



Exercise is Medicine in Cardiovascular Disease Prevention and Management



CCPN Atlantic Fall Symposium


Jonathon Fowles, Ph.D., CSEP-CEP

Chair, Canadian Society for Exercise Physiology Health and Fitness Program
Co-director, Centre of Lifestyle Studies (COLS)
Professor, School of Recreation Management and Kinesiology, Acadia University



Learning Objectives

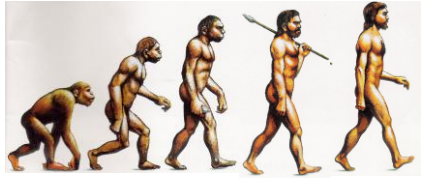

- Why Physical Activity & Exercise is important for CV disease prevention and management
 - Key take home messages
- Challenges in delivery of the PA and Exercise message in the medical system
 - Addressing support, framework & messaging
- Important points on Exercise Prescription
 - Challenges patients have for Physical Activity



Why we need physical activity & exercise....

We are 'programmed' to consume food AND
Our bodies were designed to MOVE!!...



Hunter gatherers & stationary farmers of yesteryear expended large amounts of energy

We have always 'needed' Physical Activity:

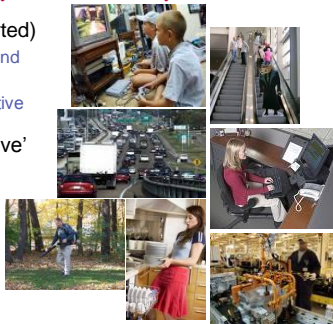

- Gatherer ancestors covered 9-15 km /day; hunters ran another ~10-25 km 2-3x/wk
(Lieberman et al Nature, 2004, 2010)
- stationary farmers of yesteryear
>8 hrs / day Mod-vigorous PA,
<4 hrs / day sedentary
 - Amish communities avg 14-18,000 steps/day low levels of obesity (0-9%) (Bassett et al., MSSE 2004)
- Today in 3rd world countries, 50% of women walk > 5km each day for water
(National Geographic, Dec 2010)

But we are also programmed for pleasure and efficiency...

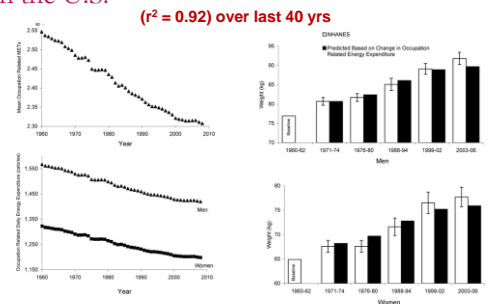
Domains of Physical Activity

- Leisure time (reported)
 - (emphasis: sports and recreation)
 - 'Active' to very inactive
- Commuting or 'active' transportation
- Occupational
- Chores or Personal Care





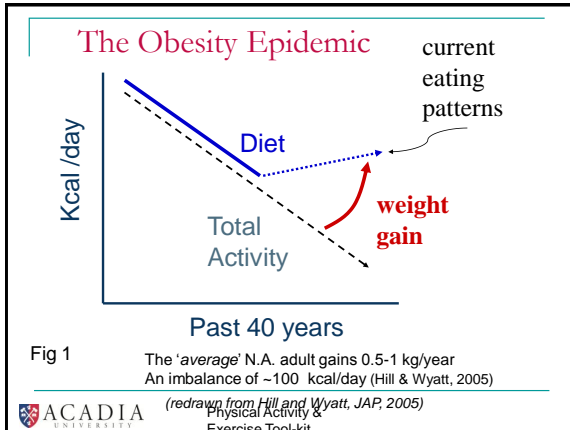
Occupational energy expenditure and Obesity in the U.S.

(r² = 0.92) over last 40 yrs



Church et al 2011, PlosONE





New PA Guidelines for Canadians

Guidelines

- To achieve health benefits, adults aged 18-64 years should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more.
- It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.
- More physical activity provides greater health benefits.

© Canadian Society for Exercise Physiology, 2011. All rights reserved.

Similar guidelines aged 65 years and older

The Benefits of PA and Exercise

- Reduce risk of death by 30-60%
- Reduce risk of colon cancer by 30-60%
- Reduce mortality and risk of recurrent breast cancer by 50%
- Reduce incidence of CVD by 33-60%
- Reduce incidence of hypertension by 33-60%
- Reduce risk of developing Alzheimers by 40%
- Reduce risk of stroke by 30%
- Decrease depression as effectively as Prozac or cognitive behavioural therapy

Blair et al., EIM 2009; Warburton et al., IJBNPA, 2010

Measured Physical Activity in Canada

(Colley et al. 2011, Health Reports, CHMS 2007-2009)

Canadians reporting Mod-Vigorous PA = 52%

Canadians aged 20-79 **actually attaining PA criteria:**

- Average > 10,000 steps per day **35%**
- > 150 min MVPA / wk in bouts >10 min **15%** (i.e CSEP & CDA Guidelines)
- 30 min MVPA, in 10min bouts, 5 out of 7 days: **5%**

Sedentary: ~10 h/day, light PA ~2h/day, MVPA: 24 min

Benefits of NOT being Sedentary

- 50% reduction in all-cause mortality
For those < quarter of day sitting vs most of day
 - controlled for age, smoking, PA level on 17,000 Canadians (Katzmarzyk et al., MSSE, 2009)
- 11% ↓ all cause mortality, 12% ↓ obesity, 7% ↓ diabetes **for each hour LESS of TV viewing**
 - Spend less than 2 hr < day of screen time
 - Controlled for age, sex, waist circumference, PA (Dunstan et al., Circulation, 2010; Hu et al., AIM, 2001)

World's First Evidence-Based Sedentary Behaviour Guidelines

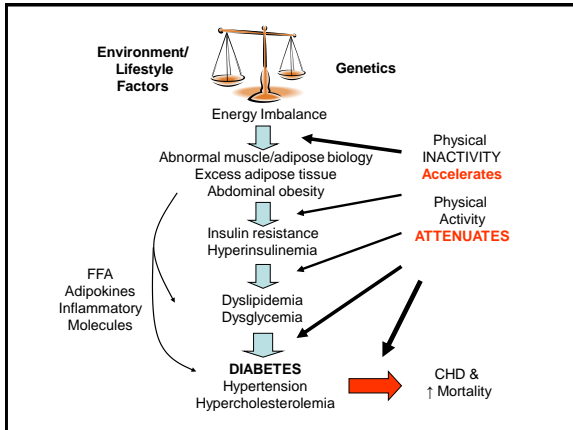
Guidelines

For health benefits, children aged 5-11 years should minimize the time they spend being sedentary each day. This may be achieved by

- Limiting recreational screen time to no more than 2 hours per day; lower levels are associated with additional health benefits.
- Limiting sedentary (motorized) transport, extended sitting and time spent indoors throughout the day.

© Canadian Society for Exercise Physiology, 2011. All rights reserved.

Similar guidelines for Teens aged 12-17
Adult guidelines currently in review



Physical Activity vs Exercise

N.B. Used 'interchangeably' in many guidelines

Physical Activity - accumulated calorie expenditure

- increase level of health
- Index Kcal / week
- Can be accumulated in small, spontaneous bouts

Exercise - structured, planned, 'threshold' intensity

- increase 'fitness' components
- index FITT
- Added benefit to health outcomes
- Requires competence (new skill)
- More difficult!

(Evidence from Dose-Response Symposium: Med Sci Sports Exerc. 2001 Suppl)

WC, Diabetes and CVD

Strong relationship Abdominal Obesity (WC) and diabetes

- 80-90% of Type 2 diabetes are obese
- Presence of additional risk factors leads to CVD and Mortality

ACADIA UNIVERSITY

Incident Diabetes by CR Fitness

Aerobics Centre Longitudinal Study (ACLS)

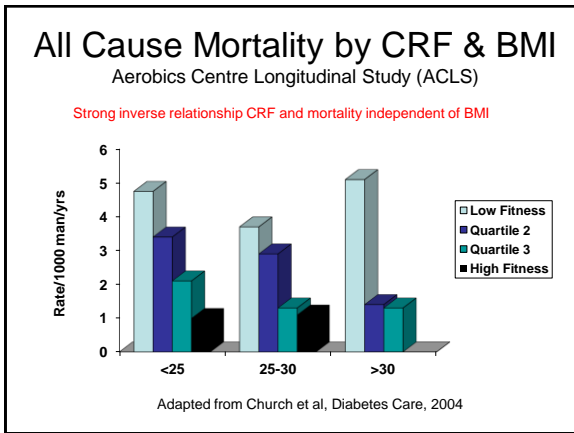
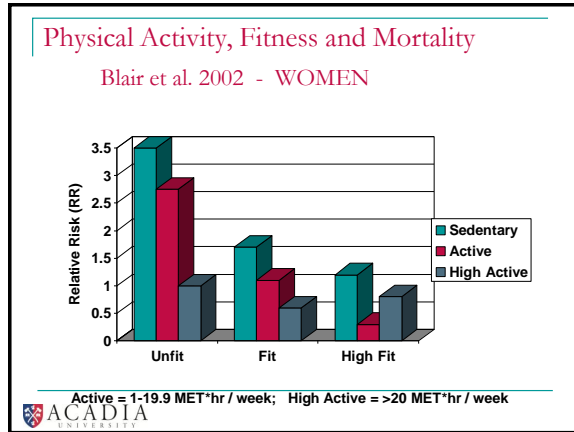
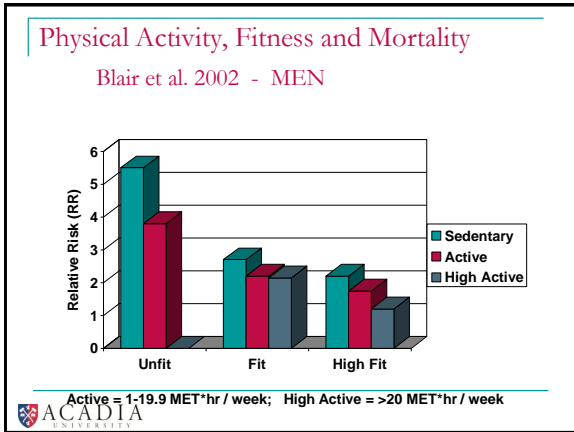
Adapted from Wei et al., Ann. Intern. Med. 1999
8633 non-diabetic men, follow up 6 years

Walking pace and CVD: Health Professionals Follow-up Study

*Adjusted for walking time, other CVD risks, vigorous activity
(Health Professionals Study, 2803 diabetic male professionals)

Weight lifting and incident CVD

Adjustment:
Multivariate: adjusted for EtOH, smoking, family history of MI, nutrient intake
Health Professionals Follow-up Study – 51,529 male professionals
Tanasescu M, JAMA 2002; 288:1994-2000



CCS 2011 PA Recommendations

Early release, published at www.cmaj.ca on September 12, 2011. Subject to revision.

CMAJ

GUIDELINES

Harmonization of guidelines for the prevention and treatment of cardiovascular disease: the C-CHANGE Initiative

Sheldon W. Tobie MD, James A. Stone MD PhD, Melissa Brouwers PhD, Onil Bhattacharyya MD PhD, Kimberly M. Walker BA, Martin Dawes MD PhD, Jacques Genes Jr MD, Steven Grover MD MPA, Gordon Gaitzer MD, David Lau MD PhD, Andrew Pope MD, Peter Selby MBBS, Mark S. Tremblay MD MSc, Darren E.A. Warburton PhD, Richard Ward MD, Vincent Woo MD, Lawrence A. Leiter MD, Peter P. Liu MD

Cardiovascular disease is the most prevalent chronic medical condition in Canada, and evidence-based management of risk factors for cardiovascular disease can reduce morbidity and mortality. However, there are more than 400 individual recommendations for risk management of cardiovascular disease from various guidelines authored or sponsored by many different organizations. Because the guidelines were developed through multiple processes, they use different evidence-grading systems, wording and emphasis. Table 1. Thus, one can appreciate the challenge for health care providers who are attempting the care of patients, particularly with respect to individual risk factors.

Competing interests: None reported. This article has been peer reviewed. Correspondence to: Dr. Peter P. Liu (p.liu@acadia.ns.ca) (CMAJ 2011;183(18):E168-E169) (doi:10.1503/cmaj)

C-CHANGE (Canadian-Cardiovascular Harmonization of National Guidelines Endeavor)

- ### CCS 2011 PA Recommendations
- “To achieve health benefits, {insert condition} adults aged 18-64 should accumulate a minimum of 150 minutes of moderate- to vigorous-intensity aerobic physical activity each week, in bouts of 10 min or more”
 - “It is also beneficial to add muscle and bone strengthening activities at least 2 days per week” (i.e. in addition to aerobic exercise)”

- ### Who is meeting Guidelines?
- #### Diabetes Patients Pre-Test (n=203)
- Report Moderate Physical Activity: 38% (≥ 3x/week)
 - Aerobic Exercise: 9.6% (≥3x/week); 83% none
 - Resistance Exercise: 9.6% (≥ 3x/week); 83% none
 - Both Aerobic AND Resistance Exercise: 2.4% (both ≥ 3x/week)
- Fowles, Shields, et al., in progress

The Exercise Delivery Model in Canadian Health Care

- Physicians often defer to other HCP's for exercise advice
- Nurses and dietitians (i.e. diabetes educators) not typically trained in exercise counseling or prescription (Dillman, Shields, Fowles et al., 2010 CJD)
 - Low self-efficacy
 - Low confidence in client's abilities
 - Qualified Exercise Professionals not typically part of team

ACADIA UNIVERSITY

Practical Message

- "First and foremost, regardless of the starting point, a regular pattern of activity should be advice given repeatedly by all members of the health-care team...."

(Riddell & Fowles, Med. Post, 2010)

ACADIA UNIVERSITY

Benefit-Cost ratio of PA Interventions

ACADIA UNIVERSITY Physical Activity & Exercise Tool-kit

Benefit-Cost ratio of PA Interventions

ACADIA UNIVERSITY Physical Activity & Exercise Tool-kit

Levels of PA and Exercise Interventions

1. "Exercise Vital Sign"
2. Clear Recommendation
3. "How to" information
4. Thoroughly explain, demonstrate exercise
5. Phone/email follow up
6. Regular PA classes and education sessions (i.e. Cardiac Rehab)

ACADIA UNIVERSITY Physical Activity & Exercise Tool-kit

Exercise Vital Sign

- "There is no better indicator of a person's health and likely longevity than the min/week of activity they engage in" ■ Sallis, Br J Sports Med, 2011
- Exercise as 5th vital sign – 150 minutes?
 - 2 questions, 1 minute
 - Accuracy low (?)
 - But does this matter?
 - Helpful step to create a Rx to qualified exercise professional

ACADIA UNIVERSITY Physical Activity & Exercise Tool-kit

2 questions – The Exercise Vital Sign

Frequency & Intensity

On average over a typical week how many days do you engage in moderate to vigorous continuous physical activity (like a brisk walk) lasting for at least 10 minutes at a time?

___ days per week

Time

On those days that you are at least moderately physically active (specified above), **on average**, how many minutes do you engage in activity at this level?

___ minutes per day



Physical Activity & Exercise Tool-kit

2 More questions – PA and Fitness

Type

Over a typical seven day period (one week), do you engage in muscle and bone strengthening activities at least 2 times (such as resistance training or very heavy gardening)?

___ Yes

___ No

Perceived Fitness

In a general fashion, would you say that your overall physical fitness is:

___ Excellent

___ Very Good

___ Good

___ Fair

___ Poor



Physical Activity & Exercise Tool-kit

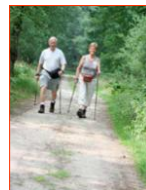
Graded PA & Exercise Prescriptions

“Regular PA is important for health and reducing risks of disease. As your health care provider I recommend you meet the following physical activity prescription”:

- Increase physical activities in your day and reduce sedentary time.**
 - No more than 2 h per day of recreational screen time
- Begin a regular program of physical activity:**
 - three to four days per week for 10 to 15 minutes per session
- Begin an introductory resistance activity:**
 - one to two days per week for 15 to 30 minutes per session
- Maintain aerobic exercise:**
 - five days per week for a minimum of 30 minutes per session
- Do resistance exercise:**
 - two or more days / week for 30 minutes or more per session



Would You Prescribe a Drug without Understanding How it Works or it's Dose-Response Characteristics?



- Weight loss?
- Glucose & FFA uptake?
- Improved insulin action?
- Vascular changes?



Benefits of Exercise – Evidence

Meta-Analyses: Boule et al., 2001; Boule et al. 2003; Snowling & Hopkins, 2006; Sigal et al., 2006 ADA Consensus; Bassuk & Manson, 2005; Periera et al. 2009

- Aerobic OR resistance exercise
- Beneficial effect independent of weight loss
- Dose response effects
- **Aerobic exercise:**
 - 150 minutes per week = ↓ CVD by >33%
 - Direct enhancement insulin sensitivity, FFA transport (24-72 h).
 - Brisk walking is easy to do, consumes glucose & calories
 - Builds Cardio-respiratory fitness
- **Resistance training:**
 - 60-90 minutes/ week = increase MSK fitness
 - Activate muscles not typically used
 - Helps preserve ACTIVE muscle mass
 - Good alternative for those with mobility problems



Practical Message : Physical Activity & Exercise gives CONTROL

- PA & Exercise directly improves CV status by:
 - Increasing glucose uptake, insulin sensitivity
 - Reducing stress, inflammatory state
- The benefits occur in a dose-response manner
 - Any Physical Activity is good, but more is better
 - Exercise provides more 'bang for the buck'
 - Benefits are greater when CRF improves (1 MET)
- Regular PA can reduce co-morbidities
 - *Exercise is Medicine®*



Most important method of improving physical health, by CHB

	AVDHA	EK	CK	WK	K-G	Ann.
Start / increase exercise sports / physical activity	62%	58%	62%	67%	64%	60%
Change diet / improve eating habits	13%	15%	13%	11%	15%	12%
Lose weight	6%	5%	7%	6%	5%	7%
Quit smoking / reduce amount smoked	6%	5%	6%	3%	5%	9%
Reduce stress level	1%	1%	1%	1%	1%	1%
Receive medical treatment	1%	0%	1%	1%	1%	1%
Take vitamins	0%	1%	0%	0%	0%	0%
Drink less alcohol	0%	0%	0%	0%	0%	0%
Other	5%	7%	5%	6%	3%	4%
Nothing	6%	8%	5%	5%	5%	6%

CHB Survey results (2009) of n=2200 patients

AMH Healthy People, Caring Communities, Valued Healthcare Teams
and Partners

Practical Message– Give the benefit of the doubt

- Many patients are aware PA is good for them
 - But may not know HOW good it can be...
 - Need to value what physical activity can do for their health condition
- Bridge the 'Awareness-Action' Gap
 - Individually relevant recommendations
 - Follow with 'How-to' information to build confidence

ACADIA UNIVERSITY Physical Activity & Exercise Tool-kit

Advise

New 'Prescription Pad' tool being release by CDA

Primary care provider to identify a PA 'prescription'

Relevant how to information on the back.

Diabetes and Physical Activity
Your Exercise Prescription

As your healthcare provider, I recommend that you follow the physical activity prescription ticket below (please all that apply):

1. Increase physical activity to your day and reduce sedentary time. Limit sedentary recreational time to less than 2 hours per day.
2. Begin regular aerobic exercise** 3 days per week for 30 minutes per session.
3. Begin resistance exercise** 2 days per week.
4. Continue to do regular aerobic exercise** 3 days per week for a minimum of 30 minutes per session.
5. Continue to do regular resistance exercise** 2 or three days per week.

**Aerobic exercise is activities which help increase the amount of oxygen used by the body. Resistance exercise is any activity that increases the strength of the muscles.

Regular physical activity is one of the most important things you can do to manage and live well with your diabetes. Many people, however, need help starting an exercise routine and achieving their goals.

The benefits of physical activity to lower the risks you do, from whatever your starting point. Refer to the information on the back of this ticket to help you get started with your physical activity prescription. If you need help, you can ask our on-site diabetes educator or nurse for support that is right for you.

Physical activity and building strength in your regular muscle groups can provide you with these benefits:

Benefits:

- Lower your blood glucose control
- Control your blood pressure and weight
- Improve your cholesterol
- Reduce the risk of heart attack, stroke and death

Helping you:

- Control your blood glucose control
- Control your blood pressure and weight
- Improve your cholesterol
- Reduce the risk of heart attack, stroke and death

ACADIA UNIVERSITY Physical Activity & Exercise Tool-kit

Back of prescription pad

Gives basic how to information

Many patients may seek further help from DC's or pharmacists

Align roughly with the 5 brochures.

You can be physically active. Becoming physically active may seem challenging, but it is easier than you might think. This information will help you get started with your physical activity prescription.

1. Increase physical activity to your day and reduce sedentary time. Choose active options when you can, such as taking the stairs. Include more activities that you may already do, such as walking the dog, gardening, walking or playing golf. Limit TV or recreational computer use to no more than 2 hours per day and reduce or break up the time you spend sitting.
2. Begin regular aerobic exercise. At least every second day, do activities like brisk walking, cycling or swimming, for at least 30 minutes at a time. Each week, add 5 minutes to every activity session you do.
3. Begin regular resistance exercise. Build the bulk of a qualified exercise professional. At least twice a week do resistance exercises such as a video or instructor-led routine. Do 8-10 sets of strength building exercises using weight machines, free weights (such as lifting a barbell or dumbbell), resistance bands or your own body weight. You will need to work each of the muscles in your body with 8-10 different exercises. Do each exercise 10-15 times such as a light to moderate intensity. Repeat this routine 2-3 times.
4. Continue to do regular aerobic exercise. Do at least 150 minutes of aerobic activity every week, spread over 3 separate days. Don't go for more than 2 days in a row without exercise. For example, 30 minutes Monday, Wednesday, Friday, Saturday and Sunday = 150 minutes total. Gradually increase the time of your activity session up to 60 minutes or more. Also, try to increase the intensity or challenge of your activities. More challenging activities could be hiking, sports, jogging or swimming laps.
5. Continue to do regular resistance exercise. Continue using weight machines or free weights (such as lifting a barbell or dumbbell). You will need to work each of the muscles in your body with 8-10 different exercises, done 8 to 10 times such as a moderate to hard intensity. Repeat this routine 2 or 3 times.

For more information on physical activity and exercise, go to [diabetes.ca | 1-800-BANTING \(226-8464\)](http://diabetes.ca/diabetesandphysicalactivity/resources)

ACADIA UNIVERSITY Physical Activity & Exercise Tool-kit

Tools for the 'How to'

Diabetes Physical Activity & Exercise Toolkit 2nd Edition, 2010

For diabetes care providers wanting to get their clients moving in the right direction

Planning for Regular Physical Activity 2

Introductory Resistance Program 3

Diabetes Physical Activity & Exercise Toolkit

ACADIA UNIVERSITY

Primary Barriers to PA for Patients

- Generalized Barriers
 - TIME
 - Motivation
 - Know how
 - Cost, Facilities, Transport
- Disease Dependent Barriers (examples)
 - Tend to avoid doing more harm than doing good
 - Loss of blood sugar control (diabetes)
 - Inflammation and soreness (arthritis)
 - Increased heart rate impact (MI, CVD)

ACADIA UNIVERSITY

Practical Message: Relative Risk of Exercise

- Most people are at greater risk from sedentary behaviour than from exercise.
- Be aware of the short-term and long-term complications of cardiovascular disease.
- Goals of pre-exercise screening:
 - To identify problems that might make exercise-associated risks outweigh the benefits.
 - To expedite treatment of such problems.



Why Cardiac Rehabilitation?

- Helps to slow or stop progression of CVD
- Significantly reduces cardiac and total mortality in patients with symptomatic coronary artery disease
- Significantly improves cardiovascular risk factors and may reduce the number of re-hospitalizations for cardiac disease and the need for invasive procedures
- Improved patient adherence to lifestyle interventions and prescribed medications
- It is cost effective and may reduce costs to the health care system



Summary

- Think differently about PA & Exercise
 - Should be a priority in HEALTH care
 - Challenge is implementation, time barriers
- Give patients the benefit of the doubt
 - They face the same behavioural challenges, with the added stresses of their disease
- Qualified Exercise Professionals have a role
 - Addresses the needs to tailor exercise to the individual and their situation



Acknowledgements

My research supported through contributions of:

The Team

- Co-investigators
 - Chris Shields
 - Rene Murphy
 - Matt Durant
- Project/Research Coordinator
 - Arlene Perry, Brittany Barron

THE
LAWSON
FOUNDATION

ACADIA
UNIVERSITY

DIABETES
CARE PROGRAM
OF NOVA SCOTIA



CSEP SCPE
THE GOLD STANDARD IN EXERCISE
SCIENCE AND PERSONAL TRAINING



Physical Activity & Exercise Tool-kit