Novel approaches in the promotion of physical activity and exercise for the prevention of type 2 diabetes

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Andrew P Hills PhD
Deputy Dean Research, Faculty of Health
Professor of Sports and Exercise Science
University of Tasmania, Australia

Physical activity and health

• Humans are designed to be active.
• Therefore, optimal health and fitness can only be achieved by those who are habitually active.
• Being active is normal and natural - modern environments have ‘engineered’ activity out of our lives.
• Low levels of physical activity and sedentary behaviours are killers!

Physical Activity and Health: “What is Old is New Again”

Andrew P. Hills*, Steven J. Street*, Nuala M. Byrne*
*Maier Research Institute, University of Queensland, South Brisbane, Queensland, Australia
*Bond Institute of Health and Sport, Bond University, Gold Coast, Queensland, Australia
*Corresponding author: e-mail address: andrew.hills@maier.uq.edu.au


Renewed Prescriptions For An Old Remedy: Physical Activity

Policy makers struggle to act on a growing body of evidence that links better health to physical activity.

By David Tuller

Tuller, Health Affairs (2015)
Movement is Medicine and P4 – Predictive, Preventive, Personalized, & Participatory

A new model for assessing and tracking movement – Movement is Medicine

Figure 1. Theoretical benefits of human movement. A: Sedentary lifetime no participation in a structured exercise program, minimal daily step count, prolonged daily sedentary time; B: Physically active, participating in a structured exercise program, accumulating daily steps and reduced daily sedentary time but not achieving recommended levels in these areas; C: Physically active, participating in a structured exercise program, accumulating daily steps and reduced daily sedentary time but not achieving recommended levels in these areas; D: Physically active, participating in a structured exercise program, accumulating daily steps and reduced daily sedentary time achieving recommended levels in these areas.
Moving forward in the prevention of obesity and type 2 diabetes based on important lessons

- Supposed ‘intensive’ lifestyle interventions to date – not intensive enough.
- Therefore, no surprise that modest outcomes reported.
- Control group comparator should be healthy participants engaged in an optimal standard care lifestyle intervention.
- Windows of opportunity for physical activity at all phases of the lifespan must be exploited.
- Multiple teachable moments throughout.

Life course approach to obesity and diabetes prevention

- Characterise phenotype
- Define markers of risk
- Nutrition & activity interventions
- Adult diet, activity, other risk factors
- Childhood diet, activity, adiposity
- Infant feeding, activity, adiposity
- Fetal growth, growth, adiposity
- Health of adolescent, mother’s diet & body composition
- Chronic diseases

Adiposity-Based Chronic Disease (ABCD) and lifestyle medicine

Regional Symposium on Diabetes - Current Science and Multi-Stakeholder Approaches to Prevention & Management, October 4-5, 2017, Singapore
Overweight and Obese Adolescent Girls: The Importance of Promoting Sensible Eating and Activity Behaviors from the Start of the Adolescent Period

Alwysn S. Todd 1,2,3, Steven J. Street 1,4, Jenny Ziviani 5,6, Nuala M. Byrne 4,7 and Andrew P. Hills 1,3,*

1 Centre for Nutrition and Exercise, Mater Research Institute, The University of Queensland, OPEN ACCESS

Article

Diabesity in women of childbearing age - huge disparity between current and past activity levels (and nutritional practices) of many young women.

Exercise prescription for patients with type 2 diabetes—a synthesis of international recommendations: narrative review

Romue Mendes,1,2 Nelson Sousa,2 António Almeida,2 Paulo Subtil,3 Fernando Guedes-Marques,1 Victor Machado Reis,4 José Luis Themudo-Barata4

What are the findings?

- Exercise guidelines agree on a weekly accumulation of a minimum of 150 min of aerobic exercise at moderate-to-vigorous intensity spread over a minimum of 3 days per week. Resistance exercise for muscle strengthening is also recommended at least 2 days a week. Flexibility exercises may complement other types of exercise.
- Individual exercise prescription should include specific information on the type, mode, duration, intensity and weekly frequency.
- Exercise strategies must be adapted for each individual, based on comorbidities, contraindications and realistic personal goals.

The essential role of exercise in the management of type 2 diabetes

(British J Sports Med 2016)

(Kirwan et al. Cleveland Clinic J Med 2017)
Neuromuscular defects - reduced muscle strength, power, mass and quality and higher fatigability more pronounced in lower limb and exacerbated by diabetic peripheral neuropathy. Resistance exercise is effective in prevention diabetic neuromuscular dysfunction.

High-intensity aerobic interval training improves aerobic fitness and HbA1c among persons diagnosed with type 2 diabetes

‘High-intensity aerobic interval training (85–95% HRmax) is an effective strategy to improve important risk factors associated with T2D, and more effective than moderate continuous exercise in improving VO2max and lowering HbA1c.’

Age-related loss of muscle (sarcopenia), strength and functional ability

A ‘poverty of flesh’ including decrease in FFM. Often associated with an increase in FM with little or no change in body weight.
Sarcopenia: a potential cause and consequence of type 2 diabetes in Australia's ageing population?

David Scott, Babara de Courten, Peter R Ebling

Intra-abdominal (visceral) fat

CVD & diabetes risk

Upper Body

Skeletal muscle

Lower Body

Subcutaneous fat

Obese elderly: merging of 2 epidemics

Complementary, not alternate

Obesity Facts

‘Small Changes’ to Diet and Physical Activity Behaviors for Weight Management

Andrew P. Hills, Nuala M. Byrne, Rachel Lindstrom, James O. Hill

Mater Mothers’ Hospital, Mater Research and Centre for Musculoskeletal Research, Griffith Health Institute, Griffith University, South Brisbane, Institute of Health and Biomedical Innovation, School of Exercise and Nutrition Sciences, Queensland University of Technology, Brisbane, Australia, Anschutz Health and Wellness Center, University of Colorado School of Medicine, Aurora, CO, USA
Looking ahead perspective: Where will the future of exercise biology take us?
The spectrum of obesity (and T2DM) management

- Prevention of weight gain
- Weight maintenance
- Management of obesity co-morbidities
- Weight loss

Original Article: Intermittent energy restriction improves weight loss efficiency in obese men: the MATADOR study

(by Byrne et al. 2017)