

Physical Activity and Cancer-a review of innovative current research and future directions

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Official Conference for the European Week Against Cancer 2013

AVIVA Stadium Dublin

29-30 May 2013



Waterford Institute of Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE



Purpose of workshop

- Examine the state of current knowledge on physical activity and cancer prevention and treatment
- What we know, what we still need to know
- What are the research and policy implications for Ireland and the EU?



Promoting Physical Activity Participation among Children and Adolescents

Jo Salmon¹, Michael L. Booth², Philayrath Phongsavan³, Niamh Murphy⁴, and Anna Timperio¹



Impact of social disadvantage on physical activity levels in Europe



HEPA Europe

European Network for the Promotion of Health-Enhancing Physical Activity



www.euro.who.int/hepaeurope



The role of community programmes and mass events in promoting physical activity to patients

A Bauman, N Murphy and A Lane

Br. J. Sports Med. 2009;43:44-46; originally published online 29 Oct 2008; doi:10.1136/bjism.2008.054189



The National Guidelines on Physical Activity for Ireland

Journal of Physical Activity and Health, 2007, 4, 193-202
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Mass Sporting and Physical Activity Events—Are They “Bread and Circuses” Public Health Interventions to Increase Population Levels of Physical Activity?

Niamh M. Murphy and Adrian Bauman

Do mass participation sporting events have a role in making populations more active?

FINAL REPORT

What we need in Ireland is a National Physical Activity Plan.

Physical activity guidelines exist in many EU countries

WHO, 2012

getirelandactive.ie



YOUNG AND PHYSICALLY ACTIVE:

a blueprint for making physical activity appealing to youth

Get Ireland Active | Get the Guidelines | How much physical activity should I be doing?

Home Events Get Started Get Active Get Motivated Get the Guidelines Get Info

How much physical activity should I be doing? Children and young adults Adults (18 - 65) Older people (65+)

People with disabilities Weight management Promoting the guidelines

How much physical activity should I be doing?

What does regular physical activity mean? How much should we be doing per day? Per week?

Adults: At least 30 minutes a day of moderate activity on 5 days a week (or 150 minutes a week).

Children and Young People: Should be active at a moderate to vigorous level for at least 60 minutes every day. Including muscle strengthening, flexibility and bone strengthening exercises 3 times a week.

Who?	How much?	How often?	What counts?
Children and young people	At least 60 minutes moderate intensity activity	Every day of the week	All activity no matter how short counts
Children and young people with disabilities	At least 60 minutes moderate intensity activity or as much as ability allows	Every day of the week	All activity no matter how short counts
Adults	At least 30 minutes moderate intensity activity	5 days a week	Short bouts of at least 10 minutes can be accumulated
People with disabilities	At least 30 minutes moderate intensity activity, or as much as ability allows	5 days a week	Short bouts of at least 10 minutes can be accumulated

At the beginning start off slowly, gradually building up to the target of at least 30 minutes moderate intensity activity five days a week

Specific PA guidelines for cancer?

World Cancer Research Fund



American Institute for Cancer Research

Food, Nutrition, Physical Activity, and the Prevention of Cancer:
a Global Perspective

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Home	Continuous Update Project	Second Expert Report	Policy Report	Conferences	Resource downloads
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American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention

This document is a condensed version of the article describing the American Cancer Society (ACS) Nutrition and Physical Activity Guidelines, which are updated about every 5 years. The guidelines were developed by the American Cancer Society Nutrition and Physical Activity Guidelines Advisory Committee. The full article (including references), which is written for health care professionals, is published in the January/February 2012 issue of CA: A Cancer Journal for Clinicians, and is available for free online at: <http://onlinelibrary.wiley.com/doi/10.3322/caac.20140/full>

For most Americans who do not use tobacco, the most important cancer risk factors that can be changed are body weight, diet, and physical activity. One-third of all cancer deaths in the United States each year are linked to diet and physical activity, including being overweight or obese, while another third is caused by tobacco products.

U.S. Department of Health & Human Services www.hhs.gov

AHRQ Agency for Healthcare Research and Quality
Advancing Excellence in Health Care www.ahrq.gov

National Guideline Clearinghouse

Guideline Summary NGC-9119

Guideline Title
Nutrition and physical activity guidelines for cancer survivors.

Bibliographic Source(s)
Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, Bandera EV, Hamilton KK, Grant B, McCullough M, Byers T, Gansler T. Nutrition and physical activity guidelines for cancer survivors. CA Cancer J Clin. 2012 Jul;62(4):242-74. [321 references] PubMed ®

What are the PA guidelines for cancer prevention (and post cancer)?

ACSM Consensus statement and American Cancer Society-**same as Irish PA guidelines**, i.e.

-a minimum of 150 minutes of moderate to vigorous PA per week or 75 minutes/week of vigorous exercise

-Strength training 2-3 times/week

- Avoid Inactivity!!!
- Return to normal daily activities as quickly as possible
- Continue normal daily activities and exercise as much as possible during and after non-surgical treatments

There is a clear list of contraindications/special considerations

- ACSM/ACS Certification:Cancer Exercise Trainer

Most recently (2012), WCRF/AICR conducted a comprehensive review of current evidence and recommended that adults aim to participate in at least 60 minutes of moderate activity or 30 minutes or more of vigorous activity daily as a means of reducing cancer risk.

Meeting PA guidelines??

In Ireland, 3 out of every 4 Irish adults DO NOT MEET the Department of Health and Children's National Physical Activity Guideline for maintaining and improving their current and future health.

“Current national guidelines may not be sufficient for cancer prevention, nor for weight management.” (Aparicio-Ting et al, 2012).

Amongst adults aged 35-65 years participating in the Tomorrow Project (49% of those eligible) in Alberta, Canada an estimated 55% of participants met CSEP guidelines, and 23% met WCRF/AICR guidelines, respectively. Women are less likely to meet guidelines than men, and being obese was correlated with not meeting guidelines (Aparicio-Ting et al, 2012).



Dr. Christine Friedenreich, acting principal investigator for the Tomorrow Project in Alberta, the research study into the causes of cancer.



“
Why do some
people develop
cancer and
others do not?
”

Physical activity in female adolescents

CSPPA Study, 2010: Table shows the % of primary and post-primary boys and girls who meet national minimum physical activity guidelines (Woods *et al*, 2010).

(National sample of 1275 primary and 4122 post primary students.
Measurement tool: physical activity questionnaire)

Age (Years)	% Males meeting guidelines	% Females meeting guidelines
10-12	27	13
12-13	24	13
14-15	16	8
16-18	7	6

35% of primary pupils and 10% of post-primary pupils received the Department of Education and Skills recommended minimum minutes of physical education per week.

What does the evidence tell us about the link between physical activity and cancer?



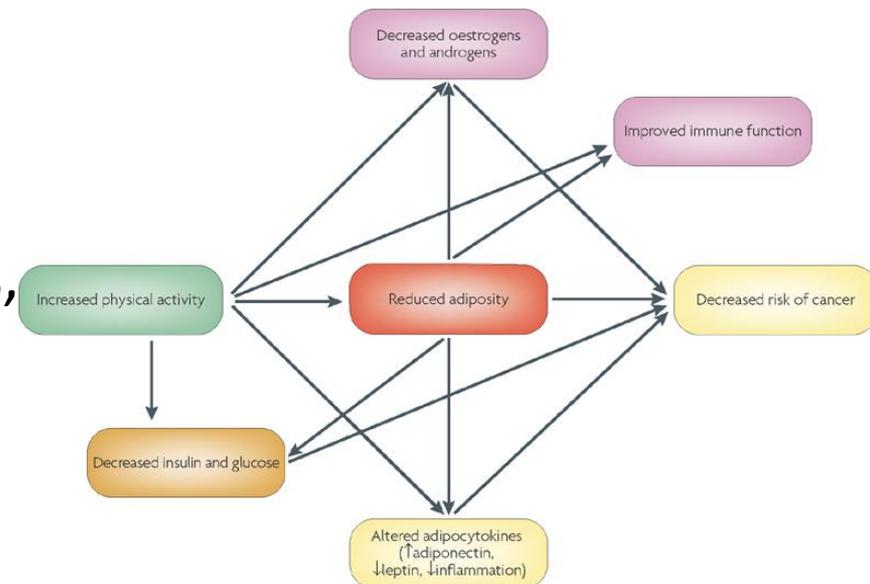
"You are completely free to carry out whatever research you want, so long as you come to these conclusions."

Mechanisms

- The evidence for a role of PA in cancer etiology is now
- considered to be fairly strong, consistent and biologically plausible (Aparicio-Ting et al, 2012).

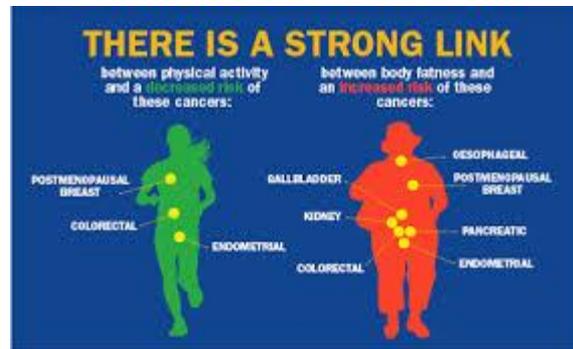
Includes an effect of activity on

- levels of body fat,
- insulin resistance,
- inflammation,
- metabolic and growth hormones,
- endogenous sex steroid hormones,
- immune function and
- oxidative stress.



What we know

- Since 1985....epidemiologic evidence has been accumulating that **physical activity reduces the risk of developing cancer**
- Since 2005... evidence that increased activity levels can **improve survival** after cancer.
- The risk of colon, breast and endometrial cancers is reduced by 25% to 30% in physically active individuals, and evidence for a beneficial effect of PA in reducing prostate, ovarian, lung and other gastrointestinal cancers is emerging (Wolin et al, 2009; Cust, 2011; Monninkhof et al, 2007)



Physical activity is effective!-What we know...

Breast cancer

- Engaging in moderate intensity PA reduces the risk of breast cancer by 15%.
- **More is better**-up to 28% reduction w 14 hours/ week PA (Lynch,Neilson and Friedenreich, 2011).
- **Most benefit for lean women**. No effect of family history.

Breast cancer survivors

- Exercise is **effective in treating many side effects** in breast cancer survivors (fatigue, lymphoedema, improved functional status and upper body range of movement ; Speck et al, 2010)

Colon cancer

86 studies have been conducted worldwide.

- 72 of 86 studies found a positive effect for physical activity.
- Type, dose and timing. All types of activity equally effective. Sedentary behaviour may increase the risk. Consistent effects across BMI groups-benefit equal for men and women

Endometrial cancer

- Consistent evidence of relationship with physical activity. A 33% decrease in risk in physically active individuals.

RCTs and impact on breast cancer biomarkers

- Three year-long RCTs have been conducted to date.

ALPHA trial, PATH trial, SHAPE trial

- **ALPHA trial (Alberta Physical Activity and Breast Cancer Prevention Trial)**
- 220 postmenopausal women, year long prog, 5 days/week, 45 mins/session (93 supervised, 2 unsupervised). Excellent adherence to trial, very little dropout. All inactive before trial. Statistically sig change in PA levels from baseline to 12 months. Increased VO₂max.
- Sig decrease in estradiol,
- CT and DEXA scans to measure body fat-very strong effects on adiposity. With increased adherence, body fat reductions were greater.
- Decreases in insulin and leptin.

Greatest changes in those who did most exercise.

- (Friedenrich 2012)

The effects of physical activity on cancer have been examined in nine meta-analyses, with three focusing on breast cancer and six on any type of cancer.

- Fong et al. Physical activity for **cancer survivors**: meta-analysis of randomised controlled trials BMJ 2012;344:e70
- 34 randomised controlled trials, of which 22 (65%) focused on patients with breast cancer. Twenty two studies assessed aerobic exercise, and four also included resistance or strength training. The median duration of physical activity was 13 weeks (range 3-60 weeks). Most control groups were considered sedentary or were assigned no exercise
- **Physical activity has positive effects** on physiology, body composition, physical functions, psychological outcomes, and quality of life in patients after treatment for breast cancer. When patients with cancer other than breast cancer were also included, physical activity was associated with reduced BMI and body weight, increased peak oxygen consumption and peak power output, and improved quality of life.

RESEARCH

Physical activity for cancer survivors: meta-analysis of randomised controlled trials

Daniel YT Fong,¹ Judy W C Ho,² Bryant P H Hui,³ Antoinette M Lee,⁴ Duncan J Macfarlane,⁵ Sharron S K Leung,¹ Ester Cerin,⁵ Wynnie YY Chan,⁶ Ivy P F Leung,⁷ Sharon H S Lam,⁸ Alikei J Taylor,⁹ Kar-keung Cheng⁹

OBJECTIVE To systematically evaluate the effects of physical activity in adult patients after completion of main treatment related to cancer.

DESIGN Meta-analysis of randomised controlled trials with data extraction and quality assessment performed independently by two researchers.

DATA SOURCES PUBMED, CINAHL, and Google Scholar from the earliest possible year to September 2011. References from meta-analyses and reviews.

STUDY selection Randomised controlled trials that assessed the effects of physical activity in adults who had completed their main cancer treatment, except hormonal treatment.

RESULTS There were 34 randomised controlled trials, of which 22 (65%) focused on patients with breast cancer, and 48 outcomes in our meta-analysis. Twenty two studies

Introduction

Cancer survivors who have successfully completed their primary cancer treatment often expect to resume their work or daily life at a level similar to that before the cancer diagnosis. While cancer treatment has been shown to be effective in prolonging survival, it can be intensive and can lead to increased fatigue, decreased physical activity, and a reduction in quality of life.^{1,2} In addition, these unwanted effects of treatment can be prolonged and hinder the patients' return to normal life.^{3,4}

Physical activity is a potentially appealing intervention that could alleviate sequelae related to cancer and assist patients in returning to the health status they had before treatment. A systematic review published in 2005 summarised the evidence supporting the recommendation

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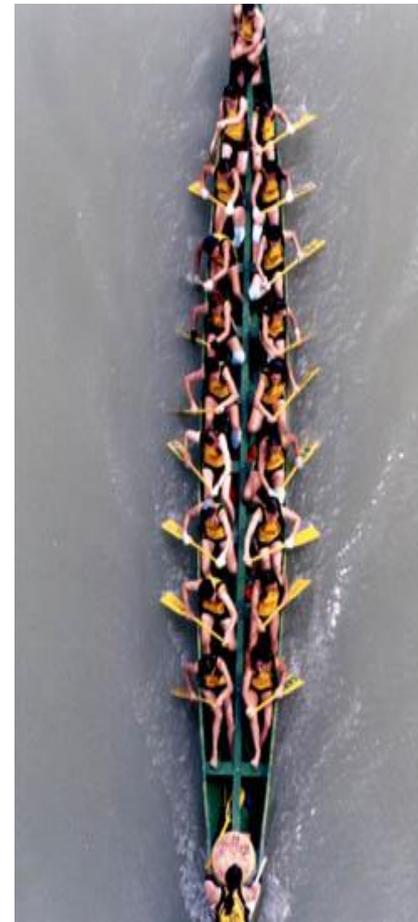
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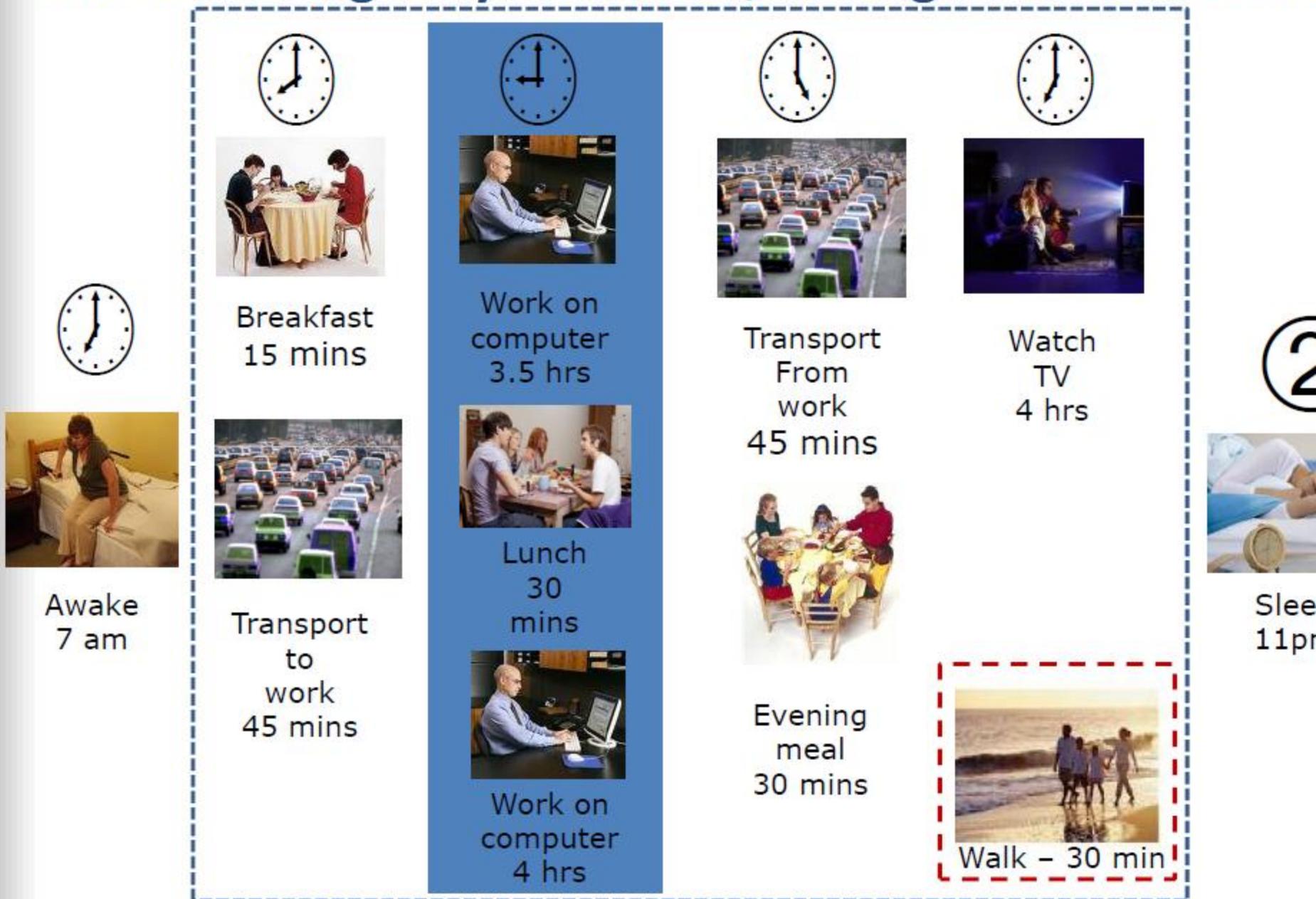
Physical activity (PA) and health-related fitness (HRF) are essential for the health of any population but they appear to be **particularly important for breast cancer survivors.**



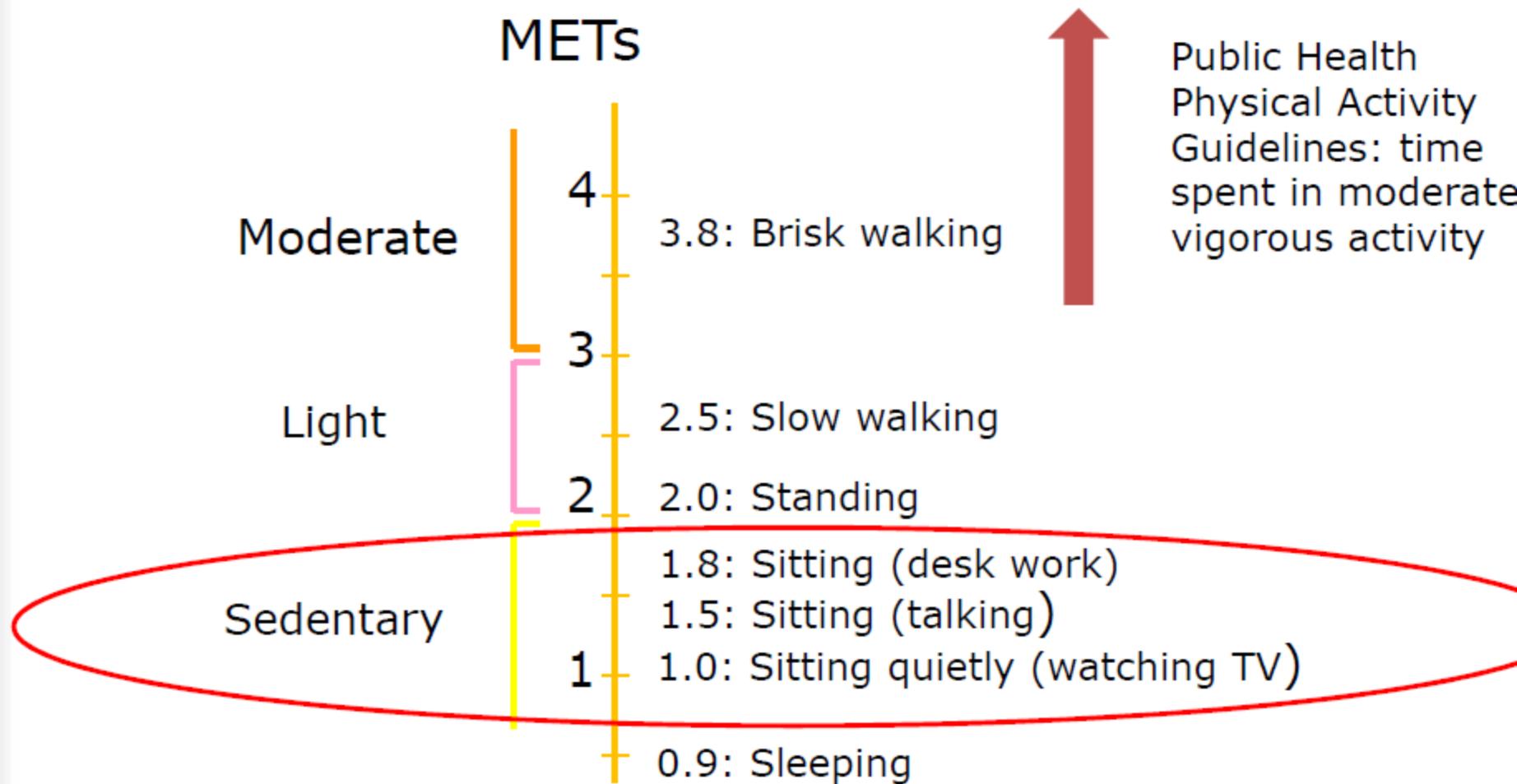
New and emerging evidence- Sedentariness



Our technologically-advanced, 'sitting-oriented' society



Sedentary behaviours





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Too Much Sitting: Health Risks of Sedentary Behaviour and Opportunities for Change

Introduction

Large volumes of daily sedentary time—i.e., too much sitting—are an integral element of how humans have adapted to our modern-day physical and social environments. In contemporary societies, we sit not only to pursue most of our serious purposes in life, but also to enjoy the majority of our diversions and recreations. Most obviously, we sit in cars to get to and from our places of work; we sit to do much of our work, particularly when using communication technology that has become integral to so many contemporary occupations; and at home, we sit in front of our television sets and when we use other screen-based entertainment and communication devices. Put simply, most of us are likely to move from chair to chair throughout our daily lives.

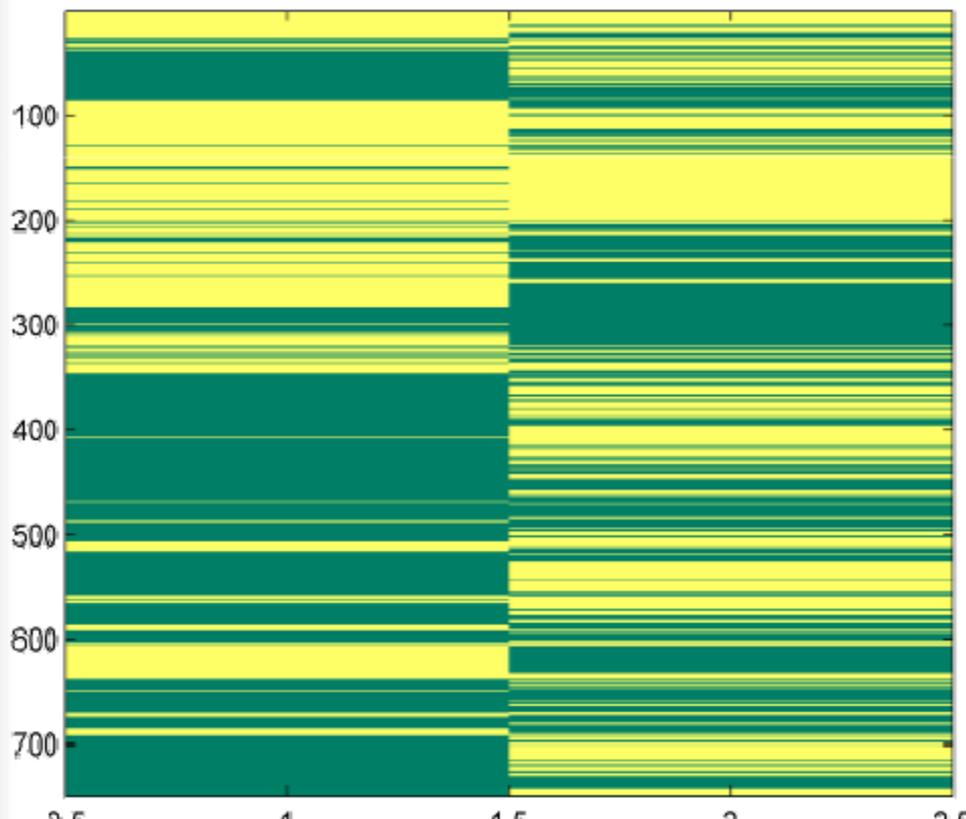


Patterns of sedentary behavior are also important



'Prolonger'

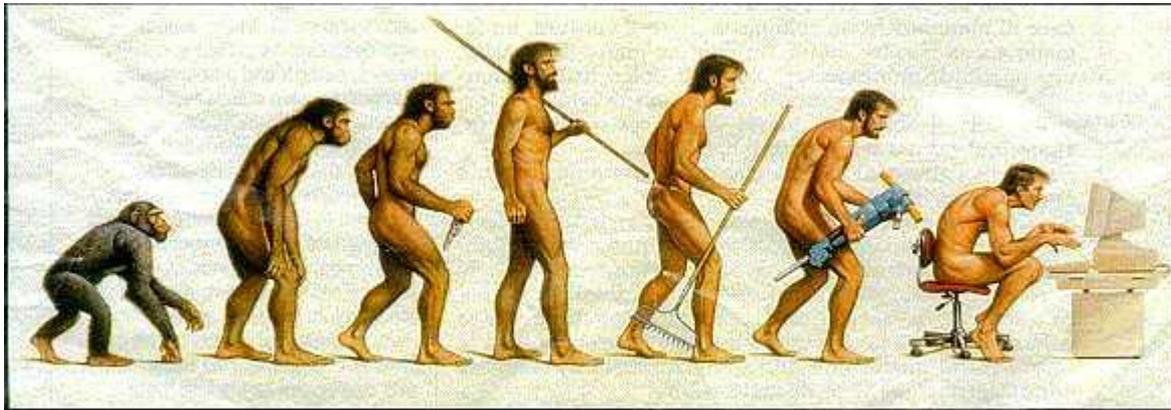
'Breaker'



These participants have exactly the same sedentary time

More breaks from sitting time associated with lower average waist circumference, BMI, triglycerides, and 2-hr plasma glucose

Workplace and school based interventions now underway



Somewhere, something went terribly wrong



What do we still need to know about PA and cancer?

- the exact **type, timing, dose** of activity needed for optimal cancer risk reduction and improved coping, rehabilitation, quality of life and survival after cancer.
- further understand the **underlying biologic mechanisms** involved in the association between physical activity and cancer risk as well as survival.
- In breast cancer survivors studies are limited because none were designed with a **primary focus** on PA or fitness and there is a reliance on self-report measures with no objective assessment. Studies don't generally assess lifetime PA and other important domains of PA (e.g., occupational), or sedentary behavior

AMBER Study-role of PA and fitness in treatment completion, side effects, recovery, quality of life,disease

Courneya *et al.* *BMC Cancer* 2012, **12**:525
<http://www.biomedcentral.com/1471-2407/12/525>



STUDY PROTOCOL

Open Access

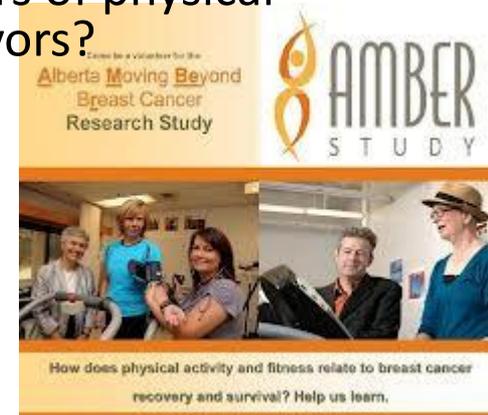
The Alberta moving beyond breast cancer (AMBER) cohort study: a prospective study of physical activity and health-related fitness in breast cancer survivors

Kerry S Courneya^{1,10*}, Jeff K Vallance², S Nicole Culos-Reed³, Margaret L McNeely⁴, Gordon J Bell¹, John R Mackey⁵, Yutaka Yasui⁶, Yan Yuan⁶, Charles E Matthews⁷, David CW Lau⁸, Diane Cook¹ and Christine M Friedenreich⁹

What is new about the AMBER study?

Examining **the exact biologic mechanisms** by which PA and fitness influence breast cancer recurrence and survival

- Will recruit **a total of 1500 breast cancer survivors** (recruitment will take 5 years).
 - Seven years of follow-up to **2022**
 - What are the independent and interactive associations of objective measures of **physical activity** (at work, at home, and for recreation and transportation), **health-related fitness**, and **sedentary behaviour** with....
 - disease outcomes (e.g., recurrence, breast cancer-specific mortality, overall survival)
 - treatment completion rates, symptoms and side effects (e.g., pain, lymphedema, fatigue, neuropathy), quality of life,
 - psychosocial functioning (e.g., anxiety, depression, self-esteem, happiness), (
- 2) What are the determinants, mechanisms, and moderators of physical activity and health-related fitness in breast cancer survivors?



Trial of Combined Aerobic and Resistance Exercise in Breast Cancer Survivors (CARE)

Prospective, three-armed, randomized controlled trial conducted in Edmonton, Ottawa, and Vancouver with breast cancer survivors receiving chemotherapy. **Completion date January 2014**

- Combined aerobic and resistance exercise program (1,000 kcal/week; COMB)
- Standard moderate volume of aerobic exercise (500 kcal/week; STAN)
- High volume of aerobic exercise (1,000 kcal/week; HIGH)

All exercising 3 days/week

Outcome measures:

- Cardiorespiratory fitness (maximal treadmill test)
- muscular strength (8 repetition maximum tests)
- muscular endurance (standard load test at 50% of estimated baseline maximum)
- body composition (DEXA scans)
- psychological distress, sleep quality, exercise adherence, and chemotherapy completion rates.

The Colon Health and Life-Long Exercise Change (CHALLENGE) trial

- *Courneya KS et al*
- Just started-will take 3 years to recruit people.
- Colon cancer survivors (N=962) in Canada and Australia randomly assigned to a 3 year structured PA intervention (behavioral support program and supervised PA sessions) or general health education materials. The primary endpoint is disease-free survival. Important secondary endpoints include multiple patient-reported outcomes, objective physical functioning, biologic correlative markers, and an economic analysis.

Scotland: RCT

Mutrie et al (BMJ, 2007) and 5 year follow up (Mutrie et al, J Cancer Surviv, 2012)

- 12 week supervised group exercise programme (2 supervised 45 min exercise sessions/ week plus one home based session) during treatment for early stage breast cancer, with six month follow-up.
- 203 women entered the study; 86% completion rate.
- Control group: usual care.
- Functional and psychological benefit after a 12 week intervention and six months later.
- **Did gains persist 18 and 60 months later?**
- 44 % of women lost to follow up at 18 months and 58% at 60 months
- At 5 years, the intervention group achieved on average around 200 min of activity each week more than the control group
- Irrespective of original group allocation, women who were more active consistently reported lower levels of depression and increased quality of life compared to those who were less active.
- Benefits may be caused by the exercise itself, by the group experience, or by a combination of both.

Ireland...

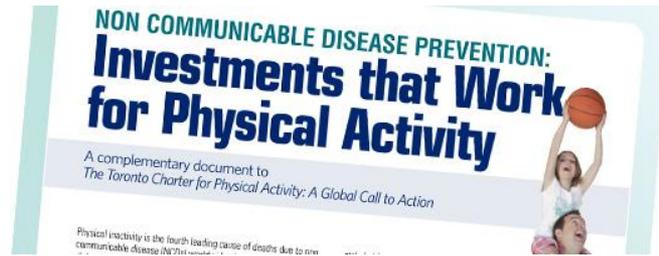
15 week walking and resistance training programme with 48 breast cancer survivors in Dublin yielded positive results (Grant, Murphy, Cotter and Vance, 2011)



“The next challenge for the Irish Cancer Society is to make the programme available on a wide reaching basis across the country.”

Physical activity research? Opportunities to share today!

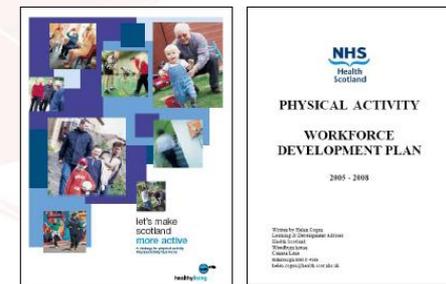
Policy implications



- Elements of a successful population-based approach to physical activity**
- High-level (political) commitment
 - Resources / funding
 - Integration in national policy context and with other agendas in related sectors
 - Support from stakeholders
 - Leadership and coordination
 - Workforce; skilled, with capacity



Example: Scotland
Strategic approach to developing a workforce



Big gaps

- Surveillance
- Systematic, timely evaluation of programmes
- Co-ordination, sharing, non-duplication
- Changes in policy, changes to the environment, to structures, to ways of working are less commonplace than programmes, and are rarely evaluated
- Physical activity is everyone's job-and no-one's!
- Physical activity is the poor relation of nutrition

We need to focus on environments and policies and not just on lots of (often) unconnected behaviour change programmes



One e.g...Cancer prevention, and physical activity involvement needs to begin in youth so...

It's not OK for our schools to have...

- inadequate PE provision
- no indoor sports facilities
- large (unwalkable) distances from towns
- no footpaths or unsafe roads
- unhealthy food on offer
- overemphasis on competition and winning....
- overreliance on outside agency delivery of programmes

..or for Government to fund sport that is not accessible/affordable for all



Towards a positive physically active future

