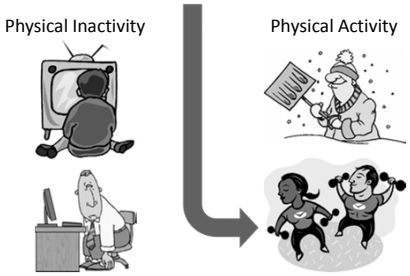
Talk Overview

1. Benefits of exercise
2. Risks of inactivity
3. Exercise recommendations
4. Evidence for high-intensity interval training (HIIT) as efficient way to exercise
5. Integrating exercise counseling
6. Practical tips and resources

What is exercise?



For the purposes of this talk EXERCISE = PHYSICAL ACTIVITY

Garber CE et al. *Med Sci Sport Exerc* 43.7(2011):1334-1359.

Benefits of Exercise

- All-cause mortality
- Cardiovascular disease
- Metabolic syndrome
- Weight loss
- Depression/Cognition
- Fibromyalgia
- Chronic fatigue syndrome
- Osteoarthritis of the knee
- Etc.

US HHS Physical Activity Guidelines 2008
Cochrane Reviews

Pills vs. Exercise

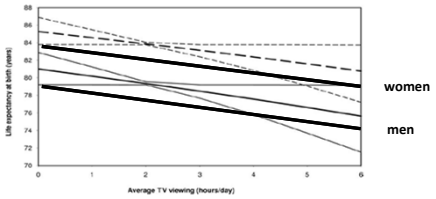
- Modern medical research is lopsided
  - Medication vs placebo/medication
  - Rarely medication vs lifestyle intervention
- Compared mortality benefits of exercise and drug interventions

Condition	Exercise		Pills
Coronary artery disease	Exercise	>	Statins, beta blockers, ACE inhibitors, antiplatelets
Stroke	Exercise	>	Anticoagulants, antiplatelets
Pre-diabetes	Exercise	=	Alpha glucosidase inhibitors, thiazolidinediones, biguanides, ACE inhibitors, glinides
Heart Failure	Exercise	<	Diuretics

Naci et al. BMJ. 2013:f5577.

Not just benefits of exercise, but also RISKS of inactivity

Television viewing time and reduced life expectancy: a life table analysis



On average, every single hour of TV viewed after the age of 25 reduces the viewer's life expectancy by 21.8 (95% UI: 0.3–44.7) min. (1)

Compare this with 11 minutes of life expectancy reduction with 1 cigarette. (2)

1. Veerman et al. Br J Sports Med. 2011;46(13);927-930.
2. Shaw et al. BMJ. 2000;320(7226):53.

WHO Mortality Risks (% of deaths)

1. Hypertension (13%)
2. Tobacco use (9%)
3. High blood glucose (6%)
4. Physical inactivity (6%)
5. Overweight and obesity (5%)

WHO 2009.

Inactivity is a Public Health Problem

- 6-10% of non-communicable diseases worldwide are caused by physical inactivity
- 9% of total premature mortality is caused by physical inactivity
- Physical inactivity is as detrimental a risk factor as smoking and obesity

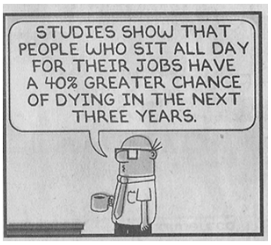
Lee IM et al. Lancet. 2012;380(9838):219-229.

Estimated Gains in Life Expectancy by Eliminating Inactivity

Lee IM et al. Lancet. 2012;380(9838):219-229.

Prolonged Sitting Increases Mortality Risk

- >200,000 adults
- >7 hours of sitting time
- >40% all-cause mortality risk over 2.8-8.5 years
- Independent of BMI and physical activity levels



Matthews CE et al. Am J Clin Nutr. 2012; 95(2):437-445.
Van der Ploeg HP et al. Arch Intern Med. 2012; 172(6):494-500.

How much exercise to recommend?

PLUS:
Resistance exercise 2-3 times/week
Flexibility exercise 2 times/week

Garber CE et al. Med Sci Sport Exerc. 2011; 43(7):1334-1359.

Exercise Intensities

Moderate Exercise

3.0-5.9 MET

Carry a conversation

- Brisk walking (20 min mile)
- Water aerobics
- Biking <10 mph
- Tennis (doubles)
- Gardening
- Ballroom dancing

Vigorous Exercise

6.0 MET or greater

Out of breath

- Jogging or running
- Swimming laps
- Tennis (singles)
- Biking >10 mph
- Jumping rope
- Hiking uphill

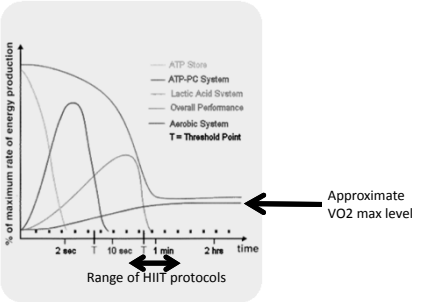
1 Metabolic Equivalent of Task (MET) = energy cost of sitting quietly 1 cal/kg/hr

How do we reconcile…

What is HIIT?

- High Intensity Interval Training
- Bouts of maximal or near maximal intensity exercise followed by periods of rest or light intensity exercise
- Often measured in terms of %VO2 max
- Practically should be at 8-10/10 intensity

Energy Recruitment



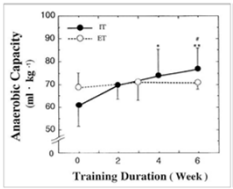
http://www.brianmac.co.uk/energy.htm

What's the evidence for HIIT?

- Well studied in the exercise physiology literature
- Recent work translating into clinical performance
  - Cardiac blood flow
  - Metabolic syndrome
  - Psychological health

Early HIIT Study: The 4 Minute Work Out

- HIIT: 20 sec @ 170% VO2 max, 10 sec rest x8 sets
- Endurance: 60 minutes on cycle @ 70% VO2 max
- 5 days/week x6 weeks
- Similar increases in aerobic capacity



Tabata I. Med Sci Sports Exerc. 1996; 28(10):1327-1330.

Low-Volume High-Intensity Interval Training in a Gym Setting Improves Cardio-Metabolic and Psychological Health

Study Subjects:

90 individuals aged 18-60 (mean 42 yo)
Did not meet physical activity guidelines for at least 1 year
No history of metabolic or cardiovascular disease
12 lead EKG to rule out underlying cardiac abnormalities

Stratified by:
- Age (less/greater than 40 yo)
- Gender (M, F)
- BMI (less/greater than 27 kg/m^2)
- Pairs randomly assigned to each test group

Shephard SO et al. PloS one. 2015; 10(9):e0139056.

Low-Volume High-Intensity Interval Training in a Gym Setting Improves Cardio-Metabolic and Psychological Health

Test Groups, Spinning Bike, 10 weeks

High Intensity Interval Training (HIIT)

- 5 minutes cycling warm up
- 15-60 seconds sprints
- Goal heart rate >90% max
- 45-120 seconds active recovery
- 5 minute cool down
- Total session time: 18-25 min
- Frequency: 3 times per week

Moderate Intensity Continuous Training (MICT)

- Short warm up
- 30-45 minutes
- Goal heart rate 70% max
- Short cool down
- Total session time: 30-45 min
- Frequency: 5 times per week

Shephard SO et al. PloS one. 2015; 10(9):e0139056.

Low-Volume High-Intensity Interval Training in a Gym Setting Improves Cardio-Metabolic and Psychological Health

Table 2. Attendance to prescribed exercise sessions and time spent exercising.

Variable	HIT	MICT	Group effect (*p value*)
Adherence (% of prescribed sessions completed)	83±14	61±15	<0.001
Total number of sessions completed	25±5	33±12	<0.001
Number of sessions completed (per week)	2.6±0.4	3.4±1.0	0.02
Number of supervised sessions completed	25±5	21±7	0.01
Number of unsupervised sessions completed	N/A	11±8	-
Total time spent training (min) per week (range)	55±10 (36–65)	128±44 (50–225)	<0.001

Data provided are means ± SD.

doi:10.1371/journal.pone.0139056.t002

Shephard SO et al. PloS one. 2015; 10(9):e0139056.

Low-Volume High-Intensity Interval Training in a Gym Setting Improves Cardio-Metabolic and Psychological Health

Results

No significant difference between groups with respect to:

- Improved VO2 max
- Reduced BMI and fat mass
- Reduced mean arterial pressure and resting heart rate
- Improved whole-body insulin sensitivity
- Reductions in plasma total cholesterol and LDL
- Increased HDL
- Improved perception of health and subjective vitality scores

…despite less than ½ the time spent training in the HIIT group

Shephard SO et al. PloS one. 2015; 10(9):e0139056.

More Evidence for Efficient Exercise

Low-Volume, High-Intensity Interval Training in Patients with CAD

Inclusion criteria at least 1 of:

- Angiographically documented stenosis in >50% of at least 1 major coronary artery
- Myocardial infarction >2 months out
- Percutaneous coronary intervention >1 month out
- Coronary artery bypass graft surgery >2 months out
- Positive exercise stress test

Currie KD et al. Med Sci Sports Exer. 2013;45(8):1436-42.

Low-Volume, High-Intensity Interval Training in Patients with CAD

12 weeks cycling, intensity as % of Peak Power Output (PPO)

Endurance Group

- 10-15 minute warmup/cooldown
- 30-50 minute 58% PPO
- 2 sessions per week
- 1 independent day per week
- Approx. 150 minutes per week

High Intensity Interval Group

- 10-15 minute warmup/cooldown
- 1-min at 89% PPO followed by 1- min 10% PPO x 10 sets
- 2 sessions per week
- 1 independent day per week
- Approx. 90 minutes per week

Currie KD et al. Med Sci Sports Exer. 2013;45(8):1436-42.

Low-Volume, High-Intensity Interval Training in Patients with CAD

Results

- No difference in VO2 max gains or brachial artery flow-mediated dilation between groups
- HIIT group performed less than half the work per session
- No adverse events in either group

Currie KD et al. Med Sci Sports Exer. 2013;45(8):1436-42.

How little exercise is enough?

- 3 minutes per week all-out exercise on cycle ergometer
  - 2 minute warmup (50W)
  - 20 seconds all out (450W), 2 minute recovery (50W) x 3 sets
  - 3 minute cool-down (50W)
  - Total of 10 minutes, 3 times per week
- Improved skeletal muscle oxidative capacity
- Improved indices of cardio-metabolic health including blood pressure and aerobic capacity

Gillen JB et al. PLoS One. 2014;9(11): e111489.

Is HIIT dangerous?

- Heart failure patients in their 70s– no adverse events, increased VO2 max, endothelial function, LV remodeling, increased QOL (1)
- Cardiac rehab in patients with <40% LV ejection fraction (2)
- COPD patients with forced expiratory volume of 45±4% of the predicted value (3)

1. Freyssin C et al. Arch Phys Med Rehab. 2012;93(8): 1359-1364.
2. Vogiatzis I et al. Eur Respir J. 2002;20(1): 12-19.
3. Wisløff U et al. Circulation. 2007; 115(24): 3086-3094.

What Doesn't Kill You Makes You Fitter: A Systematic Review of High-Intensity Interval Exercise for Patients with Cardiovascular and Metabolic Diseases

- Systematic review to evaluate safety of HIIT for people with cardiometabolic disease
- 11 studies met inclusion criteria
- Of 156 total patients, 13 had adverse events (8%) including:
  - Myocardial ischemia
  - Arrhythmias
  - Vagal reactions
  - Nausea
  - BUT NO DEATHS

Levinger I et al. Clin Med Insights Cardiology. 2015; 9: 53-63.

Mini Modified Tabata
20 sec on / 10 sec rest

- Squats
- Jumping Jacks
- High knees

Get set…go!

If INACTIVITY is a disease…
..then EXERCISE is a treatment

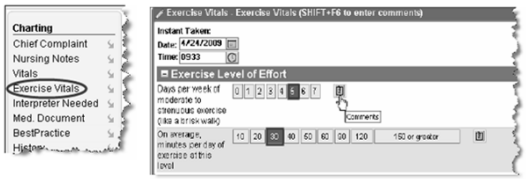
- Remember
  - 4th highest contributor to mortality in the world
  - Panacea with limited side effects
  - Something is better than nothing

Hypertension
EXERCISE

- Take vital sign
- Prescribe treatment
- Follow up visit
  - Check vital signs
  - Ask about adverse reactions
  - Adjust treatment dose if necessary

Khan KM et al. BMJ. *2011;*343(d4141): 806.

Exercise Vital Sign- Kaiser Permanente



1. How many days per week do you exercise at a moderate level or greater (like a brisk walk)?
2. How long do you spend exercising at this level (moderate or greater) when you do exercise (in minutes)?

Sallis R. Br J Sports Med. 2011. 45(6):473-474.

Your recommendation counts!

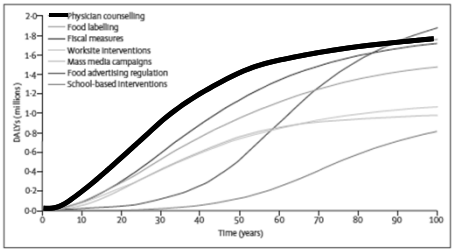


Figure 3: Cumulative disability-adjusted life-years (DALYs) gained over time

Cecchini M,et al. Lancet. 2010. 376 (9754):1775-1784.

Your recommendation counts!

Effectiveness of physical activity promotion based in primary care: systematic review and meta-analysis of randomised controlled trials

- 15 trials (N=8745 patients)
- NNT = 12 for physical activity counseling for 1 additional sedentary adult to meet internationally recommended levels of activity (150 min/week moderate) at 12 months
  - *NNT for atorvastatin to prevent 1 heart attack = 100*

Orrow G et al. BMJ. 2012; 344:e1389.

How to promote in clinical practice?

- Similar tools to smoking cessation counseling
- Intermountain Healthcare Lifestyle Process Model

TIME-EFFICIENT 5As:

At many office visits, the time available to discuss behavior change is limited. But even very brief behavioral counseling is better than none at all — and will increase patient motivation and reinforce the importance of patient responsibility for modifying behavioral risk factors.

TABLE 2: Integrating the 5As behavior change approach into a busy office environment

If you have	Then
No time	Point out your concerns and arrange follow-up. "Your exam showed some wellness issues that I'd like to discuss with you at a future appointment. My nurse will give you a handout and can help you schedule an appointment where we can talk."
1 minute	☐ **ADVISE** briefly on one of the patient's most important risks. ☐ **ASSIST** by providing a patient education handout or link to online information. ☐ **ARRANGE** a follow-up appointment or specialist referral. *For example:* "You know, 150 minutes of moderate-intensity physical activity each week is important to your health, and it looks like you're only getting about 60 minutes. Here's some information to help you increase your activity level. I'd like to discuss this more with you at a future appointment. How does that sound?"
2 to 5 minutes	**Above plus:** ☐ **ADVISE** further about the importance of relevant behavior changes. ☐ **AGREE** mutually on a goal and document the goal and a follow-up plan on a brief prescription such as the *Do-to-Goal*; save a copy in the patient's chart. *For example:* "You know, 150 minutes of moderate-intensity physical activity each week is important to your health, and it looks like you're only getting about 60 minutes. Can you think of a way to increase your activity that you don't dislike or hate ... "Great. I'll keep that goal in your record. I'd like you to keep track of how you're doing, and then I'd like to check on your progress in a few months."
5 to 10 minutes or more	**Above plus:** ☐ **Use more open-ended questions to assess readiness and help the patient focus on an effective goal** *For example:* "I'm noticing a few issues that put you at risk for other health problems. It looks like you're not getting enough physical activity or sleep, and you've mentioned you drink a lot of soda. Which of these concerns you the most?" "Of all these things, what would it be like if you did get more exercise and increase your activity?" "Of all these, which do you feel you are ready and able to do?" ... "Great. Let's write that as your goal. Here's a prescription and an Action Plan — people who make a plan often do better with their goals. My nurse can help you with a follow-up appointment so I can check on your progress in a few months."

Sallis R. Br J Sports Med. 2011. 45(6):473-474.

5A's of Motivational Interviewing

1. ASSESS activity level and readiness for change
2. ADVISE on benefits of activity
3. AGREE on activity goals
4. ASSIST on an action plan and resources
5. ARRANGE for referrals and follow up

Barriers to Exercise Counseling

- Lack of knowledge, skill, or comfort
- Competing demands during the visit
- Poor reimbursement
  - ICD-10:
    - Z72.3 Lack of physical exercise
    - Obesity, diabetes, fatigue, depression, insomnia, etc.
  - Bill appropriate E&M Code with documentation of counseling
    - Must account for >50% of visit
    - Document time spent and description of counseling/coordination of care

http://exerciseismedicine.org/assets/page_documents/BillingCodingPhysActFINAL.pdf
https://intermountainhealthcare.org/ext/Dcmnt?ncid=522452203

Let's Add to Your Toolkit

- Wearable Devices
- Workout Ideas
- Resources

Wearable Devices

- Allow for goal setting
- Keeps track of activity
- Reminders

Wearable Devices

- No convincing research data for improved activity levels (1)
- BUT may provide motivation via self-feedback, accountability, and systems-based rewards: (2)

"So initially it was, oh, okay. Your practice needs to change a little bit if you account to get this extra health benefit in. I've figured out ways to do that, and now they're part of my daily practice."

"I pay less attention to it now than I did when I first got it. And maybe that's because by now, I sort of know my patterns."

"There was one time that I came home, and it had been a particularly active day, and I think I was at like 33,000 steps or something like that, and I was just like, 'I'm just going to walk around the house until I get 35.' So I did that. I just literally walked in circles around the house picking up things and moving things around."

1. Bort-Roid J. Sports Med. 2014; 44(5):671-686.
2. Fritz T. ACM 2014.

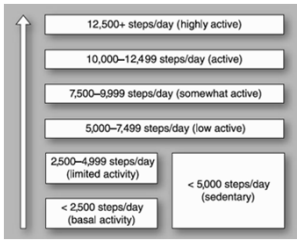
What's with the 10,000 step goal?

Marketing! 万歩計

Japan, 1965, K. Hatano

"manpo-kei"

"10,000 steps meter"



Subsequent validation of heath benefits

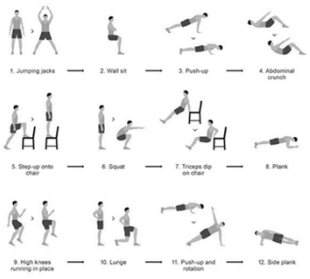
Tudor-Lock C. Curr Cardiovasc Health Rep. 2010; 4(4):271-276.

Workout Ideas

- Rowing/running machine intervals:
  - 30 seconds on, 90 seconds off x6 sets
  - Tabata protocol 20 s on, 10 s off x8 sets
- Quick circuit:
  - 50 jumping jacks to warm up
  - 10 reps of 3 different weight exercises x3 sets
- Purchase workout videos
  - P90X has been shown to meet ACSM criteria for energy expenditure and intensity

Wold JM. Diss. University of Wisconsin La Cross. 2011.

7 Minute High Intensity Circuit Training
30s active, 10s rest



*Available via the New York Times Workout App

Klika B et al. ACSM. 2013: 17(3): 8-13.

Everybody Walk

- Brainchild of the former Kaiser Chairman and CEO, George Halvorson
- Unbranded campaign that celebrates the power of walking to improve health
- www. Everybodywalk.org

Exerciseismedicine.org

- Healthcare Providers Action Guide
- Patient and professional resources
- Rx Pad

Your Prescription for Health

Exercise is Medicine®

Name: _____ Date: _____

❑ **Aerobic Activity**

Type: Walk Run Swim Bike Other_____

Frequency (days/week): 2 3 4 5 6 7

Intensity: Light (A Casual Walk) Moderate (A Brisk Walk) Vigorous (Jogging or Running)

Time (minutes/day): 10 20 30 60 60 or more

Steps/day: 2,500 5,000 7,500 10,000 More than 10,000

❑ **Strength Training**

- Muscle strengthening should be done at least two days per week
- Exercise should be done to strengthen all major muscle groups: legs, hips, back, chest, abdomen, shoulder, arms
- For each exercise, 8-12 repetitions should be completed
- Examples include bodyweight exercise (e.g. push-ups, lunges), carrying heavy loads, and heavy gardening

Physician Signature: _____

Gym Membership Benefits

- Medicare- none
- Independence Blue Cross- up to $150
- BCBS- depends on plan, $25 monthly access fee
- Tufts Network Health - $75/year
- Fallon Community Health- includes home equip.
- MassHealth- approx $50 rebate

Case Study

- 34 year old female physician
- 5 months post-partum
- BMI 29.2, BP 100/60, HR 60
- EVS:
  1. 2 days per week exercising at a moderate level or greater (brisk walking)
  2. 45 minutes exercising at this level per session

  = 90 minutes/week of moderate exercise

  = NOT ENOUGH !

Intervention

- Saw fellow physician modeling good behavior
- Started high intensity exercise program

Follow Up

- 5 months later:
  - BMI 27.3, BP 100/60, HR 55
  - EVS:
    1. 6 days per week exercising at a moderate level or greater (HIIT, brisk walking)
    2. 30 minutes exercising at this level per session

    =180 minutes per week of mostly vigorous exercise

Summary of Key Points

- Inactivity is dangerous
- HIIT for efficient exercise
- Treat physical activity as a vital sign
- Recommend 150 mins (mod)/75 min (heavy) activity per week
- Physical activity on most days
- Your recommendation counts, but live by example