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AMERICAN COUNCIL ON EXERCISE
TASK PERFORMANCE AND HEALTH IMPROVEMENT RECOMMENDATIONS
FOR EMERGENCY MEDICAL SERVICE PRACTITIONERS
NAEMT
Serving our nation's EMS practitioners

TASK PERFORMANCE AND HEALTH IMPROVEMENT RECOMMENDATIONS FOR EMERGENCY MEDICAL SERVICE PRACTITIONERS

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Distributed by:
American Council on Exercise
4851 Paramount Dr.
San Diego, CA 92123
(858) 576-6500
FAX (858) 576-6564
ACEfitness.org

Author: American Council on Exercise
Technical Editor: Sabrena Merrill, M.S.
Project Editor: Daniel J. Green
Layout: Karen McGuire
Production: Nancy Garcia

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Task Performance and Health Improvement Recommendations for Emergency Medical Service Practitioners

Endorsed by:

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Initial Observations and Practitioner Task Analysis Report

Background

According to the U.S. Department of Labor, emergency medical technicians (EMTs) and paramedics experience a much larger than average number of work-related injuries or illnesses (Bureau of Labor Statistics, 2012). In addition to performing physical tasks such as kneeling, bending, and lifting while caring for and moving patients, emergency medical service (EMS) practitioners may be exposed to contagious diseases, such as hepatitis B and AIDS, or they can be injured by mentally unstable or combative patients. To address these elevated occupational risks, the National Association of Emergency Medical Technicians (NAEMT) has taken on the task of working closely with other national organizations to ensure that EMTs and paramedics can do their jobs without putting themselves in harm's way.

In the area of physical fitness, NAEMT is working in collaboration with the American Council on Exercise (ACE) to develop suggested physical fitness guidelines for EMS practitioners. Intended to ultimately help reduce the number and severity of musculoskeletal injuries on the job, these guidelines are based on the physical fitness requirements needed to perform the variety of occupational tasks undertaken by EMTs and paramedics in the day-to-day performance of their jobs.

As reported on NAEMT's website, obesity and lack of physical fitness among the general population impact the ability of the EMS systems to effectively serve the needs of patients. That is, obese patients directly contribute to increasing levels of lifting-related injuries among EMS practitioners. In addition, the increased incidence of obesity and lack of physical fitness within EMS agencies also contribute to injuries and increases in chronic diseases. Specifically, NAEMT (2012) reports that:

- EMS practitioners are seven times more likely than the average worker to miss work as a result of injury
- Half of all EMS workers suffer back pain annually
- One out of four EMS practitioners will suffer a career-ending injury within the first four years of service
- Back injury is the most frequently cited reason for leaving EMS
- Back injuries are often the result of cumulative wear and tear

Other research on EMS practitioners and work-related injuries confirms the cause for concern about the occupational risks associated with performing the work. Data from the Bureau of Labor Statistics Census for the period 2003 to 2007 revealed that the majority of nonfatal injuries (84%) involved sprains and strains, mostly in the hands and fingers, and 42% affected the lower trunk. Approximately half of these incidents involved interaction with, or movement of, another person, often as a result of lifting or moving the patient (Reichard, Marsh, & Moore, 2011).

The National Institute for Occupational Safety and Health (NIOSH) also reported that among EMS worker injuries and illnesses, sprains and strains were the most common diagnosis. Most injuries affected the trunk, hand, and leg. For the years 2008 and 2009, the majority of sprain and strain injuries involved the EMS worker's trunk. More than one-third of all sprain and strain injuries were related to interactions with a patient (NIOSH, 2009; NIOSH, 2008). These injury rates are alarming and reflect the need for EMS practitioners to meet and maintain the physical fitness requirements for the job.

It is also worth noting that, similar to the general population, EMS personnel may experience an elevated risk for obesity, coronary heart disease, and poor cardiorespiratory fitness. Furthermore, occupational mental health hazards stemming, in part, from altered sleep schedules and high work-stress burnout have been shown to affect an EMS worker's overall health (Becker & Spicer, 2007).

Because EMS workers function within a number of different types of organizations, including career and volunteer fire departments, commercial ambulance services, and others, a team of exercise physiologists from ACE traveled to several sites to observe EMTs and paramedics on the job. The following five sites were selected from across the country because they reflect a diversity of service-delivery models and environments, populations served, and geographic locations.

- Memphis Division of Fire Services, Memphis, Tennessee (June, 2012)
- Austin-Travis County EMS, Austin, Texas (June, 2012)
- Charleston County EMS, Charleston, South Carolina (July, 2012)
- Upper Pine River Fire Protection District, Bayfield, Colorado (August, 2012)
- North East Mobile Health Service, Scarborough, Maine (August, 2012)

This report details the initial observations and practitioner task analysis based on the information gathered from the site visits by the ACE specialists.

General Observations

Upon completion of the site visits, ride-along encounters, and staff interviews, we have collected useful information that will allow us to establish a set of guidelines and recommendations to help improve the overall wellness and physical ability of NAEMT's constituents. Overall, from one site to the next, we found consistent concerns, requests, and obstacles regarding health improvement.

Common Concerns

The most frequently reported concerns from the interviewees (both supervisors and EMTs alike) revolved around work-related injury risk, general health issues, and retirement from the service. EMTs expressed a concern for time lost and healthcare costs associated with suffering a work-related injury. Accordingly, supervisory personnel mentioned a concern about the additional costs to the department from time lost due to staff injuries. Discussion on general health issues focused on the interviewees expressing an interest in topics such as weight management, stress management, and promoting healthy lifestyle habits. Lastly, on the subject of retirement, interviewees indicated that a healthy retirement was the goal of most workers, which included the avoidance of a forced retirement associated with injuries and a good quality of life after retirement.

Common Requests

When asked about suggestions or requests for addressing the concerns mentioned in the previous section, a common topic of discussion from supervisory personnel was the ongoing need for adequate physical competencies of EMT staff. As such, the managers at each site we visited acknowledged the usefulness of incorporating regular testing for physical competencies annually (at minimum) and quarterly (at maximum). There was even some discussion of creating mandatory physical requirements for EMT staff, but there was concern about how feasible this approach is considering the different cultures and workplace policies that currently exist at each site.

Common Obstacles

Whenever change is implemented, obstacles are always present. The EMS personnel we interviewed at each site shared what they viewed as barriers to participation in a health-improvement program based on the unique characteristics of their stations. The most common obstacles reported were (1) lack of resources, such as space and equipment for exercise; (2) a lack of knowledge about the proper implementation of a program and guidance for healthier living; (3) work demands that cause scheduling issues surrounding sleep deprivation and the interference with an ability to follow "normal" exercise and healthy habit routines; (4) lack of healthy eating options when out of the station for long stretches working a shift as well as in the station itself; and (5) low motivation to begin and then stick with a healthy lifestyle-change program.

Possible Solutions

After discussing the concerns and barriers related to implementing a health-improvement program at the various sites, we also explored possible solutions to help overcome the obstacles. Both the supervisory personnel and EMTs seemed to agree that exercise education that addressed both general physical-fitness concerns and work-related functional movement factors would be a welcome resource. There was also some discussion that partnering with local fitness and wellness centers to provide EMS employees with discounted rates could be feasible.

We talked with the supervisors at each site about the possibility of implementing a physical-ability assessment for the EMTs. It was acknowledged that currently there are no entry standards or requirements pertaining to physical ability or capacity to become an EMT. In some instances, individual regions have implemented their own assessments and standards, while others have avoided or removed these requirements due, in some part, to station risk-management issues or fear of upsetting the current culture of the organization. ACE believes that it is possible to design and implement a basic, entry-level physical-ability assessment that can be used to screen EMTs to distinguish those who have a potentially increased risk for suffering movement-related injuries from those who are at less of a risk. Furthermore, a retesting protocol should also be put in place that assesses EMTs either annually, biannually, or quarterly, depending on each site's resources and operating plan.

Lastly, but perhaps most importantly, there were several discussions centered on the concept of lifestyle-change education. Designing and implementing a plan for exercise participation and healthy eating will have no consequence if the target audience (i.e., EMS personnel) has no intention of adopting it. To overcome this obstacle, we discussed the need for education on effective behavior-change strategies, including strong support from within the EMS organizations (e.g., management, fellow team members, and peer fitness trainers) as well as outside agencies (e.g., local fitness facilities, Weight Watchers, and recreation departments).

Primary Outcomes Through ACE Involvement

As stated earlier, ACE endeavors to recommend physical-ability assessments and develop physical-fitness guidelines for EMS practitioners that will ultimately help reduce the number and severity of musculoskeletal injuries on the job. Additionally, resources for guidance on healthy eating and behavior-change implementation will be provided.

Improve Job-related Physical Capacity

Due the nature of an EMS professional's physical job responsibilities, the potential for injury—especially musculoskeletal injury—is higher than average compared with other occupations (Bureau of Labor Statistics, 2012). During our ride-along encounters, we observed EMTs and paramedics performing various repetitive tasks such as bending, twisting, reaching, pushing, and pulling as they were caring for and maneuvering patients. The performance of these tasks was sometimes required in tight spaces, such as a small bathroom area or the inside of an ambulance. Added to the repetitive movements, we witnessed external loads imposed by carrying or maneuvering work-related equipment.

It is clear to us that the forces endured in the awkward body positions assumed by EMTs and paramedics carrying out such maneuvers could potentially take their toll on various joints and soft-tissue structures, especially if the worker does not possess the requisite functional strength, stability, and mobility to tolerate such stresses. Consequently, ACE will recommend basic physical-ability assessments and task-specific training guidelines to improve job-specific demands for the EMS professional.

Improve Overall Wellness

When individuals adopt healthier lifestyles that include regular physical activity, healthy eating, and stress-reduction techniques, overall wellness improves. The concept of wellness encompasses physiological health measures (e.g., body composition, blood pressure, and physical fitness) as well as psychological variables (e.g., stress, anxiety, and feelings of well-being). A program of regular physical activity can positively influence physiological and psychological health factors by conditioning the body and preparing it for life and work demands and by providing a positive outlet for stress management, respectively. Improved employee wellness results in fewer days lost due to illness, which means a reduction in overall costs associated with work-time loss. It is also possible to see a decline in injury rates as individuals become more focused on wellness, even with non-specific strategies for injury prevention. In other words, an individual who is not engaging in any physical activity is at a higher risk for health problems than someone who meets minimal recommendations. To this end, ACE will provide general physical-activity recommendations that are central to overall wellness.

When considering improved wellness, the importance of proper nutrition must not be overlooked. Several good, no-cost resources exist that can help provide better knowledge and awareness about healthy eating options for EMTs and paramedics. These resources, such as the United States Department of Agriculture's *2010 Dietary Guidelines for Americans,* provide strategies that can be executed by EMS practitioners on and off the job to promote consistent healthy eating (United States Department of Agriculture, 2010). ACE will provide guidance on accessing these resources and implementing them with EMS professionals.

Create Self-reliance

The ultimate goal after implementing any workplace program is that it is adopted and maintained by the individuals for whom it was developed. An effective way to achieve this goal is to offer strategies that promote self-reliance within the targeted individuals. The program has to be accessible to EMS personnel in ways that allow the participants to experience early success while not feeling overwhelmed. This approach can help create increased participation and eventual self-reliance among employees at participating sites, which could lead to regional and national success. ACE will provide basic behavior-change strategies for implementing improved physical capacity and wellness programs with the ultimate goal of creating self-reliance in the participants who engage in them.

Recommendations for the NAEMT

According to the U.S. Department of Labor, EMTs and paramedics experience a much larger than average number of work-related injuries or illnesses (Bureau of Labor Statistics, 2012). To address these elevated occupational risks, the NAEMT has taken on the task of working closely with other national organizations to ensure that EMTs and paramedics can do their jobs without putting themselves in harm's way.

In the area of physical fitness, the NAEMT is working in collaboration with the American Council on Exercise (ACE) to develop physical-fitness guidelines for emergency medical service (EMS) practitioners. Intended to ultimately help reduce the number and severity of musculoskeletal injuries on the job, these guidelines are based on the physical fitness requirements needed to perform the variety of occupational tasks undertaken by EMTs and paramedics in the day-to-day performance of their jobs.

From June through August 2012, a team of exercise physiologists from ACE traveled to several states in different geographical areas (i.e., Tennessee, Texas, South Carolina, Colorado, and Maine) to observe EMTs and paramedics on the job. The initial observations and practitioner task analysis based on the information gathered from the site visits by the ACE specialists provide the foundation for the physical-fitness testing recommendations and exercise guidelines detailed in this paper.

Three Approaches for Improved Health for EMS Practitioners

The recommendations and guidelines that follow have the potential to positively influence three main areas for individual EMS practitioners: (1) job-related physical capacity, (2) overall wellness, and (3) self-reliance. The successful implementation and maintenance of these suggested recommendations and guidelines will promote improved health and wellness among the participating NAEMT constituents and will serve as a starting point for enhanced physical fitness.

Improve Job-related Physical Capacity

Due the nature of an EMS professional's physical job responsibilities, the potential for injury—especially musculoskeletal injury—is higher than average compared with other occupations (Bureau of Labor Statistics, 2012). During ride-along encounters, ACE exercise physiologists observed EMTs and paramedics performing various repetitive tasks such as bending, twisting, reaching, pushing, and pulling as they were caring for and maneuvering patients. The performance of these tasks was sometimes required in tight spaces, such as a small bathroom area or the inside of an ambulance. Added to the repetitive movements, we witnessed external loads imposed by carrying or maneuvering work-related equipment.

Physical-ability Assessments

The forces endured in the awkward body positions assumed by EMTs and paramedics performing work-related maneuvers could potentially take their toll on various joints and soft-tissue structures, especially if the worker does not possess the requisite functional strength, stability, and mobility to tolerate such stresses. To address these concerns, ACE recommends the following basic physical assessments to screen for potential deficien-

cies or dysfunctions that could predispose an EMS practitioner to an increased risk for work-related injuries. A detailed explanation of these assessments and their scoring protocols can be found in Appendix A.

- Waist circumference
- Standing Posture
  - ✓ Static postural assessment
- Stability
  - ✓ Stork-stand balance test
  - ✓ Sharpened Romberg test
- Core function
  - ✓ McGill's torso battery
- Stability and mobility
  - ✓ Modified body-weight squat test
  - ✓ Front plank
  - ✓ Overhead reach

The purpose of conducting these assessments is to identify postural deviations and/or physical deficiencies and any accompanying pain. If pain is present during any of these assessments, the test should be discontinued and the EMS practitioner should seek an appropriate medical evaluation to address the cause of the pain. Performing the physical tests recommended in this paper in the presence of pain will yield inaccurate results, as test takers will either consciously or subconsciously move differently to compensate for movements that result in pain.

If deficiencies are noted without the presence of pain, using the guidelines presented in this paper (or guidance from the participant's rehabilitation professional if pain was present), a restorative exercise program to strengthen and lengthen appropriate muscle groups can be implemented. The goal is to foster new healthier habits that will not only improve the body's structure and function, but also reduce the likelihood of pain, injury, and dysfunction.

General Exercise Guidelines

Human movement can essentially be broken down and described by five primary patterns that people perform during daily activities (Cook, 2003):

- Bending/raising and lifting/lowering movements (e.g., squatting)
- Single-leg movements (e.g., walking and climbing stairs)
- Upper-body pushing movements
- Upper-body pulling movements
- Rotational movements

When mobility is compromised, the following movement compensations typically occur:

- The joint will seek to achieve the desired range of motion (ROM) by incorporating movement into another plane. For example, when a person walks, which requires hip extension (sagittal plane movement), and lacks flexibility in the hip flexors, it is possible to see excess rotation in the lumbar spine (transverse plane movement), thereby producing a compensated movement pattern.
- Adjacent, more stable joints may need to compromise some degree of stability to facilitate the level

of mobility needed. For example, if a person exhibits increased kyphosis and attempts to extend the thoracic spine, an increase in lumbar lordosis often occurs as a compensation for the lack of thoracic mobility.

A lack of mobility can be attributed to numerous factors, including reduced levels of physical activity and increased actions that promote muscle imbalance (e.g., repetitive movements, habitually poor posture, side-dominance, poor exercise technique, and imbalanced strength-training programs) (Kendall et al., 2005). This loss of mobility leads to compensations in movement and potential losses of stability at subsequent joints. Thus, to promote efficient movement and adequate stability and mobility throughout the body's postural segments, ACE recommends the inclusion of foundational exercises that train the five primary movement patterns at least two days per week.

Additionally, to further promote overall health and wellness, ACE recommends that EMS practitioners engage in at least 150 minutes per week of moderate-intensity cardiorespiratory physical activity (e.g., walking) or 75 minutes per week of vigorous-intensity physical activity (e.g., running). These recommendations are consistent with the *2008 Physical Activity Guidelines for Americans,* which emphasize that regular exercise is a critical component of good health and that individuals can reduce their risk of developing chronic disease by staying physically active and participating in structured exercise on a regular basis (U.S. Department of Health & Human Services, 2008). The guidelines specifically state that regular exercise will help prevent many common diseases, such as type 2 diabetes, coronary artery disease, high blood pressure, and the health risks associated with obesity.

Improve Overall Wellness

When individuals adopt healthier lifestyles that include regular physical activity, healthy eating, and stress-reduction techniques, overall wellness improves. The concept of wellness encompasses physiological health measures (e.g., body composition, blood pressure, and physical fitness) as well as psychological variables (e.g., stress, anxiety, and feelings of well-being). A program of regular physical activity (as described in the previous section) can positively influence physiological and psychological health factors by conditioning the body and preparing it for life and work demands and by providing a positive outlet for stress management, respectively.

2010 Dietary Guidelines for Americans

Included in the concept of wellness is the consumption of a healthy, balanced diet. Several effective, no-cost resources exist that can help provide better knowledge and awareness about healthy eating options for EMTs and paramedics. These resources, such as the United States Department of Agriculture's *2010 Dietary Guidelines for Americans*, provide strategies that can be executed by EMS practitioners on and off the job to promote consistent healthy eating (United States Department of Agriculture, 2010).

The *2010 Dietary Guidelines,* which are elaborated upon in detail at www.dietaryguidelines.gov, emphasize the following:

- Balance calories to achieve and maintain a healthy weight: The *Guidelines* encourage Americans to prevent or reduce overweight by eating better and exercising more. This includes eating fewer calories for people who are overweight or obese; increasing physical activity; and decreasing time spent in

sedentary behaviors like watching television or browsing the Internet. Of note, the *2010 Dietary Guidelines* are the first set of guidelines that explicitly recommend that Americans eat less.

- Foods and food components to reduce: The *Dietary Guidelines* advise Americans to reduce sodium intake to less than 2,300 mg/day for the general population and to less than 1,500 mg/day for higher-risk populations such as older adults, African Americans, and people with hypertension, diabetes, or chronic kidney disease; consume fewer than 10% of calories from saturated fat and instead consume monounsaturated and polyunsaturated fats; consume less than 300 mg/day of dietary cholesterol; minimize consumption of trans fatty acids; reduce caloric intake from sugar and solid fats; and consume alcohol in moderation (one drink per day for women and two drinks per day for men). The *2010 Dietary Guidelines* also introduce the term solid fats and added sugars (SoFAS). The *Guidelines* recommend that Americans cut back on calories from SoFAS; limit foods that contain refined grains, especially those that contain solid fats, added sugars, and sodium; and use oils to replace solid fats whenever possible.
- Foods and nutrients to increase: The *Dietary Guidelines* advise that Americans eat more fruits and vegetables, especially dark-green, red, and orange vegetables; consume at least half of all grains as whole grains; increase intake of fat-free or low-fat milk products; choose lean proteins and especially try to increase the amount of seafood eaten; replace high-fat proteins with leaner proteins; use oil instead of solid fat; and try to consume more of the often insufficiently consumed nutrients in the American diet, including potassium, fiber, calcium, and vitamin D.
- Building healthy eating patterns: A healthy eating pattern meets nutrient needs through consumption of nutrient-dense foods while staying within calorie limits. Some examples of well-known and effective healthy eating patterns include the Dietary Approaches to Stop Hypertension (DASH) eating plan, the Mediterranean diet, and a well-planned vegetarian diet. The *Guidelines* also advise Americans to follow food safety recommendations when preparing and eating foods so as to reduce the risk of foodborne illness.
- Helping Americans make healthy choices: The *Guidelines* charge all sectors of society to play an active role in the movement to make America healthier by developing coordinated partnerships, programs, and policies to support healthy eating. Food and activity behaviors should be viewed in the context of a socio-ecological model. The *Guidelines* describe this model as "an approach which emphasizes the development of coordinated partnerships, programs, and policies to support healthy eating and active living. In this framework, interventions should extend well beyond providing traditional education to individuals and families about healthy choices, and should help build skills, reshape the environment, and reestablish social norms to facilitate individuals' healthy choices." The socio-ecological model takes into consideration individual factors such as age, gender, socioeconomic status, and knowledge; environmental settings including homes, schools, workplaces, and other community venues; sectors of influence such as government, marketing and media, and industry; and social and cultural norms and values including belief systems, religion, lifestyle, and body image. The *Dietary Guidelines* issue a call to action to ensure that all Americans have access to nutritious foods and opportunities for physical activity; facilitate individual behavioral change through environmental strategies; and set the stage for lifelong healthy eating, physical activity, and weight-management behaviors.

MyPlate

The goal of MyPlate is to simplify the government's nutrition messages into an easily understood and implemented graphic—a dinner plate divided into four sections: fruits, vegetables, protein, and grains, with a glass of 1% or non-fat milk—and to encourage Americans to eat a more balanced diet that is made up of approximately 50% fruits and vegetables (Figure 1).

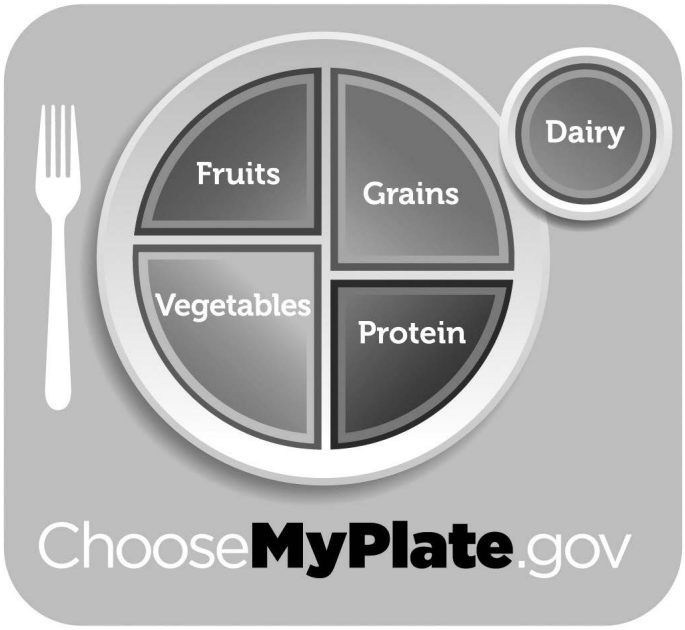


Figure 1
MyPlate

On the website www.ChooseMyPlate.gov, consumers can use the Super Tracker, which uses age, gender, height, weight, and physical-activity level to develop an individualized eating plan to meet their caloric needs. The program calculates estimated energy requirement based on this demographic information. Within seconds, users are categorized into one of 12 different energy levels (anywhere from 1,000 to 3,200 calories) and are given the recommended number of servings—measured in cups and ounces—to eat from each of the five food groups (i.e., vegetables, fruit, protein, grains, and dairy). A set number of empty calories (i.e., calories from food components such as SoFAS that provide little nutritional value) is also allocated for that individual. By following these recommendations, users receive an optimal diet for disease prevention and weight maintenance based on their personalized needs.

In general, MyPlate encourages people to:

- Balance calories. People should only eat the amount of calories that the body needs. Physical activity helps to balance calories (this is the only place where physical activity is discussed in the new MyPlate talking points). Individual calorie recommendations are available at www.ChooseMyPlate.gov.
- Enjoy food, but eat less. The key here is to slow down while eating to truly enjoy the food (and key in to the body's internal cues of hunger and satiety) and try to minimize distractions like television.
- Avoid oversized portions. MyPlate recommends smaller plates, smaller serving sizes, and more mindful eating.
- Eat more vegetables, fruits, whole grains, and fat-free or 1% milk dairy products for adequate potassium, calcium, vitamin D, and fiber.
- Make half the plate fruits and vegetables. Most Americans need nine servings of fruits and vegetables per day. Very few people get anywhere near that.

- Switch to fat-free or low-fat (1%) milk. Full-fat dairy products provide excess calories and saturated fat in exchange for no nutritional benefit over fat-free and low-fat versions.
- Make half the grains whole grains (ideally even more than that). This will help to ensure adequate fiber intake and decreased intake of highly processed foods.
- Eat fewer foods high in solid fat (typically saturated and trans fat), added sugars, and salt.
- Compare sodium in foods and then choose the lower sodium versions.
- Drink water instead of sugary drinks to help cut sugar and unnecessary, empty calories.

These messages are emphasized during the multiyear campaign by the Let's Move initiative and the United States Department of Agriculture (USDA) to promote better eating. Online tools and how-to strategies are also available (see www.ChooseMyPlate.gov). Table 1 shows recommended daily amounts of each of the five food groups for a 2,000-calorie diet.

Table 1

MyPlate Recommended Daily Amounts for a 2,000-Calorie Diet

Food Group	Daily Average Over 1 Week
Grains	6.2 oz eq
Whole grains	3.8 oz eq
Refined grains	2.4 oz eq
Vegetables	2.6 cups
Vegetable subgroups (amount per week)	
Dark green	1.6 cups
Red/orange	5.6 cups
Starchy	5.1 cups
Beans and peas	1.6 cups
Other vegetables	4.1 cups
Fruits	2.1 cups
Dairy	3.1 cups
Protein foods	5.7 oz eq
Seafood	8.8 oz per week
Oils	29 grams
Calories from added fats and sugars	245 calories

Note: oz eq = Ounce equivalents

Create Self-reliance

The ultimate goals after implementing any workplace program are the adoption and maintenance of the program by the individuals for whom it was developed. An effective way to achieve these goals is to offer strategies that promote self-reliance within the targeted individuals. The program has to be accessible to EMS personnel in ways that allow the participants to experience early success while not feeling overwhelmed. This approach can help create increased participation and eventual self-reliance among employees at participating sites, which could lead to regional and national success.

Strategies for Establishing Self-reliance

Self-reliance is the dependence on one's own powers, capabilities, and resources. Without exception, individuals working toward positive lifestyle change should develop self-monitoring and goal-setting skills throughout the program to promote self-reliance. When a person has been successful at maintaining a healthy lifestyle for more than six months, he or she should be self-reliant (Glanz et al., 2008).

Goal-setting

EMS personnel should be educated about effective goal-setting, which includes the following components:

- Goals should be specific and action-oriented. A vague goal of "try your hardest to eat healthy" is not very helpful. "Eat one more serving of vegetables per day" is a better goal.
- Long-term goals, such as lose 45 pounds (20.4 kg), should be broken down into incremental, short-term goals, such as, "Run on the treadmill for 30 minutes, five days this week."
- Goals should be time-sensitive. For example, consider a person who does not usually eat breakfast but knows she will be better able to stop overeating throughout the day if she starts off the day with breakfast. A time-specific goal for this person would be "I will eat breakfast four days this week." Without a timeframe, it will be difficult for her to get motivated.
- Goals should be made with, and be acceptable to, the individual. The peer fitness trainer's role is to help set and then adjust individualized goals so they can be attained.
- Tracking goals is imperative to success. As with tracking eating and exercise habits, tracking of goals gives a person a road map to success. Tracking can be used by participants to review successes, lapses, and barriers on their paths to goal achievement.
- A formal plan of action, such as an exercise program or eating plan, is necessary to accomplish the goals.
- Goals should be prioritized based on a person's needs and desires.

This goal-setting process should be an integral part of a person's approach to making lifestyle improvements. Setting and attaining goals will build self-reliance, with the ultimate goal being a true lifestyle change.

Promote Social Connection Among EMS Personnel

Positive social support by the people around an individual making a lifestyle change cannot be underestimated. This could include support from family members, spouses/partners, friends, coworkers, workout buddies, and peer fitness coaches. Social support is positively related to maintaining physical-activity and weight-management programs. For example, people who participate in group physical-activity sessions report more enjoyment, support, camaraderie, and a personal sense of commitment to continue with their physical-activity programs (Dahn et al., 2011). There is little doubt that those people who surround an individual can positively influence his or her lifestyle and support the person's efforts to make and maintain healthy behaviors.

Supervisors at EMS facilities can promote social connection among their employees by adopting the following two strategies:

- Help identify people who are interested in the same types of physical activity through informal conversations or surveys, and then help them connect with each other. For example, are there several employees who are looking to start a walking club on their time off? If so, the supervisor can facilitate communication among the interested parties.
- Start a group session at the facility. The EMS supervisor can ask experts to come in to facilitate these sessions, whether they are group exercise classes, discussions about healthy eating, goal-setting sessions, or healthy cooking classes. These sessions provide excellent opportunities for the employees to exchange ideas, tips, and solutions to stay on course. The supervisor or peer fitness trainer simply guides the discussion.

Maintain an Environment That Fosters Success

A person's immediate environment directly affects his or her success when attempting to make healthy lifestyle changes. An individual's home, workplace, and car are the places where he or she has the most control over the environment. EMS supervisors can introduce the following strategies for changing a negative, unhealthy environment into a healthy one.

- First, have the EMS worker identify those places or cues that encourage unhealthy behaviors. Have the employee take an inventory of his or her home, especially the kitchen, as well as his or her car and station workspace. Are there cookies, cake, and chips on the kitchen counter at home for the kids? Are there unhealthy snacks in the glove compartment or a soda in the cup holder? At work, is there easy access to candy or other unhealthy foods? In terms of physical activity, is the treadmill covered by clothes? At home, are the workout shoes buried underneath slippers? Identifying these types of negative environmental cues can be as simple as having EMS practitioners perform these types of self-inventories.
- Second, encourage the worker to clean up those places where there are negative, unhealthy temptations. Be wary of recommending that a person throw out all the "junk" food, as this is a lifestyle change. Is it realistic to not have any sweets or salty snacks in the house for the rest of the person's life? Instead of getting rid of food, designate a place for "junk" food that is not as accessible as having it displayed on the kitchen counter. Prepackaged snacks are a good idea. This will encourage the individual to only grab one portion and then have to think about going back for another one. Also suggest that the employee pack a gym bag the night before to remove the barrier of not having appropriate clothing for exercise.
- Lastly, the EMS supervisor should support the employee's effort to change the negative into positive.

The bottom line is to make the healthy choice the easiest one. Some suggestions include putting washed fruit in a bowl in the middle of the kitchen table, placing cut-up vegetables in prepackaged baggies in the refrigerator, or posting encouraging notes at home and at the station such as, "Get up and walk." The EMS practitioner should consider creating a workout/eating calendar. The employee can use the calendar to track diet and physical activity and check off those days when he or she worked out and ate well. Seeing a month full of check marks will continue to encourage the individual's healthy lifestyle.

Using Technology to Encourage Self-reliance

Computer software and handheld devices can offer potent platforms to support self-regulation. The following are some examples of tools available to keep people on track in their health-improvement efforts.

- *Phone apps*: Platforms on smartphones include diet trackers, energy calculators, tools for making healthy shopping lists and finding restaurants that offer healthy, low-fat food, workout videos, activity trackers, and relaxation and inspirational videos.
- *Websites, blogs, and vlogs:* Website, blogs, and vlogs (i.e., video logs) are excellent ways to keep people motivated. The ACE website (www.ACEfitness.org) is a great resource filled with how-to videos, articles summarizing the latest research, and references about a variety of fitness topics. EMS personnel are encouraged to visit the ACE website often for the up-to-date information on health and wellness.
- *Social media*: Sites that connect people with similar goals and interests, such as Facebook, Pinterest, and Twitter, can be very effective at keeping those with ongoing lifestyle goals focused and part of a supportive group. EMS organizations can create their own social media pages and encourage their constituents to visit the site regularly for updates on health-related events (e.g., cooking classes, stress-management courses, and health fairs) and physical-activity information (e.g., exercise of the day, workout challenges among different stations, or fun runs for charity).

Summary

Similar to the general population, EMS personnel may experience an elevated risk for obesity, coronary heart disease, and poor cardiorespiratory fitness. Furthermore, occupational mental health hazards stemming, in part, from altered sleep schedules and high work-stress burnout have been shown to affect an EMS worker's overall health (Becker & Spicer, 2007). In this report, ACE recommends physical-fitness assessments and exercise guidelines for EMS practitioners that will ultimately help reduce the number and severity of musculoskeletal injuries on the job. Additionally, resources for guidance on healthy eating and behavior-change implementation are provided.

A program of regular physical activity can positively influence physiological and psychological health factors by conditioning the body and preparing it for life and work demands and by providing a positive outlet for stress management, respectively. Improved employee wellness results in fewer days lost due to illness, which means a reduction in overall costs associated with work-time loss. It is also possible to see a decline in injury rates as individuals become more focused on wellness, even with non-specific strategies for injury prevention. In other words, an individual who is not engaging in any physical activity is at a higher risk for health problems than someone who meets minimal recommendations. By reaching out to ACE, NAEMT has taken the initial steps toward addressing a growing problem of EMS practitioner injury rates and health concerns through suggested physical-fitness assessments and exercise guidelines for its constituents.

Appendix A: Physical Assessments

Waist Circumference

Waist girth can be a simple gauge of abdominal obesity. Waist girth alone has been shown to correlate strongly to direct measures of abdominal visceral fat accumulation and other heart-disease risks (Despres, 2001). Specifically, women with waist measurements higher than 30 inches (76.2 cm) develop heart disease twice as frequently as slimmer women. In general, men with waist circumferences above 40 inches (102 cm) and women with waist circumferences above 35 inches (86 cm) display elevated cardiovascular risk profiles (Expert Panel, 1998).

Objective: Determine waist circumference to gauge risk for abdominal obesity

Equipment: Cloth or fiberglass (i.e., non-elastic) measurement tape

Test protocol and administration:
Locate the narrowest part of the torso, or at the midpoint between the base of the sternum and the umbilicus (Figure 2).
Pull the tape tight enough to keep it in position without causing an indentation of the skin.
When assessing significantly overweight participants, be sure to use a long enough tape so as to avoid embarrassing the participant.

Evaluation:

- Women
  - ✓ Waist measurements ≥35 inches (86 cm) indicate an increased risk for heart disease
- Men
  - ✓ Waist measurements ≥40 inches (102 cm) indicate an increased risk for heart disease

Figure 2
Waist circumference

Standing Posture

The initial physical assessments should begin with a basic assessment of standing posture and muscular fitness. When individuals have adequate movement efficiency, which is positively influenced by proper posture and good muscular balance and control, the performance of activities of daily living (ADL), as well as work-related and fitness activities, requires less energy and poses a reduced risk for musculoskeletal injury. The following list presents three examples of how functional imbalances can lead to musculoskeletal problems.

- If a person has excessive ankle pronation, a program of continuous walking may reinforce these structural deficiencies and place undue stress on the knee joint.
- If a person comes into the program with weak core muscles, many movement patterns may be altered under physical stress. For example, a weak core can cause the lower back to arch excessively when lifting objects overhead, placing undue stress on the lumbar spine.
- Posture can be compromised when the body's frame is carrying excessive amounts of body weight. Excessive abdominal fat can contribute to lordosis of the lower back that may lead to back pain and dysfunction over time.

With chronic poor posture, the supporting musculature eventually adapts by either shortening or lengthening. Prolonged misalignment adversely affects the structure and function of nerve tissue as well. The resulting muscular imbalances can lead to a number of health issues. Occupational and sports-related activities often contribute to postural deviations. Prolonged sitting or standing can certainly cause muscle imbalance. Repetitive motions and heavy manual labor can also be harmful, especially if proper body mechanics are not employed. For EMS practitioners, postural limitations also include pushing and pulling large amounts of weight, such as patients and emergency equipment. Wearing high heels and restrictive clothing, as well as sleeping on non-supportive mattresses, can also lead to postural problems. In older adults, postural changes can occur from a general weakening of the musculoskeletal system that is associated with a decline in physical activity. Age-related limitations caused by poor posture include difficulty with the following actions:

- Walking or standing for prolonged periods
- Stooping, crouching, or kneeling
- Getting in and out of a car
- Reaching or extending the arms overhead

Assessments are a necessary component of uncovering postural changes. If not addressed, joint misalignments and muscular weaknesses can become more pronounced.

Static Postural Assessment

A basic postural assessment provides a good starting point to determine muscular imbalances. Figure 3 illustrates proper alignment and anatomical positioning in all three planes:

- Sagittal plane: A longitudinal line that divides the body or any of its parts into right and left sections
- Frontal plane: A longitudinal line dividing the body into anterior and posterior parts
- Transverse plane: A horizontal line that divides the body or any of its parts into superior and inferior sections

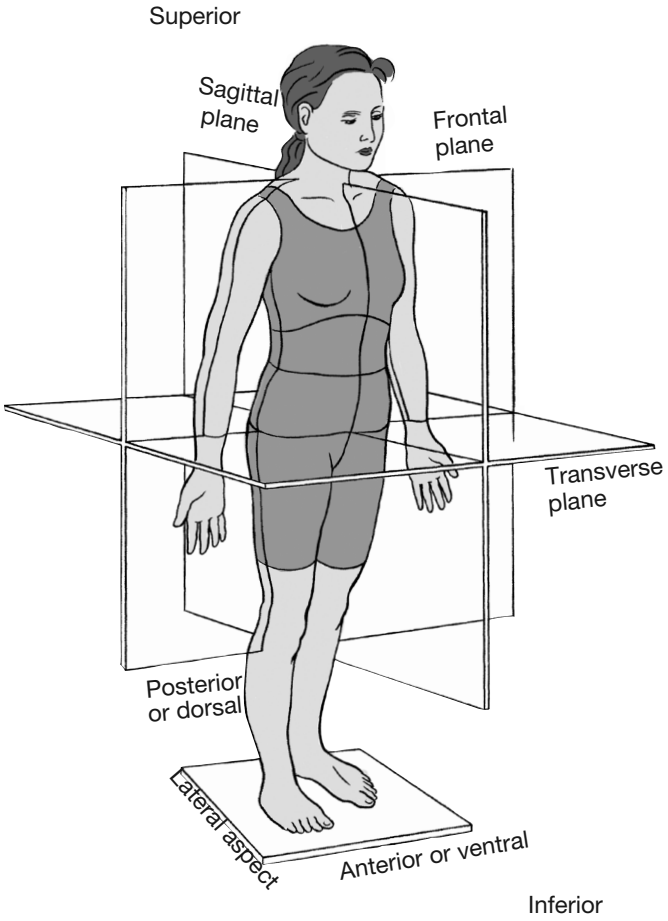


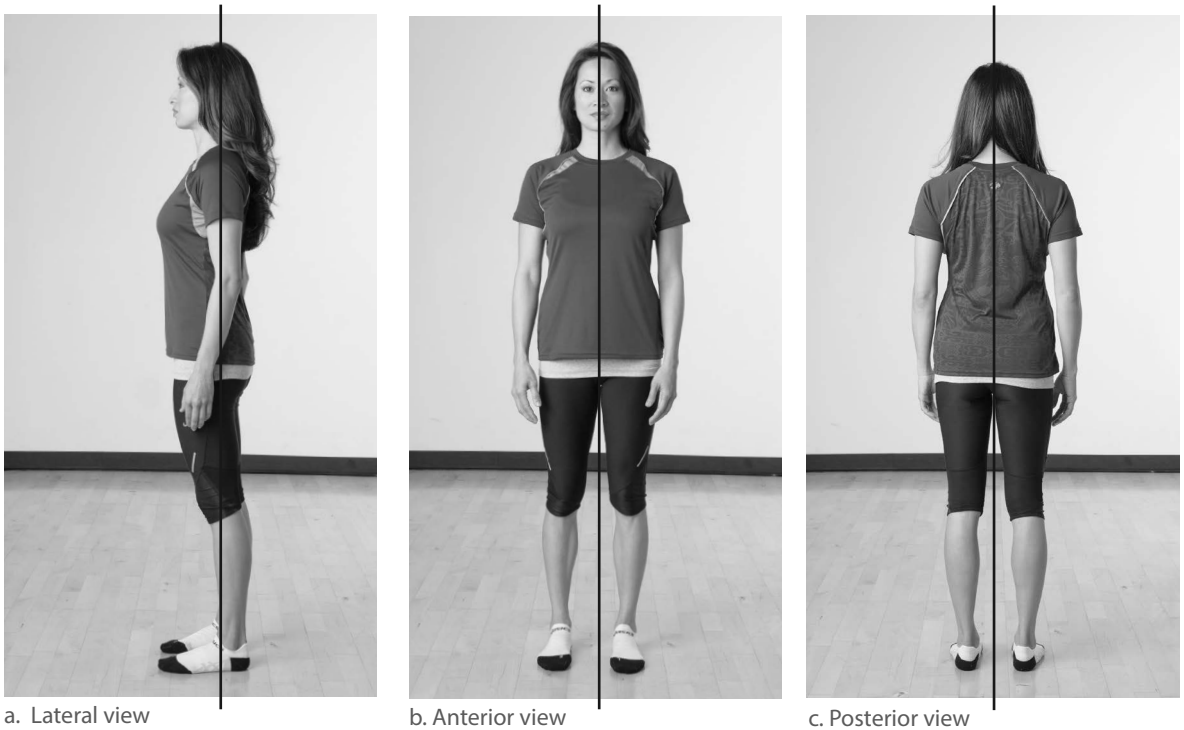
Figure 3
Anatomical position and planes of motion

The following points represent what to look for when assessing a person's standing posture.

- *Lateral view* (Figure 4a): The head should be suspended (not pushed back or dropped forward) with the ears in line with the shoulders, shoulders over hips, hips over knees, and knees over ankles. An imaginary plumb line dropped from overhead should pass through the cervical and lumbar vertebrae, hips, knees, and ankles. Participants should maintain the three natural curves of the spine. A decrease or increase in the spinal curvature changes the amount of compression the spine can withstand. The hips can be tucked slightly, particularly for individuals with exaggerated lumbar lordosis, pregnant women, and participants with a large, protruding abdominal area. The knees should be unlocked or soft. Hyperextended knees shift the pelvis, contributing to an increased low-back curve and back strain, along with decreased blood flow to and from the legs.
- *Anterior and posterior views* (Figures 4b and 4c): The feet should be shoulder-width apart with the weight evenly distributed. Excessive pronation or supination could lead to musculoskeletal injuries if a participant performs high volumes of exercise with poor foot mechanics. Any individual who complains of joint pain in the ankles, knees, hips, or back should consult his or her healthcare provider, especially if he or she exhibits high arches (excessive supination) or flat feet (excessive pronation). There should be overall symmetry between the two sides of the body with no visible lateral shifting or leaning to one side.

- *Anterior view* (Figure 4b): The arms should hang with equal spaces between the arm and the torso, and the hands should hang such that only the thumbs and index fingers are visible (i.e., no knuckles should be visible from the anterior view). A one-sided, asymmetrical space between the arm and the torso indicates a muscular imbalance at the trunk or shoulder girdle complex. Hands that hang with the knuckles facing forward indicate an imbalance of the muscles of the shoulder and/or forearm. The kneecaps (patellae) should be oriented forward without deviation into internal or external rotation. A patella that appears rotated inward or outward is an indication of a potential muscular imbalance or structural deviation of the hips and/or foot/ankle complex.

Figure 4
Assessing a person's posture



a. Lateral view b. Anterior view c. Posterior view

It is important to note that the body is rarely symmetrical. Therefore, it is important to focus on areas of obvious muscle imbalance and gross deviations that differ from ideal alignment by more than 1/4 inch (0.6 cm). A person's health history will provide valuable information on past injuries and/or musculoskeletal problems. The visual and manual observations from the postural assessment will enable a targeted focus on any problematic areas. If a person reports persistent musculoskeletal pain (i.e., lasting longer than two weeks), or if a structural or congenital condition (e.g., scoliosis) is suspected, the individual should be referred to his or her primary healthcare professional and receive medical clearance prior to engaging in a new exercise program.

Stability

Baseline assessments of balance are important to evaluate the need for comprehensive balance training and core conditioning during the early stages of an exercise program. Often, abdominal obesity shifts the center of gravity anteriorly. This can lead to instability and balance problems. The following two tests measure a participant's basic level of static balance.

Stork-stand Balance Test

Source: Johnson & Nelson, 1986

Objective: To assess static balance by standing on one foot in a modified stork-stand position

Equipment:

- Firm, non-slip surface
- Stopwatch

Test protocol and administration:

- Explain the purpose of the test.
- Ask the participant to remove his or her shoes and stand with feet together, hands on the hips.
- Instruct the participant to raise one foot off the ground and bring that foot to lightly touch the inside of the stance leg, just below the knee (Figure 5).
- The participant must raise the heel of the stance foot off the floor and balance on the ball of the foot (Figure 6).
- Stand behind the participant for support if needed.
- Allow 1 minute of practice trials.
- After the practice trial, perform the test, starting the stopwatch as the heel lifts off the floor.
- Repeat with the opposite leg.
- Allow up to three trials per leg position and record the best performance on each side.

Figure 5
Stork-stand balance test: Starting position

Figure 6
Stork-stand balance test: Test position

Observations:

Timing stops when any of the following occurs:

- The hand(s) come off the hips.
- The stance or supporting foot inverts, everts, or moves in any direction.
- Any part of the elevated foot loses contact with the stance leg.
- The heel of the stance leg touches the floor.
- The participant loses balance.

General interpretation:

- Use the information provided in Table 2 to categorize the participant's performance.

Table 2
The Stork-stand Balance Test

Rating	Excellent	Good	Average	Fair	Poor
Males	>50 seconds	41–50 seconds	31–40 seconds	20–30 seconds	<20 seconds
Females	>30 seconds	25–30 seconds	16–24 seconds	10–15 seconds	<10 seconds

Source: Johnson B.L. & Nelson, J.K. (1986). *Practical Measurements for Evaluation in Physical Education* (4th ed.). Minneapolis, Minn.: Burgess.

Sharpened Romberg Test

Sources: Black et al., 1982, Newton, 1989

Objective: To assess static balance and postural control while standing on a reduced base of support while removing visual sensory perception

Equipment:

- Firm, flat, non-slip surface
- Stopwatch

Test protocol and administration:

Explain the purpose of the test.

- Instruct the participant to remove his or her shoes and stand with one foot directly in front of the other (tandem or heel-to-toe position), with the eyes open.
- Ask the participant to fold his or her arms across the chest, touching each hand to the opposite shoulder (Figure 7).
- Allow sufficient practice trials. Once the participant feels stable, instruct the participant to close his or her eyes. Start the stopwatch to begin the test.
- Always stand in close proximity as a precaution to prevent falling.
- Continue the test for 60 seconds or until the participant exhibits any test-termination cue, as listed in the "Observations" section below.
- Allow up to two trials per leg position and record the best performance on each side.

Figure 7
Sharpened Romberg test

Observations:

Continue to time the participant's performance until one of the following occurs:

- The participant loses postural control and balance.
- The participant's feet move on the floor.
- The participant's eyes open.
- The participant's arms move from the folded position.
- The participant exceeds 60 seconds with good postural control.

General interpretations:

- The participant needs to maintain his or her balance with good postural control (without excessive swaying) and not exhibit any of the test-termination criteria for 30 or more seconds.
- The inability to reach 30 seconds is indicative of inadequate static balance and postural control.

Dynamic Warm-up

The following exercises can be used as a brief warm-up to prepare participants for the core function and stability and mobility assessments described in the following sections. The duration of the warm-up should be approximately five to 10 minutes with equal time devoted to each side of the body (for example, Warrior 1 with the left foot forward should be followed by Warrior 1 with the right foot forward). Performing each exercise for 30 to 60 seconds before moving on to the next should be a sufficient amount of time for an adequate warm-up.

Forward Lunge

Side Lunge

Standing Gate Openers (Frankensteins)

Standing Triangle Straddle Bends



Warrior 1


Core function

Core stability involves complex movement patterns that continually change as a function of the three-dimensional torque needed to support the various positions of the body. Dr. Stuart McGill (2007) reports that back problems can often be alleviated by improving and then grooving the motor patterns of the abdominal musculature. To determine balanced core strength and stability, it is important to assess all sides of the torso. The benefit of each one of these tests is to assess the interrelationships among the three torso tests. The tests are evaluated collectively. Poor endurance capacity of the torso muscles or an imbalance between these three muscle groups is believed to contribute to low-back dysfunction and core instability.

McGill's Torso Muscular Endurance Test Battery

Trunk Flexor Endurance Test

The flexor endurance test is the first in the battery of three tests that assesses muscular endurance of the deep core muscles (i.e., transverse abdominis, quadratus lumborum, and erector spinae). It is a timed test involving a static, isometric contraction of the anterior muscles, stabilizing the spine until the individual exhibits fatigue and can no longer hold the assumed position. As participants move through this battery of tests, make sure they are not holding their breath.

Contraindications
This test may not be suitable for individuals who suffer from low-back pain, have had recent back surgery, and/or are in the midst of an acute low-back flare up.

Equipment:

- Stopwatch
- Board (or step)

Pretest procedure:

- After explaining the purpose of the flexor endurance test, describe the proper body position.
- The starting position requires the participant to be seated, with the hips and knees bent to 90 degrees, aligning the hips, knees, and second toe.
- Instruct the participant to fold his or her arms across the chest, touching each hand to the opposite shoulder, lean against a board positioned at a 60-degree incline, and keep the head in a neutral position (Figure 8).
- It is important to ask the participant to press the shoulders into the board and maintain this position throughout the test.
- Instruct the participant to engage the abdominals to maintain a flat-to-neutral spine. The back should never be allowed to arch during the test.
- The tester can anchor the toes under a strap or manually stabilize the feet if necessary.
- The goal of the test is to remove the back support and ask the participant to hold this 60-degree position for as long as possible.
- Encourage the participant to practice this position prior to attempting the test.

Test protocol and administration:

- The tester starts the stopwatch as he or she moves the board about 4 inches (10 cm) back, while the participant maintains the 60-degree, suspended position.
- Terminate the test when there is a noticeable change in the trunk position:

- ✓ Watch for a deviation from the neutral spine (i.e., the shoulders rounding forward) or an increase in the low-back arch.
- ✓ No part of the back should touch the back rest.

- Record the participant's time on the testing form.

Figure 8
Trunk flexor test

Trunk Lateral Endurance Test

The trunk lateral endurance test, also called the side-bridge test, assesses muscular endurance of the lateral core muscles (i.e., transverse abdominis, obliques, quadratus lumborum, and erector spinae). Similar to the trunk flexor endurance test, this is a set of timed tests involving isometric contractions of the lateral muscles on each side of the trunk that stabilize the spine.

Contraindications
This test may not be suitable for individuals with shoulder pain or weakness or who suffer from low-back pain, have had recent back surgery, and/or are in the midst of an acute low-back flare up.

Equipment:

- Stopwatch
- Mat (optional)

Pretest procedure:

After explaining the purpose of this test, describe the proper body position.

- The starting position requires the participant to be on his or her side with extended legs, aligning the feet on top of each other or in a tandem position (heel-to-toe).
- Have the participant place the lower arm under the body and the upper arm on the side of the body.
- When the participant is ready, instruct him or her to assume a full side-bridge position, keeping both legs extended and the sides of the feet on the floor. The elbow of the lower arm should be positioned directly under the shoulder with the forearm facing out (the forearm can be placed palm down for balance and support), and the upper arm should be resting along the side or across the chest to the opposite shoulder.
- The hips should be elevated off the mat and the body should be in straight alignment (i.e., head, neck, torso, hips, and legs). The torso should only be supported by the participant's foot/feet and the forearm (Figure 9).
- The goal of the test is to hold this position for as long as possible. Once the participant breaks the position, the test is terminated.
- Encourage the participant to practice this position prior to attempting the test.

Test protocol and administration:

The tester starts the stopwatch as the participant moves into the side-bridge position.

- Terminate the test when there is a noticeable change in the trunk position.
  - ✓ A deviation from the neutral spine (e.g., the hips dropping downward)
  - ✓ The hips shifting forward or backward in an effort to maintain balance and stability
- Record the participant's time on the testing form.
- Repeat the test on the opposite side and record this value on the testing form.

Figure 9
Trunk lateral endurance test

Trunk Extensor Endurance Test

- The trunk extensor endurance test is generally used to assess muscular endurance of the torso extensor muscles (i.e., erector spinae, longissimus, iliocostalis, and multifidi). This is a timed test involving an isometric contraction of the trunk extensor muscles that stabilize the spine.

Equipment:

- Elevated, sturdy exam table
- Nylon strap
- Stopwatch

Pretest procedure:

After explaining the purpose of the test, explain the proper body position.

- The starting position requires the participant to be prone, positioning the iliac crests at the table edge while supporting the upper extremity on the arms, which are placed on the floor or on a riser.
- Secure the lower extremity with the legs supported on a table while the torso, or upper body, is suspended over the ground.
- While the participant is supporting the weight of his or her upper body, anchor the participant's lower legs to the table using a strap. If a strap is not used, the tester will have to use his or her own body weight to stabilize the participant's legs. Participant body size in relation to the tester may become a limiting factor in this particular test.
- The goal of the test is to hold this position for as long as possible. Once the participant falls below horizontal, the test is terminated.
- Encourage the participant to practice this position prior to attempting the test.

Test protocol and administration:

- When ready, the participant lifts/extends the torso until it is parallel to the floor with his or her arms crossed over the chest (Figure 10). This position requires activation of the torso extensor muscles (i.e., erector spinae, longissimus, iliocostalis, and multifidi).
- Start the stopwatch has soon as the participant assumes this position.
- Terminate the test when the participant can no longer maintain the position.
- Record the participant's time on the testing form.

Figure 10
Trunk extensor endurance test

Evaluation and Application of Performance for McGill's Torso Muscular Endurance Test Battery

Each individual test in this testing battery is not a primary indicator of current or future back problems. McGill (2007) has proven that the relationships among the tests are important indicators of muscle imbalances that can lead to back pain. In fact, even in a person with little or no back pain, the ratios can still be off, suggesting that low-back pain may eventually occur without diligent attention to a solid core-conditioning program. McGill (2007) suggests that the following ratios indicate balanced endurance among the muscle groups:

- Flexion/extension ratio should be less than 1.0.
  - ✓ For example, a flexion score of 120 seconds and an extension score of 150 seconds generate a ratio score of 0.80.
- Right-side bridge (RSB):left-side bridge (LSB) scores should be no greater than 0.05 from a balanced score of 1.0.
  - ✓ For example, an RSB score of 88 seconds and an LSB score of 92 seconds generate a ratio score of 0.96, which is within the 0.05 range from 1.0.
- Side bridge (either side): extension ratio should be less than 0.75.
  - ✓ For example, an RSB score of 88 seconds and an extension score of 150 seconds generate a ratio score of 0.59.

Demonstrated deficiencies in these core functional assessments should be addressed during exercise programming as part of the foundational exercises for a participant. The goal is to create ratios consistent with McGill's recommendations. Muscular endurance, more so than muscular strength or even ROM, has been shown to be an accurate predictor of back health (McGill, 2007). Low-back stabilization exercises have the most benefit when performed daily. When working with participants with low-back dysfunction, it is prudent to include daily stabilization exercises in their home exercise plans.

Stability and Mobility

Muscular fitness encompasses both muscular endurance and muscular strength. Muscular endurance represents a muscle's ability to resist fatigue and perform sustained work for many successive repetitions, while muscular strength defines a muscle's ability to overcome external resistance. Both are essential health-related fitness components. The following list describes the many benefits of muscular fitness:

- Enhances the ability to carry out ADL, which can increase self-esteem and foster a sense of independence
- Provides for musculoskeletal integrity, which can decrease the occurrence of common musculoskeletal injuries
- Enhances or maintains fat-free mass and ultimately increases resting metabolic rate, which is an important aspect of weight management
- Enhances glucose tolerance, which can protect against type 2 diabetes

Muscular-strength assessments typically involve a participant performing few repetitions with a very heavy load. For example, in one-repetition maximum testing, individuals lift a weight load that is so heavy it can only be lifted one time. Because the risk for injury is higher with muscular-strength testing, and because assessing muscular strength is not necessary—especially for participants new to exercise or those who are deconditioned or obese—muscular-strength testing is not addressed in this report. Muscular-endurance testing assesses the ability of a specific muscle group to perform repeated contractions to sufficiently invoke muscular fatigue. Assessment criteria are typically based on the number of repetitions that can be performed with correct form or the length of time a muscle contraction can be held while keeping the body in correct postural alignment (e.g., McGill's torso endurance battery described in the previous section). The muscular assessments in this section focus on tests that can be easily administered and are only moderately challenging for most deconditioned individuals. One of the most important things to observe during any muscular fitness test is that the participant is maintaining the integrity of joint movement during each repetition and/or the recommended posture for the specific exercise movement. In this respect, the following muscular fitness tests can also act as assessments of appropriate joint mobility and overall movement patterns. In essence, these assessments can be thought of as movement screens.

Modified Body-weight Squat Test

The modified body-weight squat test assesses muscular fitness of the lower extremity when performing repetitions of a squat-to-stand movement. It also allows the tester to observe a participant's movement pattern while he or she performs a squat, which is an essential movement required in many ADL. This test can be used to effectively gauge relative improvements in a participant's lower-extremity muscular fitness.

Equipment: None needed

Pretest procedure:

- After explaining the purpose of the modified body-weight squat test, explain and demonstrate the proper technique.
- Allow for adequate warm-up and stretching if needed (see pages 21–22).

Figure 11
a. Body-weight squat test—adequate depth

b. Anterior view

Test protocol and administration:

- Instruct the participant to perform six to 10 repetitions of a squat at a depth that is tolerable to his or her lower-extremity joints.
- Evaluate the depth of the squat using the following criteria (Figure 11a):
  - ✓ Knees flex between 0 and 45 degrees (poor)
  - ✓ Knees flex between 45 and 90 degrees (good)
- To enhance balance and stability, the participant may extend his or her arms to the sides or front for balance.
- The goal of the test is to complete as many controlled and proper repetitions (up to 10) as possible. Once the participant exhibits muscular fatigue (e.g., shakiness) or needs a pause to rest, terminate the test.

Test evaluation:

- After the repetitions are complete, ask the participant where he or she felt the muscles working the most. That is, did the participant feel the movement mainly in the lower back and upper area of the posterior hips, the front of the thighs and knees, or the lower area of the posterior hips and back of the thighs?
  - ✓ If the participant felt it mainly in the lower back and/or upper portion of the posterior hips, he or she is likely performing a lumbar-dominant squat.
  - ✓ If the participant felt it mainly in the front of the thighs and/or knees, he or she is likely performing a quadriceps-dominant squat.
  - ✓ If the participant felt it mainly in the lower portion of the posterior hips and/or the back of the thighs, he or she is likely performing a glute-dominant squat.
- The depth of the squat is also important in that it shows the participant's tolerance for loading the lower-extremity joints in a flexed position and the participant's ability to balance while lowering and raising his or her center of gravity in a squat movement pattern.
  - ✓ The lower the participant can squat while maintaining proper form, the better he or she is able to tolerate the squat movement pattern and to maintain balance while performing it.
  - ✓ Use the depth of squat information to compare to the participant's follow-up assessment to gauge relative improvement.
- Lastly, when viewed from the front, the alignment of the knees, ankles and feet during the squatting movement can indicate the amount of valgus or varus strain—if any—in the participant's lower extremities (Figure 11b).
  - ✓ Varus strain (i.e., femoral abduction and tibial adduction) is associated with knee pain and instability and excessive supination at the feet.
  - ✓ Valgus strain (i.e., femoral adduction and tibial abduction) is also associated with knee pain and instability, but it is more correlated with excessive pronation at the feet. Participants will most likely present with a valgus misalignment rather than a varus deviation, as valgus strain is more common in the general population.

Front Plank

The front plank test assesses the core musculature's ability hold the spine in neutral alignment when the body is in a forearm plank position. To perform the assessment, the participant adopts a prone plank position in which the forearms and toes are in contact with the floor. The elbows should be aligned directly underneath the shoulders and the body should maintain a straight line from shoulders to heels (i.e., the hips should not rise above or fall below shoulder level). Participants can also be given the option of supporting the lower body using the knees instead of the toes if they feel that attempting to hold the position on the toes will be too challenging.

Equipment:

- Stopwatch
- Exercise mat

Pretest procedure:

- After explaining the purpose of the front plank test, explain and demonstrate the proper technique.
- Allow for adequate warm-up and stretching if needed (see pages 21–22).

Test protocol and administration:

- Instruct the participant to adopt the forearm plank position. As soon as the participant is in the position and exhibiting proper alignment, start the stopwatch and cue the participant to hold the position for 30 seconds (or as long as possible) (Figure 12).
- The goal of the test is to hold the forearm plank position with the body in proper alignment for as long as possible, up to 30 seconds. If the participant breaks form and comes out of proper position, terminate the test and record the number of seconds attained.

Test evaluation:

- After the test is complete, ask the participant where he or she felt the muscles working the most. That is, did the participant feel the work mainly in the lower back or the abdomen?
- If the participant felt it mainly in the lower back, it is an indication that he or she lacks appropriate core stability.
- If the participant reports feeling it mainly in the abdominal muscles, it is an indication that he or she is recruiting the appropriate musculature to support the spine in the forearm plank position.
- If the participant is able to hold proper alignment throughout the duration of the test, it is an indication that his or her core muscles are able to effectively stabilize the spine. Evaluate the muscular fitness of the core using the following criteria:
  - ✓ Unable to hold proper alignment for 30 seconds (poor)
  - ✓ Able to hold proper alignment for 30 seconds (good)

Figure 12
Front plank with good alignment

Overhead Reach

The overhead reach test assesses the mobility of the shoulder joints in external rotation. Limited mobility in the shoulder is a common problem in individuals who execute daily tasks with poor posture and/or dysfunctional biomechanical movement patterns. For example, participants who work for extended periods in a slouched position with the arms in front of the body, such as those who sit at a desk working on a computer throughout the day, may present with limited external rotation of the shoulder because their arms are positioned in habitual internal rotation.

Equipment: Exercise mat

Pretest procedure:

- After explaining the purpose of the overhead reach test, explain and demonstrate the proper technique.
- Allow for adequate warm-up and stretching if needed (see pages 21–22).

Test protocol and administration:

- Instruct the participant to lie in the supine position with the knees bent and the feet flat on the floor about 18 inches in front of, and in line with, the hips. The hands should be placed on the mat alongside the body with the thumbs pointed up toward the ceiling. Cue the participant to keep the arms straight (i.e., elbows fully extended) and the lower back pressed into the mat as he or she reaches the arms as far as possible overhead (Figure 13).
- The goal of the test is to see how far the participant can reach his or arms overhead in a position of external rotation at the shoulder joint. If the participant cannot touch the thumbs to the floor, it indicates limited ROM at the shoulder joint. Inadequate shoulder flexibility is also indicated if the participant allows the back to arch upward off the floor while reaching overhead, thus effectively furthering his or her reach by repositioning the spine instead of moving through the shoulder joints.

Test evaluation:

- After the test is complete, ask the participant where he or she felt the stretch the most. That is, did the participant feel the work mainly in the shoulders or the back?
- If the participant felt it mainly in the back and the back arched upward off the floor, it is an indication that he or she lacks appropriate shoulder mobility and core stability.
- If the participant felt it mainly in the shoulders, was able to keep the back flat on the mat, yet could not touch the thumbs to the floor, it indicates a lack of adequate shoulder mobility.
- If the participant felt it mainly in the shoulders, was able to keep the back relatively flat on the mat, and could touch the thumbs to the floor, it indicates good shoulder mobility.

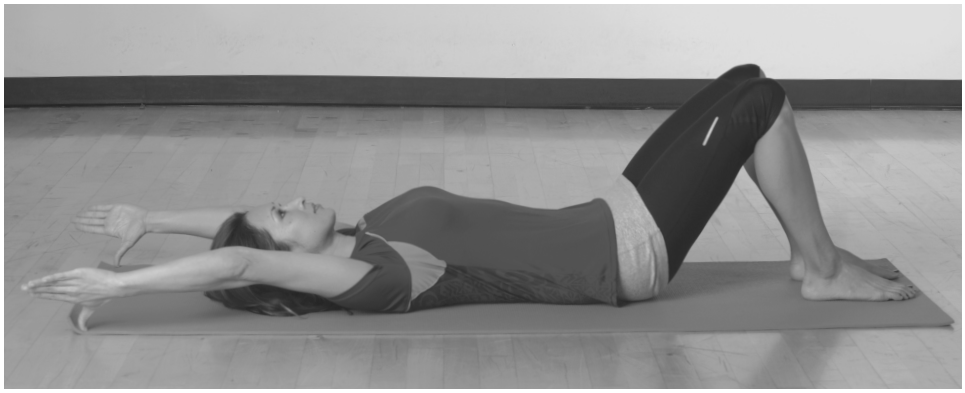


Figure 13
Overhead reach with adequate ROM

Fitness Testing Accuracy

There are many causes of inaccuracy in fitness testing, ranging from equipment failure to human error (Table 3). Most participants are motivated by improvements in their fitness assessments. Participants like to see that the hard work and dedication to their fitness programs have paid off. There may be test inaccuracies, but repeating the same test, in the same environment, and at the same time of day, will ensure test reliability when compared to earlier test outcomes. For example, even if optimal results are not always attainable, a participant who sees his or her performance assessment move from "below average" to "average" will likely be thrilled with the results and motivated to continue with a regular program of exercise. The following section addresses reassessment guidelines.

Table 3

Causes of Fitness Test Inaccuracy
Participant
Fatigue, lack of sleep
Motivation, lack of conviction
Excess activity prior to test
Food intake prior to test
Hydration level
Chronic health condition(s)
Medications or supplements
Test Technician
Inexperience with testing protocol
Poor application of testing protocol
Partiality; trying to affect results
Level of encouragement
Equipment
Improper calibration
Mismatched to subject
Failure, out of order
Environment
Distractions
Privacy
Temperature
Weather conditions

Reassessment

There is little value in conducting reassessments too often. However, waiting too long between follow-up assessments can also be problematic. In order to give the body enough time to physiologically adapt to a new stimulus (e.g., healthier eating or an exercise program), a minimum of four to six weeks must pass from the introduction of a new program to the time of reassessment. From a practical standpoint, monthly re-evaluations are typically too frequent and they often do not show significant improvement. Therefore, the performance of follow-up assessments every three months (i.e., once per quarter) is the minimum recommended schedule for physical-fitness retesting. Limiting scheduled reassessments to twice per year or once per year are also options, but it should be noted that waiting this long between testing can make it difficult to modify and fine tune a participant's program, if needed, and to evaluate if a participant is on the right path toward achieving his or her goals. At the very least, biannual assessment should be considered to help participants remain focused on improving or maintaining initial testing results.

Using Assessment Data to Guide Exercise Programming

If, through conducting the physical-fitness assessments recommended in this report, it is noted that an EMS practitioner exhibits deficiencies in any one area, an exercise program can be implemented to help reduce those deficiencies over time. For example, a participant who scores poorly on core function testing can engage in a program to activate the core musculature, thus improving core function on and off the job. Apart from a self-reported decrease in pain and dysfunction and increase in job performance and ADL, repeating the same tests for core function after at least three months of training is a good way to gauge the effectiveness of the exercise program.

The exercise guidelines suggested in Appendix B are provided to address the areas that EMS practitioners may benefit from the most in terms of reducing injury and increasing on-the-job performance. They coincide with the general physical-ability categories measured in the physical-fitness assessments provided in this report. Therefore, EMS practitioners can choose exercises from Appendix B that will specifically address their areas of deficiency.

Appendix B: Exercise Program Recommendations and Guidelines

Health–Fitness–Performance Continuum

The health–fitness–performance continuum is based on the premise that exercise programs should follow a progression that first improves health, then develops and advances fitness, and finally enhances performance (Figure 14). Each individual will have different needs based on his or her personal health, fitness, and goals. Therefore, each person will start his or her exercise program at a unique point along the continuum. The first component of this continuum is exercise for improved health, which serves as the foundation of every exercise program, even if the participant's ultimate goal is to achieve optimum athletic performance for a specific competition. For a participant who has been sedentary, improved health should be a primary program goal. For participants who have progressed into the fitness or performance domains, their comprehensive training programs should still feature components that maintain or help improve health as well as address their specific fitness or athletic goals.

Figure 14
The health–fitness–performance continuum

Applications for EMS Practitioners

For the purposes of this report, the information presented on specific exercise programming will focus primarily on the EMS practitioner's ability to successfully fulfill his or her occupational requirements. This format is targeted because there seems to be the most need for this type of programming based on ACE's site visits and interviews, as well as the Department of Labor Statistics findings on EMS worker injuries. If followed, these recommendations will work to improve EMS practitioner health, increase productivity, and reduce the potential risk for work-related musculoskeletal injury and stress. The subsequent sections provide physical-activity guidelines and behavioral strategies for individuals who have weight-loss goals, followed by recommendations for cardiorespiratory exercise, core activation techniques, and movement training.

Weight Loss

For improved health, a minimum of 150 minutes of physical activity per week, or 30 minutes of physical activity on most days of the week is advised (U.S. Department of Health & Human Services, 2008; Haskell et al., 2007). For obese individuals, a progression to approximately 250 to 300 minutes of physical activity per week, or 50 to 60 minutes five days each week, may be necessary for long-term weight loss success. In some cases, 60 to 90 minutes of daily exercise may be required (Zoeller, 2007).

There is a general consensus among the U. S. Department of Agriculture, American College of Sports Medicine (ACSM), and International Association for the Study of Obesity that a weekly energy expenditure of ≥2,000 calories per week, which equates to approximately 60–90 minutes per day of moderate-intensity physical activity, may be required for long-term weight loss (U.S. Department of Agriculture, 2010; ACSM, 2009; Sarris et al., 2003). The basis for these recommendations is also supported by the National Weight Control Registry (NWCR), a cohort of approximately 10,000 "successful losers" who have lost an average of 66 pounds and maintained this loss for approximately 5.5 years. The NWCR found that while dietary control was an important factor in the maintenance of weight loss, one of the most significant findings was that successful losers maintained consistently high daily physical-activity levels. In fact, 90% of the NCWR subjects exercise, on average, about 1 hour per day and 62% report watching fewer than 10 hours of television per week (NCWR, 2012).

The primary mode of initial activity to facilitate weight loss is aerobic, or endurance, exercise, which includes activities such as walking, running, bicycling, and elliptical machine training. Aerobic conditioning maximizes caloric expenditure in individuals who have obesity or are new to exercise, and reduces the risk of chronic disease associated with obesity (e.g., CVD, type 2 diabetes, and the metabolic syndrome). It is important that all new exercisers have initial positive experiences that promote adherence through achievable initial successes. This can be achieved, in part, by recommending that participants begin working at an exercise intensity that is appropriate for their tolerance levels and physical-fitness limitations.

Targeting Behaviors for Change in Overweight/Obese Individuals

The two main program components that have been shown to be successful for sustained weight-loss in overweight and obese individuals are modest reductions in energy intake and adequate levels of physical activity (ACSM, 2009; NHLBI, 1998). These two behaviors require a significant lifestyle change, which is perhaps the reason why losing weight and maintaining weight loss proves to be incredibly difficult for most people. Nonetheless, an overweight or obese participant who is interested in losing weight must target changing eating and exercise behaviors in order to be successful in the long term.

Setting Goals for Metabolic Success

The following recommendations have been set forth by ACSM (2010) to guide overweight and obese individuals in their efforts with weight loss.

- Adults with a BMI ≥25 kg/m^2 should be encouraged to engage in a weight-loss program.
- An initial weight-reduction goal of 5 to 10% of body weight should be targeted over a three- to six-month period.
- Following the initial weight-loss period, participants should be encouraged to enhance communication between their healthcare professionals, nutrition experts, and exercise professionals.
- Dietary changes resulting in a reduction of current caloric intake by 500 to 1,000 calories per day* and a decrease in dietary fat to <30% of total caloric intake should be targeted.

* Total caloric intake of less than 1,200 claories per day should be supervised by a physician.

- Increasing physical activity to a minimum of 150 minutes per week of moderate-intensity exercise should be encouraged.
- A progression to higher amounts of exercise (i.e., 200–300 minutes per week or ≥2,000 calories per week of physical activity) should be recommended to facilitate long-term weight control.
- Resistance training can be implemented as a supplement to the combination of aerobic endurance exercise and modest caloric reduction. While it is not the primary form of exercise recommended for weight loss, a program of regular resistance training can help to preserve muscle mass as a person loses body weight, which has positive implications for improving muscular fitness and body composition and helping maintain resting metabolic rate.
- Behavioral modification strategies (such as those described in the *Self-reliance* section of this report) should be incorporated to promote the adoption and maintenance of the lifestyle changes associated with long-term weight control.

EMS practitioners can use these recommendations to set effective lifestyle-change goals. Furthermore, EMS personnel in supervisory positions can help coordinate communication between employees with similar goals so that they stay connected and support each other as they progress through their weight-loss achievements.

Cardiorespiratory Fitness

For novice exercisers, improving on cardiovascular fitness should be addressed in a twofold manner. The first goal is to gradually increase exercise duration. This allows the body to adapt to the new demands of exercise and respond accordingly to the physiological stress of training (e.g., increase in capillary density, increase in mitochondrial size/number, and enhanced ability to remove lactic acid). Initially, training volume can be increased by 10 to 20% per week, until the desired training volume is achieved.

For those who already have a solid cardiorespiratory training base, the second phase of training focuses on increasing exercise intensity, in an effort to increase aerobic fitness (i.e., maximum oxygen capacity). As long as there are no contraindications to higher-intensity training, it is appropriate to incorporate moderate-intensity steady-state training as well as interval training. Peer fitness trainers should keep in mind that even among the obese population, physical fitness exists in a continuum, meaning that individuals have different abilities and some are able to tolerate more exertion than others. For participants who are not capable of achieving the minimum recommendation of 150 minutes of weekly moderate-intensity activity (i.e., 30 minutes of endurance exercise, five days per week), reaching this level of activity should be the primary goal during the initial conditioning stage. Overweight and obese adults may find that accumulating 30 minutes of activity in multiple daily bouts of at least 10 minutes in duration is preferable to exerting themselves for longer time periods. This approach is appropriate, at least in the beginning of the training program, as it may be better tolerated and is likely to promote positive feelings associated with successfully accomplishing a healthy task (ACSM, 2010).

Three-zone Intensity Model

A fairly reliable intensity marker (especially for beginning exercisers) is the ability to talk during exertion. For simplicity, exercisers can use a three-zone model to gauge appropriate exertion during cardiorespiratory activity, where:

- Zone 1 is relatively low-intensity exercise, during which the exerciser can talk comfortably.
- Zone 2 is moderate-intensity exercise, during which the exerciser is not sure if talking is comfortable.
- Zone 3 is vigorous-intensity exercise, during which the exerciser definitely cannot talk comfortably.

Aerobic-base Training

Initially, individuals who are either sedentary or have little cardiorespiratory fitness should begin engaging in regular cardiorespiratory exercise of low-to-moderate intensity with a primary goal of improving health and a secondary goal of building fitness. The intent of this phase is to develop a stable aerobic base upon which the participant can build improvements in health, endurance, energy, mood, and caloric expenditure.

Once regularity of exercise habits is established, the duration of exercise is extended until the individual can perform 20 to 30 continuous minutes of cardiorespiratory exercise on most days with little residual fatigue, at which point they can progress to the next phase. This approach to training ensures the safety of exercise, while at the same time allowing some of the potential physiologic adaptations and most of the health benefits to occur. Within this general design is recognition that the benefit-to-risk ratio of low-intensity zone-1 training is very high for the beginning exerciser, with the possibility for very large gains in health and basic fitness and almost no risk of either cardiovascular or musculoskeletal injury. As the exerciser develops more ambitious goals, more demanding training (either longer or more intense) can be performed. Table 4 presents a sample training program for an exerciser who is just beginning regular cardiorespiratory exercise.

Table 4

Sample Initial Cardiorespiratory-training Progression

Training Parameter	Week 1	Week 2	Week 3	Week 4	Week 5
Frequency	4 sessions	4 sessions	4 sessions	4 sessions	4 sessions
Duration of Sessions	15 min	16.5 min	18 min	20 min	22 min
Duration Total for Week (10% weekly increase)	60 min	66 min	72 min	80 min	88 min
Intensity Zone	1	1	1	1	1

Aerobic-efficiency Training

The next phase of training has a principal focus of increasing the duration of cardiorespiratory exercise while introducing intervals to improve the ability to exercise at greater workloads to improve fitness and increase caloric expenditure. However, it is important to understand that after an aerobic base has been achieved, additional gains in fitness will require increases in training intensity, frequency, or duration. Exercise in this phase is representative of training for regular exercisers in a fitness facility who have goals for improving or maintaining fitness and/or weight loss.

Cardiorespiratory training in this phase includes increasing the workload by modifying frequency, duration, and intensity, with intervals introduced that go into zone 2. Individuals training in this phase who have a goal to complete an event, such as a 10K run, can reach their goal of completing the event within the training guidelines of this phase. Additionally, for the many participants who never develop competitive goals or the desire to train like an endurance athlete, training in this phase will provide very adequate challenges to help them improve and maintain cardiorespiratory fitness for many years. The workouts in most non-athletically focused group exercise classes fall into this phase.

As a general principle, intervals should start out relatively brief (initially about 60 seconds), with an approximate hard-to-easy ratio of 1:3 (e.g., a 60-second work interval followed by a 180-second recovery interval), eventually progressing to a ratio of 1:2 and then 1:1. The duration of these intervals can be increased in regular increments, depending on the goals of the exerciser, but should be increased cautiously over several weeks depending on the participant's fitness level. As a general principle, the exercise load (the integrated time in the zone) should be increased by no more than 10% per week. Table 5 presents a sample training program for an exerciser who is beginning regular aerobic-efficiency exercise.

Table 5

Sample Cardiorespiratory-training Progression for Aerobic Efficiency

Training Parameter	Week 1	Week 2	Week 3	Week 4	Week 5
Frequency	3 sessions	3 to 4 sessions	3 to 4 sessions	4 sessions	4 to 5 sessions
Duration of Sessions (10% increase)	30 min	33 min	36 min	40 min	44 min
Intensity Zone	1	1 and 2	1 and 2	1 and 2	1 and 2
Work-to-recovery Intervals	None	1:2 2- to 3-min intervals	1:2 3- to 4-min intervals	1:1½ 3- to 4-min intervals	1:1 4- to 5-min intervals

Core Training

The goal of functional movement and resistance training is to promote stability of the lumbar spine by improving the reflexive function of the core musculature that essentially serves to stabilize this region during loading and movement. The core functions to effectively control the position and motion of the trunk over the pelvis, which allows optimal production, transfer, and control of force and motion to more distal segments during whole-body movements (Willardson, 2007; Kibler, Press, & Sciascia, 2006). The term "core" generally refers to the muscles of the lumbo-pelvic region, hips, abdomen, and lower back. Table 6 on page 37 summarizes important core-activation exercises and provides guidelines for their implementation.

Movement Training

In movement training, the entire kinetic chain is integrated into dynamic patterns. As noted earlier in the report, human movement can essentially be broken down into five primary movements that encompass all ADL (Figure 15). Movements can be as simple as one primary movement or as complex as the integration of several of them into a single motion. The five primary movements are as follows:

- Bend-and-lift movements (e.g., squatting)
- Single-leg movements (e.g., single-leg stance and lunging)
- Pushing movements
- Pulling movements
- Rotational movements

Figure 15
Five primary movement patterns


a. Bend-and-lift movement


b. Single-leg movement


c. Pushing movement


d. Pulling movement


e. Rotational movement

What is universal to all individuals is the need to train these movement patterns as a prerequisite to all resistance-training exercises that involve an external load. In essence, if a participant can perform these five primary movements effectively and possesses the appropriate levels of stability and mobility throughout the kinetic chain, it improves his or her potential for efficient movement and decreases the likelihood for compensation, pain, or injury (Gray & Tiberio, 2007). This type of training typically uses body weight as resistance and the levers within the body (e.g., the arms) as drivers to increase exercise intensity (Gray & Tiberio, 2007). However, some of the movements, such as those related to pulling and pushing, can be performed properly with light resistance as indicated in the following exercise descriptions.

Illustrations for the following exercises and guidelines for their performance can be found at their associated links in the ACE Exercise Library on ACE's website www.acefitness.org. Properly performing these recommended exercises on a regular basis (i.e., at least two times per week) will help EMS practitioners enhance their work-related physical-function requirements. Table 6 summarizes the recommended exercises and provides guidelines for their implementation.

Table 6	
Physical-training Exercises and Guidelines	
Exercise Category	**Exercise Name**
Core-activation	Birddog
	Front Plank
	Side Plank with Bent Knee
Bend-and-lift	Dumbbell Deadlift
	Dumbbell Front Squat
Single-leg	Single-leg Stand
	Forward Lunge
Push	Push-up
	Standing Barbell Shoulder Press
Pull	Single-arm Dumbbell Row
	Seated High-back Row
Rotation	Standing Wood Chop
	Hip Rotations
Mobility	Cobra
	Child's Pose
	Downward-facing Dog
	Seated Side-straddle Stretch
Training Parameter	**Exercise Guidelines**
Frequency	At least 2 days per week
Intensity	Moderately challenging with the ability to complete all recommended repetitions
Repetitions	Complete 12 to 20 repetitions of each exercise
Sets	Complete at least one set of at least one exercise from each category listed above; if time permits, complete 1 to 2 sets of all exercises from each category listed above
Type	Include core activation, movement-pattern, and mobility exercises from the list above

Note: Illustrations and performance guidelines are available for all exercises listed in this table on the ACE website at www.acefitness.org.

Links to the Specific Exercises

- Exercises that activate the core:
  - ✓ Birddog www.acefitness.org/exerciselibrary/14/bird-dog
  - ✓ Front Plank www.acefitness.org/exerciselibrary/32/front-plank
  - ✓ Side Plank with Bent Knee www.acefitness.org/exerciselibrary/100/side-plank-with-bent-knee
- Exercises that address the bend-and-lift movement pattern:
  - ✓ Dumbbell Deadlift www.acefitness.org/exerciselibrary/20/dumbbell-deadlift
  - ✓ Dumbbell Front Squat www.acefitness.org/exerciselibrary/22/dumbbell-front-squat
- Exercises that address the single-leg movement pattern:
  - ✓ Single-leg Stand www.acefitness.org/exerciselibrary/112/single-leg-stand
  - ✓ Forward Lunge www.acefitness.org/exerciselibrary/94/forward-lunge
- Exercises that address the push movement pattern:
  - ✓ Push-up www.acefitness.org/exerciselibrary/41/push-up
  - ✓ Standing Barbell Shoulder Press www.acefitness.org/exerciselibrary/71/standing-barbell-shoulder-press
- Exercises that address the pull movement pattern:
  - ✓ Single-arm Dumbbell Row www.acefitness.org/exerciselibrary/126/single-arm-dumbbell-row
  - ✓ Seated High-back Row www.acefitness.org/exerciselibrary/46/seated-high-back-row
- Exercises that address rotation movement pattern:
  - ✓ Standing Wood Chop www.acefitness.org/exerciselibrary/108/standing-wood-chop
  - ✓ Hip Rotations (Push-up Position) www.acefitness.org/exerciselibrary/110/hip-rotations-push-up-position
- Exercises that address mobility:
  - ✓ Cobra www.acefitness.org/exerciselibrary/16/cobra
  - ✓ Child's Pose www.acefitness.org/exerciselibrary/227/childs-pose
  - ✓ Downward-facing Dog www.acefitness.org/exerciselibrary/18/downward-facing-dog
  - ✓ Seated Side-straddle Stretch www.acefitness.org/exerciselibrary/212/seated-side-straddle-stretch

Movement-training Program Design for Beginners

The FIRST acronym can be used to guide exercise program design: frequency, intensity, repetitions, sets, and type.

- Frequency: Two to three days per week is adequate for the beginning stages of a movement-training program. Considering that many participants who are deconditioned and have a weight-loss goal will also be engaging in regular cardiorespiratory training, a frequency of two days per week may be a more appropriate recommendation.
- Intensity: Since the goal is to focus on coordination and muscular conditioning for the basic movement patterns, participants should not use any external load while performing the exercises.
- Repetitions: An appropriate repetition range for movement training is 12 to 20 repetitions.
- Sets: A range of two to three sets is appropriate for each movement-training exercise.
- Type: Exercise selection should focus on core activation, mobility, and the five basic movement patterns: squats, lunges, pushes (both in the horizontal plane and overhead), pulls, and rotational movements.

Program Design Progression: Adding Resistance to Movement Training

When the five primary movements can be performed with proper form, external resistance may be applied for progressive strength development. It is essential that external loads are increased gradually so that correct movement patterns are not altered during the exercise performance.

- *Squat:* External loading may be applied with various types of resistance equipment. A participant may begin by holding a medicine ball while doing squats. Another resistance option is placing an elastic band under the feet and holding each end of the band while performing squats. A third resistance tool is free weights, beginning with dumbbells and progressing to barbell squats when the legs can handle more resistance than the hands can hold. An alternative exercise to the barbell squat is the leg press, which trains the same pattern of movement without the direct pull of gravity, while strengthening the quadriceps, hamstrings, and gluteus maximus muscles.
- *Lunge:* Lunge movements (in any direction) may be performed with external loads by holding a medicine ball or dumbbells. Initially, resistance bands and barbells are not recommended tools for lunge movements, as lunging is a high balance-challenge activity and the unpredictable forces of elastic resistance and the awkward length of barbells might make it too difficult for participants who have minimal experience with lower-extremity exercise.
- *Pushing movements*: Pushing movements may be performed with added resistance by using resistance bands or cables in a standing position, by performing machine chest presses from a seated position, or by lifting free weights (dumbbells or barbells) from a lying (supine) position. Medicine balls may also be used for pushing movements from a supine position, and from a standing position by performing a chest pass (releasing the medicine ball).
- *Pulling movements:* Pulling movements may be performed with external loads by using resistance bands or cables in a standing position, by performing machine rows and pull-downs from a seated position, and by lifting dumbbells from a bent-over standing position with the torso parallel to the floor and supported by one arm (bent-over row exercise). Medicine balls and barbells are not recommended for beginners for rowing exercises, because one arm is not free for torso support.
- *Rotational movements:* External resistance may be applied to rotational movements by using resistance bands or cables in a standing position, by using machines from a seated position, or by lifting medicine balls from a variety of positions (standing, seated, and lying). It can be difficult to use barbells in rotational movements, but dumbbells can be used in movements that directly oppose gravity's line of pull.

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M12-096

Physical Assessment Score Sheet

Name: _____ Date: _____

WAIST CIRCUMFERENCE

Measurement: _____ inches or _____ cm

	Heart Disease Risk
Males	Waist measurements ≥40 inches (102 cm) indicate an increased risk
Females	Waist measurements ≥35 inches (86 cm) indicate an increased risk

Does waist circumference indicate increased risk (✓)? _____ Yes _____ No

STATIC POSTURAL ASSESSMENT

Lateral view notes:

Anterior view notes:

Posterior view notes:

STORK-STAND BALANCE TEST Time to completion: _____

	Excellent	Good	Average	Fair	Poor
Males	>50 seconds	41–50 seconds	31–40 seconds	20–30 seconds	<20 seconds
Females	>30 seconds	25–30 seconds	16–24 seconds	10–15 seconds	<10 seconds

Rating (✓): _____ Excellent _____ Good _____ Average _____ Fair _____ Poor

---

SHARPENED ROMBERG TEST Time to completion: _____

	Static Balance and Postural Control Criteria
Good	The participant maintains balance with good postural control and does not exhibit any of the test-termination criteria for 30 or more seconds.
Poor	The participant is unable to reach 30 seconds without exhibiting test-termination criteria.

Rating (✓): _____ Good _____ Poor

MCGILL'S TORSO MUSCULAR ENDURANCE TEST BATTERY

Trunk flexor endurance test

Time to completion: _____

Trunk lateral endurance test

Right side time to completion: _____ Left side time to completion:_____

Trunk extensor endurance test

Time to completion: _____

Ratio of Comparison	Criteria for Good Relationship Between Muscles
Flexion/extension	Ratio less than 1.0
Right-side bridge:left-side bridge	Scores should be no greater than 0.05 from a balanced score of 1.0
Side bridge (either side)	Extension ratio should be less than 0.75

Flexion/extension ratio: _____ Rating (✓): _____ Good _____ Poor

Right-side bridge/left-side bridge ratio: _____ Rating (✓): _____ Good _____ Poor

Side-bridge (either side)/extension ratio: _____ Rating (✓): _____ Good _____ Poor

---

MODIFIED BODY-WEIGHT SQUAT

Depth of squat: _____degrees Number of repetitions: _____

Where does the participant report feeling the muscles working the most?

Rating (✓): _____ Lumbar dominant _____ Quadriceps dominant _____ Glute dominant

Knee alignment from anterior view:_____

Overall Squat Rating (✓): _____ Good _____ Poor

_____

FRONT PLANK

Time to completion: _____

Where does the participant report feeling the muscles working the most?

_____

	Front Plank Criteria
Good	The participant holds the plank position with proper alignment for 30 seconds.
Poor	The participant breaks form and comes out of proper position before 30 seconds.

Rating (✓): _____ Good _____ Poor

_____

OVERHEAD REACH

Do the thumbs touch the floor? _____

Does the participant arch the back? _____

	Overhead Reach Criteria
Good	If the participant felt it mainly in the shoulders, was able to keep the back relatively flat on the mat, and could touch the thumbs to the floor, it indicates good shoulder mobility.
Poor	If the participant felt it mainly in the back and the back arched upward off the floor, it is an indication that he or she lacks appropriate shoulder mobility and core stability. If the participant felt it mainly in the shoulders, was able to keep the back flat on the mat, yet could not touch the thumbs to the floor, it indicates a lack of adequate shoulder mobility.

Analysis of shoulder flexibility (✓): _____ Good _____ Poor