

One on One



The One-On-One Column provides scientifically supported, practical information for personal trainers who work with apparently healthy individuals or medically cleared special populations.

COLUMN EDITOR: Sorace, Paul MS, RCEP, CSCS*D

Interval Training for the Senior Population

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ABSTRACT

INTERVAL TRAINING HAS BEEN ONE OF THE HOTTEST TOPICS OF DISCUSSION IN FITNESS. DESPITE BEING AN INTEGRAL PART OF ATHLETIC TRAINING PROGRAMS, IT IS NOT TYPICALLY THOUGHT OF AS SAFE FOR ALL POPULATIONS. THIS ARTICLE LOOKS INTO THE CONSIDERATIONS OF ADDING INTERVAL TRAINING INTO SENIOR TRAINING PROGRAMS.

One of the hottest topics of discussion in fitness has been interval training. Interval training is defined as intense workout periods performed at 80–90% of an individual's estimated maximal heart rate for a range of time anywhere from 5 seconds to 8 minutes in duration with intermittent recovery times at 40–50% of an individual's estimated maximum heart rate (16). Over the years, interval training has been widely used as part of athletic training programs, because of the short bursts of movement at high intensities that many sports and recreational activities require. As a result,

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interval training has become an increasingly preferred and recognized method of training (9,14). For decades the exercise prescription for improving cardiovascular health was moderate to vigorous aerobic exercise, or as most recently outlined by the American College of Sports Medicine guidelines as moderate (40 to <60% of Heart Rate Reserve or $\dot{V}O_2$ Reserve) to vigorous (60 to <90% of Heart Rate Reserve or $\dot{V}O_2$ Reserve) (1). Research has shown interval training to be one of the most effective and efficient ways to exercise at a high enough intensity to significantly increase oxygen demands (19).

A BETTER EXERCISE PRESCRIPTION

Over the past several years, poor cardio-respiratory fitness has earned attention as a predictor of cardiovascular disease risk and premature mortality (13). Research has shown that by improving mitochondria function through regular aerobic exercise, biological age can be decreased by 10 years or more (15). As a result of improved mitochondria function through interval training, there is a greater likelihood of a reduction in biological age over the life span of the individual (4). It has been reported by the International

Health, Racquet & Sportsclub Association (IHRSA) that the 2 most significant industry changes between 1987 and 2005 were the growth in the population of members over 55 and that women accounted for 57% of all members (7). With aging, heart rate decreases, resulting in decreased cardiac output. Maximum oxygen consumption also decreases because of decreased lung capacity. This decrease in muscle oxygen consumption is one of the primary physiologic reasons the senior population slows down, grows weaker, and loses stamina. After peaking at age 35, maximum oxygen consumption begins to decrease between 50 and 60 years of age, with the greatest decrements occurring after 60 (17). It would seem within reason that the senior population would benefit from interval-based training as part of their exercise programming. When compared with slow, steady-state exercise, interval training has been proven to be more effective at improving several physiological factors such as an increased $\dot{V}O_{2\max}$, decreased resting blood pressure, and increased insulin response (15).

INCORPORATING INTERVAL TRAINING

With proper use and program design, interval training can be the most effective

way to incorporate high-intensity exercise into any exercise program. Consideration must be given to choose exercises that incorporate large muscle groups to increase the heart rate and cause an increase in maximal oxygen consumption (2,18). When designing interval training programs, the key elements are programming the “all-out,” intense phase, and the recovery, rest phase. The “all-out” phase should be to program high-intensity activities that can be sustained for 30 seconds–1 minute. High-intensity activities are defined as eliciting a minimum of 85% of maximum heart rate. Because 85% of maximum heart rate may not be feasible or the safest for the senior population, the intensity levels may need to be modified (10). This can be accomplished by decreasing the work interval time (>30 seconds), increasing rest/recovery time (1–3 minutes), and/or decreasing frequency of workouts (1–2 times per week). The recovery phase should be programmed to be proportional to the intensity and length of time of the “all-out” phase. For example, 30 seconds at 85% may require 1–2 minutes of recovery.

It is essential to identify through initial assessment whether individuals are prescribed any cardiovascular medications such as beta blockers which may alter heart rate responses with physical activity (12). Being able to accurately and reliably identify the appropriate exercise intensity for a senior client is absolutely essential and cannot be reasonably accomplished using the percentage of heart rate methods only. Perceived exertion and the talk test can also be used as reliable indicators of exercise intensity. Exercise programming at too low of an intensity may result in the desired benefits not being attained. Likewise, exercise programming at too high an intensity could lead to a greater chance of potential for injury and overtraining.

FACTORS TO CONSIDER

Interval training can be easily modified for the senior population. Exercise mode selection can range

anywhere from cycling, walking, swimming, elliptical, and even in class formats. The most obvious area of concern is age as there are many musculoskeletal changes that occur naturally with age such as decreased muscle mass, bone density, and joint laxity. According to the National Council for Physical Activity & Disability, all individuals over 40 show some sign of degenerative joint disease due to cartilage deterioration and normal wear and tear (11,12). Because the nature of most physical activities cause greater forces and stress to be placed on joints and joint surfaces, careful consideration must be made to sex and weight as females generally have lower bone density and being overweight can contribute to even more force placed on the joints. Muscular coordination and balance must also be considered as interval training because of its increased level of intensity which will require more total body coordination. Finally, the mode of exercise selected should consider the client’s physical limitations and safety. Going faster on a treadmill just to increase intensity is generally not a safe recommendation. One study looked at the risk of injury of fast walking versus incline treadmill walking, showing that a greater injury risk was associated with fast walking, not incline or overall exercise intensity (3).

DESIGNING INTERVAL TRAINING PROGRAMS FOR SENIORS

An important aspect to designing interval training workouts for seniors is to keep it simple and manipulate just a few simple variables to add intensity to the workouts. Sprinting, jumping, or high-intensity circuits are not necessary. Stair stepping can be more than sufficient to increase work capacity. Some of the variables to manipulate are as follows:

- Intensity or speed of movement: Simply increasing speed, or the velocity of movement, is a quick and simple way to increase exercise intensity. With increased speed however comes an increased risk of

injury and should be used cautiously to increase exercise intensity only with conditioned clients who also have no history of musculoskeletal injuries.

- Variable resistance and incline: This variable can be easily manipulated by increasing resistance on aerobic machines. With more resistance, the harder the muscles work to move the bones creating a larger cardiac response.
 - Length of time and/or distance of each interval: All 3 energy systems can be addressed through interval training: Adenosine triphosphate/Phosphocreatine (sprints or shorter intervals); anaerobic glycolysis (moderate distance or time); and aerobic (longer distance or time). The interval lengths and recovery times can all be manipulated to address desired outcomes (8).
 - Adjusting incline: Adding incline on most aerobic pieces of equipment such as a treadmill or stationary bike will add more resistance and is a great way to increase exercise intensity.
 - Adding bodyweight and external resistance: A simple and cost-effective way to interval train other than with aerobic machines is to incorporate bodyweight exercises with or without adding external resistance. Using everyday movements like squatting or stair climbing can be an effective way to work the largest muscles, increasing maximum oxygen uptake. Adding some light external resistance with items such as dumbbells, bands, or medicine balls can be an effective way to increase work capacity.
 - Alternating movement patterns: Alternating a lower-body exercise with an upper-body exercise is an effective method of altering cardiac response without having to increase speed or intensity of the interval. A lower-body exercise increases the heart rate because of the size of the muscles involved, whereas the upper-body work allows a brief recovery while still exercising.
- The safest approach to interval training for the senior population is to

Table
Sample interval training programs for seniors

	Aerobic machines	Bodyweight exercises	External resistance
Warm-up (min)	3	3	3
Intensity	40–60% HRR	40–60% HRR	40–60% HRR
Modality	Treadmill/bike/elliptical	Alternating step ups using 6-inch aerobic step	Alternating horizontal row using a resistance band
Working interval	30 s with increasing resistance and/or incline	30 s–1 min	30 s
Intensity	60–85% HRR	60–85% HRR	60–85% HRR
Rest interval	1–2 min with decreasing resistance and/or incline	30 s–1 min with light marching in place	30 s–1 min
Intensity	40–60% HRR	40–60% HRR	40–60% HRR
Cycle (min)	30	15–20	15–20

HRR = heart rate reserve.

keep it basic by changing one variable at a time and not introducing complex moves. The careful and safe manipulation of these variables will produce the desired results an individual wishes to obtain from the training program. An important element to consider when programming interval workouts for the senior population is that no matter what modes are used, the goal is to create increases in heart rate and maximum oxygen uptake while providing sufficient rest periods at lower intensities to facilitate recovery.

DESIGNING INTERVAL TRAINING PROGRAMS

Despite the many benefits that interval training can provide, special care and consideration should be used before incorporating it into a training program for seniors (6). Because of the high-intensity nature of interval training, senior participants should have a solid base and foundation of cardiorespiratory fitness. All-out and recovery time intervals can range anywhere from 1:3 or 1:4 for novices and 1:1 for those who have achieved a higher level of fitness. Because heart rate percentages may not be the most accurate method for determining exercise intensity for the senior

population, the “talk test” method can be applied (15). In a study performed at the University of Wisconsin-La Crosse, the “talk test” was found to provide an accurate but very simple marker of more complex physiologic processes as a guide for exercise prescription (5). See the Table for some basic examples of interval training programs.

CONCLUSION

Integrating interval training into a general conditioning program for the senior population is a great way to optimize development of cardiorespiratory fitness in addition to several other health benefits. Once they have achieved a base of fitness, incorporating an interval training program into a senior’s exercise regimen can be a fun and challenging way to increase their physical capabilities and explore more advanced training opportunities down the road. Although more research is needed in this area, a well-designed and structured interval training program can be an added benefit to the largest growing segment of the population.

Conflicts of Interest and Source of Funding: The author reports no conflicts of interest and no source of funding.

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