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ACSM Information On...

Resistance Exercise for Persons with Spinal Cord Injury

Resistance training is important for persons with spinal cord injury (SCI). In general, regular resistance exercise improves ability to complete daily living activities, enhances body composition, and enhances motor function.

A COMPLETE PHYSICAL ACTIVITY PROGRAM
 A well-rounded physical activity program includes aerobic exercise and strength training exercise, but not necessarily in the same session. This blend helps maintain or improve cardiorespiratory and muscular fitness and overall health and function. Regular physical activity will provide more health benefits than sporadic, high intensity workouts, so choose exercises you are likely to enjoy and that you can incorporate into your schedule.

ACSM's physical activity recommendations for healthy adults, updated in 2011, recommend at least 30 minutes of moderate-intensity physical activity (working hard enough to break a sweat, but still able to carry on a conversation) five days per week, or 20 minutes of more vigorous activity three days per week. Combinations of moderate- and vigorous-intensity activity can be performed to meet this recommendation.

Examples of typical aerobic exercises are:

- Walking
- Running
- Stair climbing
- Cycling
- Rowing
- Cross-country skiing
- Swimming.

In addition, strength training should be performed a minimum of two days each week, with 8-12 repetitions of 8-10 different exercises that target all major muscle groups. This type of training can be accomplished using body weight, resistance bands, free weights, medicine balls or weight machines.

In addition to these benefits, resistance training improves aerobic fitness in persons with SCI as much as, if not more than, aerobic exercise. When combined with circuit training, resistance exercise is an excellent training modality to improve health-related physical fitness, reduce secondary disease risk and slow typical age-related declines in function thereby enhancing independence and reducing risk of inactivity.

RESISTANCE TRAINING: THE PRESCRIPTION

Resistance training includes any type of resistance to muscular contraction and includes activity incorporating body resistance exercise, circuit training, free weights, plyometrics, resistance bands or weight machines. A resistance training prescription is typically called a 'training program' and is designed to achieve specific outcomes in muscular strength, power, endurance or some combination of the three called muscular fitness. In general, a resistance training prescription or program includes manipulation of key training variables included in the Physical Activity Guidelines and ACSM recommendations.

General Resistance Training Program

Prescription Component	ACSM Recommendation
Exercise Choice	Choice of free weights (e.g., dumbbells) or machine weights
Exercise Frequency	2 to 3 days per week
Exercise Intensity	8 to 12 repetition maximum (RM) or 60-80% of one-repetition maximum (1-RM)
Exercise Order	Larger muscle group exercises should be completed prior to small muscle group exercises. Multi-joint exercises should be completed prior to single-joint exercises.
Number of Repetitions	8 to 12
Number of Sets	2 to 4 sets although 1 set is sufficient for beginning exercisers
Rest Periods between Sets	2 to 3 minutes

PRESCRIPTION MODIFICATIONS FOR PERSONS WITH SCI

The general training program has been recommended to maximize health-related physical fitness and reduce disease risk in persons with and without disabilities. Persons with SCI, however, can also make some adjustments to this prescription to maximize functional and performance outcomes.

The primary modification for persons with SCI centers on exercise order. Circuit training, rather than large and small muscle group exercise, is recommended for persons with SCI. Circuit training is simply a series of low-intensity resistance exercises (i.e., generally 40 to 60% of the one-repetition maximum) inter-mixed with aerobic exercise. This exercise order has been used extensively in programs for persons with paraplegia and typically has included 3 circuits or rounds of approximately 6 resistance exercises separated by two minutes of aerobic exercise. Aerobic exercise, in this case, usually implies arm ergometry, hand-cycling or wheelchair pushing. This minor adjustment to exercise order, in conjunction with the reduced rest period between sets (less than 30 seconds), can result in important fitness benefits for persons with SCI.

A secondary modification involves exercise choice. Options for exercise choices are increasing in both therapeutic and general fitness settings. Some of the more common exercise choices for persons with SCI now include:

- Adaptive machine weights,
- Functional electrical stimulation, and
- Resistance bands.

Adaptive resistance equipment allows an individual to engage a resistance while still seated in their chair. This general fitness center option allows individuals to perform 8 to 10 exercises on one adaptive machine without needing transfers or assistance. Functional electrical stimulation also enables some persons with SCI to engage in leg training or treadmill walking. This therapy allows individuals to engage a higher intensity exercise which can result in better cardiac benefits. Finally, resistance bands can be used at home or in a fitness center and can be much more 'user-friendly' exercise choices than traditional barbells or dumbbells.

RESISTANCE TRAINING PRECAUTIONS FOR SCI

There are several considerations that persons with SCI may need to consider during resistance exercise. First, spasticity can affect persons with SCI. Rimmer (2012) recommends individuals to include muscle groups opposite spastic regions in the prescription. For example, if the biceps brachii muscle is spastic, the triceps should be targeted in the resistance

program. Additionally, overuse injuries are problematic in persons with SCI. Therefore, individuals need to ensure that aerobic and resistance training modes are varied regularly to reduce the risk of shoulder injury. Finally, temperature regulation can be problematic in persons with SCI; therefore, water spray bottles should always accompany an exerciser.

TRAINING RESOURCES FOR PERSONS WITH SCI

Two important resources are available to resistance exercisers. The first, the National Center on Physical Activity and Disability, provides thorough discussions of resistance training benefits and recommendations for persons with SCI (<http://www.ncpad.org/>). Information provided by this Center reflects recent research and summarizes 'best practices' in training, equipment choices and novel exercise techniques. The Center is a model online resource that has disability-specific information for persons wanting to become more active or improve their lifestyle through physical activity.

Multiple disability sport organizations provide many opportunities for persons with SCI. Blaze Sports (<http://www.blazesports.org/>), Disabled Sports USA (<http://www.disabledsportsusa.org/>), and Wheelchair and Ambulatory Sports USA (<http://www.wsusa.org/>) provide community, regional and national sport and recreation opportunities. Although these organizations do not offer specific resistance training guides, they do offer resources that address physical activity within local communities. Although many disability sport organizations do not provide resistance training guidelines, they do help individuals identify local and national physical activity opportunities for persons with SCI.

FINAL THOUGHTS

Despite the benefits of resistance exercise, few persons with disabilities regularly participate in such training. The good news is that resistance exercise is a safe and effective method of improving health and function while simultaneously reducing chronic disease risk. Additionally, overuse injuries are problematic to persons with SCI and resistance exercise provides an excellent training alternative to continuous aerobic training. In essence, resistance training can be an important part of your weekly routine.

STAYING ACTIVE PAYS OFF!

Those who are physically active tend to live longer, healthier lives. Research shows that moderate physical activity – such as 30 minutes a day of brisk walking – significantly contributes to longevity. Even a person with risk factors like high blood pressure, diabetes or even a smoking habit can gain real benefits from incorporating regular physical activity into their daily life.

As many dieters have found, exercise can help you stay on a diet and lose weight. What's more – regular exercise can help lower blood pressure, control blood sugar, improve cholesterol levels and build stronger, denser bones.

THE FIRST STEP

Before you begin an exercise program, take a fitness test, or substantially increase your level of activity, make sure to answer the following questions. This physical activity readiness questionnaire (PAR-Q) will help determine if you're ready to begin an exercise routine or program.

- Has your doctor ever said that you have a heart condition or that you should participate in physical activity only as recommended by a doctor?
- Do you feel pain in your chest during physical activity?
- In the past month, have you had chest pain when you were not doing physical activity?
- Do you lose your balance from dizziness? Do you ever lose consciousness?
- Do you have a bone or joint problem that could be made worse by a change in your physical activity?
- Is your doctor currently prescribing drugs for your blood pressure or a heart condition?
- Do you know of any reason you should not participate in physical activity?

If you answered yes to one or more questions, if you are over 40 years of age and have recently been inactive, or if you are concerned about your health, consult a physician before taking a fitness test or substantially increasing your physical activity. If you answered no to each question, then it's likely that you can safely begin exercising.

PRIOR TO EXERCISE

Prior to beginning any exercise program, including the activities depicted in this brochure, individuals should seek medical evaluation and clearance to engage in activity. Not all exercise programs are suitable for everyone, and some programs may result in injury. Activities should be carried out at a pace that is comfortable for the user. Users should discontinue participation in any exercise activity that causes pain or discomfort. In such event, medical consultation should be immediately obtained.



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