Translating Exercise into the Community with Adults Aging with HIV
Thursday September 13, 2018
9th International Workshop on HIV and Aging

Dr. Kelly O’Brien, PhD, BScPT
Associate Professor,
Department of Physical Therapy, Institute of Health Policy, Management and Evaluation (IHPME), University of Toronto
Funding: Canada Research Chair (CRC) in Episodic Disability and Rehabilitation
Canadian Institutes of Health Research (CIHR) HIV/AIDS Community-Based Research Initiative
Overview of Session

1) Episodic Disability and Aging with HIV
2) Role for Rehabilitation – Exercise as Intervention
   - Evidence on Effectiveness of Exercise (Cochrane Collaboration)
3) Physical Activity Among Adults Aging with HIV
4) Translating Exercise Interventions in the ‘Real World’ Community
   - CBE Study
5) Practical Considerations for Enhancing Physical Activity
6) Canada-International HIV and Rehabilitation Research Collaborative
1) HIV, Aging and Episodic Disability
Multimorbidity & Aging

- HIV Associated Neurocognitive Disorder (HAND)
- Renal Disease
- Non-AIDS related cancers
- Mental Health – Anxiety & Depression
- Cardiovascular Disease
- Liver Disease
- Bone and Joint Disorders
Episodic Disability

Conceptual framework to describe the health-challenges experienced from the perspective of adults living with HIV

Health and Quality of Life Outcomes

Research
Exploring disability from the perspective of adults living with HIV/AIDS: Development of a conceptual framework
Kelly K O'Brien* 1,2, Ahmed M Bayoumi1,2, Carol Strike3,4, Nancy L. Young1,5, and Aileen M Davis1,6

Address: 1Department of Health Policy, Management and Evaluation, University of Toronto, Toronto, Ontario, Canada; 2Centre for Research on Inner City Health, St. Michael's Hospital, 33 Bond Street, Toronto, Ontario, M5B 1W8, Canada; 3Department of Preventive Medicine, University of Toronto, Toronto, Ontario, Canada; 4Centre for Addiction and Mental Health, 33 Russell St, 3rd Floor Tower, Toronto, Ontario, M5S 2L7, Canada; 5School of Social Work, Laurentian University, 935 Ramsey Lake Road, Sudbury, Ontario, P3E 2C6, Canada and 6Office of Health Care and Outcomes Research and Ambulatory and Community Research and Evaluation Unit, Toronto Western Research Institute, 399 Bathurst Street - 7th Floor, Toronto, Ontario, M5T 2E8, Canada

Email: Kelly K O'Brien* - kelly.obrien@utoronto.ca, Ahmed M Bayoumi - ahmed.bayoumi@utoronto.ca; Carol Strike - carol_strike@camh.net; Nancy L. Young - nyoung@camh.ca; Aileen M Davis - adavis@utoronto.ca

* Corresponding author

http://www.hqlo.com/content/6/1/76

Journal of the International AIDS Society

Research
Putting episodic disability into context: a qualitative study exploring factors that influence disability experienced by adults living with HIV/AIDS
Kelly K O'Brien* 1,2,7, Aileen M Davis1,3, Carol Strike4,5, Nancy L. Young1,6 and Ahmed M Bayoumi1,2

Address: 1Department of Health Policy, Management and Evaluation, University of Toronto, Toronto, Ontario, Canada; 2Centre for Research on Inner City Health, St. Michael's Hospital, 33 Bond Street, Toronto, Ontario, M5B 1W8, Canada; 3Department of Preventive Medicine, University of Toronto, Toronto, Ontario, M5S 2L7, Canada; 4School of Social Work, Laurentian University, 935 Ramsey Lake Road, Sudbury, Ontario, P3E 2C6, Canada; 5School of Social Work and Northern Health, Laurentian University, Sudbury, Ontario, Canada; and 6Office of Health Care and Outcomes Research and Ambulatory and Community Research and Evaluation Unit, Toronto Western Research Institute, 399 Bathurst Street - 7th Floor, Toronto, Ontario, M5T 2E8, Canada

Email: Kelly K O'Brien* - kelly.obrien@utoronto.ca, Aileen M Davis - adavis@utoronto.ca; Carol Strike - carol_strike@camh.net; Nancy L. Young - nyoung@camh.ca; Ahmed M Bayoumi - ahmed.bayoumi@utoronto.ca

* Corresponding author

http://www.jiasociety.org/content/12/1/30
1. Dimensions of Episodic Disability

Episodic Disability

Symptoms / Impairments
- Adverse Effects Of HIV or Meds (Fatigue, Diarrhea, Nausea, Pain, etc.)

Difficulties with Day-to-Day Activities
- Stress, Anxiety, and Depression
- Fear, Decreased Self Esteem, Shame or Embarrassment, Loneliness

Challenges to Social Inclusion
- Parental Roles
- Work & School
- Personal Relationships

Uncertainty
- Other Social Roles and Activities

Adverse Effects Of HIV or Meds (Fatigue, Diarrhea, Nausea, Pain, etc.)
Stress, Anxiety, and Depression
Fear, Decreased Self Esteem, Shame or Embarrassment, Loneliness
Parental Roles
Work & School
Personal Relationships
Other Social Roles and Activities
Consequence of HIV and Aging

Uncertainty
Symptoms and Impairments
Difficulties with Day to Day Activities
Challenges to Social Participation

AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV

Aging with HIV and disability: The role of uncertainty
Patricia Solomon\(^a\), Kelly O'Brien\(^b\), Seanne Wilkins\(^a\) & Nicole Gervais\(^a\)
\(^a\) School of Rehabilitation Science, McMaster University, Hamilton, Ontario, Canada
\(^b\) Department of Physical Therapy, University of Toronto, Toronto, Ontario, Canada

Published online: 26 Jun 2013.

Uncertainty related to Aging with HIV
- Sources of Health Challenges
- Who will care for me?
- Appropriate Long Term Housing
- Transition to Retirement
- Episodic Nature of HIV
- Health care providers’ knowledge & skills
- Financial Uncertainty
2. Contextual Factors

**Contextual Factors**
Interact with and influence dimensions of disability (exacerbate or alleviate disability from the participant perspective)

**Extrinsic Contextual Factors**
- Social Support
  - Support from Friends, Family, Partners, Pets, Community
  - Support From Accessing Health Care Services and Personnel
- Stigma

**Intrinsic Contextual Factors**
- Living Strategies
  - Program & Policy Support (income, housing)
  - Seeking Social Interaction With Others
  - Maintaining Sense of Control over Life
  - “Blocking HIV out of the Mind”
- Personal Attributes (Aging)
  - Attitudes & Beliefs

Physical Therapy
UNIVERSITY OF TORONTO
BOUNDLESS
Episodic Disability Framework

O'Brien et al. Health and Quality of Life Outcomes 2008 6:76
doi:10.1186/1477-7525-6-76 http://www.hqlo.com/content/6/1/76
2) Role for Rehabilitation
Non-pharmacological approaches to treatment
What is rehabilitation?

**Rehabilitation** = “a dynamic process, including all prevention and/or treatment activities and/or services that address body impairments, activity limitations and participation restrictions for an individual”

- Broad definition, containing maintenance, restoration, and enhancement of well-being among those living with HIV
- Involved at any stage of the disease process along a wellness and illness continuum
- Client-centred
- Goal focused

Responding to the shift of HIV to a chronic episodic illness

1) Despite the role for rehabilitation, few people living with HIV access formalized rehabilitation services (HIV Health and Rehabilitation Survey, 2016)

- 17% had visited a physiotherapist or physical therapist in the past year
- 6% had visited an occupational therapist in the past year
- 3% had visited a speech-language pathologist in the past year

2) Exercise is a living strategy that can be used in a self-management framework

- 37% engaged ‘most’ (few times a week) or ‘all of the time’ (everyday).
- Similar across <40 versus 40-49 versus >50 years
Exercise as a Rehabilitation Living Strategy aging with HIV and complex multi-morbidity
High level evidence - Exercise in HIV

Effectiveness of Progressive Resistive Exercise (PRE) in the context of HIV: systematic review and meta-analysis using the Cochrane Collaboration protocol

Kelly K. O'Brien¹,²,₃*, Anne-Marie Tynan⁴, Stephanie A. Nixon¹,² and Richard H. Glazier³,⁴,⁵,⁶,⁷

https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-017-2342-8

Effectiveness of aerobic exercise for adults living with HIV: systematic review and meta-analysis using the Cochrane Collaboration protocol

Kelly K. O'Brien¹,²,₃*, Anne-Marie Tynan⁴, Stephanie A. Nixon¹,² and Richard H. Glazier³,⁴,⁵,⁶,⁷

# Characteristics of Included Studies

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Aerobic Exercise Review</th>
<th>Resistive Exercise (PRE) Review</th>
</tr>
</thead>
<tbody>
<tr>
<td># studies met inclusion criteria</td>
<td>24 studies</td>
<td>20 studies</td>
</tr>
<tr>
<td># participants @ baseline</td>
<td>1242 participants</td>
<td>959 participants</td>
</tr>
<tr>
<td>Mean age range (years)</td>
<td>30-49 years</td>
<td>32-49 years</td>
</tr>
<tr>
<td>% women @ completion</td>
<td>22%</td>
<td>23%</td>
</tr>
<tr>
<td>Withdrawal rate</td>
<td>~24% (0-76%)</td>
<td>~20% (0-38%)</td>
</tr>
<tr>
<td>% studies published &gt;1996</td>
<td>20 (83%)</td>
<td>17 (85%)</td>
</tr>
<tr>
<td>Length of intervention</td>
<td>5 to 52 weeks</td>
<td>6 to 52 weeks</td>
</tr>
<tr>
<td>Supervised exercise</td>
<td>18 (75%)</td>
<td>17 (85%)</td>
</tr>
<tr>
<td># meta-analyses performed</td>
<td>58</td>
<td>34</td>
</tr>
</tbody>
</table>

14 studies overlap (PRE+AER; or PRE versus AER versus no exercise)
Cardiopulmonary Fitness: VO2max (AER)  

Aerobic (or AER+PRE) versus No Exercise  

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Exercise Mean</th>
<th>SD</th>
<th>Total</th>
<th>Control Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference</th>
<th>IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baigis 2002</td>
<td>0.3</td>
<td>1.31</td>
<td>43</td>
<td>-1.2</td>
<td>1.77</td>
<td>35</td>
<td>23.5%</td>
<td>1.50 [0.79, 2.21]</td>
<td></td>
</tr>
<tr>
<td>Dolan 2006</td>
<td>1.5</td>
<td>3.49</td>
<td>19</td>
<td>-2.5</td>
<td>6.97</td>
<td>19</td>
<td>7.8%</td>
<td>4.00 [0.50, 7.50]</td>
<td></td>
</tr>
<tr>
<td>Fitch 2012</td>
<td>2.3</td>
<td>3.79</td>
<td>10</td>
<td>-0.7</td>
<td>5.31</td>
<td>11</td>
<td>6.6%</td>
<td>2.70 [-1.22, 6.62]</td>
<td></td>
</tr>
<tr>
<td>Muramura 2008a</td>
<td>4.7</td>
<td>3.9</td>
<td>48</td>
<td>0.5</td>
<td>0.3</td>
<td>49</td>
<td>20.9%</td>
<td>4.20 [3.03, 5.31]</td>
<td></td>
</tr>
<tr>
<td>Perna 1999</td>
<td>2.17</td>
<td>2.67</td>
<td>18</td>
<td>-1.8</td>
<td>4.03</td>
<td>10</td>
<td>10.6%</td>
<td>3.97 [1.18, 6.76]</td>
<td></td>
</tr>
<tr>
<td>Smith 2001</td>
<td>2.6</td>
<td>1.97</td>
<td>18</td>
<td>1</td>
<td>1.68</td>
<td>29</td>
<td>21.0%</td>
<td>1.60 [0.50, 2.70]</td>
<td></td>
</tr>
<tr>
<td>Stringer 1998</td>
<td>0.8</td>
<td>28.2</td>
<td>18</td>
<td>-2.1</td>
<td>23.24</td>
<td>8</td>
<td>0.3%</td>
<td>2.90 [-17.81, 23.61]</td>
<td></td>
</tr>
<tr>
<td>Tiozzo 2011</td>
<td>4.48</td>
<td>3.87</td>
<td>12</td>
<td>0.38</td>
<td>3.6</td>
<td>11</td>
<td>9.4%</td>
<td>4.11 [1.06, 7.16]</td>
<td></td>
</tr>
</tbody>
</table>

Total (95% CI)  

- 186  
- 172  100.0%  
- 2.87 [1.69, 4.04]

Heterogeneity: Tau² = 1.40; Chi² = 21.51, df = 7 (P = 0.003); I² = 67%  
Test for overall effect: Z = 4.79 (P < 0.00001)

Statistically significant (and potential clinically important) increase (improvement) in **maximum oxygen capacity (VO2max)** of 2.87 ml/kg/min (95% CI: 1.69, 4.04, n=358) for exercisers compared with non-exercisers.
Body composition

PRE versus no exercise (PRE review)

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lux 1995</td>
<td>5.19</td>
<td>4.32</td>
<td>12</td>
<td>-6.59</td>
<td>9.74</td>
<td>10</td>
<td>36.4%</td>
<td>11.78 [5.27, 18.29]</td>
</tr>
<tr>
<td>Spence 1990</td>
<td>3.5</td>
<td>2.22</td>
<td>12</td>
<td>-2.2</td>
<td>2.64</td>
<td>12</td>
<td>63.8%</td>
<td>5.70 [3.75, 7.65]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td></td>
<td></td>
<td>24</td>
<td></td>
<td></td>
<td>22</td>
<td>100.0%</td>
<td>7.91 [2.18, 13.65]</td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 12.47; Chi² = 3.07, df = 1 (P = 0.09); I² = 67%
Test for overall effect: Z = 2.71 (P = 0.007)

Statistically significant increase in arm and thigh girth of 7.91 cm (95% CI: 2.18, 13.65, n=46) for exercisers compared with non-exercisers.

PRE+AER versus no exercise (AER review)

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolan 2008</td>
<td>6</td>
<td>4.36</td>
<td>19</td>
<td>2</td>
<td>4.36</td>
<td>19</td>
<td>76.0%</td>
<td>4.00 [1.23, 6.77]</td>
</tr>
<tr>
<td>Grinspoon 2000</td>
<td>7.97</td>
<td>6.54</td>
<td>10</td>
<td>0.68</td>
<td>6.34</td>
<td>12</td>
<td>24.0%</td>
<td>7.29 [1.68, 12.70]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td></td>
<td></td>
<td>29</td>
<td></td>
<td></td>
<td>31</td>
<td>100.0%</td>
<td>4.79 [2.04, 7.54]</td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 0.60; Chi² = 1.12, df = 1 (P = 0.29); I² = 11%
Test for overall effect: Z = 3.41 (P = 0.0007)

Statistically significant increase in leg muscle area of 4.79 cm² (95% CI: 2.04, 7.54, n=60) for exercisers compared with non-exercisers.
Statistically significant greater increase in upper extremity strength (combined 1RM or 3RM) of 14.56 kg (95% CI: 10.63, 18.49, n=41) and lower extremity strength 23.09 kg (95% CI: 13.01, 33.18) among PRE exercisers compared with AER exercisers.
### Quality of life: SF36 questionnaire (Aerobic)

#### Aerobic (or AER+PRE) versus No Exercise

<table>
<thead>
<tr>
<th>Domain</th>
<th>Weighted Mean Difference (WMD) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Health</td>
<td>4.73 (3.13, 9.75)</td>
</tr>
<tr>
<td>Mental Health</td>
<td>11.58 (1.35, 21.81)</td>
</tr>
<tr>
<td>Role Physical</td>
<td>6.56 (3.17, 9.96)</td>
</tr>
<tr>
<td>Role Emotional</td>
<td>10.95 (8.19, 13.71)</td>
</tr>
<tr>
<td>Pain</td>
<td>-6.59 (-9.83, -3.36)</td>
</tr>
<tr>
<td>Physical Function</td>
<td>16.30 (6.89, 25.72)</td>
</tr>
<tr>
<td>Energy / Vitality</td>
<td>5.03 (1.33, 8.72)</td>
</tr>
<tr>
<td>Social Function</td>
<td>2.73 (-4.84, 10.30)</td>
</tr>
</tbody>
</table>

Statistically significant improvement on 6 out of 8 SF36 domain QOL sub-scales for exercisers compared with non-exercisers (n=59; 2 studies).
Conclusions

Exercising at least 3X per week for at least 5 weeks is safe and can lead to improvements in....

- **Cardiopulmonary Fitness**
  - VO2max*, exercise time

- **Body Composition**
  - Decrease in % body fat
  - Increases in weight*, arm and thigh girth*, leg muscle area among exercisers

- **Strength**
  - Increase in upper and lower body strength among exercisers (greater increases among PRE versus AER)*

- **Quality of Life***

What about CD4 count and Viral Load? Despite trend towards improvement in CD4 count for some meta-analyses, majority continue to be non-significant

No comparisons of older versus younger adults with HIV
Neurocognitive health

Physical activity associated with greater neurocognitive health


- Neurocognition: verbal fluency, working memory, speed of information processing, learning, memory, executive function, and motor function
- Declined over time in all groups
- Consistent PA – significantly better vs No and inconsistent PA.


Community dwelling older (≥50) adults (n=100) - Greater self-reported moderate level PA (IPAQ) associated with less neurocognitive impairment (executive function) and IADL impairment among older adults with HIV.
Metabolic Outcomes

- Metabolic syndrome
- Adults living with HIV (n=10) higher quantity and consistency of PA (accelerometer) compared with HIV negative controls (n=10)
- Insulin resistance and triglycerides


- Older adults with HIV (Median age: 58; n=69)
- Thrice weekly (moderate and high) aerobic exercise for 12 weeks
  - No significant decrease – inflammatory markers; similar in HIV+ and HIV- participants
- 10% increase in adherence to exercise associated with lower IL6 and lower CRP.


**Strength Training:** 3 months PRE+AER training – increase strength; no change in CRP (Cutrono, 2016)

12 weeks – decrease inflammatory markers; increase in muscle strength in EX vs control (Zanetti et al. Non-linear resistance training reduces inflammatory biomarkers in persons living with HIV. European J of Sport Science. 2016)
Sleep health

• Systematic review (up to 2015)
• 4 articles included with PLWH
• Measured PA and sleep using accelerometer and questionnaires.
• Regular physical activity associated with
  • Improvements in total sleep time, sleep efficiency, reduction of sleep disorders


• Cross-sectional study (n=90)
  # minutes of home based-physical activity (7 day diary) associated with decreased self-reported fatigue. No association with sleep (actigraph).

Is all exercise equal?

- Pilot randomized trial
- 22 older adults (>50 years) taking ART
- **High Intensity** - INCREASES in VO2MAX (3.6 ml/kg/min)
  - treadmill / elliptical; 50-90% Heart Rate Reserve
  - Exercise endurance (27 min)
  - 6MWD (54m)*
- **Moderate Intensity** – No change in VO2max
  - Walking
  - Exercise Endurance (11 min)
  - 6MWD (62m)* clinically relevant.

3X/week for 16 weeks; supervised
20-30 minutes increased to 40-45 minutes.

**BOTH GROUPS – Improvements in exercise endurance**

Moderate versus High Intensity – Older Adults

• Older sedentary HIV+ and HIV- adults (50-75 years)

  • **High Intensity** @ Week 12-24 weeks
    • 60-70% VO2max and >80% 1-RM

  • **Moderate Intensity** @ Week 1-11 weeks
    • 30-50% Vo2max; 40-70% 1-RM; up to 50 minutes / session

3X/week for 24 weeks; supervised

Aerobic + resistive exercise
  - treadmill walking; weight machine

Improvements in Physical Function

• Both HIV+ and HIV- groups;

• Both moderate and high intensity (greater improvements in High)

Adherence

- Moderate (90%) and high (88%) intensity among PLWH

Evidence-Informed Guidelines: Rehabilitation with Older Adults Living with HIV

BMJ Open Evidence-informed recommendations for rehabilitation with older adults living with HIV: a knowledge synthesis

**Overarching Recommendations on Rehabilitation for Older Adults with HIV (n=8)**

1. Rehabilitation Professionals (RPs) should be prepared to provide care to older adults with HIV who present with complex comorbidities.
2. RPs should adopt an individualized approach to practice, sensitive to unique values, preferences and needs of older adults with HIV.
3. Multidisciplinary rehabilitation is strongly recommended across continuum of care.
4. RPs should consider the role of extrinsic contextual factors (stigma, ageism, HIV disclosure, social supports).
5. Cognitive rehabilitation interventions may be recommended for older adults with HIV with mild cognitive impairments and stroke.
6. Aerobic and resistive exercise may be recommended for older adults with HIV who are medically stable and living with comorbidities.
7. In absence of high level evidence RPs should refer to high level evidence for recommendations on interventions for a specific comorbidity.
8. Preparedness of Rehabilitation Professionals

**Stream A Recommendations**

<table>
<thead>
<tr>
<th>HIV Aging and Rehabilitation Derived from 41 low or very low level evidence articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme</td>
</tr>
<tr>
<td>Preparedness of Rehabilitation Professionals</td>
</tr>
<tr>
<td>Approaches to Rehabilitation Assessment and Treatment (physical, mental, neurocognitive, uncertainty, social inclusion)</td>
</tr>
<tr>
<td>Extrinsic Factors to consider with rehabilitation of older adults with HIV (ageism, stigma, disclosure, social support)</td>
</tr>
<tr>
<td>Intrinsic Factors to consider with rehabilitation of older adults with HIV (self-management, spirituality)</td>
</tr>
<tr>
<td>Rehabilitation Approaches (interprofessional practice, CAM)</td>
</tr>
<tr>
<td>Rehabilitation Interventions (exercise)</td>
</tr>
</tbody>
</table>

**Total # Recommendations** 16

**Stream B Recommendations**

<table>
<thead>
<tr>
<th>Rehabilitation Interventions in Comorbidities Derived from 108 high level evidence articles (meta-analyses or systematic reviews)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation Classification</td>
</tr>
<tr>
<td>Bone and Joint Disorders</td>
</tr>
<tr>
<td>Cancer</td>
</tr>
<tr>
<td>Stroke</td>
</tr>
<tr>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>Mental Health</td>
</tr>
<tr>
<td>Cognitive Impairment</td>
</tr>
<tr>
<td>COPD</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Older Adults</td>
</tr>
<tr>
<td>HIV</td>
</tr>
</tbody>
</table>

**Total # Recommendations** 36

http://bmjopen.bmj.com/content/4/5/e004692.full
3) So exercise works….. But how many older adults with HIV actually engage in exercise or physical activity?
Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants

Regina Guthold, Gretchen A Stevens, Leanne M Riley, Fiona C Bull

Summary
Background Insufficient physical activity is a leading risk factor for non-communicable diseases, and has a negative effect on mental health and quality of life. We describe levels of insufficient physical activity across countries, and estimate global and regional trends.

Methods We pooled data from population-based surveys reporting the prevalence of insufficient physical activity, which included physical activity at work, at home, for transport, and during leisure time (ie, not doing at least 150 min of moderate-intensity, or 75 min of vigorous-intensity physical activity per week, or any equivalent combination of the two). We used regression models to adjust survey data to a standard definition and age groups. We estimated time trends using multilevel mixed-effects modelling.

Findings We included data from 358 surveys across 168 countries, including 1.9 million participants. Global age-standardised prevalence of insufficient physical activity was 27.5% (95% uncertainty interval 25.0–32.2) in 2016, with a difference between sexes of more than 8 percentage points (23.4%, 21.1–30.7, in men vs 31.7%, 28.6–39.0, in women). Between 2001, and 2016, levels of insufficient activity were stable (28.5%, 23.9–33.9, in 2001; change not significant). The highest levels in 2016, were in women in Latin America and the Caribbean (43.7%, 42.9–46.5), south Asia (43.0%, 29.6–74.9), and high-income Western countries (42.3%, 39.1–45.4), whereas the lowest levels were in men from Oceania (12.3%, 11.2–17.7), east and southeast Asia (17.6%, 15.7–23.9), and sub-Saharan Africa (17.9%, 15.1–20.5). Prevalence in 2016 was more than twice as high in high-income countries (36.8%, 35.0–38.0) as in low-income countries (16.2%, 14.2–17.9), and insufficient activity has increased in high-income countries over time (31.6%, 27.1–37.2, in 2001).

Interpretation If current trends continue, the 2025 global physical activity target (a 10% relative reduction in insufficient physical activity) will not be met. Policies to increase population levels of physical activity need to be prioritised and scaled up urgently.

https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30357-7/fulltext
‘Physical Activity’ versus ‘Exercise’

**Continuum – health promoting behavior, should be a greater priority**

**Physical Activity**
- Any bodily movement produced by skeletal muscles that results in energy expenditure.

**Exercise**
- Planned, structured, repetitive and purposive form of physical activity that aims to improve or maintain one or more components of physical fitness.

I think exercise always involves physical activity, but I don’t necessarily think the reverse.

I think of [physical activity and exercise] as the same thing on a sliding scale.


Physical Activity & Inactivity

Physical Inactivity

- **Vancampfort et al (2018)**
  - Systematic review (n=24 studies); 3780 PLWH (37-58 years)
  - 99 min/day of physical activity (lower than other chronic diseases)
  - 51% reaching PA Guidelines of 150 min moderate to vigorous PA / week
  - 5900 steps/day (below 10,000 recommendation)

- **Schuelter-Trevisol (2012)**
  - Systematic review (1990-2011) (n=24 studies)
  - **Physical Inactivity : 19-73% among PLWH**
Physical Activity

Physical Activity Correlates

Lower activity correlated with

- Older age (6/10 studies)
- Lower education level (6/7 studies)
- Lower CD4 count (7/11 studies)
- ART exposure (4/6 studies)
- Lipodystrophy (4/4 studies)

Barriers of Physical Activity – bodily pain; depression; opportunistic infections

Facilitators of Physical Activity – higher cardiorespiratory fitness; higher self-efficacy; perceived benefits; better motivation
Considerations – evidence to date

Methodological Quality
- Inability to blind participants to exercise
- Results based on participants who completed the exercise

Majority of included studies...
- Young men, 30-49 years of age, little multi-morbidity
- Resource rich countries
- Highly supervised exercise settings by highly trained personnel
- Trend towards combined AER and PRE interventions

Do these benefits apply to people with HIV and ++multi-morbidity?
How does exercise translate and is it sustainable in ‘real world community’ setting over the long term?
4) Translating exercise into the community: evaluating a community-based exercise intervention to improve the health of adults living with HIV

Kelly O’Brien, Patty Solomon, Ahmed Bayoumi, Aileen Davis, Ada Tang, Sean Rourke;
YMCA: Mehdi Zobeiry, Ivan Ilic
Coordinator: Rachel Aubry
Collaborators: Kate Murzin (Realize), Ken King, Chris Godi (Toronto PWA)

Funded by the Canadian Institutes of Health Research HIV/AIDS Community-Based Research Program Pilot Study Funded by Connaught New Researcher Award (University of Toronto)
Purpose

To evaluate the translation of a community-based exercise (CBE) intervention with the goal of reducing disability and enhancing health (cardiopulmonary, strength, weight and body composition, neurocognitive outcomes) and contextual factor outcomes (social support, stigma, mastery, coping) for adults living with HIV.

http://bmjopen.bmj.com/content/6/10/e013618
Study Design

Interrupted time series

Baseline Monitoring Phase
YMCA Membership
Exercise 3X/week (supervised weekly)
Fitbit Zip; Monthly In-Person Education Sessions
https://www.youtube.com/playlist?list=PLC7sbi41p_oTr7B7n7oVOYriA_CS6MpM

CBE Intervention
YMCA Membership
Exercise 3X/week (supervised weekly)

The “Interruption”
Aerobic exercise
• 3 days/week, 60-70% HR maximum, at least 30 min with variation in type based on participant choice

Resistance exercise
• Resistance training for each major muscle group (~8-10 exercises), 3X per week, 60-70% 1 repetition maximum (1RM), 10-12 reps each

Flexibility
• Stretching major muscle-tendon groups 10-30 seconds with 2 repetitions each

Neuromotor / Balance exercise
• Range of motor skills (e.g. balance, coordination, agility, gait) for approximately 20-30min.

Weekly progression as tolerated

Follow-Up Monitoring Phase
YMCA Membership
Exercise 3X/week (independent)
**Data Collection**

**Patient Reported Outcome (PRO) Assessments**
- HIV Disability Questionnaire
- EQ5D
- MOS-HIV
- PHQ-8
- MOS-Cognitive Scale
  - Brief COPE
  - Mastery Scale
  - Stigma Scale
- MOS-Social Support
- Demographic and Disease Questionnaire
- Rapid Assessment of Physical Activity (RAPA)

**Fitness Assessments (YMCA)**
- Cardiopulmonary Fitness
- Strength
- Weight, body composition
- Flexibility

**Neurocognitive Assessment**
- NIH Toolbox App

**Physical Activity Measures**
- Weekly online exercise logs
- Fitbit

**Qualitative Interviews** (adults with HIV and instructors)
- Pre (T1), Midway (T2), Post-Intervention (T3)

**Goal Attainment Scale**
- Disability Rating Scale
- Global (Amount and Importance) of Disability Change Scale

**HDQ Assessment**
- Disability Rating Scale
- Global (Amount and Importance) of Disability Change Scale
Goals of Participants at Baseline

- confidence
- posture
- cardiopulmonary-endurance
- body-toning
- energy
- cholesterol
- flexibility
- muscle
- strength
- yoga
- agility
- swimming
- bone-density
- sleep
- routine
- weight-loss
- mood-mental-health
Determinants to Initiating Engagement in CBE

**Anticipated Concerns and Potential Barriers with Exercise Intervention**
- Ability to adhere to the thrice weekly exercise among work and family commitments, fluctuations in health (emotional and physical)
  - Inclement weather
- Despite probing, some did not express concerns – focused on positive outlook

**Anticipated or Expected Health Benefits with Exercise**
- Benefits to mental health closely linked to routine, reducing fatigue, and sleep health
  - Decrease depressive episodes
  - Ability to learn from fitness instructor staff and study team

**Looking Forward to Structure and Routine**
associated with the intervention with optimism and enthusiasm
- Accountability to the fitness instructor
- Level of commitment
- Good intentions to adhere with intervention
- Sense of Optimism – a new start

“Beginning with the coaching person, I think that will help me to start something that’s structure...something regular…” [P026; Woman; >40 years of age]

“I feel really committed...I’m not going into it with the attitude that I might start missing” [P108; Man, >60 years of age]
**Started Baseline Monitoring Phase** - 108/120 (90%) (completed at least 1 questionnaire or fitness assessment)

**Baseline Interviews**
- 8 months (staggered)
- Aug 2016-Aug 2017

**Started Intervention Phase** – 80/108 (74%)  
[Overall Retention: 80/120 (67%)]
(completed at least 1 YMCA coaching session)

**Midway Interviews**
- 6 months (staggered)
- April 2017-Feb 2018

**Completed Intervention & Started Follow-Up Phase** – 67/80 (84%)
Overall Retention: 67/120 (56%); Fitbit Enrolled (as of August 2018) - 38/69 (55%)
(finished 25 weeks with weekly YMCA coaches)

**Final Interviews**
- 8 months ongoing
- Sept 2017-Nov 2018

**Currently in Follow-Up Phase**
- As of August 2018 – 30/67 (45%)
[Overall Study Retention to Date: 57/120 (48%)]

**As of August 2018**
- 5 - Lost to Follow-Up;
- 5 – Withdrew
(health reasons, unhappy with study, personal & family reasons)

**Completed Entire Study**
as of August 31, 2018 - 27/67 (40%)
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Enrolled (n=108) N (%)</th>
<th>Initiated CBE (n=80) N (%)</th>
<th>Completed CBE (n=67) N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median Age (IQR)</strong></td>
<td>51 years (45, 59)</td>
<td>51 years (45, 60)</td>
<td>52 years (46, 60)</td>
</tr>
<tr>
<td>&gt;50 years</td>
<td>53 (58%)</td>
<td>42 (61%)</td>
<td>37 (64%)</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td>94 (87%)</td>
<td>72 (90%)</td>
<td>59 (88%)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td>11 (10%)</td>
<td>6 (8%)</td>
<td>6 (8%)</td>
</tr>
<tr>
<td>Two-Spirited or Inter-sexed</td>
<td>&lt;5 (5%)</td>
<td>&lt;5 (6%)</td>
<td>&lt;5 (3%) (7%)</td>
</tr>
<tr>
<td><strong>Median Number of comorbidities (IQR)</strong></td>
<td>4 (2, 7)</td>
<td>4 (2, 7)</td>
<td>4 (2, 7)</td>
</tr>
<tr>
<td>Living with ≥2 comorbidities</td>
<td>86 (80%)</td>
<td>65 (81%)</td>
<td>55 (82%)</td>
</tr>
<tr>
<td><strong>Common Comorbidities (&gt;30%) included:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Health (e.g. depression, anxiety)</td>
<td>52 (49%)</td>
<td>36 (46%)</td>
<td>31 (47%)</td>
</tr>
<tr>
<td>Joint Pain (arthritis)</td>
<td>44 (41%)</td>
<td>34 (43%)</td>
<td>29 (43%)</td>
</tr>
<tr>
<td>Bone and Joint Disorder (osteopenia, osteoporosis, osteoarthritis)</td>
<td>39 (36%)</td>
<td>31 (39%)</td>
<td>25 (38%)</td>
</tr>
<tr>
<td>Muscle Pain</td>
<td>39 (36%)</td>
<td>28 (35%)</td>
<td>25 (38%)</td>
</tr>
<tr>
<td><strong>Live Alone</strong></td>
<td>73 (71%)</td>
<td>51 (68%)</td>
<td>43 (68%)</td>
</tr>
<tr>
<td>Gross Yearly Income $&lt;20,000</td>
<td>57 (53%)</td>
<td>38 (48%)</td>
<td>31 (47%)</td>
</tr>
<tr>
<td>Employed Full-Time or Part-Time</td>
<td>34 (31%)</td>
<td>28 (35%)</td>
<td>21 (31%)</td>
</tr>
<tr>
<td>Exercise History</td>
<td>I currently exercise and have done so for &gt; 6 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>36 (33%)</td>
<td>27 (34%)</td>
<td>25 (37%)</td>
</tr>
</tbody>
</table>

- Median # of comorbidities (IQR) 4 (2,7)
- 80-82% were living with ≥2 concurrent conditions
- Mental health conditions – most prevalent comorbidity
Number of participants who attended coaching session

Week (1-25) * >25 was additional on case by case basis

Blue = within the 25 weeks (Intention to treat)
Red = After the prescribed 25 weeks (29/80 participants who went over the intended 25 weeks)

Median # of Sessions Attended – 18 / 25 sessions

Reasons for ‘Extending’ Weekly Coaching Sessions: health reasons, travel, work, change in coach, communication
## Monthly Educational Sessions (n=11)

<table>
<thead>
<tr>
<th>Session</th>
<th>Topic</th>
<th>Date</th>
<th>Attendance (%)</th>
<th># attended/# invited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>HIV &amp; Exercise</td>
<td>(June 6, 2017)</td>
<td>11/35 (31%)</td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>Tips for Healthy Eating</td>
<td>(June 29, 2017)</td>
<td>11/44 (25%)</td>
<td></td>
</tr>
<tr>
<td>Session 3</td>
<td>Mindfulness &amp; Stress Reduction</td>
<td>(August 2, 2017)</td>
<td>17/54 (22%)</td>
<td></td>
</tr>
<tr>
<td>Session 4</td>
<td>Complimentary &amp; Alternative Therapies in HIV</td>
<td>(August 28, 2017)</td>
<td>15/63 (24%)</td>
<td></td>
</tr>
<tr>
<td>Session 5</td>
<td>HIV and Neurocognitive Health</td>
<td>(September 28, 2017)</td>
<td>16/68 (24%)</td>
<td></td>
</tr>
<tr>
<td>Session 6</td>
<td>Sleep Health and Hygiene</td>
<td>(October 16, 2017)</td>
<td>18/67 (27%)</td>
<td></td>
</tr>
<tr>
<td>Session 7</td>
<td>HIV and Physiotherapy – What’s the Connection?</td>
<td>(November 27, 2017)</td>
<td>17/45 (38%)</td>
<td></td>
</tr>
<tr>
<td>Session 8</td>
<td>HIV &amp; Exercise</td>
<td>(December 13, 2017)</td>
<td>15/36 (42%)</td>
<td></td>
</tr>
<tr>
<td>Session 9</td>
<td>Tips for Healthy Eating</td>
<td>(January 29, 2018)</td>
<td>4/22 (18%)</td>
<td></td>
</tr>
<tr>
<td>Session 10</td>
<td>Mindfulness and Stress Reduction</td>
<td>(February 21, 2018)</td>
<td>7/18 (38%)</td>
<td></td>
</tr>
<tr>
<td>Session 11</td>
<td>Complimentary and Alternative Therapies in HIV</td>
<td>(March 27, 2018)</td>
<td>1/7 (14%)</td>
<td></td>
</tr>
</tbody>
</table>

### # of Views – CBE Study Online Educational Sessions

[https://www.youtube.com/playlist?list=PLC7sbi41p_oTr7B7n7oVOYriA_CS6MpM](https://www.youtube.com/playlist?list=PLC7sbi41p_oTr7B7n7oVOYriA_CS6MpM)

- HIV and Exercise (Kelly and John) 25
- Ten Steps to Healthy Weight (Nema McGlynn) 8
- Mindfulness & Stress Reduction (Bill Gayner) 8
- Sleep Health and Hygiene (Kieran Cooley) 22
- HIV and Neurocognitive Health (Sean Rourke) 5
- Complimentary & Alternative Therapies in HIV (Kieran Cooley) 7
- HIV and Physiotherapy – what’s the connection? (Puja Ahluwalia) 7
Preliminary CBE Study Observations

- **Participants**
  - Majority are men (90%)
  - Median age – 51 years
  - Median of 4 concurrent health conditions (mental health, pain)

- **Level of Engagement**
  - Of 80 participants who initiated, 67 (84%) completed the intervention
  - 29/80 extended coaching weeks due to episodic illness, travel, life commitments
Lessons Learned & Reflections to Date

Episodic Health = Episodic Exercise
• CBE study symbolized a ‘new beginning’ – offered a new structure (and healthy) routine
• Flexibility of our intervention timeline (‘extended intervention phase’)

Implementation Science Approach - Research Procedure and Intervention Intertwined
- Research team intertwined with the intervention.
- Assessments involve ongoing interaction with research and YMCA staff – source of social support beyond that of the ‘pure’ CBE intervention. Potential influencing and motivating factor to engage and retain participants in exercise.

HIV-specific versus Complex Chronic Disease
HIV itself – appeared to have little influence on level of engagement and effect of exercise - rather the complexities that come from living with an episodic illness, mental health, complex personal and environmental factors (e.g. relationships with others, stigma, financial insecurity) seems to emerge more strongly as influential factors in initiating and sustaining engagement in CBE. **Not one-size fits all**
5) Considerations for Exercise / Physical Activity Prescription
A) Barriers and Facilitators to Engaging in CBE in HIV

Community-Based Exercise in the Context of HIV: Factors to Consider when Developing and Implementing Community-Based Exercise Programs for People Living with HIV

http://journals.sagepub.com/doi/full/10.1177/2325957416686836

Anna Li, MSc1,2, Taylor McCabe, MScPT1, Erin Silverstein, MFSc, MScPT1, Stephanie Dragan, MScPT1, Nancy M. Salbach, BScPT, MSc, PhD1,3, Mehdi Zobeiry4, Sarah Beldick4, Chris Godi5, and Kelly K. O'Brien, BSc, BScPT, PhD1,3,6

BMJ Open

Experiences participating in a community-based exercise program from the perspective of people living with HIV: a qualitative study

Chantal A Montgomery,1 Katherine Liu,1 Tamar B Kiddeckel,1 Cheryl F M Yang

http://bmjopen.bmj.com/content/7/1

BMJ Open

Are you ready? Exploring readiness to engage in exercise among people living with HIV and multimorbidity in Toronto, Canada: a qualitative study

Alya Simonik,1 Kyle Vader,1 Denine Ellis,1 Dirouhi Kesbian,1 Priscilla Leung,1 Patrick Jachyra,2 Soo Chan Carusone,3 Kelly K O'Brien1,2,4

http://bmjopen.bmj.com/content/6/3/e010029
Interaction between physical, mental, emotional – readiness to change
Perceived well-being

B) Are older adults with multi-morbidity ready to exercise?

Interaction between physical, mental, emotional – readiness to change
Perceived well-being

http://bmjopen.bmj.com/content/6/3/e010029.full

Factors that Influence Readiness to Exercise in People Living with HIV and Multi-Morbidity

Complex and Episodic Nature of HIV and Multi-Morbidity
(e.g. physical impairments, uncertainty, mental health)

Social Supports
(e.g. peer supports during exercise & safe and inclusive environment)

Perceptions & Beliefs
(e.g. attitudes, perceived risks of exercise, priority of exercise)

Experience with Exercise
(e.g. exposure through healthcare, positive/negative experiences)

Accessibility
(e.g. facility, finances)
C) Is all Physical Activity Considered Equal?

American College of Sports Medicine (ACSM), Canadian Physical Activity Guidelines (CPAG), World Health Organization

- 150 minutes of moderate to vigorous intensity aerobic physical activity per week or 75 minutes vigorous intensity aerobic physical activity per week
- Add muscle and bone strengthening with major muscle groups at least 2 days/week

**Guidelines**

To achieve health benefits, and improve functional abilities, adults aged 65 years and older should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more.

It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.

Those with poor mobility should perform physical activities to enhance balance and prevent falls.

More physical activity provides greater health benefits.
D) Considerations for Exercise Prescription

Goals of Exercise

Combination of Aerobic + Resistive

- Frequency, Intensity, Time, Type (FITT); Progression

Contextual Factors

- Intrinsic Factors
  - Aging; Frailty
  - Motivating Factors

- Extrinsic Factors
  - Accessibility of Exercise
  - Social Support

Consider Functional Outcomes

- **Disability** (HDQ) - physical, cognitive, mental-emotional, social inclusion, and uncertainty

- Diet and Sleep health

---

E) Role for Physical Therapy

- Goal-oriented
- Client-centred
- Outcome measures
- Ongoing support
- Tailored with other health conditions

debor et al. Where and how does physical therapy fit? Integrating physical therapy in interprofessional HIV care. Disab Rehabil. 2018
6) Final Thoughts - Opportunities for partnerships HIV, aging and rehabilitation
CIHRRRC?

Canada-INTERNATIONAL (FORMERLY UK) HIV and Rehabilitation Research Collaborative

An International research collaborative including people living with HIV, researchers, clinicians, representatives from HIV community organizations in Canada, Ireland, UK and USA with an interest in HIV and rehabilitation research.
Advancing rehabilitation in HIV, disab

Kelly K O'Brien, Francisco William Chegwidden, Jacqui Merritt, Rosalind Ba

1) Episodic Health and Disability
   1A) Dimensions of Disability / Episodic Disability
      - Physical, cognitive, mental health consequences of HIV
      - Social Participation (labor force participation)
      - Uncertainty (worrying about the future, aging, interaction with time)
   1B) Experience of Episodic Disability and Health over Time
      - Dimensions of disability that are episodic
      - Daily episodes versus larger fluctuations in health

2) Aging with HIV Across the Life Course
   - Healthy or successful aging with HIV
   - Social participation (social engagement, location, mental health, labor force participation - complexities of retirement, financial security)

3) Concurrent Health Conditions
   - Mental Health
   - Neurocognitive Health
   - Multi-morbidities and increasing complexity of disability
   - Also includes conditions not specific to older adults

4) Access to Rehabilitation and Models of Rehabilitation Service Provision
   - Facilitators and barriers to accessing rehabilitation
   - Development and evaluation of innovative models of rehabilitation health service delivery

5) Effectiveness of Rehabilitation Interventions
   - Evidence
   - Neurocognitive interventions
   - Mental Health Interventions
   - Staff management interventions
   - Labor force participation interventions
   - Interventions to address uncertainty
   - Development of evidence-informed recommendations

6) Enhancing Outcome Measurement
   - Culturally appropriate, sensitive, valid and reliable measures
   - Improved screening tools
   - How to measure the episodic nature of disability
   - Use of international, shared and validated measures
   - Enhancing use and development of patient reported outcome measures

Methodological Advances

Personal Contextual Factors

Environmental Contextual Factors

Rehabilitation

Knowledge Translation and Exchange - Translating Research into Practice, Programs and Policy
Effectiveness of Yoga Interventions

- Mary Lou Galantino (Stockton University, Galloway, United States)
- David Kietrys (Rutgers University, Blackwood, United States)

Frailty

- Julian Falutz (McGill University)
- Living Longer Living Well Special Plenary Session – Where does Rehabilitation Fit in the Care Cascade? (CAHR Conference April 2017)

Social Connectedness & Community Engagement

- Charles Emlet, University of Washington, Tacoma
Broadening the Lens: What can we Learn from Other Complex Conditions for Successful Ageing with HIV?

You are invited!
Join an international group of researchers, clinicians, students, community organization representatives and international speakers to translate research, evidence and knowledge on rehabilitation interventions to promote successful ageing with chronic disease.

This symposium will include a dynamic group of speakers from the United Kingdom, Ireland, and Canada. Building on the field of HIV and complex chronic disease, the symposium will translate research on rehabilitation interventions in complex chronic disease, build new research and clinical partnerships, and identify new and emerging research priorities in the field.

Click Here for More Information:
https://www.kcl.ac.uk/events/event-story.aspx?id=600a09b4-bbc1-4872-44a2-24069105a447

Friday November 9, 2018
9:00am-5:00pm

Dinwoodie Lecture Theatre, Ground Floor, Cicely Saunders Institute
King’s College London, Bessemer Road, London SE5 9PJ

This Event is Free to Register!

To Register: Email your name and affiliation to:
pa.richardminton@kcl.ac.uk

For more information, contact
cihrcc@utoronto.ca

Chelsea and Westminster Hospital NHS

Physical Therapy
UNIVERSITY OF TORONTO

Funded by a Fellowship from the British Academy
Conclusions

• Aging with HIV & multimorbidity – complex, episodic disability, uncertainty

• **Rehabilitation** – non-pharmacological approach

• **Exercise** - high level evidence to support benefits and safety of exercise among older adults living with HIV

• **Community-based exercise**
  • Self-management approach
  • Physical, educational and social components
  • Considerations
    • Episodic disability = episodic physical activity & exercise
    • Influence of mental and emotional health, translating to social participation

• **CIHRRC** - New opportunities for collaborations in countries experiencing similar disability and rehabilitation issues among adults aging with HIV
Acknowledgements

Patty Solomon  
McMaster University
Colm Bergin  
St. James’s Hospital
Siobhan O’Dea  
St. James’s Hospital
Emma Stokes  
Trinity College Dublin
Ahmed Bayoumi  
St. Michael’s Hospital
Emma Stokes  
Trinity College Dublin
Paul Stratford  
McMaster University
Catherine Worthington  
University of Victoria
Francisco Ibanez-Carrasco  
St. Michael’s Hospital
Jacqueline Gahagan  
Dalhousie University
Stephanie Nixon  
University of Toronto
Steven Hanna  
McMaster University
Brenda Merritt  
Dalhousie University
Anne-Marie Tynan  
St. Michael’s Hospital
Richard Glazier  
St. Michael’s Hospital
Steve Tattle; Kate Murzin; Tammy Yates; Elisse Zack  
Realize
Andrew Matejcic  
Canadian Association for HIV Research
Darren Brown  
Chelsea and Westminster Hospital
Will Chegwidden  
National Hospital for Neurology and Neurosurgery, University College Hospitals
Patricia Gayle  
CIHRC / 3 Flying Piglets
Larry Baxter; Greg Robinson  
Community Member
Tara Carnochan / Dawn James  
Nine Circles Community Health Centre
Rosalind Baltzer Turje / Patrick McDougall  
Dr. Peter AIDS Foundation

RESEARCH COORDINATOR
Melanie Bisnauth; Ayesha Nayar; Nkem Iku, Rachel Aubry, University of Toronto
Acknowledgements

• Canadian Institutes of Health Research, HIV/AIDS Research Initiative

• Kelly supported by a Canada Research Chair (CRC) in Episodic Disability and Rehabilitation
Thank you!

kelly.obrien@utoronto.ca
@kellyobrien25