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ISSUE 48



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PHYSIOLOGICAL RESPONSES TO DEFENSIVE TACTICS TRAINING IN CORRECTIONAL POPULATIONS – IMPLICATIONS FOR HEALTH SCREENING AND PHYSICAL TRAINING

The data presented in this paper was released with consent from the law enforcement organization in question for the purpose of conducting this retrospective analysis.

INTRODUCTION

Custody assistants (CAs), or correctional officers, are responsible for maintaining order and security in detention facilities (7,8). Some of the more physically demanding tasks that can be performed by CAs include the searching of cells, responding to alarms to assist other staff, physical confrontations (including control and restraint of an inmate), or pursuing and corralling an inmate attempting to evade capture (7,8). As a result of these occupational demands, CAs complete a training academy that is designed to prepare each individual for the rigors of the job. Academy training can incorporate the following: physical training, which can include aerobic-based activity and calisthenics; classroom sessions that involve learning about occupational procedures, legal issues, and job-specific responsibilities; and defensive tactics training (DTT) to prepare for confrontations with noncompliant inmates.

Despite the potential for near-maximal to maximal physical activity during a shift, the physical fitness requirements for CAs across the United States are generally lower than that of other law enforcement positions (7,8). One law enforcement agency, as an example, does not require any formal physical testing prior to a CA being hired, despite acknowledging that the position may require “extraordinary physical activity,” (12,13). This “extraordinary physical activity” requirement is particularly integrated into DTT, as DTT is designed to prepare a CA recruit for potentially life-threatening conflicts with noncompliant inmates. This situational threat and associated physical demands are further complicated due to the policy that CAs do not carry firearms and may be limited to the use of baton-like equipment (e.g., heavy-duty flashlights) and oleoresin capsicum spray (also known as “pepper spray”).

It is important to understand the physiological stress that is involved with a noncompliant inmate, as this example of a “worst case scenario” presents as a task where task failure could have catastrophic results. Determination of the physiological responses of individual CAs to what is expected to be a maximal effort defensive tactics drill highlights the extraordinary physical activity that may be required in this position. This could influence how an

agency may wish to conduct their hiring process (will an individual be physically capable of tolerating the stress of a simulated “worst case scenario” during academy training?) and their academy training (have we adequately prepared an individual to tolerate a “worst case scenario?”).

PHYSIOLOGICAL RESPONSE TO STRESS

Confrontation with an inmate will stimulate the “fight or flight” sympathetic nervous system response, which results in the secretion of the epinephrine and norepinephrine from the adrenal medulla. These hormones will cause an increase in heart and respiration rate even before the initiation of any physical activity (14). Once physical activity is initiated, further demand is placed on the cardiovascular system as it supplies blood and oxygen to the working muscles, which will cause further increases in heart and respiration rate. Another issue for CAs is that physical activity in an emotionally-charged environment, such as during a physical confrontation with a noncompliant inmate, results in a greater heart rate response than the equivalent act in a psychologically “neutral” environment (15). Accordingly, it is important for CAs to be able to tolerate elevations in heart rate when extraordinary physical activity is required, as well as being able to make effective and rapid decisions when placed under stress. CAs should also be able to recover quickly from situations that may be stressful but do not lead to a physical altercation (e.g., a verbal confrontation with an inmate). As decision making can be impaired during periods of stress, it is essential that any stress or extraordinary physical activity encountered by a CA does not lead to a decision that places themselves, their colleagues, or other inmates at risk of physical harm (17). However, there has been no scientific study that has measured the physiological response of CAs to any form of exercise, let alone a specific defensive tactics drill.

THE DEFENSIVE TACTICS SCENARIO

Defensive tactics skills are commonly performed in law enforcement training academies (2). The recruits were required to perform a “red man” training drill (the “red man” denotes the protective equipment worn by the force training instructors), which is a drill involving physical confrontation and grappling, to complete the DTT section of their academy. The drill involved two recruits entering the training facility to confront two force training instructors who were posing as the inmates in the scenario. The recruits verbally engaged the force training instructors with specific instructions, before the instructors initiated the physical

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component of the drill by attacking the recruits. The recruits needed to complete specific actions (e.g., call for help and tell the “inmate” to stop fighting), while also attempting to fight and subdue the “inmate.” The drill lasted for approximately 40 s, with 15 – 20 s of talking and 15 – 20 s of fighting. Other force instructors communicated with the recruits during the drill, to either provide feedback (e.g., reiterate that they need to call for help), and also tell the recruits when the drill is complete.

HEART RATE RESPONSE TO THE “RED MAN” DRILL

Physical stress that could be encountered by a CA during the “red man” drill is monitored with a heart rate device (Zephyr Performance Systems) worn underneath their uniform. This system has been shown to be reliable and valid when measuring heart rate during exercise (9,10). Figure 1 displays the peak heart rate recorded during the “red man” drill for each individual CA, while Figure 2 displays this peak heart rate as a percentage of age-predicted maximum heart rate (APMHR). With regards to peak heart rate, the lowest recorded value was 131 beats per minute, while the greatest was 206 beats per minute. When considered relative to APMHR, four CAs were equal to or above 100% of their APMHR. Nine CAs were equal to or above 90% of their APMHR. These high stress levels have been found in research performed in police officers while performing work tasks during actual shifts (5). According to exercise intensity guidelines provided by the American College of Sports Medicine (ACSM), this essentially meant that these CAs, similar to those reported in the aforementioned research study, were working near or at their maximum capacity during the drill (5,6).

IMPLICATIONS FOR CAs

The “red man” DTT scenario is designed to recreate a critical situation that a CA may encounter during a shift. The physiological data indicates that this drill requires maximal effort for many of the CAs, with some achieving a heart rate in excess of their APMHR. This drill was indicative of the extraordinary physical activity that was acknowledged as being a potential requirement of the position (13). Nonetheless, even with this potential need, the physical fitness requirements for this position are not as stringent as for other law enforcement positions (12). While it is acknowledged that CAs will not have the physical demands of positions such as law enforcement officers, they are still required to perform actions where their safety, and the safety of colleagues and inmates, could be dependent on their physical fitness and ability to tolerate stress. It should be noted that the ability to tolerate stress is not just limited to the physical fitness of the individual. Mental resilience is critical, and the “red man” drill places demands on this skill as the CAs are strongly encouraged to keep fighting throughout the duration of the drill, regardless of their level of fatigue or the position they are in with the force training instructor. This suggests potential value for the use of mental skills training to develop resilience, cueing, and stress management in CAs (1,11).

The example provided by this DTT training requirement illustrates the potential high physical demand required during a confrontation with an inmate. Although the nature of the position will generally involve teams of CAs confronting or moving a noncompliant inmate, there is still the potential for one-on-one confrontations between a CA and an inmate (7). In these instances, the CA must be able to perform in a situation where they are exerting maximal effort if they are to have any chance at successfully accomplishing the task of subduing an inmate in a one-on-one encounter.

This physiological requirements should be considered by agencies that are involved in recruiting or training CA recruits. Even though physical fitness may not be the emphasis of other law enforcement positions as the overall physical demands tend to be lower, due to the common job tasks performed (e.g., supervising, processing, and interviewing inmates; performing administrative duties; and operating computer terminals), CAs still must have the capacity to tolerate near-maximal heart rates (7,13). This is an issue for less aerobically-fit individuals, as their relative heart rate will be greater for the same exercise task when compared to individuals with higher levels of fitness (14). This could result in earlier fatigue for the CA during maximal effort when the CA is potentially in a life-threatening event (e.g., being physically engaged with a noncompliant inmate). Although the academy period is used to train CA recruits, law enforcement agencies should be conscious of the physical demands that will be required of individuals, and attempt to hire individuals that actually have the capacity to succeed in the profession. Failure to do so could lead to recruit drop-out during the academy period, which can be costly to law enforcement agencies. Effective health and medical screening of potential CAs (e.g., measurement of resting heart rate, recovery heart rate, and blood pressure) could assist with this process.

For those CA recruits that make it through the academy process, learning the communication and defensive tactics techniques required for inmate control is clearly essential. However, there are several physiological factors that could be developed during academy training to assist a CA in occupational scenarios, such as that simulated by the “red man” drill. Aerobic conditioning should be a focus for CA recruits during academy training, as this could favorably influence their ability to complete high-intensity work at relatively lower levels of physiological stress (14). Furthermore, greater aerobic fitness can positively influence reaction time, which could be essential for CAs involved in confronting and physically subduing a noncompliant inmate (4). CAs should be trained to tolerate stress so that their heart rates stay at manageable levels during high-stress situations and they are able to recover in a timely manner. Lastly, greater strength and power can also positively influence an individual’s ability to grapple and strike in hand-to-hand altercations (3,16). Development of these capacities could also lead to CAs operating at a relatively lower level of their maximal capacity during confrontations with

FIGURE 1. PEAK HEART RATE FOR INDIVIDUAL CUSTODY ASSISTANT RECRUITS DURING A “RED MAN” DEFENSIVE TACTICS DRILL

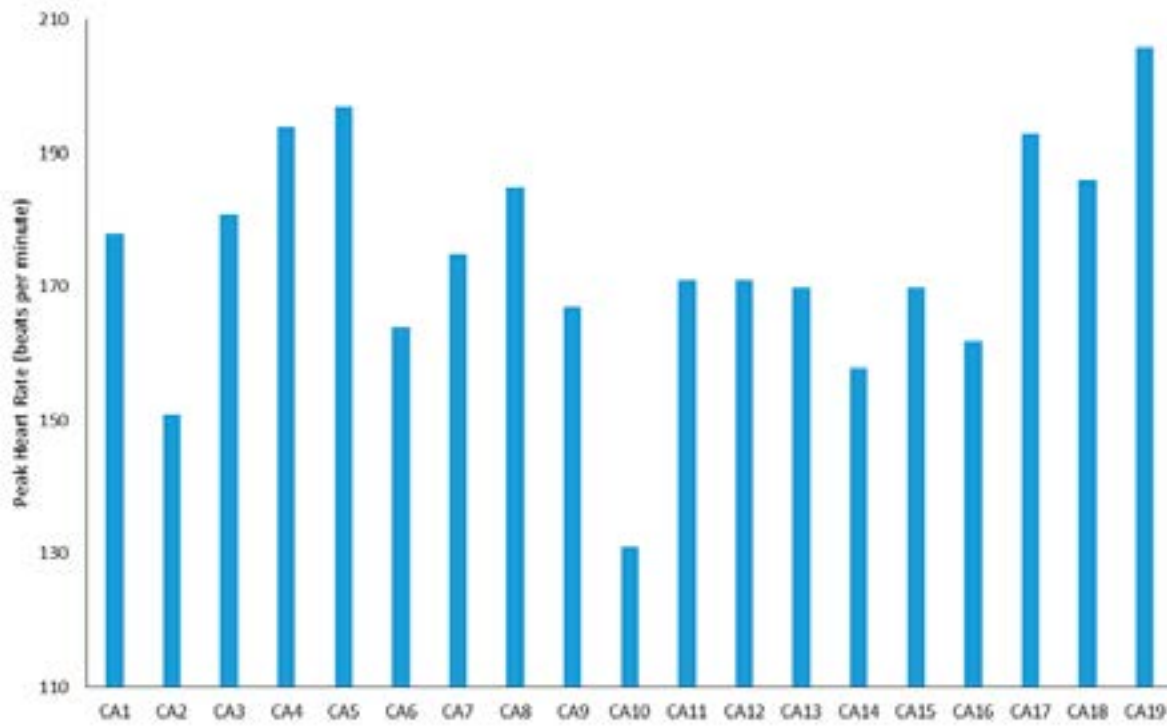
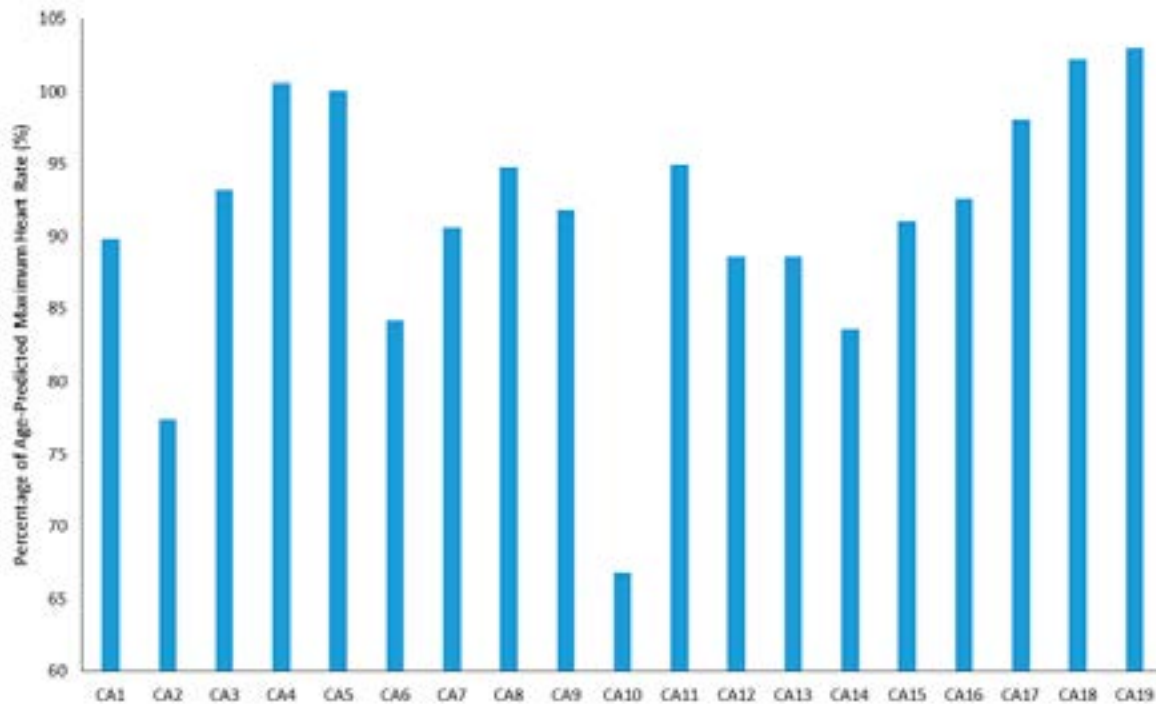


FIGURE 2. PEAK HEART RATE RELATIVE TO AGE-PREDICTED MAXIMUM HEART RATE FOR INDIVIDUAL CUSTODY ASSISTANT RECRUITS DURING A “RED MAN” DEFENSIVE TACTICS DRILL



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inmates, which would allow them a greater reserve if physical effort demands more force output, or need to be completed for an extended period of time.

CONCLUSION

In conclusion, CAs can achieve heart rates that are indicative of maximal effort exercise during a simulated confrontation with a noncompliant inmate. Given the nature of the position, law enforcement agencies should attempt to hire individuals that have the potential to be able to work (or at least develop the ability to work) in these situations of high stress. Additionally, training instructors should ensure they physically develop CAs so they can function and make correct decisions even when placed in situations where they must provide maximal effort under stress.

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CONFLICT OF INTEREST STATEMENT

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INCREASING PERFORMANCE ON TACTICAL AEROBIC ENDURANCE TASKS

INTRODUCTION

Occupational tasks for military field units undergoing training exercises and operations are varied and based on mission requirements that are dependent on factors relating to task duration, loads carried, and movement speeds. With the use of personal protective equipment, electronics, communications, and combat equipment, many of these tasks are performed while carrying external loads or equipment. The recent increased focus on physical performance of the tactical operator has resulted in a growing body of evidence around the physiological requirements to successfully perform. Research indicates that performance of load carriage tasks is influenced by several attributes, including maximal lower body strength, maximal aerobic capacity ($VO_2\text{max}$), and total body mass (9,11,12).

Numerous researchers have proposed theories regarding psychological factors, such as self-talk and optimal cognitive states, and their influence on performance and fatigue (1,2,7,15). It is possible that psychological interventions may provide meaningful improvements in performance. For example, self-talk has been shown to increase performance during aerobic endurance activities by 18% on a time to exhaustion (TTE) task in just two weeks (7). This was achieved using a series of motivational self-talk phrases during a performance-based time-trial task with no physiological training strategy. Research conducted by the same laboratory presented subjects with either a happy or sad facial display prior to cycling to exhaustion (6). Subjects primed with happy faces cycled 12% longer and reported significantly lower rating of perceived exertion (RPE) immediately following the priming session ($p = 0.04$) than those primed with sad faces. These immediate increases in performance demonstrate the interplay between psychological and physiological factors and the influence cognitive states can have on competitive events or single-session testing periods.

When isolating aerobic capacity as a determinant of performance, traditional interventions have focused on increasing an individual's $VO_2\text{max}$. These have consisted of either a continuous training session or interval-based training session, usually based around a percentage of a pre-determined physiological measure, such as heart rate (3). Results from a meta-analysis revealed studies are generally varied in design and duration; however, they regularly involve between 2 – 3 sessions per week over a 6 – 12 week period to improve $VO_2\text{max}$. Reported results from this meta-analysis of 37 studies demonstrated the range of increase to be 5 – 15% in $VO_2\text{max}$ (3). Based on the large acute improvements from the single positive psychology research, investigations into the application of integrated psychophysiological strategies to optimize performance should be explored.

PSYCHOBIOLOGICAL INTERVENTIONS

The psychobiological model of fatigue has been proposed as a theoretical model explaining the impact of perception of fatigue and the resulting impact on performance. Early research has demonstrated that cognitive fatigue has a negative impact on physical performance and maximal fatigue is related more to perception rather than physiological factors. Fatigue has been defined as “sensations of tiredness and associated decrements in muscular performance and function,” (1). This definition has contributed to the discovery of a variety of fatigue mechanisms, including reduced oxygen delivery and substrate availability, increased metabolic accumulation, and neuromuscular and cognitive limitations (1). A complementary cognitive-based approach to fatigue has seen the emergence of the proposal of a central governor model of exercise regulation (18). This model can be used to promote concepts of a self-limiting subconscious control mechanism within the brain, which regulates power output during physical tasks in an attempt to avoid physiological damage (18).

The psychobiological model has found links between cognitive fatigue generated from stressing areas of the pre-frontal cortex (similar to those activated during acute stress exposure) and increased RPE, resulting in decreased performance (15). Specifically, the research from these researchers suggests that resistance to mental fatigue is crucial to improving physical performances. In other words, physical training alone is not sufficient to optimize physical success. Research has shown that cognitive fatigue only negatively impacted subsequent physical performance when an inhibitory response task to a color and descriptor Stroop test was required over a simple congruent reaction response Stroop test (24.4 ± 4.9 min), compared to the control task (23.1 ± 3.8 min; $p = 0.008$) during cognitive training (19). Response inhibition resulted in a reduction by approximately one kilometer per hour of the average running speed ($p = 0.003$) and higher RPE ($p = 0.005$) with no significant difference between blood glucose decrease between groups. Indicating the requirement for the individual to focus on another task reduces the ability to regulate and produce high work outputs. RPE has also been identified as a reliable predictor of time to exhaustion; thus, it supports the theory of the psychobiological model that is based upon effort-related decision making (14).

Time trial tasks have been classified as closed-loop activities requiring participants to determine their own pace based upon five cognitive motivational factors: 1) perception of effort, 2) potential motivation, 3) knowledge of distance, 4) knowledge of distance covered/remaining, and 5) previous experience/memory of perception of similar task (23). Since finishing the task is

considered paramount, these factors result in individuals self-selecting a conservative effort during the first half and middle of the time trial compared to the end, where there is typically an increased effort. Subsequent training interventions aimed at altering the individual's perception of effort have utilized a combined cognitive and physiological approach. Integrating physical training at a pre-determined percentage of VO_2max with cognitively demanding tasks, known as cognitive endurance training (CET), research has reportedly shown significant improvements in time to exhaustion performance in military populations (24).

The CET intervention conducted over 12 weeks resulted in a 126% improvement in time trial performance, compared to 32% in the control group conducting just physical training alone, with no significant post intervention differences between groups in VO_2max . This demonstrates an almost 400% improvement in performance from training specific areas of the brain in conjunction with physiological interventions. This has led researchers to ask the question if it is possible for peak performers to increase their threshold for effort through this type of training (24). Comparisons between professional and novice road cyclists resulted in no significant performance decreases in professional cyclists after a cognitively demanding task compared to a significant decrease in the novice group ($34.3 \pm 2.6 \text{ km}\cdot\text{hr}^{-1}$) compared to the control condition ($35.5 \pm 1.9 \text{ km}\cdot\text{hr}^{-1}$, $p = 0.003$) (2).

Although research into this field is ongoing, determining if professional-level athletes have a genetic ability to achieve optimal cognitive states or if they have naturally developed through the course of training for high performance requires further investigation. Similarly, in the military context, it may be possible even for seasoned operators to learn to decrease the perceived physical effort associated with missions, allowing them to focus on threat detection, target prosecution, and other mission critical objectives.

TRANSCRANIAL DIRECT CURRENT STIMULATION

The use of transcranial direct current stimulation (tDCS), or neural priming, to increase motor cortex activity has seen a large increase in research and consumer use over the last few years. This is in large part due to the introduction of consumer-focused "do-it-yourself" products, which are loosely based on clinical research. Despite the lack of research validating these products, there are a growing number of bold claims surrounding the benefits for improving strength, power, motor skill acquisition, and endurance performance. Of the clinical research available, there is evidence of significant improvements in several areas, including skill acquisition and early consolidation periods of motor performance tasks, reduced times in reaction tests, and increased time to fatigue (4,13,16,17). As the motor cortex is critically involved in the early phases of procedural motor learning,

decreases in activity during the learning phase may provide a subsequent resilience effect.

Research has demonstrated that replication of motor skills under pressure can cause decreased performance, or "choking," due to increased pre-frontal cortex activity inhibiting the motor cortex and interrupting retrieval of motor patterns from procedural memory (4,13). Similar interventions utilizing tDCS have resulted in improved accuracy of focal tasks and increased duration of sustained alertness, without causing decreased performance over an extended period (16). Targeted research on motor cortex activation and subsequent pre-frontal cortex inhibition has demonstrated an increase of up to 250% in task performance and accelerated learning ability of up to 230% and 270% shown in acquisition in military marksmanship and enemy cue threat detection, respectively (8,21). Similar results have been demonstrated in high-stress tasks with decreased time to perform specific complex tasks and greater precision compared to control groups receiving traditional training (22). Although the research has yet to explore the full potential benefits from tDCS, there is the possibility that improving the specific cyclic motor patterns involved in aerobic endurance tasks could result in an increase in motor efficiency.

Anecdotal reports from consumer level tDCS devices aimed at excitation of the motor cortex have claimed that increases in efficiency reduced the resulting fatigue, translating into increased time to exhaustion on performance and time trial tasks. An acute 10-min tDCS session prior to a cycle ergometer time to exhaustion test at 80% of pre-determined peak power resulted in significantly longer time to exhaustion ($491 \pm 100\text{s}$) than the control group ($443 \pm 11\text{s}$) and placebo group ($407 \pm 69\text{s}$). This increase in performance was achieved without any significant changes in neuromuscular function measured through electromyography (EMG), leading to speculation that the underlying mechanism for improved performance was either physiological or psychological (25). Finally, research has demonstrated that positive effects of targeted tDCS of the motor cortex on muscle fatigue with significantly lower decreases in three separate endurance time trials after tDCS than a placebo condition or control ($-21.1 \pm 5.5\%$, $-35.7 \pm 3.3\%$, and $-39.3 \pm 3.3\%$, respectively; $p < 0.05$) (10). The use of tDCS is an expanding field and offers potential benefits to tactical facilitators and tactical athletes for efficiently increasing physical performance. However, until the necessary evidence to support consumer wearables for tDCS is available, it will remain unclear as to its full potential or practical utility. It would be advisable to research each device independently and utilize pilot trials, where possible, to ascertain the relevant benefits of each device prior to larger scale application.

NEUROFEEDBACK TRAINING

Neurofeedback training (NFT) consists of individuals monitoring specific frequencies within the brain region through the use of a passive collection skull cap and computer software utilizing electroencephalography (EEG) (5). The aim is to develop the individual's ability to identify the feelings related to the specific frequency elicited during optimal task performance and improve their capacity to remain in the designated frequency zone. Research in this area is less advanced than tCDS, however, there are some promising results. One theory derived from the research focuses on hypofrontality as the mechanism of improvement. This also draws from the research indicating increased pre-frontal cortex activity being identified as a major contributing factor in individuals who underperform, when attempting to perform in high-pressure situations (4,13).

There is also emerging evidence of the improvements in self-awareness of the optimal cognitive states using EEG and NFT to accelerate motor skill acquisition to the level of expert performance. Differences between novice and expert performers have been identified in several physiological areas. Specifically, expert performers tend to demonstrate decreased absolute heart rate, increased heart rate variability, decreased sympathetic activity, optimized autoregulation of brain wave activity and return to baseline during specific acute events, and syncing of respiratory regulation (5). Although not primarily focused on acquiring discrete skills for expert performance, increasing self-awareness for skill acquisition may assist with increasing economy of repeated cyclical movements over an extended duration. Small improvements in efficiency may translate to much greater performance in time trial tasks or during time to fatigue tests.

Research using EEG to increase autoregulation of pre-determined frequency parameters in cognitive states significantly improved learning ability in several areas, including more efficient focal change (2.1 times), fewer errors (3.79 times), and decreased reported cognitive workload (1.5 times) (20). Considering the research being conducted on the psychobiological model of fatigue, decreased perceptual cognitive workload could have the potential to increase power output at the same RPE after a specific intervention period. A considerable unknown is the question regarding the duration of the time the benefits last in individuals and if training self-awareness through NFT has any positive benefit over the application of an external stimulus through tCDS. The use of NFT is relatively unobtrusive with the individual required to respond to a computer-based application while wearing a specially designed skull cap. Duration of interventions have generally consisted of 20 min sessions up to three times per week over a period of 6 - 12 weeks. As such, if proven effective, NFT may be a more suitable cognitive intervention than tCDS in a tactical environment, whether it be used in-barracks during training or on operations to maintain adequate levels of psycho-physiological adaptations.

CONCLUSION

The growing body of research is beginning to form a chain of evidence around the use of integrated psycho-physiological training interventions to improve both physiological measures and performance in high-level athletes that may transfer to high-pressure tactical settings. As the understanding of the psychological and physiological mechanisms of fatigue and performance grow, the effectiveness of training programs could provide greater returns without increased time commitment. Although several of these interventions appear to be relatively unobtrusive and may provide meaningful improvements in performance after acute or short intervention periods, there are some factors to consider. The practicality of applying these novel approaches within a tactical environment remains to be determined. As military training is designed for large groups and occupational demands result in restricted availability of personnel, applying these approaches may be difficult at the unit level. However, the increase in research has resulted in the development of several commercially available devices and application-based systems that claim to provide similar results to those reported within the research. However, as with any form of technology, the benefits of the specific product need to be validated against clinical research. The relative ease of the consumer-based devices could be attractive to individuals; however, they may be misrepresenting the true complexity of the clinical requirements to elicit increased performance. These novel approaches appear to hold future benefit, but tactical facilitators should ensure the interventions are practical and validated prior to their full implementation. However, individuals should maintain awareness of the developing technology and gain an understanding of the impact of cognitive states on training outcomes. Through the use of pilot programs and small-scale initiatives of relevant devices, an improved understanding of the benefits in a field environment can begin to be understood until such time that a larger body of evidence can catch up. Tactical facilitators should also look to reduce the impact of training environments that may generate suboptimal cognitive states, including unplanned stressors or early progressions that may inadvertently reduce training benefits. This is an exciting and emerging field that presents as a developing area of opportunity for improving the efficiency of increasing aerobic endurance performance within the tactical community.

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USING COMPLEXES TO HELP IMPROVE TACTICAL JOB PERFORMANCE

Tactical personnel, whether they serve in fire and rescue, law enforcement, or the military, regularly encounter physically demanding tasks. Firefighters often encounter close spaces that also require them to push, pull, carry, and lift objects or people in those close quarters (3). While law enforcement and military personnel may occasionally find themselves in small confined spaces, they are more likely to be in open spaces that require the same physical demands. Specific physical requirements, such as grip strength (for pulling hoses, opening fire hydrants, dragging a victim to safety, and firing a weapon) and to more general muscular and cardiovascular endurance (for pursuing suspects on foot and climbing steps) is crucial for reducing fatigue after repeated bouts of effort (3,4). Therefore, in order to physically prepare tactical personnel to perform these tasks, specific muscle qualities, such as muscular strength and muscular endurance, anaerobic endurance and aerobic fitness should be targeted in a comprehensive strength and conditioning program for the tactical professional. One way to improve these qualities is through the use of complexes.

Complexes are a series of exercises that are performed consecutively (without recovery) and without putting down the chosen implement (1). Complexes are typically performed with a barbell, dumbbell (DB), kettlebell, or other implement. Performing exercises under these parameters challenges both muscular strength and muscular endurance. Based on the physical demands required to perform a complex and the occupational needs of the tactical professional, this form of conditioning provides a specific and unique training stimulus that not only can improve fitness, but occupational performance as well.

Made popular by Istvan Javorek, complexes were originally designed as conditioning programs for Olympic weightlifters, which is why Javorek's traditional complexes typically use Olympic weightlifting movements and their derivatives (1,2). An example of a Javorek Dumbbell Complex can be found in Table 1 (2).

TABLE 1. EXAMPLE OF JAVOREK DUMBBELL COMPLEX

EXERCISE	REPETITIONS
DB upright row	6
DB high pull snatch	6
DB squat push press	6
DB bent-over row	6

DEVELOPING COMPLEXES

When developing complexes, there are several factors that should be considered. To start, complexes typically consist of 3 – 6 exercises and 3 – 6 repetitions per exercise; however, they can be used with a higher repetition scheme of up to 12 repetitions if the training load is reduced. They can be performed using 1 – 6 sets with 3 – 5-min rest periods between rounds (1). For example, a lower repetition scheme may place a greater emphasis on power-endurance or strength-endurance (e.g., 6 – 8 repetitions), whereas a higher repetition scheme may have a greater emphasis on developing muscular endurance and conditioning (e.g., 8 – 12 repetitions). However, it is important to understand that the main purpose of complexes is to develop muscular endurance and exercise capacity. While some strength and power may be developed from this form of training, more traditional strength programs may be better suited to achieving these goals.

As mentioned, complexes can be implemented using a variety of implements such as barbells, DB, kettlebells, sandbags, weight plates, etc. The implement selected will often depend on the individuals being trained, as some implements are more specific to the tactical professional's occupation. Sandbags are commonly used with tactical professionals due to their odd shape and weight distribution. Fat grip DB, hoses, and other tactical equipment may also be an appropriate choice for firefighters due to the wide diameter of the hoses that are used. Sandbags are a possible option for police officers to potentially simulate a victim drag (3). These exercises may potentially have a better transfer of training effect to situations and tasks that tactical professionals encounter in the line of duty (3).

Next, the exercises selected within the complex should be chosen so that there is minimal adjustment between exercises. For example, when using a barbell it is best to select exercises that utilize the same grip (i.e., supinated, pronated, neutral) so the lifter can transition into the next movement without changing hand position or putting the barbell down. With DBs, it is easier to use different grips, because the lifter simply needs to rotate the arms or wrists. In contrast, if using a barbell, exercises that all require the same type of grip (i.e., pronated or supinated) should be used to improve efficiency and alleviate the need to change grips.

Once the exercises to be used and repetitions have been determined, it is important to recognize which exercise(s) is going to be “load limiting.” The limiting factor to how much weight can be used in a complex is generally the exercise or muscle group that is the weakest (e.g., performance of a DB biceps curl is

USING COMPLEXES TO HELP IMPROVE TACTICAL JOB PERFORMANCE

generally weaker than a DB snatch). This exercise or muscle group will determine the weight that will be used.

Finally, be aware that since these exercises are being performed non-stop, the tactical professional will not be able to use as much weight as a traditional set and repetition format (e.g., three sets of 10 repetitions at 75% one repetition maximum [1RM] with 90 s recovery). Complexes have the potential to produce a large anaerobic stimulus and thus, lead to significant fatigue as the duration of the complex continues. This will generally lead to performance decrements throughout the complex and potentially affect proper technique. As such, selecting a weight that is challenging, but can still be performed with good form and technique for each of the exercises throughout the complex is essential.

As mentioned, when progressing tactical professionals, it is critical to make certain proper form is maintained throughout the entire complex. Once proper form is demonstrated, the complexes can be intensified by decreasing the recovery time between subsequent rounds, increasing implement load, increasing the number of repetitions per exercise, and/or increasing the number of exercises within the complex.

TABLE 2. EXAMPLE OF SANDBAG COMPLEX

EXERCISE	REPETITIONS
Goblet squat	10
Front raise	10
Bent-over row	10
Toss and grab	10

**Perform each of the following exercises for the prescribed number of repetitions. All of these repetitions should be completed consecutively, with no rest between reps or between exercises.*

**Rest 1 – 3 minutes after completing complex, then repeat for 2 – 3 more rounds*

TABLE 3. EXAMPLE OF BARBELL COMPLEX

EXERCISE	REPETITIONS
Romanian deadlift	8
High pull	8
Overhead press	8
Overhead lunge	8

**Perform each of the following exercises for the prescribed number of repetitions. All of these repetitions should be completed consecutively, with no rest between reps or between exercises.*

**Rest 1 – 3 minutes, then repeat for 2 – 3 more rounds*

TABLE 4. EXAMPLE OF KETTLEBELL COMPLEX

EXERCISE	REPETITIONS
Lunge	6
Kettlebell swing	6
Bent-over row	6
Goblet squat	6

**Perform each of the following exercises for the prescribed number of repetitions. All of these repetitions should be completed consecutively, with no rest between reps or between exercises.*

**Rest 1 – 3 minutes, then repeat for 2 – 3 more rounds*

EXAMPLES OF COMPLEXES WITH DIFFERENT IMPLEMENTS CONCLUSION

There are many attributes that play a role in the success of tactical professionals. Just as any athletic team can benefit from sport-specific training, tactical professionals can benefit from occupational task-specific training as well. Combining pushing, pulling, pressing, and total body movements into complexes may help mimic the demands and movements of job tasks that tactical personnel may encounter. Complexes may provide a unique method of developing grip strength, muscular endurance, anaerobic endurance and overall performance for individuals in this population, replicating many movements seen on the job.

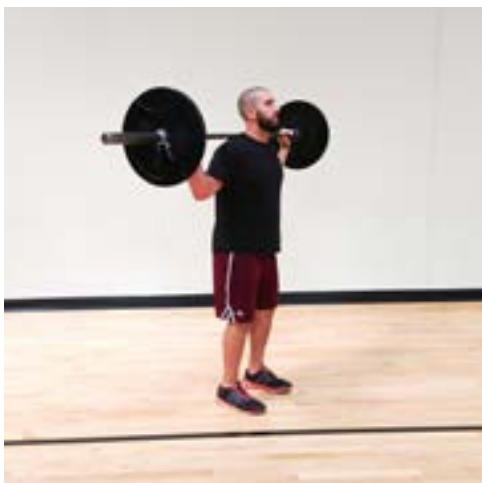


FIGURE 1. OVERHEAD PRESS

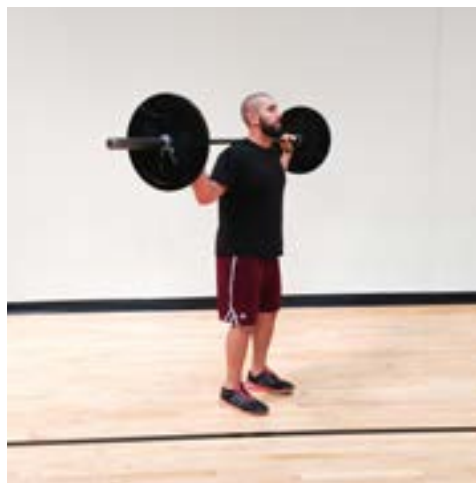


FIGURE 4. BARBELL LUNGE



FIGURE 2. OVERHEAD PRESS

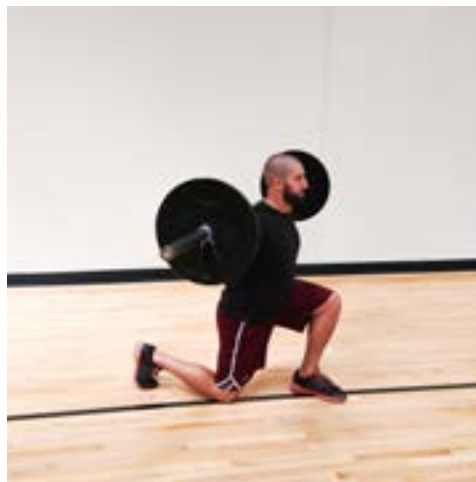


FIGURE 5. BARBELL LUNGE

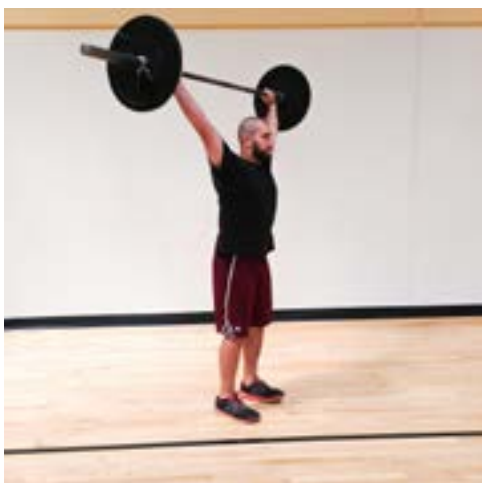


FIGURE 3. OVERHEAD PRESS



FIGURE 6. BARBELL ROMANIAN DEADLIFT

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FIGURE 7. BARBELL ROMANIAN DEADLIFT



FIGURE 10. SANDBAG BENT-OVER ROW



FIGURE 8. BARBELL HIGH PULL

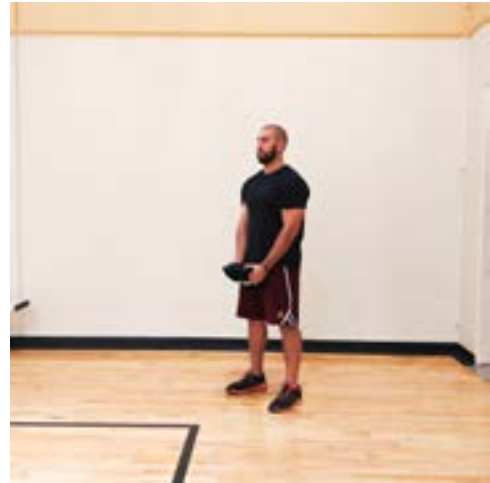


FIGURE 11. SANDBAG FRONT RAISE



FIGURE 9. BARBELL HIGH PULL



FIGURE 12. SANDBAG FRONT RAISE



FIGURE 13. SANDBAG GOBLET SQUAT



FIGURE 15. SANDBAG TOSS AND GRAB



FIGURE 14. SANDBAG GOBLET SQUAT

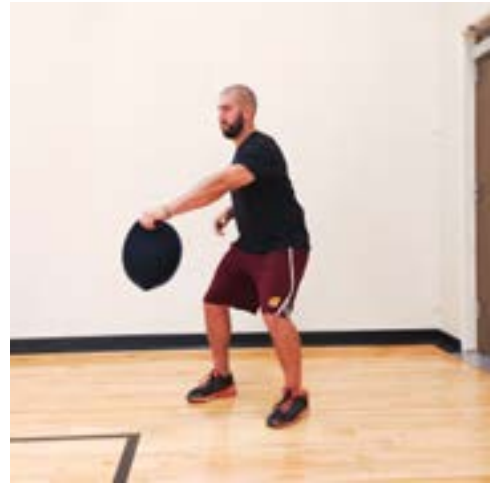


FIGURE 16. SANDBAG TOSS AND GRAB

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CONFLICT OF INTEREST STATEMENT

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NUTRITIONAL STRATEGIES TO SPEED UP RECOVERY FROM SOFT TISSUE INJURIES

Nutrition plays an important role in the injury prevention and treatment of tactical professionals. Sprains and strains to soft tissue are some of the most common injuries in sport and account for up to 70% of time away from sports (1,2). Soft tissues are made of collagen, which is the primary component in human connective tissues and is the most abundant protein among all animals (6,7,8). There are 16 different types of collagen (most of which being types I, II, and III), which includes skin, tendon, bone, teeth, ligaments, cartilage, blood vessels, and muscle (6). Decreased collagen causes connective tissue to become stiff and can result in injury to tendons, ligaments, and the like (2). For a visual reference, decreased collagen in the skin results in wrinkles, which is probably why many collagen supplements are targeted towards skin health. Nutritional goals for healthy connective tissue are twofold: increase collagen content in connective tissues susceptible to injury and prevent a decline in collagen content to help mitigate injury and facilitate recovery.

WHAT DECREASES COLLAGEN?

Collagen production will naturally decline with age (7). Women experience changes in connective tissue stiffness concurrent with the menstrual cycle, which can increase the risk of injury (1). Additionally, postmenopausal women may experience reduced collagen synthesis (7). Ultraviolet sunrays (natural or tanning beds) and tobacco smoke are environmental factors that can also decrease collagen production (7). A diet high in simple sugars from sodas, energy drinks, candies pastries, and fruit drinks may also decrease collagen by forming molecules that damage the proteins that make collagen, resulting in dry, brittle, and weak connective tissues (7).

WHAT INCREASES COLLAGEN?

Precise exercise and training to target weak areas are tactical professionals' primary method to improve connective tissue health (1,8). There are nutrition interventions that may compliment this training. The most common nutritional intervention used to improve connective tissue health is leucine-rich whey protein (1). Leucine plays a role in the signaling pathway that stimulates muscle growth. Whey protein powder is the densest source of leucine containing three grams per average scoop; alternatively, four ounces of chicken, one cup of cottage cheese, or four eggs will provide 2 – 3 g of leucine (9). Apart from leucine, proline, an amino acid found in collagen, can be found in eggs, meat, and cheese (7).

Fruits and vegetables are rich in nutrients that have a significant role in collagen health. One such nutrient is anthocyanidin, which

is a flavonoid found in purple, blue, red, and orange colored fruits and vegetables, such as blueberries, eggplants, red cabbages, cherries, raspberries, and blackberries. Vitamin C functions as an anti-oxidant and a co-factor in enzyme reactions that facilitate connective tissue development; therefore, it has a role in building collagen in connective tissues and promoting healing of wounds and injuries (5). Vitamin C also plays an important role in aiding the absorption of collagen consumed in the diet.

The research regarding the role of nutritional interventions in improving connective tissue health is rather new, which is somewhat surprising considering the number of supplements claiming to improve collagen. Collagen is considered a resorbable nutrient, meaning it can be broken down from the bones or hide of cows and pigs, converted to a consumable form, and then absorbed into the human body (7). Collagen is rich in the amino acids lysine, proline, and glycine. Collagen is also rich in hydroxylysine and hydroxyproline, amino acids not found in other proteins (5). Very preliminary research on injured athletes has shown improvement in connective tissue health with the use of 10 – 15 g exogenous collagen consumed with 50 mg of vitamin C (collagen absorption is aided with vitamin C intake) (1,2,8). Nutrient delivery to tendons is higher before exercise due to blood flow and subsequent nutrient delivery; thus, a collagen supplement should be consumed 60 min before a connective tissue health session or an exercise designed to condition an area prone to injury (1).

SOURCES OF COLLAGEN

Gelatin is a purified collagen protein source formed by hydrolysis of collagen obtained from the bones and hides of pigs and cows. The primary difference in gelatin and collagen is how they are processed, with minimal difference in amino acid profile to include between sourced animal species (4). Collagen hydrolysate, the form found in supplements, can be easily mixed with hot or cold water and is also easier to digest than gelatin. Gelatin is only hot water soluble and is used to make a gel in foods and desserts. Gelatin supplements in the form of capsules contain 650 mg per pill; a tactical professional would need eight capsules to get just five grams, which is not a practical source. Most boxed gelatin dessert mixes contain one gram of gelatin per 0.5 cup, so one would have to consume 2.5 cups to get five grams of gelatin, which again, is not a practical source. Pre-made “gels” contain no gelatin at all. Traditional boxed gelatin contains seven grams of gelatin per packet, which makes two cups of gelatin. There are collagen hydrolysate powders available that contain 10 – 20 g per scoop. These can be mixed into smoothies or used to fortify gelatin.

Bone broth is also another recently popularized source of amino acids and collagen. Supplements are sold as a powder or capsule containing dehydrated broth from chicken bones. Chicken bones are high in collagen, proline, and glycine. According to Consumerlab.com, an excellent source for reviewing supplements, few bone broth supplements list the amino acid or collagen profile, leaving the consumer in the dark about the benefits of what they are consuming (3). Additionally, some bone broth can have higher than desirable amounts of lead. Often, but not always, the pill or capsule form of bone broth or collagen will contain other ingredients, such as ashwagandha, Fo-ti, or other herbals that do not have any credible benefit to collagen health.

With any dietary supplement, the most important safety consideration is to get a quality product with minimal unnecessary ingredients. Since gelatin comes from the skin and bones of bovine, there is a concern for diseased animal parts. Considering this concern, no contamination of this kind is known have been reported. Consumerlab.com will be testing bone protein and bone broth supplements in the future and this will be an excellent resource in aiding in the selection of a credible product (3).

In summary, tactical professionals aiming to maintain or improve collagen health to treat or prevent injury should start with things that are known to impact collagen. Participation in strength and conditioning programs that strengthen weak areas is recommended. Limiting the intake of simple sugar from soda, candy, energy drinks, etc. is likewise recommended. Tactical professionals should also avoid tobacco products from all sources. Tactical professionals should aim to consume leucine-rich protein sources and colorful fruits and vegetables, focusing specifically on the orange, red, and purple varieties.

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Trisha Stavinoha has served proudly as an Army Dietitian for almost 20 years and has spent the last 12 years serving in a performance nutrition and sport capacity. Stavinoha is finishing her military career serving as Chief of Patient Room Service in a major medical center, overseeing the foodservice operations for over 200 inpatients. Stavinoha recently served the Fort Sam Houston community as Chief of Outpatient and Community Nutrition, and is still the sport nutrition and dietary supplement subject matter expert. She developed the performance nutrition service for the Center for the Intrepid, the military's premier rehabilitation center for wounded tactical athletes and advises the local adaptive sports program. She coaches and trains with the installation Army 10-miler team and Bataan Death March team. Stavinoha earned a Master of Science degree in Sport Nutrition and shortly after her Certified Specialist in Sport Dietetics (CSSD) and Certified Strength and Conditioning Specialist® (CSCS®). Stavinoha had the grand opportunity to work with the Army's esteemed World Class Athlete Program, helping combat sport and track athletes reach their fullest potential to qualify for a spot on the Olympic team. Stavinoha specializes in performance nutrition for all varieties of sport, including endurance, strength, and combat in neutral and extreme environments.

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ALTERING TRADITIONAL EXERCISES TO FIT ANY NEED

As practitioners, there is often a need to be creative in order to maintain optimal levels of performance over the occupational lifespan of the tactical professional. In today's world of training, regardless of facility or environment, there is a plethora of equipment options available to generate the most effective programming. Conversely, budgets, space, and sometimes training group numbers or even location (i.e., deployment) may limit what practitioners have at their disposal to generate quality training in challenging settings. This article will be aimed at providing options for adjusting and modifying exercises or programs for any occasion in order to provide practitioners with ideas or modifications to enable variety and adaptability to situational factors.

It is inevitable that during a training period, the tactical professional or unit leader will deal with situations that will challenge them to think “outside the box” if they are to complete the training required. Finding new ways in which they can assist tactical personnel in retaining or returning to maximum health following an injury or extended period of no training requires continual adjusting and adaptation of a training program. As much as tactical facilitators do their best to combat injuries, they are inevitable not only in duty situations, but in day-to-day life as well; so it is critical to plan for the worst, but hope for the best. Tactical professionals need to be able to assess common movement patterns and job duties, and there can be value in gaining lifestyle insight of the personnel under their care in order to generate training activities that will heighten training status while attenuating injury potential and create programming that accounts for all scenarios.

The following is a continuum which has demonstrated success for the author when the need to adjust programming, or the use of different implements or movements, to maintain the existing program to the closest degree. The first step is to determine any limitation(s) that exists within the facility or personnel that may limit or affect the ability to generate effective training. Secondly, it is paramount to understand the level at which the tactical facilitator can provide care and know when to seek qualified assistance beyond the scope of practice, as this does not disqualify one's expertise. Ideally it is beneficial to tactical facilitators to have access to a cohesive performance team that includes (but is not limited to) a strength and conditioning professional, certified athletic trainer, physical therapist, and an allied medical team. Seeking additional external expertise and resources can help to create trust and cohesion with a tactical professional by demonstrating and ensuring that their health is the primary concern.

After the initial level of care has been established, the performance team should work together to generate a plan that will provide the best approach to develop activities and exercises as part of a program designed for the individual to regain full health status. This includes a profile in which biomechanical considerations and specific movement patterns and/or limitations that the impending program should entail are identified. This step helps the tactical facilitator determine what available equipment may be used to adjust the program based on the biomechanical analysis of the performance team. The goal is to maintain the existing program to the highest degree through modified exercises and activities. The last consideration is to keep the program balanced as much as possible through adapted exercises during challenging situations. This essentially means having a balance of pushing and pulling exercises, upper and lower body exercises, and movements in all applicable planes.

The following is an example strategy for developing a modified program. First, utilize a multi-joint to single-joint approach. Second, progress from single-plane to multi-plane movements. Third, be cognizant of upper body and lower body balance of pushing and pulling exercises, and progressively single out exercises or movements which fall into the limitations that have been established by the performance team. Lastly, determine all possible options in the strength and conditioning facility in terms of equipment. Everything from traditional dumbbells and barbells to ropes, tires, chains, kettlebells, bands, and sandbags may be good tools to create modifications within programs. This allows for a vast degree of options and ensures a multitude of variations or adaptations of an exercise to be put into the program. The following section provides some creative ways to overcome potential limitations so that the practitioner can provide the best possible transition for the tactical professional to minimize the negative effects of down time or possible light duty scenarios.

COMMON INJURIES AND CONSIDERATIONS

Shoulder: Some of the most common shoulder injuries include acromioclavicular (AC) joint sprains, rotator cuff soreness, bicipital tendonitis or discomfort, and other gleno-humeral anomalies. When these types of injuries are present, often the limitations given are to maintain exercises below shoulder height and/or shortening lever lengths to minimize the stress on the shoulder girdle and surrounding structures.

Elbow: Elbow issues are not as common as the shoulder; however, these sites of injury are often seen with combative situations associated with law enforcement and military-based training, acute injury, and overuse. Common injuries in the elbow range

from tendonitis, bursitis, and epicondylitis, with occasional hyperextensions. Often the limiting factor is limited range of motion in flexion or extension and both usually will present with pain of varying degrees.

Wrist/Hand: Issues with the wrist and hand can be common. Sprains of the thumb and wrist are common, as are finger and hand problems, such as dislocations and fractures. Often, wrist and hand injuries can limit grip strength and the ability to grasp or hold things with the same strength or magnitude.

Low Back: The lumbo-pelvic-hip complex appears to account for a high proportion of injury occurrences in tactical professionals, occurring in the workplace and daily life. However, just as with any other injuries or limitations, there are many options that can be devised to work through and assist with low back issues.

Knee: Over the course of the past 15 – 20 years, the number of knee-related injuries has increased dramatically for this author. The ever so popular anterior cruciate ligament (ACL) injury topic dominates the conversation regarding knee injuries. Less extensive injuries such as medial collateral ligament (MCL), lateral collateral ligament (LCL), meniscus, and patellar tendonitis are likewise very prominent. Albeit that knee injuries are quite common, the exercise modifications for knee injuries are numerous.

Ankle/Foot: Ankle strains, sprains, plantar fasciitis, and turf toe are commonly seen with increased running frequency, load carriage, and are also quite common in everyday life.

The following section will feature the use of various equipment modalities to generate exercises that can serve as assistance options for tactical athletes who may be working through common injuries and want to maintain a high level of fitness.

EXERCISE FIGURES AND DESCRIPTIONS

Shoulder Limitations: Often athletes that have shoulder issues such as rotator cuff soreness, AC joint strains, or other minor acute limitations can still train at near full capacity with just a few program adjustments. One of the most common approaches to limitations with shoulder pain or pathology is to keep exercises below shoulder level while performing rehabilitation exercises concurrently to strengthen or improve the desired qualities within the shoulder. Below are some examples of different limitations.

The dumbbell snatch (Figure 1) allows the tactical professional to train with the unaffected arm while maintaining explosive properties and full body power development. Although this exercise does not only include the uninvolved arm, this is still a full body power movement and can help maintain these qualities during an injured period.

As previously mentioned, if the limitation dictates that the approach is to simply keep all resistance below shoulder height, a kettlebell swing may be a safe alternative as shown in Figure 2. A kettlebell swing can be performed with a single arm or bilaterally focusing on hip drive and keeping the kettlebell below shoulder height.

Additionally, there may be bilateral shoulder issues where exercises shown in Figure 3 may be beneficial. A banded jump squat is depicted in Figure 3 with power bands attached to a power rack and across the shoulders. The arms can be fixed across the chest to protect the shoulder or used if the tactical athlete is not limited in this fashion. Lastly, the squat pattern shown in Figure 4 allows for lower body strength to be trained while minimizing the stress experienced with traditional barbell squats.

Elbow Limitations: Elbow limitations can be difficult to maneuver around but with the use of some creative tools, it is possible. The traditional barbell squatting position may cause pain or discomfort with elbow bursitis or an epicondylitis issue but a Zercher squat with a sandbag can be a great alternative, as shown in Figure 5. In Figure 6, a weighted vest is used for a traditional lunge (this could also be done directionally as well). Figure 7 demonstrates a sandbag farmer's walk with added sled resistance. This allows the elbows to stay in a neutral position, yet still provides external resistance to the lower body and a focus on a duty-specific task such as load carriage.

Wrist Limitations: With wrist limitations, often the tactical professional experiences discomfort with the wrist when performing wrist extensions. Grip can also be affected with wrist injuries. Figure 8 demonstrates a squat pattern with the use of the sandbag where the tactical professional essentially hugs the sandbag throughout the movement to add resistance to the squat. This could be performed in lunging patterns as well. Modifying a rowing movement to that of a suspension trainer bodyweight row, as shown in Figure 9, can be a safe alternative. Plus, this can keep the wrists in a neutral position and decrease the load on the wrists where the tactical professional controls how much of their bodyweight will be utilized. For the most part, with minor wrist injuries, keeping the wrists neutral may be the key to minimizing discomfort. If neutral wrist position is maintained and the load is slightly decreased, there are a multitude of exercises that can still be used without much adjustment.

CONCLUSION

Given the right implement and creativity, there is no limit to being able to adjust and modify exercises to achieve program goals. These are simply a few of many exercises that can be done with the specific limitations presented. Changing where the load is applied, grip, implement, or exercise delivery will ensure that the tactical professional can maintain the highest level of operation while working through common injuries.



FIGURE 1. DUMBBELL SNATCH



FIGURE 2. KETTLEBELL SWING



FIGURE 3. BANDED JUMP SQUAT



FIGURE 4. STABILITY BALL DUMBBELL SQUAT



FIGURE 6. VEST LUNGE



FIGURE 5. ZERCHER SANDBAG SQUAT

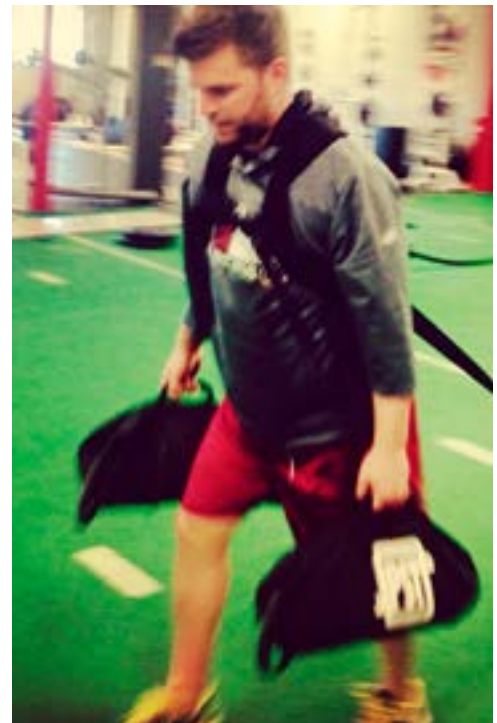


FIGURE 7. SANDBAG SLED DRAG



FIGURE 8. SANDBAG SQUAT

ABOUT THE AUTHOR

Joel Raether is a highly sought-after presenter who has traveled the world providing education and training to sport coaches, personal trainers, sport performance coaches, tactical athletes, and tactical facilitators. He has written numerous peer-reviewed articles, contributed to more than five published books, and has consulted a multitude of popular media outlets, such as *Men's Health*, *Chicago Tribune*, *9 News Denver*, *Chinese Olympic Committee*, *Sioux Falls Fire Academy*, *California Fire and Law Enforcement Centers*, and *SOBEfit Magazine*. Raether oversees and administers one of three sites in the United States that executes the National Strength and Conditioning Association's (NSCA) TSAC Practitioners Course. In addition to coaching a multitude of Olympians, he has also coached more than 10 National Collegiate Athletic Association (NCAA) National Champions, All-Americans, League Most Valuable Players (MVPs), and All-Pros.

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FIGURE 9. SUSPENSION ROW



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REHABILITATION FOR LAW ENFORCEMENT OFFICERS

Unpredictable environments, complex and varied work requirements, shift-work, and potential exposure to violence: this is what law enforcement officers may face on a daily basis (1,3). Physical occupational requirements can include pulling, pushing, dragging, carrying, lifting, jumping, fighting, and running (13). Considering these requirements, it is not surprising that law enforcement officers can sustain physical injuries in the workplace. In terms of physical musculoskeletal injuries, sprains and strains are the most common nature of injury (12). The most common causes of injuries are confrontations with non-compliant offenders or assaults (12).

Successful rehabilitation and return to full duties relies upon knowledge of work duties and specific work tasks (6). However, given that the nature, duties, and specific tasks of law enforcement officers are always changing, the question arises as to how injured law enforcement officers can be successfully rehabilitated. In this article, three considerations are discussed to aid in addressing successful rehabilitation and return to work: 1) targeting the injury site using a combination of physiotherapy, physical therapy, and tactical strength and conditioning; 2) workplace engagement; and 3) using available tools that may assist in determining appropriate approaches (e.g., Functional Movement Screen [FMS] and Y-balance assessment).

In other areas of injury rehabilitation, such as elite sport, a multidisciplinary approach is often the best practice and typically includes physiotherapists, physical therapists, and strength and conditioning professionals (10). This enables rehabilitation and management of current injuries, and an opportunity to prevent further injuries from occurring (7). For tactical personnel, it follows

that having physiotherapists, physical therapists, and tactical facilitators working together may provide better outcomes. A good example of this is the mobility gained in a physiotherapy or physical therapy treatment carrying over to a tactical strength and conditioning session, which would enable the tactical athlete to gain control over the restored range. The key to success in this approach is communication and knowing each member of the team's role in achieving the outcomes (7). One of the most efficient ways to ensure each professional has knowledge of what the others are doing is by using the same clinical notes system. When this common notes system is used in conjunction with multi-disciplinary discussions on impairments, it enables everyone to be working towards a common goal. Additionally, it is important that each professional stays within their scope of practice and only focuses on the part of the plan that involves their expertise.

An essential strategy for a durable return to work has often been proposed to be physical exercise and conditioning for those with a physical injury (4). It has also been shown that physical conditioning with the specific purpose of work hardening, especially if conducted in the workplace, may have a positive impact and increase the effectiveness and speed of return to work (3,4,9,11). Integrating physiotherapy, physical therapy, and tactical strength and conditioning could be an effective way to improve rehabilitation timelines and the likelihood of a successful return to duty. An example of how these could be integrated for a law enforcement officer following an ankle sprain is provided in Table 1.

It is known that return to work rates depend upon the organization being involved in the process, with higher return to work rates

TABLE 1. EXAMPLE PHYSIOTHERAPY, PHYSICAL THERAPY, AND TACTICAL STRENGTH AND CONDITIONING TREATMENT FOR AN ANKLE INJURY

PHYSIOTHERAPY AND PHYSICAL THERAPY (2)	TACTICAL STRENGTH AND CONDITIONING EXERCISE APPROACH (10)
<ul style="list-style-type: none"> • Talocrural mobilizations • Subtalar mobilizations • Banded self-mobilizations • Pre-activation exercises through range of motion (e.g., resisted ABCs and single-leg heel raises) • Single-leg balance 	<ul style="list-style-type: none"> • Pattern-assisted deep squat • Double-leg landing practice • Pattern-assisted single-leg deadlift • Barbell squat • Barbell deadlift • Prowler push • Single-leg balance with slide disc Ys

associated with active engagement by the organization (6). Within tactical populations, this may be more difficult to achieve. Long hours and shift work limit options available when trying to achieve active engagement by the organization and law enforcement officers. One option is to provide services outside of work hours; however, due to the “24 hours a day/seven days a week” nature of the law enforcement occupation this is not a viable option. Another option is to allow law enforcement officers to complete a return to work program during work hours, conducted by the workplace. Going to the workplace to provide rehabilitation increases the engagement by the organization and provides better accessibility for the law enforcement officers. An important consideration for tactical athletes is to keep their commanding officer informed about outcomes. However, it is important to ensure no medical or confidential information is disclosed without the law enforcement officer’s consent.

While physical training and conditioning do play a vital part of this work hardening, other tools can add value to the rehabilitation and return to work process. One example of such a tool is the FMS, which has previously been used within law enforcement populations for identifying poor movement patterns. The FMS consists of seven different movement pattern analyses to identify asymmetries (13). Due to its focus on mobility, control, and strength, the FMS tool can potentially not only identify asymmetries, but could have the potential to provide guidance for targeted rehabilitation and strength training implementation. As

such, the FMS provides an example of a tool that can be used to not only aid in injury prevention, but also injury rehabilitation, so that the injury site is not just strengthened, but also moves well while employing its strength characteristics.

The following serves as a generic example of applying a targeted intervention using the FMS. The most common area of injury within law enforcement populations are the lower back and the upper extremity (12). When looking at regional interdependence, often lower back pain can be related to hip dysfunction (8). Table 2 shows an example program for a tactical athlete who has been diagnosed by a medical professional with hip and lower back dysfunction or pain. Similarly, when looking at the upper extremity, it is important to also consider the thoracic spine. Table 3 provides an example program for upper extremity dysfunction or pain. Both programs in Table 2 and Table 3 focus on the FMS categories of mobility, stability, and strength.

In summary, providing rehabilitation services to law enforcement personnel is multi-factorial. To achieve the best possible outcomes, it is proposed to incorporate physiotherapy, physical therapy, and tactical strength and conditioning of targeted injury rehabilitation and prevention through work-specific hardening. Providing services within the workplace may achieve greater engagement from the organization and the law enforcement officers, which may lead to improved rehabilitation outcomes.

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TABLE 2. EXAMPLE STRENGTH PROGRAM – HIP AND LOWER BACK DYSFUNCTION/PAIN

MOBILITY	STABILITY/PRE-ACTIVATION	STRENGTH
Spikey ball/foam roller self-releases <ul style="list-style-type: none"> • Tensor fasciae latae • Gluteals • Hip flexors • Quadriceps 	Banded bird dogs	Rear foot elevated split squats
Rear foot elevated hip flexor stretch	Half narrow kneel	Single-leg barbell deadlifts
Banded hip mobilizations	Pattern-assisted single-leg deadlift	Plyometric box jumps and landing

TABLE 3. EXAMPLE STRENGTH PROGRAM – UPPER EXTREMITY DYSFUNCTION/INJURY

MOBILITY	STABILITY/PRE-ACTIVATION	STRENGTH
Spikey ball release <ul style="list-style-type: none"> • Posterior shoulder and internal rotation/external rotation • Latissimus dorsi • Pectorals 	Half kneeling banded Pallof press	Farmer kettlebell carries <ul style="list-style-type: none"> • By side • Shoulder height • Overhead
Thoracic extension over thoracic wedge/foam roller	Four-point kneeling banded thoracic rotation	Kettlebell arm bar
Sweeping archer stretch	Medicine ball wall tosses	Single-arm dumbbell row

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Kate Lyons is currently working with the New South Wales Police Force in Australia as part of their Reconditioning Program (RECON), she is also working in a physiotherapy private practice. Lyons has been conducting research with the Tactical Research Unit at Bond University in Australia for two years, and is a recent graduate of their Doctor of Physiotherapy Program. She has published research in the tactical field, investigating law enforcement injury profiles and she continues to research this area. Prior to this, Lyons completed her Bachelor's degree in Exercise and Sports Science from the University of Ballarat and her Level 1 Strength and Conditioning Coach from the Australian Strength and Conditioning Association (ASCA).

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