Reframing Physical Activity Prescriptions for Improved Metabolic Health

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Main Objectives

1. Recognize the metabolic complications of suboptimal lifestyle, i.e. obesity and low physical activity, and the gravity of this public health issue.

2. Appreciate the importance/benefit of being physically active, independent of physical fitness.

3. Rethink “physical activity prescription” for the purpose of improved metabolic health.
Diabetes
+ Fatty Acids = Insulin Resistant

- Fatty Acids = Insulin Sensitive
Estimating the “cost” of Diabetes

In 2012 it was estimated that nearly 30 million Americans have diabetes, >95% of whom have type 2 diabetes.

In 2012, the total estimated economic burden of diagnosed diabetes (~21 million Americans) and related complications was $245 billion.

Perhaps more alarming is that…

90 million Americans are estimated to have pre-diabetes.
Insulin Resistance

- Diabetes
- Heart Disease
- Obesity
- Sleep Apnea
- Acid Reflux
- High Blood Pressure
- Cancer

Facchini et al., J Clin Endo & Metab, 2001
Global Health Risks (WHO)
Leading Causes of Attributable Mortality

1. High Blood Pressure
2. Tobacco Use
3. High Blood Sugar
4. Physical Inactivity
5. Overweight and Obesity

“Low fruit and vegetable intake, lack of exercise, alcohol and tobacco use, high body mass index, high cholesterol, high blood glucose, and high blood pressure are risk factors responsible for more than half of the deaths due to heart disease, the leading cause of death in the world”
Behold the power of lifestyle modification

Physical Activity & Exercise
Weight Loss
Lifestyle modification attenuates progression to Type 2 Diabetes

The DPP Research Group, *NEJM*, 2002

Translational Metabolism Research Laboratory
Lifestyle modification attenuates progression to Type 2 Diabetes

The DPP Research Group, *NEJM*, 2002
Insulin Sensitivity

Rd (mg·min⁻¹·kg FFM⁻¹)

Younger Adults
Older Adults

Athletes
Normal weight
Obese
Sedentary

Amati et al., Diabetes Care, 2009
Metabolic benefits of exercise are relatively short-lived

Heath et al., J Appl Physiol, 1983
A single session of exercise is sufficient to improve insulin sensitivity

Devlin et al., *Diabetes*, 1987

Newsom et al., *Diabetes Care*, 2013
Physical Inactivity

Translational Metabolism Research Laboratory
Sedentary
Light Activity
Mod/Vig Activity

Henson et al., Diabetes Metab Res Rev, 2016
Breaking-up sedentary time greatly improves glucose tolerance

Dunstan et al., Diabetes Care, 2012
Limiting Sedentary Time

Light Activity
5% increase in insulin sensitivity

Mod/Vig Activity
18% increase in insulin sensitivity

Henson et al., Diabetes Metab Res Rev, 2016
Physical activity is a primary determinant of energy expenditure.

Hamilton et al., *Diabetes*, 2007
Targeting Physical Inactivity

Hamilton et al., Diabetes, 2007
Translational Metabolism Research

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Translational Metabolism Research Laboratory
In the Clinic

The TMRL seeks real answers to critical metabolic health issues by studying real people. In partnership with Samaritan Athletic Medicine, we investigate the use of lifestyle intervention – changes in physical activity and diet – to improve metabolic health. Consider participating in one of our ongoing research studies.
Interested in our metabolic research studies?

The TMRL is presently recruiting individuals to participate in ongoing metabolic research investigations. Because our research is focused on improving metabolic health, participation in our studies often serve as a great way to jumpstart a lifestyle transition. Additionally, most studies involve diagnostic procedures that provide health-related information and monetary compensation. Scroll down to learn more about current opportunities.

Acute Exercise Study

It is well established that exercise improves metabolic health. But, did you know that even one session of exercise can improve metabolic health? The TMRL is presently recruiting participants for a metabolic research study aimed at understanding the effects of a single session of exercise on regulation of blood sugar and muscle metabolism. Click the Get Involved button below to see the official advertisement for this study. Also, do not hesitate to contact our research team if you have any questions regarding this metabolic research study.

Contact our research team.

Get involved! (pdf)
Key Takeaway Points

✓ Suboptimal lifestyle is causally linked with the development of insulin resistance and related cardiometabolic diseases

✓ Lifestyle intervention remains the gold-standard treatment for insulin resistance, prediabetes and type 2 diabetes, regardless of sex, ethnicity or age

✓ Even a single session of exercise is sufficient to enhance insulin sensitivity in otherwise sedentary, obese individuals

✓ Cardiorespiratory fitness is not required to gain the insulin-sensitizing benefit of aerobic exercise

✓ Because the metabolic benefits of exercise are short-lived (24-72h), one must exercise regularly to keep achieving the insulin-sensitizing benefit of aerobic exercise
Key Takeaway Points

- Sedentary behavior is generally defined as the absence of regular exercise activity.
- In the modern environment we must also consider inactivity as an independent risk factor for the development of chronic cardiometabolic diseases.
- It is likely that “exercise prescriptions” will more readily incorporate limitations on inactive behavior (i.e. sitting time), including frequent light-intensity activities to interrupt prolonged periods of inactivity.
- “Activity prescriptions” have not yet been optimized to reduce risk for chronic cardiometabolic disease conditions.
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