



Editorial

Sorting the Wheat From the Chaff in Cardiac Rehabilitation: Who Gets Better and Why?

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See article by Deley et al., pages 1353–1358 of this issue.

Cardiac rehabilitation (CR) is a well-established intervention that involves exercise training, support with healthy lifestyle behaviours, and medical management to treat cardiovascular disease. Overwhelming evidence from randomized controlled trials demonstrates the efficacy of CR for reducing morbidity and mortality across cardiovascular populations with diverse demographic and clinical features.¹ This evidence of improved patient outcomes has been pivotal in establishing CR as standard care for most patients with cardiovascular disease. Despite these achievements, a major limitation in the evaluation of the CR programs has been inadequate attention paid to an important clinical observation: not all patients show the same magnitude of improvement during CR, and some patients may even get worse.

In the present issue of the *Canadian Journal of Cardiology*, in their prospective observational study, Deley et al.² tackle the important topic of variability in CR outcomes by exploring the potential roles of age and psychosocial stress as predictors of treatment response. For both acute and chronic disease care providers, research of this nature may help identify subgroups for whom CR is more or less efficacious and identify for whom CR services can be better personalized.

Does Age Matter?

The principal finding of Deley et al.² is that age was *not* associated with post-CR physical performance outcomes (i.e., peak workload, estimated peak maximal oxygen uptake) among 733 patients, predominately with coronary artery disease (CAD), who completed a 25-session CR program. On average, all age groups experienced improved physical performance from pre- to post-CR, including a subset of adults aged 80 years or more. It is noteworthy that absolute values

for physical performance remained suboptimal at CR completion (eg, peak maximal oxygen uptake of 20.3, 15.9, and 13.4 mL/min/kg for young, old, and very old patients, respectively, based on a cycle ergometer exercise test). These suboptimal results notwithstanding, they may still be clinically meaningful given that even small improvements in cardiorespiratory fitness can confer a survival benefit.³ Cardiorespiratory fitness gains from baseline to CR completion, or lack thereof, represent an independent marker of prognosis regardless of absolute fitness level achieved.³

The authors' conclusion that age does not limit physical performance outcomes is inconsistent with prior research showing that advancing age, especially for patients aged 60 years and older, is associated with smaller cardiorespiratory fitness gains during CR.^{3,4} This apparent disparity may relate to the different program characteristics, the different methods of physical performance measurement, and the exceptional CR adherence rate reported by Deley et al.² (average 98.6% of prescribed sessions attended). Nonetheless, older adults who are eligible for CR have a decreased likelihood of receiving a referral compared with their younger counterparts,⁵ and the present report may serve as a catalyst for clinicians to recognize that older adults with CAD stand to benefit from CR only if referred and given the opportunity to participate. This report also adds to our scientific understanding of patient factors that may limit physical performance gains during CR, such as female sex, high baseline cardiorespiratory fitness, multimorbidities, tobacco use, and poor program adherence.^{3,4,6}

A strength of this work is the examination of changes in psychosocial well-being during CR—an understudied outcome that is often highly valued by patients. All age groups reported improvements in 2 manifestations of psychosocial stress, namely, symptoms of depression and anxiety, after participation in CR. Research in behavioural epidemiology spanning several decades demonstrates that elevated depressive and anxious symptoms are independent risk factors for the development of and worse outcomes from CAD although, to date, anxiety has been less thoroughly examined than depression.⁷ Persistent psychosocial stress can profoundly impair quality of life and interfere with adherence to chronic

Received for publication June 26, 2019. Accepted July 7, 2019.

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disease care by patients with CAD.^{7,8} Yet, psychosocial stress remains widely dismissed as a “soft” outcome in CR research and may be underappreciated by some clinicians. Deley et al.² convey that psychological risk factors are worthy of independent empirical and clinical attention while adding to a mounting body of research showing that CR can significantly improve the common problems of depressed mood and anxiety in patients with CAD.⁷

Just as not all patients experience improved physical performance during CR, not all patients “feel better” after program completion. This is apparent in Table 2 data from the present study showing that, when calculated across all age groups (N = 733), 17% of patients still reported clinically significant depressive symptoms and 41% still reported clinically significant anxious symptoms after completing CR (ie, Hospital Anxiety and Depression Scale ≥ 8 on each respective subscale). This is problematic given that residual psychosocial stress, and depressive symptoms in particular, post-CR may predict a worse prognosis.⁷ Although CR, on average, is linked with clear reductions in psychosocial stress,⁷ little is known about the substantial minority of patients who remain anxious or depressed at program completion. Understanding characteristics of “psychological nonresponders” could guide clinical decision-making to identify patients for whom CR is inadequate as a stand-alone treatment and help these patients through further evidence-based psychosocial intervention. The researchers suggest age is not a crucial patient characteristic in predicting whose mood improves during CR, leaving important questions about what *does* serve as a prognostic indicator of psychological improvement.

Does Psychosocial Stress Matter?

A complicated issue in behavioural medicine is that psychosocial stress (often used interchangeably with “psychological distress”) represents a heterogeneous construct that has a nuanced, bidirectional association with physical health parameters.^{7,9} Current conceptualizations of psychosocial stress in the chronic disease literature tend to convey that less distress is necessarily better than more.⁹ In contrast, Deley et al.² report that greater baseline severity of depressive and anxious symptoms predicted *better* post-CR physical performance (at least among patients aged < 80 years). This suggests greater psychosocial stress could index “room for improvement” during CR, at least in part, because more distressed patients tend to have worse baseline exercise capacity. Although there are mixed research findings on this topic, other investigators have found that anxious symptoms predict greater improvement in exercise capacity during CR and that patients with CAD and comorbid mental health conditions have higher rates of CR participation.^{10,11}

In the context of the present study, and acknowledging the aforementioned information, it follows that some degree of psychosocial stress—particularly after a major life event or potentially life-threatening cardiac condition—is not inherently a “bad thing.” Yet, psychometric instruments to screen for psychosocial stress generally yield a continuous total score wherein lower scores correspond to a “normal” intensity of distress. Arguably, this conceptualization contradicts mainstream theories of human emotion that posit a fundamental adaptive value of negative effect in some circumstances.⁹

Unpleasant emotions such as fear, anxiety, sadness, anger, guilt, and their physiologic sequelae—which are typically tapped into via distress screening instruments—are evolutionarily designed to motivate action toward fulfilling important needs in response to life’s challenges. Although the study design of Deley et al.² does not permit firm conclusions about why depressive/anxious symptoms were linked with better post-CR physical performance, it is plausible that unpleasant emotions motivated some patients (at least in the short-term) to better adhere to medical advice, to attend supervised exercise sessions, to seek social support, and to appropriately withdraw from certain activities during their recovery.

The line between normal emotional responding and clinically relevant psychosocial stress is often grey, and this important distinction is rarely made in the cardiovascular literature. As such, it is difficult to make broad conclusions based on extant literature regarding whether or how psychosocial stress upon CR intake matters to treatment response. It could be that, within the present study population, depressed mood and anxiety were not severe enough to impair patients’ ability to engage in exercise training (as indicated by average Hospital Anxiety and Depression Scale scores in the normal-to-mild range, with most patients scoring below clinically significant cut-points). To understand the role of negative affect in cardiovascular health, screening tools for psychosocial stress cannot be interpreted in isolation to confirm whether patients are experiencing a maladaptive emotional response that is likely to interfere with their recovery. A maladaptive emotional response is often characterized by emotional inertia, emotional variability/instability, lack of emotion regulation, interference with the ability to cope with one’s illness, or a diagnosable mental health disorder.⁹ The psychological benefits of CR and psychological predictors of CAD outcomes might be further clarified with the development of more refined instruments that go beyond severity ratings to capture the duration and nature of patients’ emotional responses.

Conclusions and Future Directions

The science of CR indicates that exercise training and resultant improvements in physical performance represent a central mechanism through which CR has beneficial effects on survival.³ Therefore, it is critical to understand for whom physical performance is likely or unlikely to improve to maximize the application of high-value CR services. Although age, psychosocial stress, and baseline cardiorespiratory fitness are potentially relevant factors to consider when practicing personalized medicine in CR, these factors should not serve as barriers to CR referral or enrolment. Further research to refine CR for optimal efficacy should seek to understand not just *who* gets better during CR, but also how, why, and under what circumstances. Whereas exercise training has been well studied as an “active ingredient” in CR, for example, more work is needed to understand the independent and interactive influences of other CR components—such as management of cardioprotective medications, delivery of psychological interventions, and support with smoking cessation and dietary change—on important behavioural and physical health outcomes. To advance our knowledge about the optimal delivery of CR for individual patients, researchers are encouraged to

adopt an idiographic approach and examine within-person trajectories during CR; to use adaptive treatment designs to investigate the optimal dose, timing, and duration of CR; and to focus on clinically significant signals within psychosocial stress and other behavioural risk factors. When viewed from this perspective, the work of Deley et al.² may help inform strategies to favourably augment the effects of CR, reach more patients with a greater likelihood of achieving clinical benefit, and derive improved outcomes from higher value health care.

Disclosures

The authors have no conflicts of interest to disclose.

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