Increasing and Maintaining Physical Activity Through Behaviour Change

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Objective of Session

- By the end of this session you should be able to organize and lead all aspects of a physical activity behaviour change intervention with stroke survivors. In order to do this you will learn:
  - Pertinent terminology
  - Why physical activity behaviour change is important for people with stroke
  - Evidence regarding success of physical activity behaviour change interventions
  - Components of a behaviour change intervention through participation in a behaviour change intervention

Terminology and Background Information

Definitions

- **Physical Activity**
  - all leisure and non-leisure body movements resulting in an increased energy output from the resting condition
- **Physical fitness**
  - a physiologic state of well being that allows one to meet the demands of daily living or that provides the basis for sport performance (or both)
- Physical fitness mainly determined by PA patterns in previous weeks or months (Blair, S.N. et al.Med Sci Sports Exerc, 2001. **33**(6 Suppl): p. S379-99)
- Is physical activity easier to change than fitness in people with stroke?

Physical Activity Recommendations

- Moderate intensity (3-6 METS) PA for 30 minutes minimum, 5 days per week OR vigorous intensity activity for minimum of 20 minutes, 3 times per week (Haskell, W.L., et al., *Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association.* Med Sci Sports Exerc, 2007. **39**(8): p. 1423-34).
- Expend 1000 kcals per week

MET Values Illustration

- Person with stroke
  - 4 METs average during 6 MW (VO_2 13.6 ml/kg/min)
  - 6MW distance walked 100 m
  - Gait speed - 16m/min, 0.6 mph
- Non-disabled
  - Average 3.4 METS over 2 hours curling

Low Fitness Levels

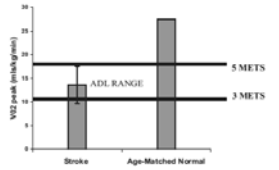


FIG. 1. Peak aerobic fitness levels (mean ± SD) of chronic stroke patients (n = 131) relative to the energy requirements for activities of daily living (ADL). Error bars represent standard deviation. Reproduced with permission from *Top Stroke Rehab* (Ref. 7).

Ivey FM, Hafer-Macko CE, Macko RF. Exercise rehabilitation after stroke. NeuroRx 2006;3(4):439-50.

Why physical activity post-stroke?

	Total (N=55)
Age (mean±SD)	59.6±10.2
Sex, n (%)	
Male	22 (40)
Female	33 (60)
Race, n (%)	
White	10 (18)
Black	37 (67)
Hispanic	6 (11)
Other	2 (4)
BMI (kg·m^{-2}) (mean±SD)	31.9±7.8
Affected side, n (%)	
Right	23 (42)
Left	28 (51)
Unknown	4 (7)
VO_{2peak} (mL·kg^{-1}·min^{-1}) (mean±SD)	13.0±4.9
Comorbidities, n (%)	
Diabetes	17 (31)
Hypertension	41 (75)
Congestive heart failure	4 (7)

Rimmer JH, Rauworth AE, Wang EC, Nicola TL, Hill B. Arch Phys Med Rehabil 2009;90(3):407-12.

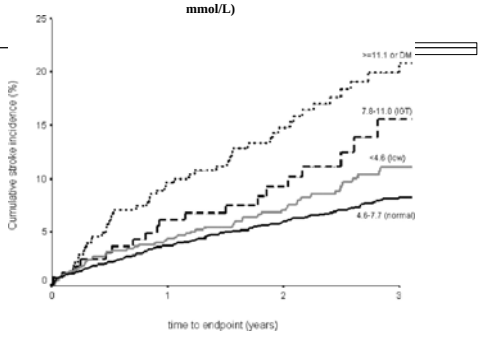
TABLE 1. Clinical and Demographic Features of Patients Randomized to Treadmill and Control Groups

Characteristic	Treadmill Exercise Group, n=32 (%)	Control Group, n=29 (%)
Age, y (mean±SD)	63±10	64±8
Gender, male:female	22:10	21:8
Race, black:white	20:12	15:14
Brain lesion side, right:left	18:14	13:16
Latency since stroke, mo (mean±SD)	35±29	39±59
Coronary artery disease	7 (22)	4 (17)
Hypertension	20 (63)	25 (86)
Diabetes mellitus	13 (41)	11 (38)
Former smokers	17 (53)	13 (45)
Current smokers	5 (16)	4 (14)
Ankle–foot orthoses	15 (47)	11 (38)
Assistive device		
None	11 (34)	6 (21)
Single-point cane	13 (40)	14 (48)
Quad cane	4 (13)	7 (24)
Walker	4 (13)	2 (7)

SD indicates standard deviation.

Macko RF et al. Stroke 2005;36(10):2206-11.

Kaplan-Meier curve of cumulative stroke incidence stratified by nonfasting glucose levels (in mmol/L)



Vermeer, S. E. et al. Stroke 2006;37:1413-1417

Stroke

American Stroke Association

Recurrent Stroke and Heart Disease

Figure 1. Kaplan–Meier survival curve comparing risk of nonfatal or fatal recurrent stroke with risk of myocardial infarction or fatal cardiac events.

Dhamoon MS, Sciacca RR, Rundek T, Sacco RL, Elkind MS. Recurrent stroke and cardiac risks after first ischemic stroke: the Northern Manhattan Study. Neurology 2006;66(5):641-6.

Interstroke - Risk Factors

	INTERSTROKE (all stroke; 3000 cases, 3000 controls)[a]	INTERHEART (acute myocardial infarction; 15 152 cases, 14 820 controls)[a]
Hypertension	34·6% (30·4–39·1)	17·9% (15·7–20·4)
Smoking	18·9% (15·3–23·1)	35·7% (32·6–39·1)
Waist-to-hip ratio (abdominal obesity)	26·5% (18·8–36·0)	20·1% (15·3–26·0)
Diet		
Diet risk score	18·8% (11·2–29·7)	–
Fruits and vegetables daily	–	13·7% (9·9–18·6)
Regular physical activity	28·5% (14·5–48·5)	12·2% (5·5–25·1)
Diabetes	5·0% (2·6–9·5)	9·9% (8·5–11·5)
Alcohol intake	3·8% (0·9–14·4)	6·7% (2·0–20·2)
Psychosocial factors		
All psychosocial factors	–	32·5% (25·3–40·8)
Psychosocial stress	4·6% (2·1–9·6)	–
Depression	5·2% (2·7–9·8)	–
Cardiac causes	6·7% (4·8–9·1)	–
Ratio of apolipoproteins B to A1	24·9% (15·7–37·1)	49·2% (43·8–54·5)

Data are population-attributable risk (99% CI). [a]Adjusted for all stroke risk factors apart from ratio of apolipoproteins B to A1. [b]Adjusted for all myocardial infarction risk factors. †See original article for definition of risk factor and methods used to calculate population-attributable risk.

Table: Comparison of the population-attributable risk (99% CI) for common risk factors: in the INTERSTROKE and INTERHEART studies

Lancet June 18· 2010; Interstroke Trial

Physical Activity

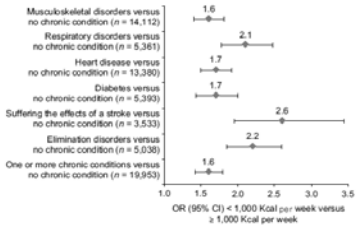


Figure 4
Odds ratios for physical activity in the chronic condition subsamples.

Sawatzky R, Liu-Ambrose T, Miller WC, Marra CA. Physical activity as a mediator of the impact of chronic conditions on quality of life in older adults. Health Qual Life Outcomes 2007;5:68.

Activity is related to a host of health issues

- Decreased mortality
- Improved function
- Better risk factor profile (blood pressure, glucose tolerance, lipids, waist circumference)

Gains are lost!!

- In spite of gains achieved with exercise or physical activity programs – gains are generally lost on follow-up.

Interventions

What works and what doesn't work

ExStroke Trial (ExStroke Trial; BMJ August 2009)

- Intervention
  - Participants met with trial instructor prior to D/C
  - Follow-up visits every 3 months during Year 1, every 6 months during Year 2 (instructions were repeated and activity plan adjusted)
- Repeated instructions and facilitation to increase physical activity doesn't change behaviour

Behaviour change with cardiac population

- Pedometer based telephone intervention with cardiac patients (Patient Educ Counsel 2009 Dec 16 epub)
  - Intervention based on social cognitive theory – focused on self efficacy, overcoming barriers to activity
  - Calls at 1, 3 & 6 weeks. Booster calls at 12 and 18 weeks.

PREPARE Program (Diabetes Care 32: 1404-1410, 2009)

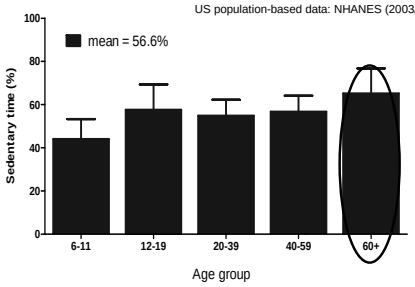
- Intervention
  - 180 minutes (see handout)
  - patient story, professional story, diet, physical activity (self efficacy, action plans, use of pedometer).
  - Follow-up – 10 minute review at 3 and 6 months
- Program with pedometer led to increased physical activity and better glucose control at 12 months

Different Approaches

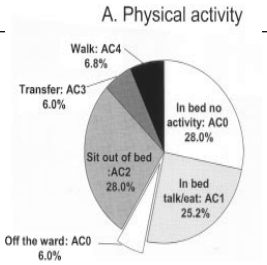
Increase physical activity or decrease sedentary time (or both?)

Sedentary Time

US population-based data: NHANES (2003/04 & 2005/06)

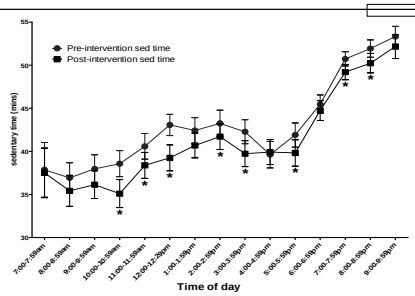


Healy et al. 2009 *J Sci Med Sport*, S44



Bernhardt, J., et al., *Inactive and alone: physical activity within the first 14 days of acute stroke unit care.* Stroke, 2004. **35**(4): p. 1005-9.

Change in objectively measured sedentary across time of day



Owen N, Ekelund U, Hamilton M, Gardiner P, & Dunstan D. Sedentary behavior in adults: longitudinal, experimental, and intervention evidence. Journal of Physical Activity and Health 2010; 7(Suppl 3): S334-336.

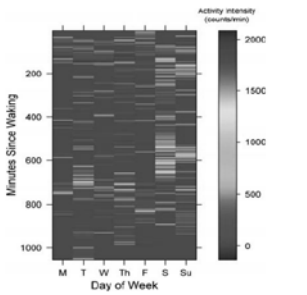


Figure 1. Being physically active, but also highly sedentary: 1 wk of accelerometer count data showing, on average, 31 min·d^{-1} moderate- to vigorous-intensity activity time (>1951 counts per minute) and 71% of waking hours sedentary (<100 counts per minute).

Owen, N., et al., *Too much sitting: the population health science of sedentary behavior.* Exerc Sport Sci Rev, 2010. **38**(3): p. 105-13.

Pattern of Activity

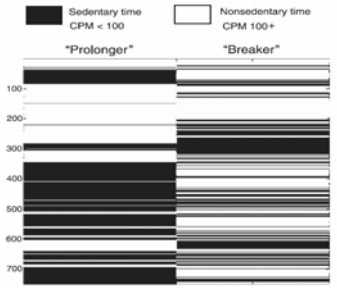
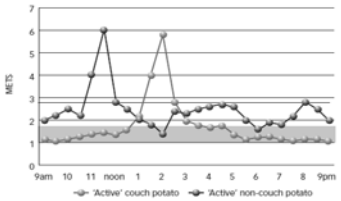


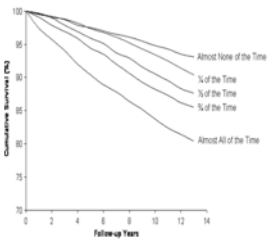
Figure 2. Breaks in sedentary time: same amount of sedentary time, but different ways of accumulation. CPM, counts per minute. (Reprinted from Dunstan DW, Healy GM, Sugiyama T, Owen N. Too much sitting and metabolic risk — has modern technology caught up with us? *US Endocrinol.* 2009; 5(1):29–33. Copyright © 2009 Touch Briefings. Used with permission.)

Importance of Light Intensity Activity

Figure 3: A Hypothetical Representation of the Physical Activity and Sedentary Patterns and Energy Equivalent (METS) Over a 12-hour Day for Two Individuals, Both of Whom Participate in Equivalent Amounts of Health-enhancing Physical Activity*



Dunstan, Healy et al 2010 at: http://www.touchendocrinology.com/articles/too-much-sitting-and-metabolic-risk-has-modern-technology-caught-us



Katzmarzyk et al. MMSE 41 (5): 998-1005, 2009.

Take Home Message

- Light intensity activity more often
- Break up sitting time – pay attention to pattern of activity

Theory

Common Sense Model

(Rheumatology 2007;46:904-906)

- Lay beliefs about illness – allows people to make sense of their symptoms and guide coping strategies.
  - Identity
  - Cause
  - Time-line
  - Consequences
  - Curability/Controllability
- The way that people think and feel about the above things can influence their outcomes and how they cope

Motivational interviewing

- Express empathy
- Develop discrepancies
- Roll with resistance
- Support self efficacy

Miller WR. Motivational interviewing: preparing people for change. The Guildford Press, New York. 2002.

Welschen, L.M., et al., *The effectiveness of adding cognitive behavioural therapy aimed at changing lifestyle to managed diabetes care for patients with type 2 diabetes: design of a randomised controlled trial.* BMC Public Health, 2007. **7**: p. 74.

Dual Process Model

- "two qualitatively different modes of information processing operate in making judgments and decisions and in solving problems"

Dual Processes Theories in Social Psychology. Editors Chaiken & Trope: 1999.

Social Cognitive

- Core determinants
  - Knowledge of health risk and benefits of different health practices
  - Perceived self efficacy – control over a behaviour
    - Use reinforcement, modeling
  - Outcome expectations – costs and benefits of different behaviours
  - Perceived facilitator – social and structural impediments or facilitators

Bandura A. Health Education and Behaviour 2004; 31(2): 143-164.

Implementation Intentions

- Different than goal intentions (i.e. my goal is to do this…)
- Implementation intentions specify the when, where, and how of the responses (when situation x happens, I will perform the response y OR I intend to engage in PA at the gym Tuesday afternoons after work)

Gollwitzer PM. 1999 American Psychologist 54 (7): 493-503.

Resources

- http://hypertension.ca/bpc/resource-center/educational-tools-for-health-care-professionals/

Increasing and maintaining physical activity through behaviour change

By the end of this session you should be able to organize and lead all aspects of a physical activity behaviour change intervention with stroke survivors. In order to do this you will learn:

- Pertinent terminology
- Why physical activity behaviour change is important for people with stroke
- Evidence regarding success of physical activity behaviour change interventions
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Outline

I. Terminology & background information
II. Why focus on changing physical activity behaviour in people with stroke?
   a. People with stroke typically have several co morbidities/risk factors for another stroke [1, 2]
   b. Interstroke findings [3]
   c. People with stroke are generally inactive [4], and gains from interventions are lost without continued activity [5]
   d. Inactivity is related to a host of health issues
   e. Inactivity or sedentary – semantics or an important distinction?
III. Evidence for change in physical activity behaviour in people with stroke
   a. What doesn't work?
   b. What works?
IV. Theoretical underpinning of intervention
   a. Common sense model
   b. Motivational interviewing
   c. Social cognitive theory
   d. Implementation intentions
V. Different approaches
VI. An example session

Options for Measurement:

- Pedometers (Example – New Lifestyles http://www.new-lifestyles.com/) - less effective at slower speeds.
- ActivPAL http://www.paltech.plus.com/products.htm (provides steps, sit to stand transitions, sitting time)
- Step Activity Monitor http://www.orthocareinnovations.com/pages/stepwatch_tradesystem (measures steps per day as well as intensity of stepping (steps/min) – validated for people with stroke
- Actical (measures all types of activity, waist worn, more complicated analysis) http://actical.respironics.com/PDF/ActicalBrochure.pdf. Step count not accurate at lower speeds Esliger, D.W., et al., *Validity of the Actical accelerometer step-count function.* Med Sci Sports Exerc, 2007. **39**(7): p. 1200-4.
- Sensewear Arm Band http://www.sensewear.com/BMS/solutions_bms.php - (measures energy expenditure, steps, postural allocation)

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PREPARE Program

Table 1
Outline of the PREPARE programme

Module name	Main aims and educator activities	Theoretical underpinning	Time weighting
Patient story	Give participants a chance to share their knowledge and perception of IGT and highlight any concerns they may want to be addressed in the programme	Common sense model [33]	10% (20 min)
Professional story	Use simple non-technical language, analogies, visual aids and open questions to provide participants with an overview of healthy glucose metabolism, the aetiology of pre-diabetes and the risk factors and complications associated with pre-diabetes Help participants calculate their own individual risk scores	Common sense model [33] Dual process theory [43]	35% (60 min)
Diet	Give participants an accurate understanding of the link between diet and metabolic dysfunction	Social cognitive theory [22] Dual process theory [43]	15% (25 min)
Physical activity	Use simple non-technical language, analogies, visual aids and open questions to help participants: identify how physical activity improves glucose control; understand the current physical activity recommendations; explore options for incorporating physical activity into everyday life; identify barriers to exercise; form action plans and set personal goals Encourage participants to use their physical activity diaries	Social cognitive theory [22] Implementation intentions [29] Duel process theory [43]	40% (75 min)

From [6]
How?

- As part of a physical activity module at stroke prevention clinic
- Education sessions for individuals with stroke in hospital
- Other?

References:

1. Kopunek, S.P., et al., *Cardiovascular risk in survivors of stroke.* Am J Prev Med, 2007. **32**(5): p. 408-12.
2. Mackay-Lyons, M.J., C. Macdonald, and J. Howlett, *Metabolic syndrome and its components in individuals undergoing rehabilitation after stroke.* J Neurol Phys Ther, 2009. **33**(4): p. 189-94.
3. O'Donnell, M.J., et al., *Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study.* Lancet, 2010. **376**(9735): p. 112-23.
4. Sawatzky, R., et al., *Physical activity as a mediator of the impact of chronic conditions on quality of life in older adults.* Health Qual Life Outcomes, 2007. **5**: p. 68.
5. Mudge, S., P.A. Barber, and N.S. Stott, *Circuit-based rehabilitation improves gait endurance but not usual walking activity in chronic stroke: a randomized controlled trial.* Arch Phys Med Rehabil, 2009. **90**(12): p. 1989-96.
6. Yates, T., et al., *Rationale, design and baseline data from the Pre-diabetes Risk Education and Physical Activity Recommendation and Encouragement (PREPARE) programme study: a randomized controlled trial.* Patient Educ Couns, 2008. **73**(2): p. 264-71.

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