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Atrial Fibrillation and Exercise: Exercise Recommendations

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This is a submission to the One on One Column, so no headshots are required.

1 Abstract:

2 Atrial fibrillation (AF), characterized by a rapid pulse rate and an irregular heart rhythm. It is a
3 more common cardiac arrhythmia. AF may lack symptoms, although fatigue and an impaired
4 exercise ability are common symptoms. This column will discuss exercise testing and training
5 recommendations as well as special considerations.

6

7 Introduction

8 Atrial fibrillation (AF), as discussed in the Special Populations Column, is the most common
9 cardiac arrhythmia worldwide and is characterized by a rapid pulse rate and an irregular heart
10 rhythm. It affects between 2.7 and 6.1 million Americans, with the prevalence increasing with
11 age (11). The Centers for Disease Control and Prevention estimates that approximately 2% of the
12 U.S. population under age 65 have AF increasing to 9% for those aged 65 years or older. This
13 number is expected to increase as the US population ages (8). Some individuals with AF may be
14 completely asymptomatic, with the condition only being discovered during a physical exam,
15 while others have symptoms that include shortness of breath, lightheadedness, palpitations, and
16 reduced exercise tolerance (15). This column will discuss exercise testing and training
17 recommendations as well as special considerations that the exercise professional (EP) should be
18 aware of.

19 Exercise Testing

20 Exercise testing for individuals with AF can include a variety of modes, similar to persons who
21 are apparently healthy. Considering the majority of persons with AF will be older adults (≥ 65
22 years of age), and therefore more likely have a reduced exercise capacity, and taking into

1 account the potential side effects of medication, a low level fitness test is often preferred. While
2 strength and flexibility testing can be performed, measuring aerobic capacity is most important.
3 An example would be a 6-minute walk test. If the individual is younger or more functional (or
4 less symptomatic, a ramped treadmill test or cycle test can be used). Since electrocardiogram
5 (ECG) monitoring will not be available in a non-clinical setting, close monitoring will be
6 paramount. This includes heart rate, blood pressure, rating of perceived exertion (RPE), as well
7 as angina and dyspnea ratings (if applicable) (16).

8 Heart rate may not be a valid indicator of exercise intensity in people with persistent AF due to
9 the potentially rapid and erratic variable ventricular response. This is particularly true if the AF is
10 not well controlled. Additionally, medications commonly used for rate control of AF will tend to
11 blunt the heart rate response to exercise (3). For these reasons, using subjective measures of
12 exertion, (e.g., RPE or dyspnea) are preferred for monitoring exercise intensity in this
13 population. In individuals with intermittent AF, monitoring heart rate prior to each exercise
14 session is recommended to aid in determining if the client is in AF that day because of the
15 variability of the ventricular response rate when in AF, taking the pulse for a longer period (e.g.,
16 30 seconds) increases the accuracy of the heart rate measurement (16).

17

18 Exercise Programming

19 Regardless if exercise has a direct benefit on AF, the common exercise benefits of increased
20 aerobic endurance, muscular strength and flexibility can be obtained. This will in turn lead to an
21 increased quality of life (e.g., greater ease with activities of daily living).

1 It is important to remember that AF can be persistent or intermittent (7). Individuals with
2 intermittent AF should have their pulse assessed before each training session as described earlier,
3 as they may have reduced exercise tolerance and become more easily fatigued when in AF (16).
4 Regardless, individuals with AF can benefit from a comprehensive exercise program.

5 AEROBIC EXERCISE TRAINING (AT)

6 Aerobic training activities should be part of a comprehensive exercise program. Current exercise
7 guidelines resemble those of healthy individuals. They should emphasize:

- 8 • Increasing physical fitness
- 9 • Improving functional capacity
- 10 • Replacing sedentary time with physical activity
- 11 • Managing and reducing cardiovascular and metabolic disease risks
- 12 • Enhancing health related quality of life (1,3,4,6,8).

13 An AT frequency of three to five days per week while accumulating at least 30 minutes of AT
14 per session is appropriate. Daily exercise with an accumulation of 60 minutes per day may be
15 necessary for weight loss or weight management (1,4,6,9,14). An exercise intensity of 60%-80%
16 of heart rate reserve (HRR) is appropriate if the client has intermittent AF and heart rate data is
17 available. A physician may prescribe a maximal heart rate for their clients to adhere to during
18 exercise if they are in persistent AF. In the absence of both a graded exercise test and physician
19 guidance, a rating of perceived exertion between 11 and 14 out of 20 (moderate intensity) is an
20 appropriate range. Treadmill walking, over-ground walking and stationary cycling are acceptable
21 initially, but activities should reflect clients' vocational and avocational needs as the program
22 progresses (6). Other activities like full body recumbent step ergometry (e.g., NuStep recumbent

1 stepper), elliptical stepping, recumbent cycling and stepping, swimming and water exercises are
2 acceptable forms of activity and incorporate the use of multiple muscle groups (1,4,6,9,14, 16).
3 Weight bearing activities in an upright position like walking, jogging and elliptical stepping for
4 maximizing weight loss or weight management might need to be gradually implemented for
5 overweight clients and those with lower body injuries and conditions like arthritis (1,4,6,14,16).
6 In this case, seated, recumbent and aquatic (water) exercises are appropriate alternatives.
7 Exercise volumes for enhancing overall health can be achieved by having clients strive to
8 accumulate between 500 and 1,000 MET-minutes per week while accumulating over 1,200 MET
9 – minutes per week may be necessary for weight loss and management (4).MET- minutes are
10 calculated by multiplying the intensity in METs (Metabolic equivalents) of specific activities by
11 the amount of time that they are performed (4). As an example, both walking at 4 miles per hour
12 (a 5 MET activity) for 48 minutes and playing basketball (an 8 MET activity) for 30 minutes,
13 yield an exercise volume of 240 MET-minutes. In addition, clients can derive similar health
14 enhancing benefits by performing between 5,400 and 7,900 steps per day. Initiating AT with
15 “light” to “moderate” intensities of (30%-59% of HRR or VO_2 Reserve) or an RPE between 11
16 and 14 (out of 20) in currently inactive clients is prudent. Increasing time as tolerated by five to
17 10 minutes every one to two weeks over the first four to six weeks is reasonable. Ultimately, the
18 volume of exercise can be progressed over the next 4 to 8 months on an individualized basis
19 (1,4,6,9, 14). Blood pressure (BP), heart rate (HR) (measured as pulse rate), and rating of
20 perceived exertion (RPE) monitoring before, during, and after exercise is warranted for clients
21 with AF.

22 Table 1 summarizes AT program recommendations for clients with AF.

23 Insert Table 1 here.

1 RESISTANCE TRAINING EXERCISE (RT)

2 Resistance training exercise goals and recommendations for medically cleared clients with AF
3 should resemble those of healthy untrained individuals. Clients' RT program goals should be
4 individualized. They should address clients' physical limitations, functional capabilities, and co-
5 morbid conditions like hypertension, dyslipidemia, diabetes, arthritis, and risk factors for
6 cardiovascular disease. Improving functional capacity and health related quality of life
7 (HRQOL) are reasonable RT program outcomes (4, 9, 14, 18, 20). To enhance RT program safety
8 and efficacy, EPs should:

- 9 • Get medical clearance (4).
- 10 • Make sure that their clients do not have congestive heart failure, uncontrolled
11 arrhythmias, severe valvular disease, uncontrolled hypertension, and unstable angina (4).
- 12 • Supervise their clients closely and monitor BP, HR, and RPE before, during, and after RT
13 (4).
- 14 • Know each client's physician determined BP and HR limits.

15 Initially, clients should complete one to two RT sessions per week. They should perform 2 to
16 4 sets per muscle group. Recommending that elderly clients (who are over 50 years old),
17 novice and deconditioned individuals) complete 1 to 2 sets per muscle group is reasonable (4,
18 9, 14, 18, 20). Clients should complete 8 to 10 exercises for all major muscle groups to include
19 the chest, shoulders, back, hips thighs, low-back arms, abdominals/trunk (4, 9, 14, 18, 20).

20 Exercise intensities between 60% to 70% of the one repetition maximum (1-RM) or 50% or
21 less of 1-RM for older (individuals >50 to 60 years old), novice, or deconditioned individuals
22 is reasonable (4, 7, 9, 14, 18, 20). Visual analog scales can monitor intensity during and after

1 individual sets and RT workouts (4, 7). Clients should be encouraged to incorporate either
2 an OMNI-RPE of 5 to 6 (0 to 10) or standard RPE of 11 to 13 (6 to 20) during the initial
3 stage of exercise training and to gradually increase their effort to levels corresponding with
4 between 7 to 8 (0 to 10) or 14 to 16 (6 to 20) respectively as tolerated (3). The resistance
5 load should enable clients to perform 8 to 12 repetitions with proper technique and control (4,
6 7, 9, 14, 18, 20). Loads enabling the completion of 12 to 15 properly executed repetitions are
7 appropriate for older, novice, or deconditioned individuals (4, 7, 9, 14, 18, 20). Although
8 clients with AF are encouraged to perform RT with a variety of types of equipment,
9 machines may be best initially for clients with limited strength or balance (4, 7, 9, 14).
10 Exercise professionals (EP) should emphasize the importance of performing each exercise
11 and repetition with control, proper breathing and good technique. Clients should be instructed
12 to use a cadence of between 1 to 2 seconds during both concentric and eccentric phases of
13 repetitions and to avoid the Valsalva maneuver (4, 20). Resistance should only be increased
14 when 1 to 2 repetitions can be performed properly beyond the prescribed number during two
15 consecutive workouts (20). The EP should ensure that the maximal number of repetitions
16 within the prescribed range should not be possible with the new loading intensity when
17 performed properly (4, 7, 9, 14, 18, 20).

18 The 1-RM can be estimated by the number of properly performed repetitions to fatigue
19 during multiple repetition maximum testing (M-RM) or directly tested. An OMNI RPE (0-
20 10) or standard RPE (6-20) can be used during (M-RM) testing to signify maximal effort (4,
21 7, 9, 14, 18, 20).

22 Table 2 summarizes RT exercise programming for individuals with AF.

23 (Insert Table 2 here.)

1 Special Considerations

2 In general, exercise is safe for people with AF and is normally tolerated as long as a few special
3 considerations are kept in mind. Broadly, these fall into the categories of rate control, increased
4 risk of bleeding, management and risk reduction.

5 Rate control refers to the response of the ventricles to the erratic impulses originating in the atria.
6 Ideally, this rate should be no more than 100-110 bpm at rest (13). If the ventricular rate is faster
7 than this at rest, the heart may not be pumping efficiently leading to poor exercise tolerance. The
8 heart rate increase during exercise should be appropriate for the training load. If the heart rate is
9 suddenly much higher than usual with the same load, or if there is wide variability in heart rate
10 during training, it may indicate the presence of AF. Training should be discontinued if this is
11 accompanied by unusual shortness of breath, lightheadedness, dizziness, or chest discomfort. As
12 discussed in the “Management and Medications” section in the Special Populations Column,
13 some individuals may undergo procedures such as cardioversion or catheter ablation to try to
14 restore normal sinus rhythm. It is advisable that these individuals receive clearance from their
15 physician before resuming vigorous exercise. Usually this occurs within 1 to 6 weeks post event.
16 (2).

17 Many individuals with AF will be taking some form of anti-coagulant therapy to prevent clot
18 formation arising from the irregular flow of blood in the atria. This greatly increases the risk of
19 bleeding and bruising during exercise, especially during contact sports (e.g., football, hockey,
20 martial arts, etc.) or “action sports” (e.g., mountain biking, downhill skiing, etc.) where falls are
21 likely. Most bleeding associated with anticoagulation therapy is minor and requires no
22 intervention. (19). However, prudence dictates that protective equipment be worn when possible,

1 and that any blow to the head be treated as serious until proven otherwise owing to the risk of
2 developing a subdural hematoma(17).

3 The mechanisms responsible for the development of AF are not fully understood, but there are
4 some general guidelines available to help manage and reduce the risk of AF. Losing weight,
5 managing high blood pressure and high cholesterol, avoiding tobacco and excessive alcohol or
6 caffeine intake are all recommended to decrease the incidence of AF(5). Another consideration
7 in the management of AF is that of vitamin K intake. Some anticoagulants, chiefly warfarin (e.g.,
8 Coumadin), are vitamin K antagonists, blocking the uptake of vitamin K required for clot
9 formation. People with AF are advised to be consistent with the amount of vitamin K consumed
10 so that their anticoagulant will have a predictable effect (10). Lastly, there is increasing evidence
11 that male ultra-endurance athletes may be at 2 to 10 times greater risk of developing AF than non-
12 ultra-endurance athletes (12). Neither the mechanism, nor the training threshold responsible for
13 this phenomenon are known. It is not uncommon for physicians to recommend that athletes with
14 symptomatic AF decrease both the volume and intensity of training to see if that decreases the
15 AF. If so, it is reasonable to resume training at a lower intensity and volume. Some athletes may
16 choose not to decrease their training and physicians should be prepared to respect this decision
17 and work towards finding alternative options for managing AF (3).

18 Summary

19 Atrial fibrillation is one of the most common cardiac arrhythmia worldwide. Individuals with
20 AF may be taking a number of medications for AF and for a number of co-existing diseases (e.g.,
21 hypertension). If AF is medically managed and well-controlled, the potential exercise benefits
22 are numerous. Most individuals with AF will be older adults (>65 years of age), so this should be
23 considered during exercise testing and training (4). Ensuring that the person is compliant with

1 their prescribed medications and having good communication regarding any AF symptoms is
2 paramount for safe and effective exercise.

3

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ACCEPTED

Table 1. Aerobic Training Recommendations for Persons with Atrial Fibrillation

Days per Week	3-5perwk ⁻¹ ; more daysperwk ⁻¹ may be necessary for weight loss, management
Intensity Heart rate (HR) data or information from a recent graded exercise test (GXT) may or may not be available to the exercise professional (EP).	60%-80% of heart rate reserve (HRR) if HR data is available.* The EP should obtain a heart rate range from the client's physician in this case. A rating of perceived exertion of 11-14 out of 20 (moderate intensity) is also an appropriate intensity range.
Time	Progressively increase to 30 and eventually 60 minutesperday ⁻¹ . Initially, exercise may need to be accumulated in shorter bouts (example: 10 minutes x 3perday ⁻¹) until it can be done continuously.
Type	Treadmill walking, over-ground walking and stationary cycling, full body recumbent step ergometry, NuStep, elliptical stepping, upper body cycling, recumbent stepping, cycling, rowing, swimming and water exercises are acceptable forms of activity. Weight bearing exercise can maximizing weight loss, management but should be implemented gradually with overweight clients and those with lower body injuries or arthritis.
Volume MET·MINUTES perWEEK ⁻¹ and Steps perday ⁻¹	Achieve a minimum energy expenditure volume of 500 MET-Minutes perwk ⁻¹ and progress to ≥1,000 MET – Minutes perwk ⁻¹ . Step counts of ≥ 5,400 to 7,900 steps perday ⁻¹ are appropriate forms of exercise for enhancing health. Greater volumes of between 8,000-12,000 steps perday ⁻¹ may be necessary for weight management.
Progression	Initiate exercise at a "light" to "moderate" intensity of (30%-59% of HRR or VO ₂

	<p>Reserve) or an RPE of 11-14 (out of 20).</p> <p>Increase time gradually as tolerated by 5-10 minutes as tolerated.</p> <p>Exercise can be progressed over the next 4-8 months on an individualized basis.</p>
Adapted from (1, 4, 6, 9, 14)	

ACCEPTED

Table 2. Resistance Training Recommendations for Persons with Atrial Fibrillation

Days perWeek	1-2/wk ¹ on non-consecutive days
Sets/Muscle Group	2-4 for individuals $\leq 50-60$ years old. 1-2 for elderly $\geq 50-60$; novice or deconditioned individuals
Number of Exercises	8-10 for all major muscle groups. (Example: chest, shoulders, back, hips thighs, low-back arms, and abdominals).
Intensity; % of known or estimated 1-repetition maximum (1-RM) Note that 1-RM can be estimated by the number of properly performed repetitions to fatigue during multiple repetition maximum testing or directly tested.	60%-70% of 1-RM for clients $\leq 50-60$. $\leq 50\%$ of 1-RM for clients $\geq 50-60$ years old and or novice and deconditioned individuals. An OMNI RPE (0-10) or standard RPE (6-20) can be used during both exercise training and when conducting multiple repetition maximum testing. An OMNI-RPE of 5-6 or standard RPE of 11-13 is appropriate during the initial stage of exercise training and can be increased to 7-8 and or 14-16 respectively as tolerated. Older, well- conditioned individuals can follow recommendations for younger individuals as tolerated.
Repetitions, Sets	8-12 for individuals $\leq 50-60$ or 10-15 for individuals $\geq 50-60$. Older individuals who are highly conditioned can follow recommendations for younger individuals as tolerated.
Types of Exercises	Bodyweight, free-weight, machine, elastic resistance and medicine ball exercises are acceptable. Machines may be best for individuals with limited strength or balance.

Primarily multi-joint exercises supplemented with single joint exercises	(Examples; leg press, shoulder press, knee extension, Latissimus pull-down, leg curl, chest press, calf raise, scapular row, Back extension, triceps extension, abdominal crunch, biceps curl).
Repetition Cadence and Breathing	<p>Clients should avoid the Valsalva maneuver.</p> <p>A cadence of 1-2 seconds each during the concentric and eccentric phases of each repetition is appropriate.</p>
Progression	Increase load intensity when 1-2 reps can be performed properly beyond the prescribed number during two consecutive workouts.

Adapted from (4, 9, 14, 18, 20)