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Cardiac Rehabilitation Programmes for Low-Risk Patients and Leisure Athletes: A Potential Paradox

Wendy Bjerke
Sacred Heart University, bjerkew@sacredheart.edu

Stu Steinman
Sacred Heart University

Vincent Cotto

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Cardiac rehabilitation programmes for low-risk patients and leisure athletes: A potential paradox

Wendy Bjerke, Stu Steinman, Vincent Cotto

Background: *Athletes are enrolled in cardiac rehabilitation (CR) programmes in small numbers and require unique diagnostic testing and training considerations. Additionally, many physiotherapists, exercise physiologists, athletic trainers and physicians lack experience treating athletes in CR due to their limited exposure to these types of patients.*

Content: *This analysis distinguishes athletes from typical CR patients within the context of diagnostic testing, assessment, exercise prescription, and management. Several case studies present unique challenges and approaches to the rehabilitation of athletes in a CR setting.*

Conclusions: *Athletes enrolled in CR should be treated and trained according to their abilities and goals. Combining traditional guidelines with alternative approaches may be the optimal manner to treat these unique patients.*

Key words: ■ Athletes ■ Cardiovascular diseases ■ Case reports ■ Electrocardiography ■ Exercise ■ Heart function tests ■ Rehabilitation

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Wendy Bjerke *is an associate clinical professor at Sacred Heart University in Fairfield CT, USA*; **Stu Steinman** *is the Owner and Director of Westsports Medicine in Westport CT and is an Adjunct Professor at Sacred Heart University, USA;* **Vincent Cotto** *is an environmental health and safety ergonomics intern at Sikorsky Aircraft Corporation in Stratford CT, USA.*

Correspondence to: *Wendy Bjerke E-mail: bjerkew@sacredheart.edu*

The special needs of athletes are not included in the basic structure of cardiac rehabilitation (CR) programmes. An athlete entering CR is not the norm and, as a result, this population of patients is under-represented in the research and may be suboptimally trained in CR settings given the lack of specific guidelines (Schmid et al, 2009).

The term leisure athlete lacks some specificity but generally refers to a middle-aged to senior individual who engages in sports or activities of moderate to vigorous intensity (Corrado et al, 2011). This analysis defines an athlete as a combination of a low-risk CR patient and a leisure athlete. A low-risk patient in cardiac rehabilitation (CR) is an individual with a functional capacity above 7 metabolic equivalents (METs), an ejection fraction greater than 50%, and the absence of heart failure, complicated arrhythmias, and ischemia (Durstine et al, 2008). This article discusses athletes in CR and exceptions that may be seen in these patients, e.g. athletes with stable angina symptoms.

CR guidelines and exercise prescriptions are generally conservative, which is appropriate in many cases; however, conservative exercise prescriptions may be inappropriate for highly-functioning athletic patients whose baseline physiology is superior to the average CR patient. Athletes' objectives often include a return to physically-demanding activities (Kennedy et al, 2012).

The objective of this analysis is to discuss the association between testing and training athletes in CR, including the examination of specific case studies and resources that CR professionals could potentially use.

Cardiovascular diseases and testing

Acute cardiac events in young athletes receive the bulk of attention for several reasons, including the unexpected nature of the event and the potentially high degree of publicity if the athlete is well known. However, cardiac events in older athletes have also received more attention. This may be due to the increased participation among aged athletes in athletic events, and the similar paradoxical circumstances associated with acute cardiac events incapacitating otherwise healthy, active individuals (Maron et al, 2009).

The athletic population is not a homogeneous group regarding age and health status but they do have a significantly decreased risk of most chronic diseases (Teramoto and Mungum, 2010). Most researchers examining cardiac events among athletes have studied sudden cardiac death (SCD) in athletes younger than 35 years of age, and limit discussion of older athletes to the acknowledgment that cardiac events are usually the result of cardiovascular disease (CVD). Within that context, researchers have largely neglected to expand this topic beyond distinguishing between how older and younger athletes are impacted by cardiac events. Additionally, although most cardiac events among young athletes are due to congenital heart abnormalities, underlying coronary artery disease causes SCD in about 1% of young athletes (Maron et al, 2009). Therefore, examining the topic of CVD and athletes need not be limited exclusively to older populations.

One challenge associated with athletes is the potential for masked or absent angina symptoms. One reason for a lack of symptoms is an elevation of the angina threshold due to exercise training. Angina symptoms are typically not present with coronary artery occlusions below 70% of the lumen of the artery (Durstine et al, 2008). Additionally, while allied health professionals are aware of the paradigm shift from the early 2000s, which reflected findings that most heart attacks are caused by smaller more vulnerable plaques rupturing, the general population is not. The general public's perception is that CVD slowly progresses over time and a heart attack is typically preceded with chronic angina symptoms. In actual fact, most heart attacks occur without prior warning (Durstine et al, 2008).

Electrocardiogram (ECG) testing

Some researchers recommend pre-participation screenings for leisure athletes as well as masters athletes (Maron et al, 2001); however, most diagnostic testing for CVD is undertaken outside of the context of athletics (Brosnan and Prior, 2012). Typically, the first step pursuant to testing is a 12-lead resting electrocardiogram (ECG). Many exercise science researchers and professionals highlight the 12-lead resting ECG's limited use due to a lack of overload placed on the cardiovascular system compared to an exercise ECG. An often-overlooked benefit of 12-lead resting ECGs for athletes is the prior identification of abnormalities that could confound the results of a graded exercise test (Sharma et al, 2012). In other words, a resting ECG can provide a baseline that can be subsequently compared to an ECG with exercise.

Considerations when interpreting ST segment depression on an ECG include that it can be seen in: acute myocardial ischemia; pericarditis; myocarditis; ventricular aneurisms; some medications (e.g. hormone replacement therapy [Sharma et al, 2012]); conduction abnormality arrhythmias; and electrolyte abnormalities. ST elevation can be seen in: left ventricular hypertrophy; myocardial ischemia; pericarditis; myocarditis; electrolyte abnormalities; some medications; conduction abnormalities; and arrhythmias.

Endurance athletes are more likely to present with bundle branch blocks and bradycardia (Wilson et al, 2010). Therefore, if ST segment depression or other abnormalities are noted on a resting ECG and a cause is identified, that information can direct the interpretation of a graded exercise test. Left ventricular hypertrophy (LVH) is another possibility in athletes as LVH can be associated with an athleticism or alternatively congestive heart failure (Durstine et al, 2008). LVH is an adaptive response to pressure overload and can be a normal physiological response to training. While LVH associated with athleticism is assumed to be exclusive to younger athletes, Seals et al (1994) observed enhanced left ventricular performance and hypertrophy in endurance-trained older adults.

Graded exercise test with an ECG

The graded exercise test combined with an ECG is among the most prevalent diagnostic test used to assess CVD. These tests are noninvasive, relatively inexpensive, and can be combined with imaging tests, such as photon emission tomography and echocardiograms (Sharma et al, 2012). Although there are many considerations when testing an athlete vs. a non-athlete, the chief consideration is the graded exercise testing intensity.

Stress tests are a type of graded exercise testing that are performed to maximum or sub-maximum levels depending on termination criteria established by medical standards and/or the diagnostic centre's termination criteria (Stuart and Ellestad, 1980). Given that ischemia or cardiac arrhythmias are unlikely to be present at lower workloads in athletes, it is critical that the stress test provides adequate overload on the cardiovascular system. Maximum stress tests also have limitations among asymptomatic individuals given that significant coronary artery stenosis typically needs to be present to cause ST segment changes and angina or equivalent symptoms among athletes (Durstine et al, 2008). Sensitivity and specificity analysis of stress tests suggests that up to 30% of patients with CVD will not be accurately diagnosed with stress testing (Sharma et al, 2012). One of the most powerful prognostic indicators on a stress test is exercise capacity. Myers et al (2002) suggest exercise capacity on stress testing provides equal prognostic value in predicting mortality to perfusion defects on single-photon emission computerised tomography (SPECT) imaging, angiogram, or ST segment depression. Overall, exercise capacity is a valuable prognostic tool (Franklin, 2007), and this reinforces the need for adequate overload during the stress test.

Diagnostic tests

Increasingly, diagnostic tests, such as CT coronary angiography and coronary artery calcium scoring (Brosnan and Prior, 2012) and cardiac biomarkers for ischemia and infarction (Cummins et al, 1987), are being used to assess cardiovascular disease. Athletes present some unique considerations when evaluating these tests. In CT angiography, arteries with small occlusions can be as problematic in athletes as non-athletes. Although higher calcium scores in athletes and controls have been associated with increased risk of coronary events, almost 40% of the athletes had elevated coronary artery calcium scores, which was similar to the sedentary controls (Brosnan and Prior, 2012). In short, this test may identify a subgroup of athletes at increased risk of coronary events but is currently lacking sufficient data for prognostic value.

Additional biomarkers for myocardial damage indicative of a heart attack pose potential diagnostic ambiguities. Elevated troponin levels can occur with high intensity endurance sports and have been associated with myocardial damage. Apple et al (2002) reported troponin levels elevated in endurance runners post participation in a marathon to levels equivalent to those found in a mild heart attack. Fortunately, Cummins et al (2008) re-examined this topic and reported increased troponin levels in athletes after long endurance events but attributed this to skeletal rather than cardiac muscle damage. Mousavi et al (2009) confirmed this finding using magnetic resonance examinations of the heart, which showed no cardiac muscle damage after endurance exercise.

Cardiovascular diseases and medications

Cardiovascular medications have direct effects on exercise-related variables, including heart rate, stroke volume, maximum oxygen uptake and blood pressure. As a result, unnecessary use should be limited in athletic populations (Alaranta et al, 2008). Common types of medications that can effect exercise-related variables include those for hypertension, hypercholesterolaemia, arrhythmias, and cardiovascular disease risk (Peel and Mossberg, 1995). While managing these issues is the primary objective of patients and physicians, where appropriate, some types and classes of medications may be better than others for regularly active cardiac patients (Peel and Mossberg, 1995).

Commonly-prescribed medications for managing blood pressure include beta blockers, calcium channel blockers, angiotensin-converting-enzyme (ACE) inhibitors, and diuretics (Peel and Mossberg, 1995). As beta blockers reduce resting heart rates, sub-maximum heart rates and maximum oxygen consumption, athletes may require alternative medications for optimal blood pressure control (Van Baak, 1988).

Diuretics are also commonly prescribed for blood pressure control but reduce blood pressure via excretion of excess sodium and water, which reduces blood volume. Given that one of the body's primary adaptations to chronic exercise is increased blood volume, this conflict with the objectives of diuretics highlight the need for alternatives (Niedfeldt, 2002). Armstrong et al (1985) reported little or no effect of diuretics on performance in elite endurance athletes. However, Peel and Mossberg (1995) stated that the side effects of diuretics, e.g. dehydration, electrolyte imbalance, arrhythmias, rhabdomyolysis, and kidney failure, are ill-suited to athletes.

Calcium channel blockers reduce blood pressure by relaxing smooth muscle. Therefore, they have little or no impact on the resting, submaximum or maximum heart rate depending on the agent, and this drug class is commonly prescribed to athletes with hypertension (Peel and Mossberg, 1995; Niedfeldt, 2002). Similarly, ACE and angiotensin II receptor blockers (ARBs) are also recommended as they do not directly affect heart rate response during exercise (Niedfeldt, 2002).

Statins reduce cholesterol in the liver and the amount of low density lipoprotein in the body. However, statins also have musculoskeletal side effects, myalgia, myositis and rhabdomyolysis, which CR professionals must closely monitor and distinguished from delayed onset muscle soreness (DOMS) (Stasi et al, 2010). Muscle soreness stems from exercise-induced muscle damage following prolonged exercise, especially eccentric weight bearing exercise. Temporality may assist CR professionals in distinguishing between DOMS and statin side effects. For example, if soreness is reported after a change in statin medication, suspect rhabdomyolysis; alternatively, if patients report soreness after introduction of a new exercise, suspect delayed onset muscle soreness (DOMS). An additional consideration is symptom severity, as patients with rhabdomyolysis typically report more severe symptoms than those with DOMS (Stasi et al, 2010).

Anticoagulants are prescribed to manage blood coagulation after procedures such as angioplasty, and reduce the risk of stroke and heart attack. Therefore, athletes may be at increased risk of bleeding or injury from contact or outdoor sports (Peel and Mossberg, 1995).

Nitrates are commonly prescribed for patients with stable angina as well as for athletes with cardiovascular disease; however, there are several considerations (Peel and Mossberg, 1995)). Symptoms of angina, e.g. shortness of breath, can be difficult to distinguish from typical exercise responses. The use of nitrates, especially long-acting agents, has not been found to conflict with exercise-related variables in athletes with cardiovascular disease (Peel and Mossberg, 1995). However, any marginal change in symptoms or exercise tolerance among active patients taking nitrates for stable angina should be noted.

Exercise prescription and programming

The American Heart Association, American College of Sports Medicine (ACSM), and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) have suitable exercise guidelines for CR programmes (AACVPR, 2004; ACSM, 2009). The frequency, duration, intensity, and type of exercises can be altered to optimally prepare athletes for return to their sports and activities (Schmid et al, 2009). For example, Skinner (2005) suggests a conservative approach for patients who do not enter CR with a stress test. This approach includes setting a target heart rate at 20–30 beats above rest and beginning cardiopulmonary activities at 2 METs. However, while this prescription may be suitable for a significant portion of CR patients beginning a programme, consider the lack of overload and specificity for a marathon runner or endurance cyclist. Thankfully, numerous other options for prescribing exercise exist, including top-down approaches (when a stress test has been conducted) or bottom-up approaches (in the absence of stress test results) (Skinner, 2005). Other approaches to adding specificity to an athlete's exercise prescription include aligning METs of current or recent training, and using the ventilatory threshold (VT).

Top-down exercise prescription (using stress testing)

Durstine et al (2008) argue that if a recent stress test is available, a top-down approach to exercise prescription provides sufficient and adequately conservative overload. However, such an approach must consider the peak or maximum results from the test, which involves computing 0.7–0.85 peak or 0.6–0.85 maximum proportions for target heart rates and METs. Careful attention must also be given to whether or not the stress test was a peak or maximum stress test. For example, if a maximum stress test was actually a peak stress test terminated at 85% of an age-predicted heart rate, then the assigned proportions might be unnecessarily conservative. In this case, CR professionals would need to identify why the test was terminated, since termination at a designated heart rate impacts the prescription differently than a reported adverse event, e.g. chest pain or fatigue.

A trial by fire, top-down approach aligns the metabolic cost of specific activities with the patient's approximate ability by posing a minimum of two questions about the patient's metabolic capabilities and activity tolerance. This alignment of METs and activity tolerance can help CR professionals determine an appropriate starting workload for cardiopulmonary CR training. Ainsworth et al (2011) detail the MET levels of hundreds of activities including exercise, and activities of daily living. For example, if the patient states that climbing stairs and jogging is very tolerable, the patient's maximum metabolic capabilities are likely to be 10 METs, allowing the professional to use a top-down approach with previously described proportions of 10 METs. This approach would likely be more optimal than arbitrarily selecting 2 METs for exercise as described in conservative exercise prescription approaches.

Botttom-up exercise prescription (no stress test available)

A bottom-up approach to exercise prescription is potentially more challenging for CR professionals, as the absence of a stress test increases the potential for inadequate overload for the athletic CR patient. Where a stress test lacked relevant details or absent, the CR professional must make an educated guess about appropriate workloads using a number of other variables, e.g. rate of perceived exertion and submaximum heart rates. However, this approach does not need to be less accurate than a top-down approach and two strategies in particular—trial by fire and incorporation of VT—may be helpful in determining more specific exercise prescriptions for athletes (Meyer et al, 1995).

Ventilatory threshold (VT) exercise prescription

The use of VT may be particularly useful to guide cardiopulmonary exercise prescription for athletes. VT precedes the onset of ischemia in cardiac patients with and without angina symptoms (Meyer et al, 1995). While research suggesting VT precedes the onset of ischemia almost exclusively evaluated non-athletes (due to the scarcity of athletes in CR) it is likely the use of VT in CR is safe (Meyer et al, 1995; Schmid et al, 2009). VT can be used in exercise prescription, especially in highly functioning patients, by increasing the cardiopulmonary workload incrementally until they reach their VT, then reducing intensity to steady-state aerobic exercise that adequately overloads the cardiovascular system (Durstine et al, 2008). Patients with angina in Meyer (1995) were able to delay the angina threshold further with regular exercise and potentially increase the gap between VT and the onset of angina.

Types of exercise

Mitchell et al (1994) highlight the importance of distinguishing between dynamic and static exercises and the demands they place on the cardiovascular system. Dynamic exercises involve a repeated pattern of large muscle mass contraction, and the demand on the heart depends on the force production, enabling the athlete to reach steady-state exercise. Static exercises demand less oxygen overall but can generate significantly larger forces than dynamic exercises using smaller muscle groups. Many activities involve a mix of the two types but an example of an exercise with proportionately high dynamic activity would be jogging and an example of a highly static activity would be lifting weights.

Dynamic and static exercise pose different demands on the cardiovascular system. Dynamic exercise places a volume-associated overload on the heart (moving more blood volume to and from the heart) and static exercise places a force overload (increasing pressure) on the heart. Although both activities can be safely conducted, CR professionals should consider which activities involve a combination of high dynamic and static loads on the cardiovascular system, e.g. boxing, rowing (Mitchell et al, 1994). The intensity of these activities is critical and can be varied; for example, weight lifting with low weights can reduce the static and increase the dynamic component and rowing slowly at a low intensity can reduce the static and dynamic components compared to the high demands on both components rowing typically involves.

Resistance training (RT) is also a component of CR but often the RT in CR programmes involves lifting weights as light as 1–3 lbs (Adams and Berbarie, 2013). At this weight, true RT is arguably not even taking place as RT is defined as progressive overload to specific muscles or muscle groups (Durstine et al, 2008). Although very light RT or range of motion activities are indicated in many cases, e.g. after recent bypass graft procedures among high-risk patients, Netz et al (2005) reported that high-intensity RT is safe and effective in CR. Therefore, RT could be incorporated into programmes tailored to athletes.

Monitoring

Monitoring athletes in CR may also present unique challenges. Traditionally, CR patients are monitored using telemetry for rate, rhythm, and ischemic changes during exercise, and blood pressures may be monitored up to three times during a typical exercise session (Durstine et al, 2008). The presentation of electrical artefacts during vigorous or alternative activities may make ECG monitoring difficult or impossible during exercise. Alternative durations and intensities as well as sport-specific exercises may make blood pressure monitoring more difficult. Strategies for monitoring patients in these situations include scheduling a brief active cool-down or recovery period midway through the exercise session, during which time artefacts could be minimised and blood pressure measured. Monitoring blood pressure and ECGs are not the only ways to assess patients' exercise tolerance. Other signs that the exercise is well tolerated include formal or informal ratings of perceived exertion (RPE), absence of pallor or profuse sweating, and the overall performance (Durstine et al, 2008). Relative exercise tolerance—the ability to work at the same intensity or perform the same activities compared to a previous session—is also a useful monitoring strategy (Durstine et al, 2008).

Recommendations for return to play among athletes with heart procedures are specific to the condition and procedure, and include a 3–6 month period for athletes post angioplasty or bypass graft surgery and 1–3 months for ablation procedures (Pelliccia et al, 2005). CR is recommended during this delay to restore and maintain cardiovascular function, and for sport-specific assessments, and training, plus traditionally-prescribed CR programme exercises (Herring et al, 2002).

Additional resources

Questionnaires that assess the extent to which an individual views themselves as an athlete may aid CR professionals in identifying athletes among their patients beyond their metabolic capabilities and risk profiles. Two out of the three cases studies discussed below (Case 1 and Case 3) used the Athletic Identity Measurement Scale-Plus, which quantifies the extent to which an individual identifies with the role of an athlete. Three domains are assessed, including the extent: that the individual identifies with the role of athlete socially; to which this role is aligned with the individual's view of their self-worth; and that negative experiences impact the individual relative to athletics (Brewer et al, 1993). Schmid et al (2009) reports that cardiac patients and competitive athletes can demonstrate high levels of athletic identity; therefore, CR professionals must consider sport-specific training goals for these patients and failure to do so can lead to depression, anxiety, and diminished self-worth. Athletes in CR who are not guided towards their athletic goals may be inclined to exercise outside a supervised setting in a suboptimal or even dangerous manner.

Other helpful resources include compilations from the 2011 Compendium (Ainsworth et al, 2011), which include METs associated with running minute-mile paces, miles per hour running and cycling, and many other sports.

Safety and appropriateness in CR programmes

CR programmes are the safest place for individuals to exercise after a cardiac event. In fact, surveillance of patients during exercise is among the top reasons why cardiologists refer patients to a CR programme (Durstine et al, 2008). Referring physicians and patients find that surveillance during exertion by CR professionals in close proximity to emergency facilities is ideal for exercise training. Strategies that modify existing CR programming and prescription guidelines optimise the treatment course for athletes and facilitate them to meet their objectives, if possible, during CR (Kennedy et al, 2012).

Case studies

From a literature search, the authors selected three similar cases that were all conducted at the same facility. These cases serve as examples to support the paper's content and highlight additional alternatives to exercise prescription. Given that athletes are not prevalent in CR programmes, these documented case studies may illustrate considerations and strategies that may apply to specific cases (see *Table 1*).

Case 1 focussed on using the rate pressure product (RPP) despite the fact that heart rates and blood pressures were examined separately. Although the patient regularly exceeded the upper limit typically assigned for exercise heart rates and frequently approached 100% of his age-predicted maximum heart rate, he was consistently below the recommended upper limit for RPP. Schmid et al (2009) highlighted how important they felt modifying the typical CR programme was for this patient who had run over 27 000 miles during his lifetime and how satisfying his return to sport was.

In Case 2, Kennedy et al (2012) reported that the patient competed in his track and field events 5 months postoperatively. This patient reached the same physical fitness level as he had prior to his heart attack.

The patient in Case 3 was a police officer (Adams and Berbarie, 2013). Adams et al (2010) found that 30 police officers had an average range of 7.8–12.3 METs during simulated law enforcement activities (e.g. foot chases), with a peak range of 9.8–17.6 METs. Therefore, training for police work requires training for tasks in the 8–10.5 METs range. Ainsworth et al (2011) reported that the workload associated with soccer and hockey has a similar range of 8–10 METs. This patient exercised at high intensities approximately 2 weeks post-surgery, which is far earlier than the 3–6 month delay Pelliccia et al (2005) and the AACVPR and ACSM guidelines recommend.

Table 1. Patient characteristics of case studies

Case number	Authors (year)	Patient (history)	Treatment (outcome)
1	Schmid et al (2009)	77 years of age, male, runner, underwent angioplasty; (30 years CVD, positive stress test and uncontrolled hypertension)	6 weeks of phase 2 CR, 3.5 mph running speed, 3% incline progression (heart rate decreased from 144 bpm to 130 bpm with training)
2	Kennedy et al (2012)	65 years of age, male, athlete, underwent CABG; (myocardial infarction)	Block starts, sprints, agility activities, hurdles, high intensity RT (reduced bp: maximum 168/86 mmhg during exercise)
3	Adams and Berbarie (2013)	39 years of age, male, police officer, ice hockey and soccer player, underwent CABG; (abnormalities in ECG)	High-intensity training (returned to ice hockey and regular work activities at 6 weeks postoperatively)

CABG=coronary artery by-pass graft; CVD=cardiovascular disease; CR=cardiac rehabilitation; RT=resistance training; ECG=electrocardiogram; bpm=beats per minute; bp=blood pressure

These cases highlight the possibility of modifying CR guidelines and programmes to suit special populations and special individuals. The age range (39–77 years) of these three cases, the varied diagnoses, and their varied sports or occupation-specific goals, highlighted the different presentations of these patients on beginning CR.

If exercise prescriptions are more aggressive or initiated earlier, more vigilant monitoring is necessary (Adams and Berbarie, 2013). For example, individuals such as the police officer (Case 3) who engage in high-intensity exercise as early as 2 weeks post bypass graft surgery should avoid activities that will irritate or injure the sternal or leg incisions. The patient and CR professional should also monitor incision site healing. During alternative CR programming, indicators of poor tolerance to newly-prescribed medications should be monitored, since medication adjustment and healing from procedures often delay return to play.

CONCLUSION

Researchers suggest that some patients can exceed the typical outcomes associated with CR and that sports-related objectives within the context of safety are possible when treating athletes in alternative ways after acute cardiac events. Being mindful of the features that distinguish athletes from non-athletes relative to testing, prescription, medications, and symptoms, can help CR professionals and patients meet agreed objectives.

Evaluation and treatment of athletes carries a unique set of challenges. Athletes may have a number of ECG changes that are normal training adaptations suggestive of cardiovascular disease in the sedentary population. Athletes are more fit than the population usually evaluated, and as a result, tests can be falsely negative because the appropriate exercise threshold has not been reached. This presents the risk of both over-diagnosis, which can prematurely end an athlete's career, or under-diagnoses, which has dire health consequences. A thorough understanding of the training adaptations of the cardiovascular system can ensure this special group of patients receive appropriate care. Modification of established exercise prescription guidelines is within the context of individualised care required of CR professionals by special cases. Such exercise modification is also part of best practice in assessment, prescription, and monitoring of the objective and subjective indicators that indicate exercise toleration and safely. IJTR

Conflicts of interests: None.

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KEY POINTS

- Athletes are not common in cardiac rehabilitation settings, and they are less likely to present with angina, will have higher metabolic capacities and may be more likely to have baseline abnormalities on an ECG.
- Higher exercise capacities require more intense exercise prescriptions.
- Athlete patients likely align their role as an athlete with their identity so training them specifically may be associated with positive psychosocial variables including reduced anxiety and depression.
- A combination of traditional guidelines for programming and prescription, and alternative approaches may be the best strategy pursuant to cardiac rehabilitation of the athlete patient.
- Researchers point to the possibility of safely training athlete patients outside of traditional guidelines.