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The Exercise Tolerance Test

Recently, there's been a growing interest in the social and psychological predictors of exercise tolerance. Exercise tolerance is one indicator of function that has recently been linked to psychosocial factors.

Practitioners use heart patients' exercise tolerance to determine their ability to exercise, help diagnose coronary artery disease, and help prescribe safe levels of rehabilitative exercise. The exercise tolerance test (or stress test) is usually carried out on a treadmill or stationary bicycle in the presence of a physician and exercise technologist.

The test stops when the patient can no longer continue (as decided by the patient or physician). Reasons to stop the test include

- hypertensive response;
- high heart rate;
- chest pain;
- fatigue;
- leg cramps;
- ischemia (i.e., lack of oxygen to the heart) elevation;
- the patient does not want to continue.

Once the test stops, the performance is reported in minutes or METS.

The ability to tolerate exercise has been linked to longevity among heart patients. For example, Myers et al. (2002) found that exercise capacity among men (with or without cardiovascular disease) was the best predictor of mortality regardless of age.

SOCIAL AND PSYCHOLOGICAL PREDICTORS OF EXERCISE TOLERANCE

The social and psychological predictors of exercise tolerance could significantly influence the results of the exercise tolerance test. Many of the reasons listed above for stopping the test may have little to do with fitness or a capacity for exercise, but may relate more to motivation or psychological factors. For example, heightened blood pressure and heart rate may be due to anxiety. A variety of reasons, such as the fear of triggering an event, may influence a patient's request to stop the test.

Ruo, Rumsfield, Pipkin, & Whooley (2004) recently found that patients with cardiovascular disease performed less well on the exercise tolerance test if they also had symptoms of depression. (This research controlled for other factors that might influence exercise tolerance, such as smoking, BMI, diabetes, age, income, and beta-blocker and statin use.) This study's data also show that those with higher incomes and more education were more likely to have better test results.

TWO STUDIES ON THE INFLUENCE OF SOCIAL AND PSYCHOLOGICAL FACTORS

We have recently completed two studies examining how social and psychological factors can influence exercise tolerance. Both studies focused on male heart patients in the Northern Alberta Cardiac Rehabilitation Program at the Glenrose Hospital in Edmonton, Alberta.

Our first study (Fraser, Rodgers, Daub, & Black, 2003) examined how sociodemographic factors (e.g., age, income, education) and social support (e.g., from family, friends, employer, etc.) might affect exercise tolerance before (baseline) and after (at 14 weeks and then at nine months after baseline) attending cardiac rehabilitation.

Controlling for the type of disease, comorbid factors (i.e., other diseases or conditions the patient might have), smoking, and how ill patients thought they were, we found a surprisingly stable relationship between income and social support. In particular, income and social support were positively related

to exercise tolerance before and after attending cardiac rehabilitation. Interestingly, after accounting for exercise during rehabilitation, higher income and more social support were still related to better exercise tolerance. This study showed that these two social factors affected exercise tolerance regardless of exercise participation in cardiac rehabilitation.

Our second study (Fraser, Rodgers, Carlyle, & Daub, 2004) examined how social support and stress influenced exercise tolerance before cardiac rehabilitation (baseline) and 14 weeks after baseline.

After accounting for age, we found that people reporting more stress also had poorer exercise tolerance at both times. Social support seemed positively related to exercise tolerance. In addition, spousal support for exercise also seemed related to exercise tolerance at both times.

CONCLUSIONS

Although we need more research on how psychological and social factors affect exercise tolerance, these two studies suggest that exercise tolerance may not be influenced solely by the severity of illness or even by behaviour, in this case, exercise. (Exercise improves health and fitness generally and, therefore, improves exercise tolerance.) Rather, social and psychological factors may play a unique and independent role in influencing exercise tolerance.

Financial strain, lack of social supports, depression, and stress might limit the ability to tolerate physical exertion. Research on stress shows that chronic stressors (such as financial strain or social conflicts) affect responses to acute stressors (e.g., Matthews, Gump, & Owens, 2001).

Acute stressors may be physical and/or psychological. For example, the prospect of exercise may lead to a heightened physical response in a heart patient who had suffered a heart attack after physical exertion.

If the physical stressor is the exercise tolerance test itself, the result could be a low exercise test score. More importantly, these heightened physical responses are a concern if they happen outside the safety of the exercise tolerance test, e.g., anxiety about the test the night before.

A person entering a rehabilitation program with significant stressors or depression is more likely to score poorly on the exercise test compared to someone without such concerns.

It might be useful to identify people with depression and stress who have poor exercise tolerance. These patients may be susceptible to heightened responses to physical or psychological stress outside the rehabilitation setting. These heightened responses make them more likely to experience high blood pressure and heart rate responses and perhaps even chest pain in a stressful situation.

Further, psychological factors might mask people's actual physical ability to tolerate exercise. Thus, we would encourage cardiac rehabilitation programs to offer stress management and psychological counselling. Adequate support might also help people in these programs to cope with stressors.

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