Musculoskeletal Strength and Conditioning

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Musculoskeletal Strength and Conditioning

- Focus: Prescription of individualized exercise to apparently healthy adults of all ages
- Scientific evidence demonstrating the beneficial effects of exercise is indisputable; Indeed Exercise is Medicine, 2008 ACSM initiative
- Program of regular exercise should include elements of cardiorespiratory, resistance, flexibility, and neuromotor training activities
- Activities beyond ADLs are essential to improve and maintain physical fitness and health for most adults
- Activities should target major muscle groups
- Neuromotor exercises involving balance, agility and coordination---sports, Pilates, yoga & Tai Chi---2-3 days/week for 20-30 mins/episode
- Adults who fail to meet the guidelines can still benefit from activity of shorter duration
Conditioning Recommendations (ACSM_2011)

Cardiorespiratory Training (Aerobic)

• **Moderate intensity** cardio ≥ 30 min/day ≥5 days/week for a total of 150 min/wk

• **Vigorous intensity** cardio ≥20 min/day ≥3 days/week for a total of ≥75 min/wk

• **Combination** of moderate and vigorous intensity cardio 3-5 days/week (Target Volume ≥500-1000 MET/min/wk)

• Multiple 10 min sessions per day may be used to total the 30 mins/day goal
What is a MET

MET = Short for “metabolic equivalent”, a unit used to estimate the metabolic cost of physical activity. The value of 1 MET is approximately equal to a person’s resting energy expenditure. Activities are categorized as multiples of resting energy expenditure. An activity like walking is considered to be 4 METs because it requires an energy expenditure 4 times greater than that required at rest.
Higher Intensity Training Sessions

- Interval training
- Fartlek training
- Last man up running
- Cross country running
- Road marching

**Recommendation:** perform higher intensity training no more than 2 times weekly.

U.S. Army Field Manual 21-20: Physical Fitness Training
Medevac
Strengthening Recommendations (ACSM_2011)

Resistance Training

- 2-3 days/week
- Intensity: To improve strength
  - a) Novice; moderate to hard = 60-70% of 1 RM
  - b) Experienced; hard to very hard ≥ 80% of 1 RM
  - c) Older; very light to light = 40%-50% 1RM

- Improve muscular endurance; Light to moderate < 50% of 1RM
- Improve power in older adults; 20-50% of 1 RM
What is a 1 RM

Repetition Maximum (RM): maximal number of times that one can move a load with proper form & technique before failure
Resistance Training (cont)

- Repetitions
  - Goal---improve strength and power in *most* adults---8-12 reps
  - Goal---improve strength in middle aged and older adults---10-15 reps
  - Goal---improve muscular endurance---15-20 reps

- Sets
  - Recommendation for *most* adults = 2-4 sets to improve strength/power
  - A single set can be effective with novice lifters and older adults
  - ≥ 2 sets are effective at improving muscular endurance

- Rest
  - 2-3 min between sets
  - ≥ 48hrs between sessions for same targeted muscle group
Flexibility

- Dynamic warm-up favored over static stretches
- Static, prolonged stretches after activity, cool down, for ROM maintenance
- **Recommendation**: 2-3 days/week, 10-30 seconds hold per repetition for each major muscle-tendon complex; 30-60 second hold for older adults; 2-4 repetitions
Physical Therapy in Iraq
Progression Models in Resistance Training

• The optimal characteristics of strength-specific programs include the use of concentric (CON), eccentric (ECC), and isometric muscle actions...performance of bilateral and unilateral, single and multiple-joint exercises.
Progression Models in Resistance Training

• Sequence exercises to optimize the preservation of exercise intensity
  – large before small muscle group exercises
  – multiple-joint exercises before single-joint exercises
  – higher-intensity before lower-intensity exercises
Safety Tip: have a spotter
Progression Models in Resistance Training

When training at a specific RM load, it is recommended that 2–10% increase in load be applied when the individual can perform the current workload for one to two repetitions over the desired number.
Progression Principles

• The foremost principles of RT progression are progressive overload, specificity, and variation.

• The magnitude of improvement depends upon the individual’s training status and genetic predisposition.
Genetics: Sponge Bob ≠ Arnold
Progressive Overload

- Progressive overload is the gradual increase of stress placed upon the body during exercise training.

- Systematically increasing the demands placed upon the body is necessary for further improvement.
Far Forward PT and Girl Scout Cookies

SSG Munguia, PTA
SGT Douglas, PTA
Progressive Overload Variables

- exercise intensity
- total repetitions performed
- repetition speed/tempo
- rest periods
- training volume (reps x load)
Specificity

- All training adaptations are specific to the stimulus applied. Factors determining physiological adaptations include:

  1) muscle actions involved
  2) speed of movement
  3) range of motion
  4) muscle groups trained
  5) energy systems involved
  6) intensity and volume of training

- The most effective RT programs are those that are designed to target-specific training goals.
Variation

• Variation, or periodization, entails the systematic process of altering one or more program variable(s) over time to allow for the training stimulus to remain challenging and effective.

• Systematic variation of volume and intensity is most effective for long-term progression.

• Two most commonly studied variables have been volume and intensity.
Jordan-Hare Stadium
Periodization

• The concept of periodization was developed based on the studies of general adaptation syndrome to optimize performance and recovery

• Hans Selye... experiments with rats led to recognition of the "general adaptation syndrome," later renamed by Selye to the “stress response”

• Seyle performed extensive structure-activity studies in the 1930s-1940s, resulting in the first rational classification of steroid hormones
Classic Periodization

- Characterized by high initial training volume and low intensity (high reps, low load) and as training progresses, volume decreases and intensity gradually increases (lower reps, higher load)

- Other types of periodization
  - Reverse periodization
  - Undulating periodization
High Dive Platform
Periodized Resistance Training

• Need for variable-intensity loading schemes over time

• Use of a variety of training loads is most conducive to maximizing muscular strength, contrary to early suggestions of 6 RM loading

• **ACSM recommendation.** Novice to intermediate lifters should include free-weight and machine exercises
Special Considerations

- Programs for muscle hypertrophy, muscular power, muscular endurance...
- Plyometrics for vertical jump
- Ballistic resistance exercise
- Sport specific activities
- Programs for healthy, older adults
Primary Sources


Summary

• Thank You!

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