2-6-2014

Beyond Basic Exercise Guidelines: Is Sitting Really the New Smoking?

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Beyond Basic Exercise Guidelines: Is sitting really the new smoking?

http://dilbert.com STRIPS comic/2013-11-17/
150 Minutes Per Week

Frequency
5x per week

Intensity
Moderate to Vigorous

Time
30 min per session
(150 min/wk)

Type
Aerobic (cardio),
resistance training,
flexibility and balance
training

American College of Sports Medicine (2013)
Typical Day

• Wake up
• Get ready for the day (shower, coffee, breakfast, etc.)
• Commute to work
• Work (am)
• Lunch
• Work (pm)
• Commute home
• Prepare/ eat dinner
• Read, watch TV, catch up on work, laundry, drink good wine, etc.

Typical Day with 30 min of MI Exercise

• Wake up
• Go for a run/walk
• Get ready for the day (shower, coffee, breakfast, etc.)
• Commute to work
• Work (am)
• Lunch
• Exercise during lunch hour
• Work (pm)
• Commute home
• Prepare/ eat dinner
• Walk the dog
• Read, watch TV, catch up on work, laundry, drink good wine, etc.
You get in your 150 min/wk!

Good for you.

What are you doing with the other 6,570 min a week you are not exercising or sleeping??

American children and adults spend, on average, 54.9% of their waking hours sedentary.

(Matthews et al. 2008)
What is sedentary physiology?

Tremblay et al., 2010

“...any waking [behavior] characterized by an energy expenditure ≤1.5 METs while in a sitting or reclining posture.”

- SBRN, 2012

Measuring Sedentary Time

- Daily Recall
- TV viewing time
- TV time + other screen time
- Questionnaire (IPAQ)
- Accelerometer
So, what happens when we sit a lot?

- Mortality
- CVD Risk
- Weight Gain
- Diabetes
- Other Consequences

So, what happens when we sit?

- Mortality
- CVD Risk
- Weight Gain
- Diabetes
- Other
So, what happens when we sit?

Mortality  CVD Risk  Weight Gain  Diabetes  Other

Mortality Risk and Sitting Time

So, what happens when we sit?

Mortality  CVD Risk  Weight Gain  Diabetes  Other

Mortality Risk and TV Viewing

1. 4,500 Scottish men and women over 35 y/o\textsuperscript{20}
   - All Cause Mortality = 48% increase in risk with 4+ hr of TV/day
   - CVD Mortality = 125% increase in risk with 4+ hr of TV/day

2. 13,000 men and women between 45-79 y/o\textsuperscript{23}
   - All Cause Mortality = 5% increase for every hour of TV/day
   - CVD Mortality = 8% increase for every hour of TV/day
So, what happens when we sit?

Mortality  CVD Risk  Weight Gain  Diabetes  Other

- Blood lipid levels
  - Increase TC and TG \(^7,10\)
  - Decrease HDL (good cholesterol)
  - Impaired lipid metabolism\(^2,8,24\)

- Endothelial dysfunction \(^7\)
  - Decreased vessel diameter and blood flow
  - Increased blood pressure

- Increased risk for blood clots \(^2\) \(^11\)
  - Increased fibrinogen

- Increased Inflammation \(^9\)
  - CRP may be a marker for inflammation
  - High levels associated with risk for CVD

So, what happens when we sit?

Mortality  CVD Risk  Weight Gain  Diabetes  Other

Eat more calories = Expend fewer calories = Waist Circumference
So, what happens when we sit?

<table>
<thead>
<tr>
<th>Mortality</th>
<th>CVD Risk</th>
<th>Weight Gain</th>
<th>Diabetes</th>
<th>Other</th>
</tr>
</thead>
</table>

- Canadian adults, over 6 years, experienced a 0.13cm increase in WC for every 15 min increase in sedentary time \(^{18}\)
- Australian workers sitting >352 min (5.8 hr) in a work day had 6.1 cm greater WC and 1.8 more BMI units than those with <352 min of sitting time \(^{16}\)
- Over 5 years, an increase in TV viewing time was associated with a .43 cm increase in WC for men and .68 cm increase in women \(^{23}\)

We engage less muscle mass while sitting.

---

So, what happens when we sit?

<table>
<thead>
<tr>
<th>Energy Expenditure (kcal/min)</th>
<th>Resting (fidget)</th>
<th>Sitting (fidget)</th>
<th>1 mph</th>
<th>2 mph</th>
<th>3 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>54%</td>
<td>94%</td>
<td>154%</td>
<td>202%</td>
<td>292%</td>
</tr>
</tbody>
</table>

(Levine et al., 2000)
So, what happens when we sit?

<table>
<thead>
<tr>
<th>Mortality</th>
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</thead>
</table>

Not only are you expending fewer calories, but you may find yourself eating more. 3

Knowledge Based Workers?

**TABLE 1. Spontaneous Energy Intake in the Buffet-Type Meal After Each Experimental Condition**

<table>
<thead>
<tr>
<th></th>
<th>Control Condition</th>
<th>Reading-Writing Condition</th>
<th>Test-Battery Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total energy intake</td>
<td>3565 ± 942</td>
<td>4463 ± 1015*</td>
<td>4652 ± 1019*</td>
</tr>
<tr>
<td>kcal</td>
<td>461 ± 223</td>
<td>1063 ± 243*</td>
<td>1113 ± 264*</td>
</tr>
<tr>
<td>Lipid</td>
<td>1676 ± 744</td>
<td>2148 ± 472*</td>
<td>2202 ± 576*</td>
</tr>
<tr>
<td>kcal</td>
<td>401 ± 178</td>
<td>514 ± 161*</td>
<td>527 ± 138*</td>
</tr>
<tr>
<td>%</td>
<td>46.6 ± 10.1</td>
<td>48.3 ± 10.6</td>
<td>47.3 ± 16.1</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>1472 ± 485</td>
<td>1772 ± 501*</td>
<td>1835 ± 677*</td>
</tr>
<tr>
<td>kcal</td>
<td>338 ± 176</td>
<td>424 ± 120*</td>
<td>439 ± 162*</td>
</tr>
<tr>
<td>%</td>
<td>39.3 ± 8.7</td>
<td>39.9 ± 7.4</td>
<td>39.4 ± 8.1</td>
</tr>
<tr>
<td>Protein</td>
<td>505 ± 183</td>
<td>522 ± 158</td>
<td>614 ± 229</td>
</tr>
<tr>
<td>kcal</td>
<td>121 ± 44</td>
<td>125 ± 38</td>
<td>147 ± 55</td>
</tr>
<tr>
<td>%</td>
<td>14.1 ± 4.7</td>
<td>11.8 ± 6.8</td>
<td>13.3 ± 3.9</td>
</tr>
</tbody>
</table>

Data are mean ± SD.
* Significantly different from control values (p < .05).
So, what happens when we sit?

Mortality  CVD Risk  Weight Gain  Diabetes  Other

Muscle actions

Insulin-secreting cells of the pancreas activated; release insulin into the blood

Elevated blood sugar levels

Stimulus: rising blood glucose levels (e.g., after eating four jelly doughnuts)

Uptake of glucose from blood is enhanced in most body cells

Liver takes up glucose and stores it as glycogen

Blood glucose levels decline to set point: stimulus for insulin release diminishes

Homeostasis: Normal blood glucose levels (90 mg/dL)

Marieb, 2010

Increased risk for diabetes

Limited muscle actions limit glucose uptake
  • Post prandial blood glucose remains elevated
  • Important implications for T2D management and CVD risk

Insulin sensitivity decreases
  • As little as 5 days, probably less
So, what happens when we sit?

- Mortality
- CVD Risk
- Weight Gain
- Diabetes
- Other

...even if I get my 150 minutes a week?

Tremblay et al., 2010
Breaks Are Important

Mortality
CVD Risk
Weight Gain
Diabetes
Other Consequences

Sedentary behavior frequency
Interruptions in sitting time**
Time (duration of sitting)
Type (TV, driving, computer use)
Breaks Are Important

Interruptions in sedentary time:
- Every 20-30 min
- 2 minute break
- Intensity does not matter

Breaks are Important

- **CVD Risk**
  - More breaks, increased HDL⁴, increased LPL activity, decreased TG¹⁰
  - Light intensity breaks, fibrinogen decreased, blood viscosity decreased, and blood flow increased¹¹
  - Decreased inflammation with highest quartile of sitters¹⁰

- **Weight Gain**
  - Standing and walking at a normal pace for 2-5 min an hour resulted in an extra 296-660 kcal burned²¹
  - Successful weight maintenance with decreased TV time¹⁵
  - Those in highest quartile of interruptions associated with a 5.9 cm lower WC than those in the lowest quartile⁹
  - 0.15cm lower WC for each interruption in sedentary time⁴

- **Diabetes**
  - Breaks (LI or MI) decreased PP glucose and insulin concentrations⁵
    - 2 min every 20 min for 5 hr-28 min total
    - Better fasting glucose in highest quartile of sitters¹⁰

- **Other**
  - Likely to feel happier and partake in other healthy behaviors
Work Alternatives

www.lifespanfitness.com

Sedentary Time at CSB|SJU

513 students, faculty, and staff

7.54 hr/day

1.16 hr/day

4.04 hr/day
Sedentary Time at CSB|SJU

- **Students**
  - Anecdotal: 4-14 hr/day
  - Reported Seated Time: 7.39 hr/day
  - TV/Computer Time: 3.72 hr/day

- **Faculty/Staff**
  - Reported Seated Time: 7.66 hr/day
  - TV/Computer Time: 6.48 hr/day

Future Research at CSB|SJU

- **Murray 001 Spring 2014**
  - Student engagement/focus in class
  - Other healthy behaviors

- Long-term research plans
Think you don’t do a lot of sitting?

- Calculate your sitting time.
  - 24 hour recall
  - Online sitting calculator (juststand.org)

So, what do you do about it?

At work:

1. Take breaks or change posture every 20-30 min
   - Set an alarm to go off every 20 min. (on your phone, web based programs)- you will focus better
     - Tomato Timer
     - Focus Booster
     - Pomodoro Timer
2. Encourage colleagues to take breaks
3. Brainstorm while walking
   - Walk on your lunch break or have walking meetings
   - Get a pedometer
4. Get a smaller water bottle so you have to fill it more often
5. Place frequently used office/home items far enough away from where you sit so that you have to stand to get them
6. Try a different commute (if you can)
   - Stand on the bus or train
   - Bike to work
7. Ask about sit-stand workstations
At Home:

1. Take breaks!
2. Fold the laundry standing
3. Stretch while watching TV
4. Move at every commercial
5. Do your cleaning in small bouts to spread it out
6. Walk around the house while you are on the phone
7. Turn on the tunes and do a little dance while you’re cooking
8. Hand wash the dishes
9. Having a get together? Get rid of the chairs (everyone stands around the kitchen counter anyways!)
10. Get out of the car to pick up kids from school
Starting Tips for Standing

• Make sure your posture is correct
  – Screen at eye level
  – Elbows at 90°
  – Straight neutral posture
• Start standing in small time increments
• First 2 weeks are tough!
• Kick the heels
• Beware of locking knees
• Feel free to move

How much sitting is too much?

How can I move more?
Take Home Point:

Sitting can increase your risk for chronic diseases **EVEN** if you get your daily dose of exercise!

References

References


Thank you.