Research in the Child Health & Exercise Medicine Program: From Petri Dish to Playground

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Our Mission:
To advance child health through excellence in research, education, and clinical care dedicated to *exercise as medicine*

Our research program is built on 3 principles:

1) Physical activity behaviours begin early in life;

2) Physical activity is essential for health even in disease or disability;

3) Promotion of physical activity for health is more effective and acceptable when the mechanisms involved are understood.
The “Side-effects” of Exercise

- Stronger heart
- Healthier blood vessels
- Stronger bones
- Improved lung function
- Stronger muscles
- Greater insulin sensitivity
- Improved mental health
- Higher academic performance
- Better immune function
Outline

- Interactions between exercise and inflammation
- Physical activity for children growing up with a chronic disease
- Physical activity during the early years
Physical activity and infection

Figure 1—“J”-shaped model of relationship between varying amounts of exercise and risk of URTI. This model suggests that moderate exercise may lower risk of respiratory infection while excessive amounts may increase the risk.
Cytokines produced by MUSCLE?

![Graph showing net IL-6 release over exercise time. The graph compares net IL-6 release between exercising and resting legs.](chart)

- **Exercising leg**
- **Resting leg**
Effect of exercise on IL-6
Exercise and Inflammation

Exercise

Muscle

Immune activation

Growth factors
Non-invasive methods to understand exercise effects on growth

- Controls
- CF

Proliferation
Differentiation
Outline

- Interactions between exercise and inflammation
- Physical activity for children growing up with a chronic disease
- Physical activity during the early years
Why is physical activity important for chronic disease?

Chronic Disease

Over-protection  
Fear  
Social Isolation  
Ignorance  

Hypoactivity

Deconditioning  
Functional Deterioration

Bar-Or, 1983
How Fit are Children with a Chronic Disease?
Chronic Disease

Over-protection → Fear → Social Isolation → Ignorance

Hypoactivity

Deconditioning → Functional Deterioration

Bar-Or, 1983
Fitness and Physical Activity

$r^2=0.13$, $p=0.01$

CF, CD, T1DM, and BT
Monitoring Physical Activity

Accelerometry

Physical Activity Profile: 12-year-old male

- Total activity: 222.15 minutes
- Light activity: 202.30 minutes
- Moderate activity: 15.75 minutes
- Vigorous activity: 4.10 minutes
- MVPA: 19.85 minutes
Example 1: T1DM

Graph showing activity levels from 7:00 AM to 8:00 PM on Monday. The X-axis represents time in hours, and the Y-axis represents activity levels. The graph indicates periods of moderate-to-vigorous activity.
Example 1: T1DM
Example 1: T1DM
Example 2: Cancer Survivors

The graph shows the activity levels of Brain Cancer Survivors and Healthy Controls throughout the day. The y-axis represents the activity counts per 3-sec, and the x-axis represents the time of day from 7:00 AM to 10:00 PM.

- **Brain Cancer Survivor** (red line)
- **Healthy Control** (blue line)

The graph highlights periods of Moderate-to-Vigorous activity.
Example 3: Cerebral Palsy

Cerebral Palsy

Healthy

TIME OF DAY

Sedentary Time < 5 counts/3-sec

Non-Sedentary Time 5+ counts/3-sec
Chronic Disease

Over-protection
Fear
Social Isolation
Ignorance

Hypoactivity

Deconditioning
Functional Deterioration

Bar-Or, 1983
Exercise and inflammation in youth with IBD
Chronic Disease

Over-protection
Fear
Social Isolation
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Bar-Or, 1983
Outline

- Interactions between exercise and inflammation
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Health Outcomes and Physical activity in Preschoolers Study
Are **Active** Preschoolers **Healthy** Preschoolers?
### Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th></th>
<th>Boys</th>
<th></th>
<th></th>
<th>Total</th>
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<tbody>
<tr>
<td>n</td>
<td>68</td>
<td>67</td>
<td>73</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Height, cm</td>
<td>97.7 ± 4.3</td>
<td>106.5 ± 5.0</td>
<td>112.8 ± 5.0</td>
<td>99.8 ± 4.7</td>
<td>108.1 ± 5.2</td>
<td>113.8 ± 4.8</td>
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<tr>
<td>Body mass, kg</td>
<td>15.2 ± 1.6</td>
<td>17.9 ± 2.4</td>
<td>19.7 ± 3.1</td>
<td>16.0 ± 2.2</td>
<td>18.5 ± 2.7</td>
<td>20.2 ± 2.9</td>
</tr>
<tr>
<td>% overweight/obese</td>
<td>16%</td>
<td>21%</td>
<td>12%</td>
<td>16%</td>
<td>17%</td>
<td>11%</td>
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</table>

Timmons et al. BMC Public Health 2012, 12:284
http://www.biomedcentral.com/1471-2458/12/284

**STUDY PROTOCOL**

The health outcomes and physical activity in preschoolers (HOPP) study: rationale and design

Brian W Timmons¹, Nicole A Proudfoot¹, Maureen J MacDonald², Steven R Bray² and John Cairney³
Aerobic Fitness
What is the aerobic fitness of preschoolers?

Aerobic Fitness

n=206

n=207
Aerobic Fitness
Aerobic Fitness

Heart rate recovery at 1 min

Heart rate recovery, bpm

3G  3B  4G  4B  5G  5B
Aerobic Fitness

Does meeting the guidelines matter for aerobic fitness?
Anaerobic Fitness
What is the short-term muscle power of preschoolers?

Anaerobic Fitness

n=196

n=192
Anaerobic Fitness

![Box plot showing peak power W/kg for different groups (3G, 3B, 4G, 4B, 5G, 5B).]
Anaerobic Fitness

Mean Power, W/kg

3G  3B  4G  4B  5G  5B
Does meeting the guidelines matter for short-term muscle power?
People

Administrative Assistant
Shirley Lampman

Research Coordinator
Nicole Proudfoot*

Research Assistants
Natasca D’Alimonte
Madeline McDonald
Dr. Bogdan Wilk

Doctoral Students
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Joyce Obeid
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Lisa Chu
Gabriela Leites
Sara King-Dowling
Yasmeen Mezil
THE END