EDITOR'S CHOICE

When will we treat physical activity as a legitimate medical therapy…even though it does not come in a pill?

Timothy S Church, Steven N Blair

A recent highly publicised report claimed that an exercise pill has been discovered.[1] A mystical substance was found to increase endurance in mice without exercise training. By the way, this is not the first time such an observation has been made. Nonetheless, it was widely reported that this may be the end of the need to get off the couch and soon all the benefits of exercise will be delivered by a pill. Sound too good to be true? It probably is, as mimicking the multiple health benefits of exercise with a pill would be the equivalent of creating a cancer-free cigarette. If exercise could be put in a pill form, the world as we know it would be radically changed forever, with healthcare and financial implications too large to quantify. We would have a new powerful therapeutic option for the prevention and treatment of cardiovascular disease (CVD), diabetes, dementia, osteoporosis, depression, old age, certain types of cancer and many other ailments, some of which are not typically considered "exercise related".[2]

In 2007 the Milken Institute, estimated that the top seven chronic diseases which include CVD, cancer, diabetes, mental disorders and lung disease are estimated to cost the US$1.3 billion annually; with the shift in age of the population this cost is expected to increase dramatically in coming years.[3] If exercise came in a pill we could dramatically reduce the prevalence as well as the morbidity and mortality associated with these conditions creating a much healthier, happier and more productive world. Many doctors would be out of work and hospitals would have to be downsized. But creating an exercise pill is no easy task; and as indicated by the list above, the pill would have to simultaneously benefit numerous complex physiological systems, not just improve exercise capacity as documented in the recent report. It is somewhat audacious to suggest that we can mimic the health benefits of exercise with a pill and while maybe some day in the far future this may be possible it is not expected any time soon. However, this topic is not likely to go away as we know of at least four other substances that are currently under study that claim to increase fitness in animals.

As exercise scientists it is somewhat frustrating that one of the only times exercise is discussed as a serious medical therapeutic option is when a story about an exercise substitute hits the press. It is frustrating because while an exercise pill and all its exercise-associated health benefits is not even close to be becoming a reality, creating a more physically active environment and society is a very achievable goal. Yet few resources are being invested to make this happen. We can start with some relatively simple actions such as making more green spaces and bike paths, introducing modern physical education programmes into schools, further investment in behavioural research to promote and maintain healthful amounts of activity and making physical activity interventions a reimbursable medical expense. Given that the average monthly costs of drugs for chronic diseases such as hypertension, hyperlipidaemia, diabetes and depression can cost hundreds of dollars, it seems asinine to argue that reimbursing for physical activity interventions is too expensive. On the contrary, given the powerful and pleiotropic benefits of physical activity it is too expensive NOT to reimburse for physical activity interventions. Imagine if you could refer people with diabetes, depression, breast cancer or hypertension to exercise treatment centres where they get 8–12 weeks of supervised support and interventions to help them become and stay more active. The training would consist of teaching the basics of exercise prescription and slowly building up the exercise dose over time with concomitant building of behavioural skills. When the programme was over subjects could check in regularly to update their programme. This could be done by a telephone support system, interactive internet sites, iPod interventions and other means of electronic communications. This could take place in existing cardiac rehabilitation centres and if conducted in a group setting the monthly costs would be less than for any "new" drugs.

A common criticism of the use of exercise as a medical treatment is that people do not stick with it. How to we know this? It has never been tested with significant resources committed for promoting success. A related question that is not often asked is "how many patients do not take their medication as prescribed or not at all?". We know that many commonly prescribed drugs such as antidepressants and even statins are not taken as prescribed and may not be taken at all. Yet this does not prevent healthcare providers from prescribing medication at ever-increasing rates while virtually ignoring physical activity counselling. Why does our medical establishment require a higher adherence standard for exercise prescription than for medication prescription? Further, despite minimal research investment, we are quickly learning how to employ behavioural strategies to promote the initiation and maintenance of regular physical activity.

WHAT IS THE OPTIMAL DOSE OF PHYSICAL ACTIVITY?

The model of developing pharmaceutical interventions can also be applied to the development of physical activity. For any given drug there is extensive research looking at multiple doses, delivery methods and the interactions of age, gender, ethnicity and pre-existing medical conditions. Furthermore, we have multiple types of drugs for common conditions such as hypertension, raised cholesterol, or depression. This is not the case for exercise where we largely prescribe a common dose and that is the widely accepted 150 min/week of moderate intensity physical activity. Although this dose is a good starting point for exercise for general health, there remain many important concerns. The 150 min/week recommendation is the result of a self-fulfilling prophecy. Somewhere along the line, based primarily on epidemiological data, the 150 min/week was identified as a good recommendation. Subsequent

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future studies, both epidemiological and clinical trials, used this threshold to create categories or define intervention goals. Thus, while there are a lot of data examining 150 min/week or more compared with no activity, there are few data examining different doses, intensities, types, or frequencies of exercise. As a result, it is not that 150 min is the best cut-off point chosen from many dose–response studies, but rather, it is the cut-off point with the most available data.

Applying the medicine model to exercise, just as one blood pressure drug and one dose are not suitable for all patients, one exercise prescription does not fit all clinical situations. For example, a sedentary, elderly person with multiple chronic conditions is likely to get great benefit from even a small increase in physical activity, such as 60–70 min/week of low- to moderate-intensity walking, along with some balance and light resistance training. Whereas for a 30-year-old healthy person, 60–70 min is better than nothing, but achieving 150 min or more a week may have substantially more long-term benefits. The dose and type of physical activity for postmenopausal women to reduce the risk of osteoporosis, is likely to be different from the dose and type of required for weight loss in young people. Important research questions to be examined related to dose and aerobic exercise include the interaction of ethnicity, age, gender and various medical conditions.

Many questions about exercise dose, intensity and type of exercise remain to be answered. For example, we have very few data on doses of resistance or flexibility training that may be beneficial for various outcomes. Resistance, flexibility and balance training have great potential to improve health and function in older adults, and much more research is needed to clarify the relative importance of these activities. Although there are potentially a huge number of permutations to be examined, a few key dose–response studies could produce informative data for the future exercise recommendations.

In summary, while an exercise pill is an exciting concept it is also not likely to be a reality any time soon. However, the nonsense generated by the idea of such an invention creates an opportunity to discuss some real concerns related to physical activity. Central among those is why, given the powerful, pleiotropic medical benefits of exercise, it is not prescribed more in clinical settings? Should this not be an area of investment and focus? Further, there is still a need to refine the exercise prescription. For example, what is the minimal dose of aerobic activity to promote/maintain health and quality of life? How much and what type of resistance training is optimal? Does the prescription vary by age, gender, ethnicity and health status? There is no action (except abstaining from smoking) that could improve health more than being physically active, yet it remains an afterthought in clinical medicine and federal funding priorities. We continue excitably to search for health in a pill, yet we already have the readily available behaviour of regular exercise that would provide enormous benefits. We are missing a great opportunity to prescribe/promote health at an individual, societal and global level. We call upon professionals in clinical medicine, exercise science and public health to become more aggressive in implementing exercise treatments for all.

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EDITOR'S CHOICE

Too much sitting: a novel and important predictor of chronic disease risk?

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Research on physical activity and health has pointed clearly to increasing the time that adults spend doing moderate to vigorous intensity activities: 30 minutes a day is generally recommended. However, recent evidence underlines the importance of also focusing on sedentary behaviours—the high volumes of time that adults spend sitting in their remaining "non-exercise" waking hours. We provide a brief overview of recent evidence for the distinct relationships between 'too much sitting' and biomarkers of metabolic health and, thus, with increased risk of type 2 diabetes, cardiovascular disease and other prevalent chronic health problems. Particular concerns for this new field include the challenges of changing sedentary behaviours in the context of ubiquitous environmental and social drivers of sitting time; examining the effects of interventions for reducing or breaking-up sitting time and identifying the most relevant implications for clinical and public health practice.

Increasing participation in leisure time physical activity (LTPA) in adult populations is a central tenet of strategies for preventing major chronic diseases (type 2 diabetes, cardiovascular disease, breast and colon cancer) and obesity in developed and developing nations.[1 2] To date, clinical practice, community programmes, mass-media campaigns and population strategies have focused mainly on encouraging and supporting individuals to be more active, largely during discretionary or leisure time, but more recently (and to a lesser extent) also in travel time.[2] While these approaches have met with some success, our recent body of work has identified sedentary behaviour (time spent sitting) as a novel and

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