sprint ability erodes fastest when it is not touched. MED is the countermeasure when calendars tighten. Purposeful sessions preserve the signals that matter. Specifically, heavy, high-quality resistance training sets to maintain force production, and brief, conditioning intervals to

Day 1		Day 2	
A) Back Squat:	3 sets of 3–5 reps at RPE 8–9	A) Deadlift:	3 sets of 3–5 reps at RPE 8–9
B) Bench Press:	3 sets of 3–5 reps at RPE 8–9	B) Bent-Over Row:	3 sets of 5–8 reps at RPE 8–9
C) Pull-Ups:	3 sets of 3–5 reps at RPE 8–9 (Add weight as needed. If Service member is unable to raise their body, have them lower their body (eccentric phase))	C) Overhead Press:	3 sets of 3–5 reps at RPE 8–9
D) SIT:	4 sets of 30-second sprints with 2–3 minute recovery	D) HIIT:	4 sets of 4 minutes fast / 3 minutes range walk

Table 1: Two Days per Week MED Template. Acronyms: HIIT: High Intensity Interval Training; MED: Minimal Effective Dose; RPE: Rate of Perceived Exertion; SIT: Sprint Interval Training.

hold VO_2 max and anaerobic power. This is how you minimize detraining while the rest of training and life take priority.

When time becomes more available, the strategy should pivot from preservation to progression. First, increase from two exposures per week to three exposures, then four exposures by first adding frequency of training before adding much more volume to each session. Reintroduce zone-two cardiovascular work (i.e., low-intensity, steady state cardiovascular training) in regular doses to maintain base aerobic capacity, then expand accessory volume and longer intervals as recovery allows. Progress loads and total work modestly, retesting only after several steady weeks, so that the resilience built under MED does not get squandered by a rushed return. Use MED to hold the line during limitations, and when the window opens, climb back to full training with deliberate increases in frequency, then volume, then intensity.

MED Application to Context

MED is a framework, not a dogma. Accordingly, MED must flex to the situation. During deployments and field training, a hinge pattern (e.g., DL), a squat to a box, a horizontal press, and loaded carries with sandbags or duffels provide most of the needed stimulus. Intervals can be accomplished with shuttle runs, hill sprints, or a bike or rower when joints are stressed. Sessions should begin and end inside forty-five minutes to respect the unpredictability of the day. For shift workers such as, law enforcement, fire, and Emergency Medical Services, apply on-shift micro-sessions; for instance, one heavy cluster set of a main lift followed by three short sprints to protect fitness characteristics. For off-shift days, execute the full sessions.

MED Limitations

There are times when MED is not the right tool, such as phases that emphasize skill acquisition. Olympic lifters, for example, generally benefit from higher practice frequency. Advanced

hypertrophy goals typically require more weekly volume than MED entails. Return-to-run or post-injury cases may demand higher frequency of very easy graded exposures. MED is a scalpel for temporarily limited calendars, not a hammer for every nail.

Conclusion

MED training is a readiness tool. I have used versions of this template with soldiers who were coming off night jumps to US Military doctors working back-to-back, twenty-four-hour shifts. By concentrating on the narrowest set of high leverage stimuli, heavy compounds for strength, near-failure sets for muscle size when appropriate, and brief but intense intervals for VO_2 max, tactical athletes can protect and often improve physical performance with limited sessions per week. In a world where time and recovery are taxed by mission requirements, MED offers a sustainable path to staying strong, fast, and durable without compromising the job. Leaders can deploy this approach immediately, adapt it to context, and expect results measured in maintained fitness standards, or improved test scores, with fewer missed training sessions as opposed to numerous hours spent in the gym. MED is not the only approach to training; used without variation for too long, it will plateau. Its role is to maintain or make modest progress under time constraints



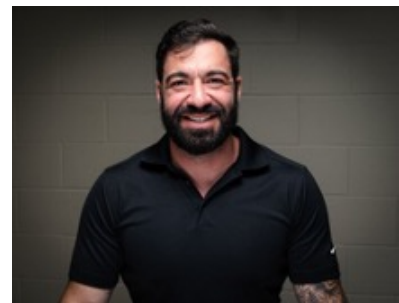
Shown above are United States Army Soldiers conducting Physical Training as overseen by the author.

and to buy back time for the mission.

Author Biography

Mark A. Christiani is an O2X Contracted Strength and Conditioning Coach, and Special Operations Army Veteran. He has human performance experience in the worksite wellness, collegiate, and tactical settings. Mark holds a Master of Science in Sports Medicine from Georgia Southern University and several certifications, including the National Strength and Conditioning Association's (NSCA's) Certified Strength and Conditioning Specialist certification and the NSCA's Registered Strength and Conditioning Coach Certification. Currently, he serves as the O2X contracted on-site Human Performance Specialist with the US Army Reserve Holistic Health and Fitness (H2F) System in Florida. Previously, he was an H2F Contracted Brigade lead strength and conditioning coach for the 44th Medical Brigade on Fort Liberty, adjunct exercise science

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