

The Contribution of Work to Overall Levels of Physical Activity in Adults with
Intellectual Disabilities

by

Kayla Rawlings
B.Sc., Oregon State University, 2010

A Thesis Submitted in Partial Fulfillment
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Abstract

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Work may be a potential source of physical activity for adults with ID, and therefore may be beneficial to their health. Using a cross-sectional descriptive research design this study examined the contribution of work to the overall physical activity levels of adults with intellectual disabilities. GT3X Actigraph accelerometers were used to measure the physical activity intensity levels of six employed adults with intellectual disabilities over eight consecutive days. Intensity levels were categorized into sedentary, light, or moderate-to-vigorous physical activity (MVPA). The overall physical activity levels were determined to establish whether participants met the Canadian physical activity guidelines for adults. In addition physical activity levels during work were compared to physical activity during non-work. Five out of the six participants met the Canadian physical activity guidelines of 150 minutes of MVPA per week. There were no significant differences between the amount of sedentary, light or MVPA during participant's work and non-work. There were, however, medium and large effect sizes for physical activity levels during work versus non-work, showing that work had a substantial impact on physical activity behaviours.

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Dedication

I would like to dedicate my thesis to my loving supportive parents, Peggy Flanagan and Bruce Rawlings. Without you both, this Master's would not be possible. Knowing I always had your support was comforting and encouraging. You have provided me with everything that has allowed me to achieve my goals, and I cannot thank you enough for that. You have supported me my entire life, and continue to support me in my decisions, and I am thankful for that. I don't take your support for granted, as I am well aware that I would not be standing where I am today without you.

This research is dedicated to adults with intellectual disabilities, and the clients and staff at the Garth Homer Society. These results can be used to better understand their physical activity patterns at work.

CHAPTER 1

INTRODUCTION

1.1 Background and Rationale

Individuals with intellectual disability (ID) often have physical and health challenges in addition to their intellectual challenges. Compared with people without ID, they generally experience poorer health (Van Schrojenstein Lantman-de Valk, Metsemakers, Haveman, & Crebolder, 2000) and have more unmet health needs (Krahn, Hammond, & Turner, 2006). Adults with ID tend to have higher rates of cardiovascular disease and cancer (Janicki et al., 2002), as well as higher rates of obesity, particularly among women (Stancliffe et al., 2011; Temple, Foley, & Lloyd, 2012). Levels of physical fitness are often low (Graham & Reid, 2000) and less than one-third of adults with ID meet their national physical activity guidelines for health (Temple, Frey, & Stanish, 2006).

The physical activity levels of adults without ID have been extensively studied in the home or work setting, usually using portable direct measures such as pedometers and accelerometers as these instruments provide the most valid and reliable results (Stanish, Temple, Frey, 2006; Temple, 2010). However, there is a lack of this type of data for adults with ID (Stanish et al., 2006; Temple, 2010). The evidence that is available suggests that a lack of social connectedness, poor weather, not having anyone to be active with, and a preference for sedentary activity are negatively associated with motion sensor measured physical activity levels; whereas self-efficacy toward exercise and higher levels of functioning are positively associated with participation (Stanish & Frey, 2008; Temple, 2010).

Some preliminary evidence suggests that work may be a motivating factor for participation in physical activity among persons with ID (Temple, 2009) as well as the context

where physical activity occurs (Temple, Anderson, & Walkley, 2000). However, the impact of work-related physical activity on health has not been examined, nor has the more basic question of the contribution of work to lifestyle physical activity among adults with ID (Temple, 2010). Therefore the aim of this study was to take the first step in this process, by describing physical activity levels of working adults with ID. This information may help employment support organizations, such as the Garth Homer Society, to prepare individuals for the physical demands of the workplace and provide evidence of an additional benefit of work that can be used to advocate for work support programs for persons with ID.

1.2 Purpose of the Study

The purpose of this study was to measure the physical activity levels of adults with intellectual disabilities and to determine the contribution of work to their overall daily physical activity.

1.3 Research Questions

1. What are the physical activity levels of adults with intellectual disabilities?
 - 1b. Do the physical activity levels of adults with ID meet the Canadian Physical Activity Guidelines?
2. What is the contribution of work to overall physical activity?

1.4 Operational Definitions

Intellectual disability: A disability “characterized by significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills. This disability originates before age 18” (Schalock, Luckasson, & Shogren, 2007, p 118).

Physical activity: Physical activity is defined as any body movement that produces contracting of skeletal muscle, which in turn increases energy expenditure (Hamilton & Owen, 2012). Physical activity levels in this study were determined using an accelerometer, and included both light and moderate-to-vigorous intensities.

Work: Work in this study was defined as supported volunteer or paid employment that occurred in the workplace setting within the labour market.

1.5 Delimitations

The study was delimited to ambulatory adults recruited through Garth Homer Supported Employment program who were working in Victoria, B.C.

1.6 Assumptions

Although the accelerometer outputs and motion sensor activity logs showed when the accelerometer was put on and taken off, it was assumed that these were the times that participants woke up and went to bed. It was also assumed that this study followed a typical week for each participant, including typical workdays.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides a context to appreciate why examining work-related physical activity among adults with ID is important. The first section of the review focuses on physical activity, specifically: the health benefits of physical activity, the current Canadian physical activity guidelines, and the physical activity levels of adults in the general population. The chapter then introduces the population of adults with ID including: defining intellectual disability, examining health status, measurement of physical activity, describing physical activity behaviours and prevalence, and barriers and affordances for physical activity.

Research shows that having a physically active lifestyle is important for our health, and a physically active job increases physical activity levels and has health benefits (Morris & Crawford, 1958; Morris, 1979). Therefore the last section in this review focuses on the health benefits of having an active job and the importance of work for adults with ID. It is thought that having a job will potentially have health benefits for adults with ID, however the intensity, duration and type of physical activity at work are unknown. Therefore this study will examine this population's physical activity intensity during a week, and see what contribution their work has to their overall physical activity levels.

2.2 Health Benefits of Physical Activity

Convincing evidence from decades of research recommends that people regularly engage in moderate-to-vigorous physical activity (Hamilton & Owen, 2012). Regular physical activity has shown to reduce our risk of premature mortality, cardiovascular disease, diabetes, obesity, and cancer (Hamilton, Healy, Dunstan, Zderic, & Owen, 2008; Hamilton & Owen, 2012;

Warburton, Katzmarzyk, Rhodes, & Shephard, 2007). For much of the population who live sedentary lifestyles, the public health goal of engaging in moderate-intense physical activity is more realistic and achievable compared to the previous goal of vigorous physical activity (Andersen, Schnohr, Schroll, & Hein, 2000; Hendelman, Miller, Baggett, Debold, & Freedson, 2000; Stanish et al., 2006). Whether or not public health physical activity guidelines are met, too much sitting time (or sedentary time) increases the risk of cardiovascular disease (Hamilton et al., 2008). Prolonged sitting time is associated with low levels of physical activity, and evidence is increasing on the negative health effects, including obesity, diabetes, and cardiovascular disease, of sedentary behaviour (Hamilton & Owen, 2012).

2.3 Physical Activity Guidelines

The intent of population level physical activity guidelines is to provide recommendations that will enhance public health through the adoption of generally attainable behaviours. In Canada, physical activity guidelines have been developed for specific age groups (0 – 4 years, 5 – 11 years, 12 – 17 years, 18 – 64 years, and 65+ years) as well as for adults living with Multiple Sclerosis, Parkinson's disease, and spinal cord injury (Canadian Society for Exercise Physiology, 2013). There are currently no specific guidelines for people with an ID. But specific guidelines may not be necessary, as the available evidence does not suggest there are more adverse events associated with exercise among adults with ID compared with the general population (Rhodes, Temple, & Tuokko, 2011). The guidelines most relevant to this study are the Canadian Physical Activity Guidelines for adults 18-64 years, which state that at least 150 minutes of moderate-to-vigorous physical activity should be accumulated per week to achieve health benefits (Canadian Society for Exercise Physiology, 2013). Moderate-intensity physical activity corresponds to activities that require a rate of energy expenditure equal to 3.0-6.0 METs (metabolic

equivalents), or 3-6 times the resting energy expenditure (Hendelman et al., 2000). Moderate-intense physical activities could include brisk walking, climbing stairs, washing windows, or fast social dancing (Temple et al., 2000). Moderate-to-vigorous physical activity is important, as it has been shown to play a preventative role in cardiovascular disease, diabetes, obesity, and cancer (Hamilton et al., 2008).

2.4 Physical Activity among Adults in the General Population

Although there is an abundance of evidence on the many benefits of physical activity, the majority of the Canadian population still do not live active enough lifestyles to meet the Canadian physical activity recommendations (Colley et al., 2011). The Colley et al. study compared participant's physical activity levels to the new Canadian and Global WHO recommendations and found that the majority of Canadian adults waking hours (69%) were spent in sedentary activities, with an overall average of four hours a day spent in light physical activities. According to data from the 2007 to 2009 Canadian Health Measures Survey (CHMS), 15% of adults were meeting the physical activity recommendations, and only 5% were meeting them on a regular basis (five or more days per week). Colley et al. also report that 53% were accumulating at least 30 minutes of MVPA on one or more days per week, leaving the remaining 47% not meeting the recommendation on any day of the week. These findings are similar to those of Troiano et al. (2008), who found that only 5% of a representative sample of the U.S. population met the recommendation of 30 minutes a day of physical activity.

2.5 Intellectual Disability

Intellectual disability (ID) is a disability that is “characterized by significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and

practical adaptive skills. This disability originates before age 18” (Schalock et al., 2007, p 118). According to the World Health Organization (WHO) up to 200 million people, or 3% of the world's population, have an ID; making it the largest population of persons with a disability in the world (WHO, 2001). Limitations in intellectual function manifest as having a difficulty in one or more of the following areas: reasoning, planning, problem solving, thinking abstractly, comprehending complex ideas, learning quickly, and/or learning from experiences (AAIDD, 2010).

Many individuals with ID experience limitations in skill areas such as communication, self-care, social skills, health and safety, home living, community living, life-long learning, self-direction, and employment (Thompson et al., 2004). Despite many of these challenges, adults with ID generally live comparable lives to the general population. They enjoy time with friends and family, participating in social activities, and in many circumstances they hold jobs, get married, have children, own homes, and participate in adult education (Hall et al., 2005).

2.5.1 Health Status of Adults with an Intellectual Disability

Individuals with ID tend to have health conditions associated with their condition such as sensory impairment (Beange, 2002), epilepsy (Beange, 2002), and thyroid disease (Beange, McElduff, & Baker, 1995) as well as secondary health conditions (Sohler, Lubetkin, Levy, Soghomonian, & Rimmerman, 2009) such as obesity (Temple, Foley, & Lloyd, 2013), osteoporosis (Center et al., 1998), heart disease and stroke (Wells, Turner, Martin, & Roy, 1997), hypertension (Bhaumik, Watson, Thorp, Tyrer, & McGrother, 2008; Sohler et al., 2009), hypercholesterolemia (Sohler et al., 2009), high serum triglycerides (Gazizova, Puri, Singh, & Dhaliwal, 2012), Type 2 diabetes (Reichard & Stolzle, 2011; Sohler et al., 2009), and metabolic syndrome in general (Hsu et al., 2012). The frequency of most adverse health conditions

increases with age, including cardiovascular, musculoskeletal and respiratory conditions; however, the frequency varies by sex and level of ID (Janicki et al., 2002). Although adults with ID have been shown to be at a higher risk for secondary health outcomes (Janicki et al., 2002), Janicki, Dalton, Henderson, and Davidson (1999) confirmed that their health has been progressively improving.

Individuals with ID tend to have low levels of cardiovascular fitness, and adults with Down syndrome have physiological characteristics that may limit their cardiorespiratory capacity more so than other persons with ID (Fernhall, 1993; Fernhall et al., 1996). The physical activities that the general population perform daily, such as walking at work, are often more physically demanding for adults with ID (Lante, Reece, & Walkley, 2010). Lante et al. revealed that the Compendium of Physical Activities (Ainsworth et al., 2000) significantly underestimated the energy expenditure of most activities of daily living for adults with ID, and they expend significantly more energy than those without ID during sitting and walking at a slow, quick, and fast speed.

2.6 Measurement of Physical Activity among Adults with an Intellectual Disability

In order to define and understand the relationships between physical activity and health, physical activity levels must be accurately quantified (Strath, Brage, & Ekelund, 2005). It is a continuous challenge to find an accurate way to measure physical activity in free-living populations (Stanish et al., 2006) and depending on the population, some ways of measuring physical activity levels are more suitable than others. According to Tudor-Locke and Myers (2001), when measuring the physical activity levels of a typically sedentary population, the most important activity to assess is walking. Stanish and Draheim (2005a) conclude that even with

studying walking patterns there are a variety of ways to measure physical activity, and the inconsistencies among techniques yield inconsistent findings.

2.6.1 Measurement Tools

Physical activity is a complex behaviour, and determining the most accurate method to assess it can be a challenge. There are several methods available for measuring physical activity, each having advantages and disadvantages, and of which some are more reliable than others. According to Stanish et al. (2006) the most common methods used for adults with ID are self-reports and activity monitors (motion sensors). Stanish and Draheim (2005a) found no significant correlations between the physical activity measured with a motion sensor and with a physical activity survey, recalling the frequency and duration of walking activity and other MVPA, which was administered through an interview with the participant, and with their direct caregiver's assistance as needed (Stanish & Draheim, 2005a). The Temple and Walkley (2003) study, however, found a modest but significant relationship between motion sensor estimate of physical activity and estimates generated by caregivers via diary recordings.

For measuring physical activity, motion sensors are more valid and reliable with adults with ID than questionnaires (Temple, 2010; Temple et al., 2006; Tudor-Locke & Myers, 2001). Pedometers have been shown to be accurate and feasible for measuring the walking activity of adults with ID (Hilgenkamp, Van Wijck, & Evenhuis, 2012; Stanish, 2004). Although few validation studies have occurred, Temple et al. (2000) found that accelerometers could distinguish those adults with ID who were meeting physical activity guidelines, and Frey (2004) found that accelerometers were able to differentiate active from inactive adults with ID. Temple et al. (2000) found high levels of agreement between the accelerometer measures and the direct observations for energy expenditure. In addition to the accelerometer measurements, daily

activity log sheets can be completed to document the participant's daily schedule of activities. In the Stanish (2004) study, caregivers documented the participants daily activities, such as work, television watching, and Special Olympics training on a sheet provided, and this assisted in determining if pedometer values accurately reflected actual participant behavior, especially when extremely high or low values were recorded.

2.6.2 Measuring Physical Activity using Accelerometers

Accelerometers have been used extensively to measure physical activity patterns in field settings within the general population (Masse et al., 2005). They produce data that is comparable among many large-scale studies done globally (Actigraph, 2013). They are used to objectively measure the amount of activity, which is then categorized into different intensities that can be used to calculate energy expenditure estimates (Actigraph, 2013; Freedson et al., 1998). This facilitates research examining the relationships between physical activity and health. There is little evidence showing that one model of accelerometer is more valid and reliable than another, so selection remains mainly on affordability, practicality and being comparable with other studies (Troost, Mciver, & Pate, 2005).

2.6.2.1 GT1M vs GT3X

Choosing an accelerometer for estimating physical activity is important; research has compared the capabilities and validity of different types of accelerometers. Accelerometers record body movements along axes of the body. Researchers and clinicians have used ActiGraph Activity Monitors in hundreds of universities and research organizations in over 65 countries (ActiGraph, 2013). The ActiGraph accelerometers were strongly correlated ($r = .91$) with the TriTrac-R3D, another model of accelerometer (Troost et al., 2005). To date, the majority of work has been with the GT1M (uniaxial), initially produced by ActiGraph; more recently, ActiGraph

produced a triaxial accelerometer. The uniaxial accelerometer measures acceleration in one plane, typically the vertical plane, and the triaxial accelerometer measures acceleration in three individual planes: vertical, antero-posterior, and medio-lateral (Sasaki, John, & Freedson, 2011). Trost et al. (2005) concluded that multiple axis accelerometers have slightly higher validity compared to uniaxial models, however literature suggests they have comparable results. The GT1M (uniaxial) and the GT3X (triaxial) were found to be comparable, as they provided similar results with no significant differences in a range of physical activity intensities (sedentary, light, moderate and vigorous) (Sasaki et al., 2011; Vanhelst et al., 2012). When 25 healthy adults wore the accelerometers for one typical weekday, Vanhelst and colleagues found no difference when identifying whose physical activity levels met physical activity guidelines of 60 minutes per day, suggesting that both accelerometers could be used without requiring further validation studies. This project used the GT3X Actigraph accelerometer, which has been validated and shown to be an accurate and reliable tool for measuring physical activity (ActiGraph, 2013; Vanhelst et al., 2012).

2.6.2.2 Wear-time Criteria

For adults, one accelerometer worn on the hip or lower back for 3-5 days is sufficient for gathering reliable measures that reflect the individual's typical level of physical activity (Troiano et al., 2008; Trost et al., 2005). Troiano et al. objectively described physical activity levels of adults using accelerometers. Participants were asked to wear the accelerometer for seven days during waking hours, excluding while swimming or bathing, and wear-time criteria for a valid day was 10 or more hours. Another study by Masse et al. (2005) reviewed the methodologies of 64 studies using accelerometers, to assess the minimal wear requirements for determining the optimal criteria for a valid day. Findings revealed that 73.4% of studies asked their participants

to wear the accelerometer only during waking hours, opposed to 26.6% that asked to be worn continuously. Most studies (96.9%) reported the numbers of days the participants were asked to wear the accelerometer, and only 27.3% of adult studies had their participants wear the accelerometer fewer than seven days. Of the studies reviewed, 45.3% reported the minimum number of monitoring days needed for the analyses, and three days was used by just over half of the studies (53.6%). Of the studies reviewed, few (32.8%) reported the criteria they used to determine whether the accelerometer was worn a significant proportion of waking time to be included in analyses, and the most common cut point used was ten hours, with 38.1% using ten hours as their cut-point for a valid day. This study used a wear-time criterion of ten hours a day, on at least four days of the week.

2.6.2.3 Intensity Cut-points

The raw data measured by accelerometers is converted into activity counts that are divided into categories, which provide an objective assessment of movement intensity. Cut-points divide the intensity categories, and allow us to determine how long someone has spent in a physical activity intensity level (Trost et al., 2005). Results commonly report the total physical activity minutes spent in different intensities, which is useful as it's a behavioural outcome variable (Esliger, Copeland, Barnes, & Tremblay, 2005). To calculate what level of intensity physical activity is in, there are different cut points that can be used.

Freedson and colleagues (1998) established accelerometer activity count categories for adults corresponding to different intensity levels of activity, along with commonly used MET categories. In other words, allowing the activity patterns to be classified into intensity levels using an accelerometer. The estimates of caloric expenditure were developed using walking and running on the treadmill (Freedson et al., 1998). The three different speeds used were 4.8, 6.4,

and 9.7 km/hr, and a high positive correlation, ($r = .93$), was found between the actual and predicted energy expenditure at each speed. The Freedson and colleagues cutpoints for adults are: sedentary activity (<1.5 METs) as <77 counts per minute (cpm), light activity (1.5-2.99 METs) as 77-1951 cpm, moderate activity (3.0-5.99 METs) as counts 1952-5737 cpm, vigorous activity (≥ 6.0 METs) as >5737 cpm, and MVPA (≥ 3.0 METs) as > 1952 cpm. These Freedson et al. cut-points have been frequently used with adults, as well as adults with ID (Frey, 2004; Troiano et al., 2008; Vanhelst et al., 2012).

2.6.2.4 Identifying Non-wear Time and Wear-time Criteria

There are times when the accelerometer is not worn or is removed for a period of time during the waking hours, such as bathing, swimming, or during contact sports when the accelerometer is at risk of being damaged. Currently there is no good method for determining when the accelerometer is not being worn (known as “non-wear time”) and the times when the participant is wearing the accelerometer and engaging in sedentary activities (Oliver, Badland, Schofield, & Shepherd, 2011). When the accelerometer is worn, the activity counts are averaged over a pre-determined amount of time, known as an epoch length. Physical activity research on adults, as well as adults with ID, typically uses an epoch length of one minute (Esliger et al., 2005; Frey, 2004; Troiano et al., 2008; Trost et al., 2005). When there are repetitive epochs with zero counts, it is not always easy to distinguish whether they represent sedentary behaviour while the accelerometer was worn, or if the accelerometer was removed for that period of time (Oliver et al., 2011). There are limited studies considering this issue, and inconsistent findings. However, typically 60-90 minutes of consecutive zero counts (but allowing up to 2 minutes of nonzero counts within that period) was used as a threshold for non-wear time (Choi, Liu, Mathews, & Buchowski, 2011; Colley et al., 2011; Troiano et al., 2008). The non-wear time was subtracted

from 24 hours to determine the wear time of the accelerometers (Colley et al., 2011; Troiano et al., 2008). Choi and colleagues recommended a “90-min time window for consecutive zero or nonzero counts” to prevent the misclassification of time spent in sedentary activity (Choi et al., 2011, p. 357).

2.7 Physical Activity among Adults with ID

Evidence suggests that many adults with ID prefer less intense activities compared to more intense ones that require greater exertion (Stanish & Draheim, 2005a; Temple & Walkley, 2007). Temple and Walkley (2007, p.33) explained that previous physical activity participation “had made them feel uncomfortable (e.g., huffing and puffing, sore muscles)”. Physical activity of adults with ID also tends to be of short duration (Frey, 2004; Stanish & Draheim, 2005a) and light to moderate intensity (Fernhall, 1993). For example, Temple and Walkley (2003) found that 14% of participants spent more than an hour a day doing light manual work and Temple et al. (2000) found that participants spent on average 10 hours laying down, 6 hours sitting, 3 hours standing, and 3 hours undertaking personal tasks, and engaging in light to moderate sport, leisure or work.

The literature suggests that some of the major sources of activity among adults with ID include walking, cycling, chores and work, dancing, and Special Olympics (Draheim et al., 2002; Frey, 2004; Stanish et al., 2006; Temple, 2007). Overwhelmingly, walking and walking for transportation have been documented as a major form of physical activity (Draheim, Williams, & McCubbin, 2002; Frey, 2004; Stanish, 2004; Stanish & Draheim, 2005a, 2005b; Temple et al., 2000; Temple et al., 2006). Stanish and Draheim (2007) found adults with ID had similar walking behaviours to that of the general population and Temple et al. (2000) found participants accumulated the majority of their activity during work or day placements and the travel to and

from work or day placements. These authors showed that 70% of the participant's moderate-intensity physical activity was obtained through walking for transportation. In addition, two of the six participants in that study accumulated several hours (over 50%) of their moderate-intensity physical activity through work (Temple et al., 2000). Stanish and Draheim (2007) also suggest that employment tasks could also increase physical activity levels, as they are often physical tasks that involve walking. Temple et al. (2000) demonstrated that participants may walk more than an hour per day for transport; however they may not meet the physical activity guidelines of 30 minutes of moderate-intense physical activity a day if the intensity of the walking isn't high enough. The study revealed that there is an opportunity for adults with ID to meet physical activity guidelines simply by increasing the intensity that they walk to their jobs, given that most adults with ID either walk or use public transport.

2.7.1 Levels of physical Activity among Adults with an Intellectual Disability

A majority of adults with ID have low levels of engagement in physical activity (Stanish & Draheim, 2005a). Systematic reviews of the literature on quantitatively measured physical activity conclude that between 17.5% and 33% of adults with ID accumulate at least 30 minutes per day of moderate-intensity physical activity and 20% to 45% accrue 10,000 steps per day (Temple et al., 2006; Temple, 2010). The following studies used motion sensors to directly measure physical activity and determine the physical activity prevalence among adults with ID. Temple et al. (2000), using accelerometers, found 33% of participants met the health criterion. Similar results by Temple and Walkley (2003), using accelerometers and the Australian physical activity guidelines of accumulating 30 minutes of moderate intense physical activity per day, found 32% met the criterion. Stanish and Draheim (2005a), using pedometers, found 21.4% met the criterion and Stanish and Draheim (2005b), using pedometers, found 21% of women and

21.5% of men met the criterion. Peterson and colleagues found somewhat lower steps per day levels in the United States, with 14% of participants meeting the criterion, concluding the majority of adults with ID have insufficient steps per day to achieve health benefits (Peterson, Janz, & Lowe, 2008). Hilgenkamp et al. (2012), using pedometers, found that 16.7% of older adults with ID achieved the criterion. Stanish (2004), using pedometers, found participants were more sedentary on the weekends, with 45% meeting the criterion on weekdays, and only 20% meeting the criterion on weekends.

A majority of the literature suggests that sedentary and light-intensity physical activity is more common among adults with ID than moderate- or vigorous-intensity physical activity. Participants in the Temple and Walkley (2003) study spent the majority of their time doing sedentary activities. Wells et al. (1997) showed over a four-week period that 51.8% of participants (including 21% with some physical incapacity) had done no moderate-intensity physical activity. The Draheim et al. study (2002) also showed a high prevalence of inactivity, with 49% of participants participating in little to no leisure time physical activity, 13% participating in none at all, and only 1% participating in regular vigorous leisure time physical activity three or more times a week. In a study completed by Frey (2004), low activity levels were found; of the 22 participants, five engaged in any form of formal exercise, and only one obtained at least one five-minute bout of continuous hard or very hard physical activity. The low prevalence of regular vigorous leisure time physical activity supports the idea that adults with ID choose less intense activities over more vigorous physical activities (Draheim et al., 2002). Stanish and Draheim (2007), also suggest that although some adults with ID spend enough time walking, the intensity may not be adequate to achieve health benefits. Temple et al. (2000)

suggests that with some encouragement and some assistance to walk more quickly, there may be potential for all participants to meet the recommendations.

2.7.2 Facilitators and Barriers to Physical Activity

Although information on the facilitators and barriers to participation in physical activity among adults with ID are limited, many factors appear to be the same as the general population (Bodde, Seo, & Frey, 2009; Stanish & Frey, 2008). However, some barriers might be more prevalent for persons with an ID, such as low incomes, difficulty with transportation, and a lack of support (Stanish & Frey, 2008). Bodde and colleagues also reported common barriers for adults with ID to be finances, transportation, and lack of awareness of their options for exercise (Bodde et al., 2009). According to Hall et al. (2005) adults with ID find it more difficult to get support from others as they are less likely to have regular contact with close friends or family, and less likely to be involved in community groups, such as church, school, or sports. Other barriers to participation in physical activity include environmental and personal constraints; with weather, health and laziness being the most common (Temple, 2007). Temple also demonstrated that having more barriers to physical activity and a preference for sedentary behaviour predicted physical activity levels, which is consistent with research with the general population.

For many adults with ID, assistance is required to live a healthy and active lifestyle (Graham & Reid, 2000). With a high prevalence of physical inactivity among adults with ID (Bodde et al., 2009; Stanish & Frey, 2008; Wells et al., 1997), it is important that they, as well as their care providers, are aware of how important incorporating regular physical activity into their lives is for a healthier lifestyle (Wells et al., 1997). According to Stanish and Frey (2008), individuals that support persons with ID, such as family or care providers, play a key role in physical activity participation; therefore, it is crucial that they have the knowledge and skills to

help facilitate healthy living. These authors also reported that for health promotion to be effective in adults with ID it is important to identify the factors that influence their physical activity participation.

For adults with Down syndrome facilitators of physical activity include: the support from others to encourage engagement, having fun and interesting activities to engage in, and having a schedule that provides routine and familiarity (Mahy, Shields, Taylor, & Dodds, 2010). These authors found adults with Down syndrome were influenced to participate in physical activity by the attitudes and actions of their support people. When the support people would initiate the activities and use “creativity, enthusiasm, interest and motivation to maintain their interest” the adults with Down syndrome were more likely to be active themselves (Mahy et al., 2010, p. 798). Also, if they had someone to join them in the activity, or the activities were done to music the engagement increased. These authors also found that participation increased when activities were interesting and there was purpose involved, such as rewards (a trophy or games) or having goals. Finally, routine was found to be important for many adults with Down syndrome; if the activities became a part of their routine and they were familiar with the activity each time, they were more like to participate and enjoy it. Mahy et al. also found common barriers to be the lack of support from parents or care providers to encourage and support physical activity. Other barriers included not wanting to engage in physical activity, and medical and physiological factors (being overweight or having uncomfortable feelings with exercise). Heller, Hsieh, and Rimmer (2002) also found that adults with Down syndrome have low physical activity participation rates and considerable barriers to exercise, such as cost, not having anyone to show them how to exercise, not being able to access the fitness centers, and not having access to transportation. Many of the barriers and facilitators identified are similar to those of adults

without impairments, such as having motivation and support from others in activities and having a routine (Mahy et al., 2010; Stanish & Frey, 2008). Evidence suggests that work may be a place for adults with ID to accumulate physical activity (Temple et al., 2000), as work can be part of their routine and become a familiar activity to them, which in turn would encourage engagement.

2.8 Health Benefits of Having Active Jobs in the General Community

The health outcomes associated with occupational-related physical activity has a long history, with one of the first studies showing health benefits arise from a physically active job was conducted in 1949 on the London Transport bus drivers and conductors (Morris, 1979). The study revealed that bus conductors had one-third the incidence of sudden death in men (under 50 years of age) compared with the drivers. The study examined contributors to heart disease, and originally stress was thought to be the cause. Additional studies followed, on desk clerks and postmen, and the explanation of stress was disregarded. The differences found between desk clerks and postmen wouldn't have been caused by stress, and the new hypothesis generated stated the variations in coronary disease experienced were attributed to the different amounts of physical activity on the job. Both a conductor on a double-decker bus and a postman attain more physical activity on their jobs compared to a bus driver and a clerk, and also experienced fewer sudden deaths at a young age (Morris, 1979). According to Morris and Crawford (1958), physical activity at work is protective against coronary heart disease, as it occurs less frequently in jobs with higher physical demands; as well, those in physically active jobs who do experience these diseases, develop it later in life and it is less severe. At higher blood pressure values, those individuals doing higher intensity physical activity experienced fewer abnormalities in heart rhythm (measured by an electrocardiogram) than those engaging in less intense physical activity

(Morris, 1979). Not only would employment enhance social inclusion of adults with ID, but also provide potential health benefits and protection against diseases.

2.9 Work and Adults with an Intellectual Disability

As well as having barriers to physical activity, adults with ID face barriers to employment. Employment can be particularly challenging for adults with ID, as they face additional barriers to those faced by the general population (Statistics Canada, 2008). Some challenges include their disability itself, their requirements for accommodations in the workplace, and their perceived workplace discrimination. Adults with ID often require that accommodations be made to their workplace, such as modifications of hours, duties, or work structure, and the kinds of work they can do may be limited (Statistics Canada, 2008). If these barriers can be overcome and the required adaptations made, employment could provide many benefits, including independence, social inclusion, and contribution to overall physical activity. Therefore employment should be something that is encouraged among adults with ID.

Despite the knowledge of its benefits, the rates of employment are still low within the population of adults with ID. According to the Rehabilitation Research and Training Center on Disability, in 2008 in the U.S., 39.5% of the working-age adults (ages 21-64) with disabilities were employed, with 25.4% working full-time. Of those with a cognitive disability, only 28.0% were employed, with 14.0% working full-time. There was a significantly higher employment rate among those without a disability (79.9%), with 60.4% working full-time, leaving an employment gap of 40.4% (Rehabilitation Research and Training Center on Disability Demographics and Statistics, 2008). A more recent study done in the U.S. shows a smaller employment gap, with 51% of persons with ID employed compared to 75% of persons without disabilities. Results show that there is a low level of employment among all types of disabilities; however, “it is

especially low (40%) among people with mobility and mental impairments” (Ali et al., 2011, p. 202) and most adults with a severe ID are unemployed (Hall et al., 2005). It is suggested that the low employment rate is not a result of them being unwilling to work or having different job interests (Ali et al., 2011), but could be partly reflected by the history of social exclusion and discrimination (US Commission on Civil Rights, 1983). The research shows that employers generally are not proactive in hiring adults with ID, while many still hold stereotypical beliefs that aren’t supported by research (Lengnick-Hall, Gaunt, & Kulkarni, 2008). Common concerns employers have for hiring from this population are that they have a lack of knowledge, skills, and ability; however, they are viewed as punctual, hard working, and competent by some employers (Lengnick-Hall et al., 2008).

Of those who are successful in securing employment, they usually work fewer, more fixed hours (Fillary & Pernice, 2006; Jahoda, Kemp, Riddell, & Banks, 2008) and generally earn less (Hall et al., 2005) than their peers without disabilities. Most “were in elementary occupations in the community, social services and personal services sector of the workforce” (Fillary & Pernice, 2006, p.35). Fillary and Pernice found that the workplaces of employed adults with ID fell into a general range of categories, which included, “food industry, retail, horticulture, elder care and schools” and ranged from “a small owned-operated restaurant and garden centre to a large nationwide retail business” (Fillary & Pernice, 2006, p.32). Literature by Nota, Ginevra, and Carrieri (2010) found a wide range of interest among adults with ID in jobs involving realistic, investigative, artistic, social, enterprising, and conventional areas. Participants were interested in jobs with a low-to-mild complexity, and tended to have more interest in occupations in conventional (secretary, accountant, or postman), realistic (mechanic, gardener, or factory worker), social (coach, teacher, or physician’s assistant), and artistic

(musician, architect, or photographer) areas, and less interest in enterprising (firefighter, train conductor, or restaurant manager) and investigative (journalist, veterinarian, or researcher) areas. Common areas of employment for adults with ID were retail and administration work (Fillary & Pernice, 2006; Flores, Jenaro, Orgaz, & Martin, 2011; Forrester-Jones et al., 2004; Jahoda et al., 2009) as well as the food industry (Fillary & Pernice, 2006; Jahoda et al., 2009), cleaning (Flores et al., 2011; Jahoda et al., 2009), and garden work (Flores et al., 2011; Forrester-Jones et al., 2004). There were no differences found between the types of jobs that males and females were interested in or employed in (Flores et al., 2011; Nota et al., 2010).

Adults with ID have a wide range of abilities and needs; and many require additional help to gain and maintain employment. It can often be a long process to find jobs that are a good fit based on their “needs, abilities and aspirations” (Taylor, McGilloway, & Donnelly, 2004, p. 100). To improve their inclusion into the workforce, the factors that facilitate employment and what inspires them to work should be considered. Then to make integration more successful, proper training and placement must be identified (Taylor et al., 2004). Along with work training, family and the work setting are also important factors for integrating adults with ID into the workforce (Vila, Pallisera, & Fullana, 2007). It is suggested that providing practical work experience prior to the work integration, providing proper training of the skills necessary for the job, and having the job trainer accompany the worker in the work place all help their integration into the workforce (Vila et al., 2007).

It is important to prepare adults with ID to live an independent life (Pitetti et al., 1993), and having a supportive workplace environment as well as employment support staff that encourage full work shifts, increases the potential for social inclusion and participation at work (Fillary & Pernice, 2006). Adults with ID are as likely to want a job as their peers in the general

population, as they value similar characteristics of work (Ali et al., 2011). Adults with ID "often aspire to being more socially included" (McConkey, 2007, p 207), and it is known that when they were asked, they consistently reported that they want to work (Bass & Drewett, 1997). Although there are still barriers, such as transportation to work, support for work, and limited working hours, to overcome in order to facilitate these opportunities, employment does hold great promise for improving the quality of life of adults with ID (Jahoda et al., 2008). There are benefits to removing barriers to employment that adults with ID face, and there is evidence that many new jobs can be done by adults with ID (Ali et al., 2011).

Because adults with ID are often working manual jobs (Hall et al., 2005) that require light to moderate physical activity (Fernhall, 1993), there can be many physical benefits. Work tasks are often physically demanding, with workdays often involving a considerable amount of walking, including to and from work (Stanish & Draheim, 2005a, 2005b; Stanish, 2004). In the Stanish (2004) study, work related walking was thought to account for the significantly higher walking activity found on weekdays compared to weekends, as most participant's weekend activities included watching television and relaxing. Participants in the Forrester-Jones et al. (2004) study showed significant positive changes in physical development (sensory and motor abilities) after working one year.

2.9.1 The Importance of Work for Adults with an Intellectual Disability

With links shown between employment and mental health in the general population, the well-being and mental health of people with ID in supported employment deserves to be explored as well (Jahoda et al., 2008). Although employment can have benefits for all individuals, it may provide an especially positive role for those who are in minority groups who are often denied job access, such as adults with ID (Schur, 2002). Employment has the potential

to be a positive aspect in the lives of adults with ID, providing the opportunity for social inclusion and giving them a sense of belonging and purpose in the community (Jahoda, Banks, Dagan, Kemp, Kerr, & Williams, 2009). Although work cannot guarantee social relationships, it can provide an opportunity for people with ID to meet others who are not associated with intellectual disability services (Forrester-Jones, Jones, Heason, & DiTerlizzi, 2004). According to Jahoda et al. (2008), supported employment had largely positive results on the quality of life, well-being and autonomy of adults with ID, with those employed reporting a higher psychological well-being and self-esteem. The Jahoda et al. (2009) study interviewed 35 adults with mild ID at the start of their jobs, and then again 9-12 months later, and reported that the majority found moving into the workforce a positive experience. They found work brought them “a greater sense of purpose and self-confidence, a feeling of autonomy and financial control, and an enjoyment of meeting people in the work place” (Jahoda et al., 2009, p 425). For many the most significant aspect of starting employment was that it gave them something to do and it provided a routine that helped them get out of the house to lead a more purposeful and active life. When one participant was asked if work had changed his life, he replied, “it has, in a big way...this is my chance to shine really...I look forward to going to work every day.” Another stated work “makes a tremendous difference. It gives you confidence and a sense of value” (Jahoda et al., 2009, p 423).

As well as intrinsic values, employment provides extrinsic benefits by giving an opportunity for financial autonomy, social inclusion, and social status by allowing them to form better social relationships and social networks (Forrester-Jones et al., 2004; Jahoda et al., 2008; Schur, 2002). On a whole, supported employment has potential to provide social interactions, friendships, and community belonging (Jahoda et al., 2008). Schur (2002) also states that for

adults with ID, employment can improve skills and enhance integration into society. Findings of Schur also suggest that the integration into society and increased employment would reduce the income gaps between adults with and without ID along with the gaps in social and psychological measures. It was found that social connectedness was positively correlated with physical activity (Temple, 2010), and physical fitness has been directly related to work productivity among adults with ID (Fernhall, 1993). Therefore if working can improve the social networks of adults with ID and get them involved socially into the community, a potential increase in their physical activity might be seen with a concurrent increase in health benefits if integration into the workplace can be improved. Holding a job that brings satisfaction to ones life may potentially increase self worth, along with increasing physical activity. Employment has a high importance and can have an impact on the health and well being of adults with ID.

Physical activity is important for our health (Hamilton et al., 2008), and adults with ID have been found to have low levels of physical activity (Stanish & Draheim, 2005a). The health of adults with ID is a concern, as they are at higher risk of secondary health conditions including obesity, heart disease, and diabetes (Sohler et al., 2009). Physical fitness has important implications for this population (Fernhall, 1993) and their work performance can be directly related to their cardiovascular fitness (Beasley, 1982). Employment is important for many aspects of quality of life, including physical activity, and Fernhall (1993) suggested that employment for many adults with ID could be a place where physical activity is acquired. This study examined how much physical activity is acquired during work to explore how much work contributes to their overall physical activity levels.

CHAPTER 3

METHOD

3.1 Sample Recruitment

Ethics approval for this project was obtained from the University of Victoria's Human Research Ethics Board (HREB) prior to commencing (see Appendix A for the Ethics Approval Form). Participants were recruited through the employment services program at the Garth Homer Society in Victoria, B.C. At the time of recruitment, there were 65 clients in the program, most of whom were engaged in full- or part-time work. The employment contexts were diverse, therefore recruiting these participants allowed for the examination of the relative contribution of work to overall levels of physical activity in many forms of work.

The Director of Quality Assurance for the Garth Homer Society sent letters of invitation to participate, prepared by the University of Victoria research team, to all employment services clients/caregivers (see Appendix B for the letter of invitation). For the one adult unable to provide his own informed consent, the Director sent an invitation and consent letter to his caregiver, along with an assent letter for the participant. Interested prospective participants returned the consent materials to the team coordinator of the Garth Homer Society Employment Services program and they were then sent to the research team.

Before starting participation in the study all participants signed a consent form, some in the presence of an employment services staff (job coach) after an additional explanation of the study (see Appendix C for the study's consent form). Eight participants returned consent/assent forms for the study, and went through the familiarization process. Of those eight, two were not able to complete the study due to their employment status ending prior to the start of data collection; therefore, a total of six participants completed the study.

3.2 Participants

The study's participants were six adults (three male, three female), aged 21-46 years (male age, $M = 28.67$ years, $SD = 6.81$; female age, $M = 34.67$ years, $SD = 12.66$), who were clients of the Garth Homer Society Employment Service. The participant's characteristics can be found in Table 1 and Table 2. Table 1 displays each of the six participant's sex, age, height, weight, and body mass index (BMI). Table 2 displays the average age, height, weight and BMI of all participants combined, as well as by sex.

Table 1
Participant Characteristics

Participant ID	Sex	Age	Height (cm)	Weight (kg)	BMI
A001	M	21	185.7	61.7	17.8
A002	F	46	155.2	86.6	36.0
A003	F	37	137.3	33.6	17.9
A004	M	34	185.4	72.6	21.3
A005	M	31	172.4	59.0	19.9
A006	F	21	151.1	83.5	36.6

Table 2
Participant Characteristics Combined and by Sex

	All ($n=6$) Mean \pm SD		Males ($n=3$) Mean \pm SD		Females ($n=3$) Mean \pm SD	
Age (yrs)	31.7 \pm	9.7	28.7 \pm	6.8	34.7 \pm	12.7
Height (cm)	164.5 \pm	19.8	181.2 \pm	7.6	147.9 \pm	9.4
Weight (kg)	66.2 \pm	19.5	64.4 \pm	19.5	67.9 \pm	29.8
BMI	24.9 \pm	8.9	19.7 \pm	1.8	30.2 \pm	10.6

3.3 Study Design

This study employed a cross-sectional descriptive research design. Data was collected over eight days for each participant, starting and ending on the same workday.

3.4 Instruments

GT3X Actigraph Accelerometers: The GT3X's used are small, lightweight devices (dimensions: 4.6 x 3.3 x 1.5 centimeters; weight: 19 grams) (Actigraph, 2013), which are the newest version of the ActiGraph Activity Monitors, with a rechargeable battery lasting 21 days, and a large (4MB) memory storage (Cain & Geremia, 2011). The GT3X's are triaxial accelerometers, which measure acceleration in three individual planes: vertical, antero-posterior, and medio-lateral (Cain & Geremia, 2011; Sasaki, John, & Freedson, 2011), providing objective measurement of the intensity levels of body activity. For this study, participants were required to meet the minimum wear time criteria of 600-minutes (10-hours), on at least four days during the week (minimum of 2 weekdays and minimum of 1 weekend day), and including at least one workday. The GT3X's collect movements in "counts," which are totalled over a length of time known as an "epoch length." Data is analyzed using these epoch lengths in order to determine the amount of time participants spend in different zones of physical activity (sedentary, light, and moderate-vigorous). The Freedson et al. (1998) cutpoints were used to classify the amount of time participants spent in each of the different physical activity intensities (sedentary, light, and moderate-vigorous) throughout the eight days of data collection.

Motion Sensor Activity Log: The motion sensor activity log was a booklet given to the participant prior to data collection, along with the accelerometer (motion sensor). It included a page of instructions for the participant/care provider with reminders on how to wear the accelerometer and how to fill out the log. It offered the opportunity for the participant to provide

the time at which the accelerometer was put on and taken off for each day of data collection. The participant was also asked to indicate if the weather conditions or other circumstances changed their usual work activities, or if the motion sensor was removed before bed (see Appendix D for the participant's motion sensor activity log).

Daily Activity Log: An eight-day activity log was given to the participant prior to the start of data collection for them to record their week's schedule. The main activities they participated in each day, such as work shifts, sports, transportation time, free time/entertainment, and social events were to be indicated on the sheet. The typical length of each activity was also to be indicated by filling in the appropriate number of boxes that represented the length of each activity. The participant/care provider kept this 8-day schedule during the week of data collection in order to fill it out and make changes as the week progressed (see Appendix E for the participant's daily activity log).

Job Coach Questionnaire: A job coach is someone who provides ongoing support to individuals in the employment services program at Garth Homer Society. Each participant in the program has a job coach. They can assist employers in identifying natural supports, such as checklists or timers. They can also provide support if the worker needs to learn a new task or procedure at work. A questionnaire was completed by the job coach of each participant prior to observation in the workplace. The questionnaire provided the researchers with information about the participant's employer, job title, length of employment, as well as a description of job tasks the participant did at work. These questions helped inform the researchers of the participant's most common tasks, most repetitive tasks, and most physically demanding tasks. It also allowed them to highlight any tasks that put the participant at risk of injury (see Appendix F for the job coach questionnaire).

3.5 Procedure

Once a participant's consent was obtained, the Garth Homer Society Employment Services Team Coordinator was contacted. The coordinator contacted the participant's job coach who then liaised with the participant's work place to let them know about the study. In addition, they completed and returned the job coach questionnaire.

The researchers then completed a process of familiarization with each participant to ensure they were comfortable with all components of the project. A meeting with each participant and care provider (if applicable) took place in a setting comfortable to the participant (e.g. home, the workplace, the University of Victoria, or Garth Homer Society). During the meeting the researchers showed and explained the accelerometer (along with other equipment that was being used to collect data for an additional study), and allowed the participant to practice putting it on and wearing it. The participant was asked to wear the accelerometer for eight consecutive days during waking hours, and they were informed that they would be observed at work for an hour during two work shifts. Once the familiarization of procedures and equipment was completed, any questions were answered and the researchers confirmed that the participant wished to continue with the study. The researchers then verbally confirmed that the participant understood the basic components of the study by asking:

1. Why are we doing this study? (*Answer: to find out how much physical activity I do at work and everyday*).
2. What will you have to do in the study? (*Answer: I have to wear the monitor for 8 days and the researchers will watch me work on two days*).
3. Can you quit being in the study any time you want? (*Answer: Yes*).
4. Will the researchers tell anyone that you're in the study? (*Answer: No*).

5. What will you get from the study? (*Answer: I get a ten-dollar gift card if I give the monitor back and I'll learn if I move enough to be healthy. I won't get the gift card if I lose the monitor or don't give the monitor back.*)

If the participant was unsure of any of the points 1 to 5, the researchers clarified or verbally prompted them with clues to the study's purpose or reminding them of the instruments being used.

Once verbal consent was obtained, the participant's work schedule was determined and a start date for data collection was chosen. Accelerometers were distributed to the participant prior to the first day of data collection. The accelerometers were worn for eight consecutive days on the hip during waking hours (from the time that the participant got out of bed in the morning to the time they went to bed that evening) to record the amounts of sedentary, light, and MVPA throughout the day. Their only exceptions for not wearing the accelerometer were when they were bathing, swimming, or when the accelerometer was put at risk of getting damaged or wet. The first day of data collection started on a workday; the participant was also observed for the first hour of their work shift, and their three main work tasks were identified. The participant (and care provider/parents where applicable) recorded the participant's daily activities in the daily activity log, as well as filled out the motion sensor activity log each day. The participant was also given two phone prompts throughout the week to see if they had any questions, to find out if they were complying with wearing the accelerometer, and to remind them when the researchers were meeting with them. At the end of the data collection week, the accelerometer, the motion sensor activity log, and the daily activity log were collected and the participant was awarded a ten-dollar gift card.

3.6 Data Treatment and Analysis

The accelerometer data was downloaded using the ActiLife 5.74 software (Actigraph LLC), and treated and processed using the Kinesoft software (version 2.0.94, Kinesoft Software, New Brunswick, Canada). A workspace was where the epoch length, the time of the start of data collection, the non-wear time, and the wear-time criteria were created specifically for this study's data. The workspace was set up (using Kinesoft software) on the computer for the data to be processed. The following settings were applied to meet the requirements of the study. Under settings, an epoch of 60 seconds was selected, and data was to start being collected on day one at 3:00am, until day eight. To be consistent with previous research, the program was selected to exclude any consecutive zeroes of 90 minutes or more, with a two-minute interruption allowed, and replace that time frame with "z," which represent sleep or non-wear time (Choi et al., 2011). For a valid day, criteria was set to meet 600 minutes, on at least four days, one of which had to be a weekend day. The Freedson et al. (1998) cutpoints were selected to depict which intensity level the accelerometer counts were in. The time periods when each participant was at work was selected to separate their working hours from their non-working comparison hours. The time the participants spent actually at work was termed their 'working hours'; the equivalent time frame on a non-work day was termed their 'non-working comparison hours' (henceforth refereed to as work and non-work). Participant's physical activity levels were averaged across work and non-work.

Accelerometer data was uploaded into the workspace created in the Kinesoft software. Before the data could be processed, it was inspected for problem files, such as when the accelerometer was worn passed midnight, worn when sleeping, or not worn long enough to be considered a valid day. Once the data was processed, it was exported into an excel document, to

be sorted and analyzed. Invalid days, where accelerometer wear-time was less than 600 minutes per day, were removed from the analysis. Activity minutes were added to the previous day for those participants who stayed up past midnight. Activity minutes were added to participant's days when the accelerometer was removed for participation in water activities or for showering. The Ainsworth et al. (2000) compendium was developed to provide researchers with an activity classification system that standardizes the intensities of different physical activities. Using participant's motion sensor activity logs, daily activity logs, and accelerometer data, researchers could note times when the motion sensor was removed for certain activities and add minutes for the activities based on the compendium. Using the compendium of physical activities, showering is coded as 2.0 METs (light activity), and water aerobics is coded as 4.0 METs (moderate activity). Based on these codes, the researchers added light activity minutes for showering and MVPA minutes for water activities. See Appendix G, Table A1 for the minutes of activity added to each participant.

All statistical analysis of accelerometer data was performed using SPSS® 20 for Windows (SPSS Inc., 2010). The first research question determined the physical activity levels of adults with ID, and was analysed by computing descriptive statistics on the accelerometer data. The means and standard deviations for minutes spent in each activity intensity zone per day were calculated. Independent sample t-tests were computed to compare differences between males and females for time spent in each activity zone.

Participant's daily minutes spent in each activity intensity zone were divided by the total minutes they wore the accelerometer to calculate the proportion of time spent in each zone. The means and standard deviations for proportion of time spent in each activity intensity zone per day were calculated. Independent sample t-tests were computed to compare the time proportions

per zone between males and females. Individual participants mean proportion of time spent in each activity intensity zone were also reported.

To determine if a participant's physical activity levels met the Canadian physical activity guidelines of 150 minutes of MVPA per week (Canadian Society for Exercise Physiology, 2013), the daily MVPA minutes were summed to get the total weekly MVPA minutes. Day one of each participant's eight-day data collection was removed to get a complete seven-day week.

The second research question determined the contribution of work to overall physical activity, and was analysed by computing descriptive statistics on the accelerometer data. The means and standard deviations for the proportion of time spent in each activity intensity zone during work and non-work were determined. Independent sample t-tests were computed to compare the proportions of time spent in each activity intensity zone during work versus non-work and effect sizes were calculated to examine magnitude of the effect. Cohen's d (Cohen, 1988) was calculated using the following formula ($M2 - M1 / \text{pooled } SD$). Cohen's commonly used benchmarks were used to interpret the size of the effect: small effect, $d = 0.2$; medium effect size, $d = 0.5$; and a large effect, $d = 0.8$. Individual participants mean proportion of time spent in each activity intensity zone during work and non-work were also calculated.

Each of the participant's rates of MVPA during work was compared to non-work. The rate of MVPA was determined for work by taking the accumulated MVPA minutes during work and dividing them by the total minutes of work. The rate of MVPA was determined for non-work by taking the accumulated MVPA minutes during the non-work and dividing them by the total minutes of non-work. For this analysis, minutes on invalid days were used as well. See Appendix H, Table A2 for the MVPA minutes for each participant.

CHAPTER 4

RESULTS

4.1 Research Question 1: Physical Activity Patterns of Adults with ID

Table 3 displays the means and standard deviations (SD) of daily sedentary, light, and MVPA minutes for all participants and by sex. Independent t-tests revealed that males spent significantly more minutes in MVPA per day; there were no differences in sedentary behaviour or light-intensity physical activity.

Table 3
Average Daily Minutes in each Activity Intensity Zone for All Participants and by Sex

Intensity	All ($n=6$)		Males ($n=3$)		Females ($n=3$)		p^*
	Mean \pm SD (min)		Mean \pm SD		Mean \pm SD		
Sedentary	458.14	\pm 63.92	490.3	\pm 76.93	425.98	\pm 34.53	.130
Light	328.59	\pm 81.07	257.94	\pm 4.39	399.23	\pm 37.92	.058
MVPA	53.92	\pm 47.49	84.24	\pm 53.53	23.61	\pm 3.96	.044

Note: * comparison between males and females.

Participant's physical activity intensity levels were also analyzed as a proportion of time. The average proportion of time participants spent in sedentary, light, and MVPA per day was determined. The means and SD of their proportion of time in sedentary, light, and MVPA per day was $54.31 \pm 7.33\%$, $39.11 \pm 8.80\%$, and $6.59 \pm 5.65\%$, respectively.

Figure 1 displays the proportion of time spent in sedentary, light, and MVPA for males and females daily. Independent t-tests revealed that males spent a significantly higher proportion of time in MVPA compared to females ($p = .045$). There were no significant differences in proportion of time in sedentary activity ($p = .392$), or in light-intensity activity ($p = .095$).

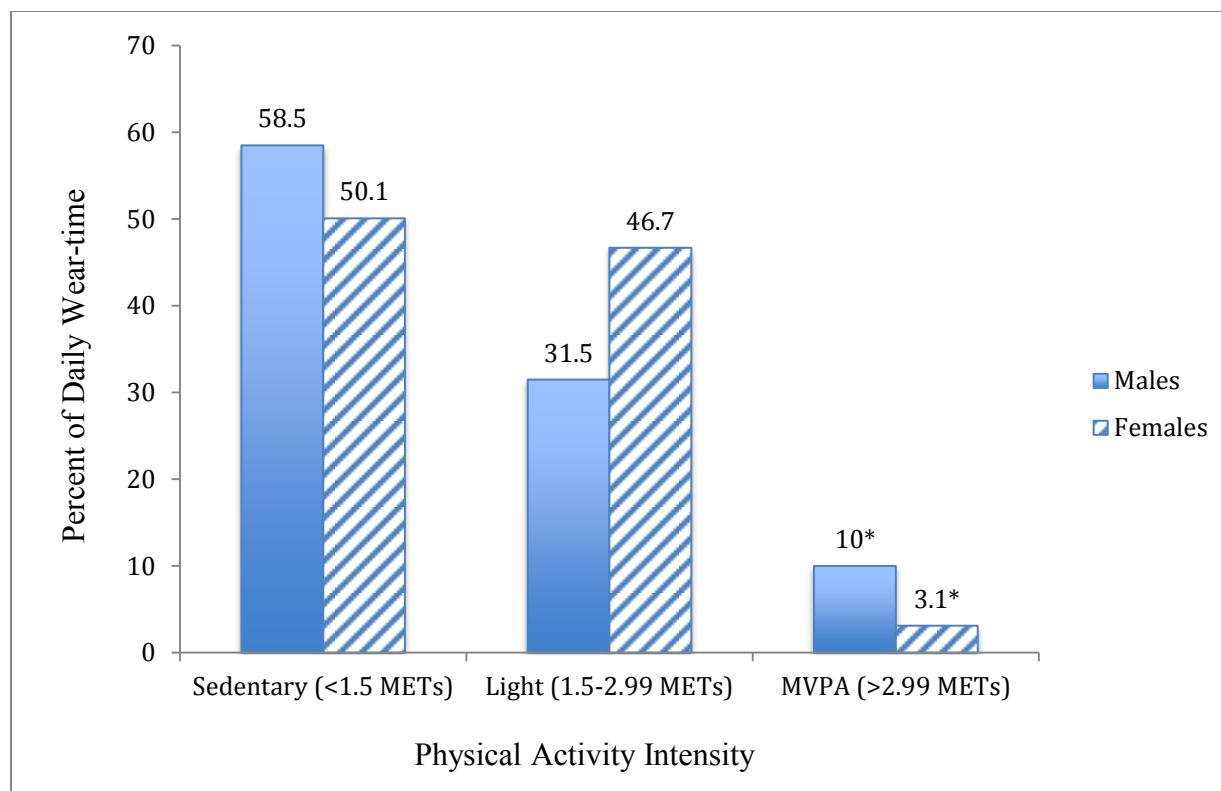


Figure 1. Average Proportion of Time Spent in Each Activity Intensity Zone by Sex

Note: * represents significance difference at $p < 0.05$.

Figure 2 displays the average proportion of time spent in sedentary, light, and MVPA for each participant per day. The six participants average proportion of time spent in sedentary behaviour ranged from 45.59 to 63.68%. Their average proportion of time spent in light activity ranged from 30.48 to 50.38%, and their average proportion of time spent in MVPA ranged from 2.32 to 17.47%.

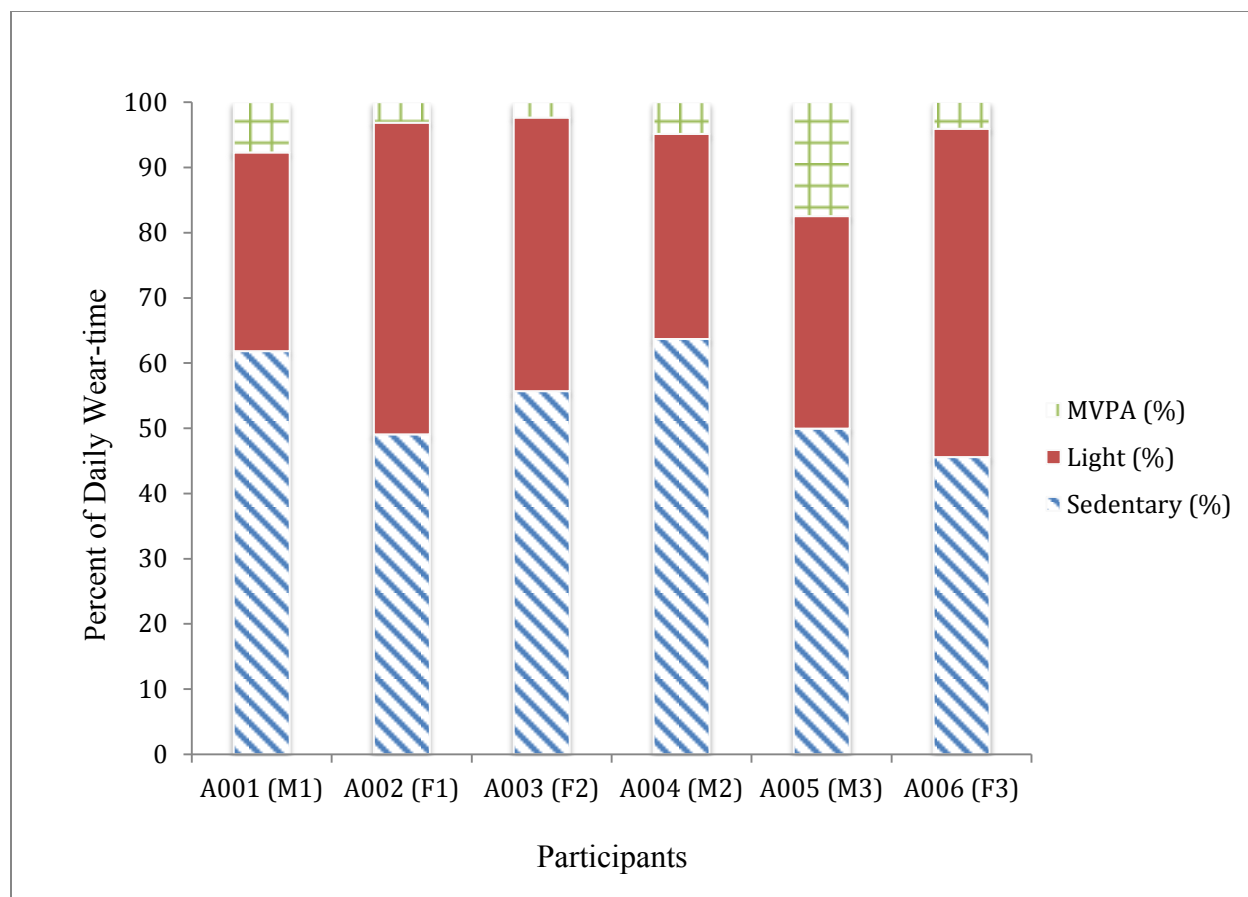


Figure 2. Average Proportion of Time Spent in Each Activity Intensity Zone per Participant

4.2 Research Question 1b: Canadian Physical Activity Guidelines

Table 4 displays each participant's total daily MVPA minutes for seven of the eight days of data collection (D2-D8), as well as the total MVPA minutes for the one week of data collection. Five out of six participants met the Canadian physical activity guidelines of 150 minutes of MVPA a week. When the total MVPA minutes for the one-week of data collection were averaged for males and for females; male participants averaged 542.67 minutes of MVPA, and females averaged 200.33 minutes.

Table 4
Total Daily and Weekly MVPA Minutes for Each Participant

	D2	D3	D4	D5	D6	D7	D8	Total
A001	37	48	43	43	61	49	132 ω	413
A002	7	25 ω	72 ω	5	20	5	57 ω	191
A003	28 \times	11	14	19	12 \times	18	34 ω	136
A004	61 ω	11	53	1	36	66 ω	57 ω	285
A005	69	96	117 ω	125 ω	119 ω	101 ω	303 ω	930
A006	17	49	27	56	18	88	19 ω	274

Note: ω refers to workdays and \times refers to non-valid days

4.3 Research Question 2: Contribution of Work to Overall Physical Activity?

The participants' workweek varied from one to five days, with work shifts ranging in length from two to six hours per day. Employment included food service workers, a flier deliverer, a general labourer, and a merchandiser. Three of the six participants worked in cafeterias and had food service jobs, mainly consisting of bussing tables and loading dishwashers. All of the participant's job tasks were physical in nature, and required standing the majority of their work shift, with a considerable amount of walking. For a more detailed description of the participant's jobs see Appendix I, Table A3. Table 5 provides an overview of each participant's job tasks and proportion of MVPA obtained from work. The three job tasks listed in Table 5 were derived from the Job Coach's Questionnaire as well as from observation done by the researchers in the workplace.

Table 5
Description of Participants Job Tasks and MVPA Obtained from Work

	Sex	Job Tasks	Work Hours/Week	Average Daily Wear-time (min)	Total MVPA (min)	Total Work MVPA (min)	Proportion of MVPA from Work (%)
A001	M	Walking, squatting, and climbing stairs	2.0	873	544	200	36.8
A002	F	Wiping tables, restocking cutlery, and organizing food items	7.5	855	215	15	7.0
A003	F	Wiping tables, lifting trays onto a food cart, and pushing cart around cafeteria	3.5	680	156	5	3.2
A004	M	Clearing and wiping tables, picking up garbage, and washing dishes	15.0	795	333	35	10.5
A005	M	Assembling bike parts, organizing supplies, and mopping floors	22.5	814	1152	542	47.0
A006	F	Pricing and organizing merchandising and facing shelves	4.0	870	288	6	2.1

Table 6 displays the means and SDs for the proportion of time spent in sedentary, light, and MVPA during work and non-work for all participants and by sex. Work represents the hours when participants were actually working, and non-work was the equivalent proportion of time on non-work days.

Table 6
Average Proportion of Time Spent in each Activity Intensity Zone at Work and Non-work for All Participants, Males and Females

	All (n=6)			Males (n=3)			Females (n=3)		
	Mean ± SD		Sig. (p)	Mean ± SD		Sig. (p)	Mean ± SD		Sig. (p)
	Work	Non-work		Work	Non-work		Work	Non-work	
Sedentary (%)	19.88 ±8.78	54.66 ±14.21	.319	16.37 ±6.98	65.18 ±10.95	.480	23.39 ±10.35	44.13 ±7.27	.580
Light (%)	61.70 ±25.60	37.17 ±18.59	.543	48.23 ±31.70	22.22 ±9.78	.236	75.17 ±9.46	52.12 ±9.92	.838
MVPA (%)	19.80 ±32.43	6.92 ±6.35	.061	37.12 ±41.53	11.31 ±6.33	.061	2.48 ±2.19	2.52 ±1.66	.480

As shown in Table 6, the proportion of time spent in sedentary, light, and MVPA during work and non-work for all participants, for males, and for females revealed no significant differences at any intensity. The effect sizes (Cohen, 1988) for all participants' work versus non-work were medium to large (sedentary, $d = 2.9$; light activity, $d = 1.1$; and MVPA, $d = 0.6$). For male participants, the effect sizes were all large (sedentary, $d = 5.3$; light activity, $d = 1.1$; and MVPA, $d = 0.9$) and for female participants, the effect sizes were small and large (sedentary, $d = 2.3$; light activity, $d = 2.4$; and MVPA, $d = 0.02$).

A comparison on males and females showed that males spent a significantly higher proportion of work in MVPA ($p = .044$). There were no significant differences found in the proportion of sedentary activity ($p = .517$) or light activity ($p = .230$) during work. There were also no significant differences found in the proportion of sedentary activity ($p = .536$), light activity ($p = .892$), or MVPA ($p = .188$) during non-work. For further details on the means and SD for males and females work and non-work at each intensity level see Appendix J, Table A4.

Table 7

Average Proportion of Time in Sedentary, Light, and MVPA During Work and Non-work

	Sedentary (%)		Light (%)		MVPA (%)	
	Work	Non-work	Work	Non-work	Work	Non-work
A001	8.75	55.28	15.83	32.92	83.33	11.82
A002	14.16	40.83	83.33	58.83	5.00	0.67
A003	21.43	52.46	77.38	40.72	1.18	3.00
A004	17.92	63.33	79.17	20.00	2.92	4.75
A005	22.45	76.94	49.68	13.75	25.10	17.37
A006	34.58	39.10	64.80	56.80	1.25	3.88

Table 7 displays each participant's average proportion of time spent in sedentary, light, and MVPA during work and non-work. All six participants spent less time in sedentary activity during work compared to non-work. Five participants spent more time in light activity during

work compared to non-work (and the sixth participant, A001, had less light activity because the majority of his work shift was spent in MVPA). Three participants spent more time in MVPA during work compared to non-work.

Table 8
Rate of MVPA per Minute during Work and Non-work

	Work	Non-work
A001	0.833	0.051
A002	0.025	0.032
A003	0.012	0.030
A004	0.029	0.058
A005	0.251	0.140
A006	0.013	0.023

Table 8 compares each participant's rate of MVPA during work compared to non-work. This analysis included wear-time minutes on invalid days as well (for participants A003 and A004). Two of the six participants had a higher rate of MVPA per minute during work compared to non-work.

CHAPTER 5

DISCUSSION and CONCLUSION

5.1 Introduction

The study examined participant's overall physical activity levels, determined if participants met the Canadian physical activity guidelines, and how much work contributed to their overall daily physical activity. This chapter discusses the two research questions on the physical activity levels of adults with ID, based on the six participants.

5.2 Research Question 1

The first research question examined the physical activity levels of adults with ID. Specifically, the minutes of physical activity per day and proportion of time spent in sedentary, light-intensity, and MVPA per day. On average, participants spent the majority of their time in sedentary behaviour (458.1 minutes/day; 54.3%), then light activity (328.6 minutes/day; 39.1%), and the least of their time in MVPA (53.9 minutes/day; 6.6%). This concurs with research by Temple and Walkley (2003), who found that adults with ID spent the majority of their time in sedentary behaviours, and similar to results of Hamilton and Owen (2012), who found that in the general population a large amount of the waking hours are spent in sedentary behaviour or in low-intense physical activity.

The study found that males participated in significantly more MVPA per day compared to females. Figure 2 clearly shows that the physical activity levels are very dependent on the individual. There was considerable variability in the proportion of time spent in each activity intensity zone, the majority in light and MVPA. This is consistent with earlier findings illustrating those physical activity levels of community-dwelling adults with ID range from sedentary to highly active (Temple et al., 2000; Temple, 2007; Temple & Walkley, 2003). The

Temple et al. (2000) study also showed little time was spent doing moderate manual work, and there was high variability among how much participants engaged in light manual work. Hamilton and Owen (2012) found the time spent in sedentary or low-intensity physical activity is influenced by many factors, and also noted a high variability between individuals and from day to day. Day to day variability in physical activity was also evident in this study. Table 4 shows there were days when a participant accrued only a few minutes of MVPA, yet within that week, the same participant would accrue more than an hour of MVPA on another day (e.g. participants A002 and A004).

Although the proportion of MVPA was proportionally quite low, as a group, the participants spent five hours per day in light-intensity physical activity. This light or low-intensity physical activity may be important in its own right. According to Hamilton and Owen (2012), physical inactivity has been identified as a significant and independent risk factor for many causes of mortality regardless of MVPA levels, and the small amount of MVPA recommended for health is not enough to significantly displace the health risk of sedentary time. These authors also suggest that the low-intensity physical activity accumulated throughout the day, including household chores, cooking meals, or other activities of daily living act to decrease the daily amount of sedentary time and thus assist in decreasing this health risk factor. Levine and colleagues looked at how non-exercise activity thermogenesis (NEAT), which “is the energy expenditure of all physical activities other than volitional sporting-like exercise” is related to obesity (Levine, Vander Weg, Hill, & Klesges, 2006, p. 729). NEAT is expended every day and can be represented by those independent activities such as going to work or dancing (Levine et al., 2006). These authors found that an increase in sedentary time is associated with obesity, as obese participants spent 164 minutes more per day seated than lean participants. Levels of NEAT

varies between individuals by up to 2000 kcals per day (Levine et al., 2006), which shows lower levels of physical activity can accumulate and play a significant role in caloric expenditure which in turn can impact body weight and health.

The second part of research question one (1b) asked if participants met the Canadian physical activity guidelines, which state "to achieve health benefits, adults aged 18-64 years should accumulate at least 150 minutes of moderate to vigorous intensity aerobic physical activity per week" (Canadian Society for Exercise Physiology, 2013). Analyses found that five of the six participants met these guidelines (Table 4). The sixth participant (A003), who was female, was only 14 minutes away from meeting the guidelines as well. She also had three invalid days in the data collection. On these invalid days, when the accelerometer was worn for less than 600 minutes, some MVPA minutes could have been missed, hindering apparently meeting the guidelines. These results contradict literature that found only 14-32% of adults with ID meeting the guidelines (Hilgenkamp et al., 2012; Peterson et al., 2008; Stanish & Draheim, 2005a; 2005b; Temple et al., 2000; Temple & Walkley, 2003). As shown in Table 4, two of the male participants (A001 and A005) significantly exceeded the recommended guidelines, obtaining over 30 minutes of MVPA on each day of data collection. A001 achieved over three times the recommended weekly minutes (413 minutes), and A005 achieved over six times (930 minutes). Three of the participants who met the guidelines (A002, A004, A006) had multiple days (at least two) with low MVPA minutes (less than 20 minutes). And for two of those participants (A002 and A003) it was the days that they had work that allowed them to achieve the Canadian physical activity guidelines. All of the participants in this study were supported in their employment through Garth Homer Society. The literature shows that individuals with higher intellectual functioning have fewer adverse health conditions (Janicki et al., 2002) and are

more physically active than the population of adults with ID as a whole (Stanish & Frey, 2008; Temple, 2010). The participants in this study all worked on at least one day a week and were able to provide their own consent, therefore it is likely that they had fewer cognitive and physical challenges than many individuals with ID. It is also likely that they were more physically active than the population of adults with ID as a whole. This could explain why the study found a high proportion of participants meeting the population physical activity guidelines.

Although both males and females met the guidelines, there were differences seen between men and women MVPA levels, with males spending significantly more time in MVPA than females (Table 3 and Figure 1). Males obtained a weekly average of 542.67 minutes of MVPA, compared to a weekly average of 200.33 minutes for females. Comparing the physical activity levels of males and females can help point to possible explanations on health differences. Stanish and Draheim (2005b) found women had significantly higher BMI values compared to men ($p = .002$), and Bhaumik et al. (2008) found obesity to be almost twice as prevalent in women (29%) than in men (15%). The higher prevalence of obesity in females has yet to be explained; however, the lower physical activity levels shown in this study's female participants could contribute to their higher obesity levels. In this study, the male participants average BMI was 19.7 (normal weight) and female participants average BMI was 30.2 (obese). A higher percent of this study's female participants were obese compared to the male participants (66% for the females as opposed to 0% of the males).

5.3 Research Question 2

The second research question focus was to determine the contribution of participant's work to their overall daily physical activity. As shown in Table 5, five out of the six participants

worked part-time with fixed hours, which is consistent with other research that has shown the majority of adults with ID had part-time work and fixed hours (Fillary & Pernice, 2006).

Participants in the Jahoda et al. (2009) study had limited working hours, with most working less than five hours per week. The Fillary and Pernice (2006) study had eight supported workers with an ID, six of which worked part-time, with hours ranging from 6 to 24 hours per week. This study was consistent with this literature, as the participants averaged 9 hours per week, with half of the participants working less than five hours per week. Also shown in Table 5, all of the six participants had manual job tasks, which supports research by Hall et al. (2005) that suggests adults with ID are usually employed in manual job tasks. All participants' jobs required them to be standing for the duration of the work shift, and most included walking as a repetitive task. This supports research concluding that work for adults with ID often involves a considerable amount of walking (Stanish & Draheim, 2005a, 2005b). However, the participant's jobs varied in how physically demanding they were, as the rate of MVPA during their work ranged from 0.01 to 0.83 (Table 8). Those in food services (A002, A003, and A004) spent the majority of their work in light activity, walking and/or standing while doing light manual tasks. While another participant, doing flyer deliveries spent 83% of his work shift in MVPA (Table 7).

The differences in some of the male's job tasks increased the amount of MVPA obtained at work, and therefore increased MVPA during the day and for the week. This could help explain the significantly higher levels of MVPA for men compared to women. On average male participants had higher rates of MVPA during work (Table 8) and accrued a higher proportion of their MVPA from work (Table 5), compared to females. This suggests that males had more physical jobs, which may be typical of the types of jobs that males have. If females aren't getting

enough MVPA from work to meet the physical activity guidelines, then they should be looking to accumulate minutes of MVPA in other activity in their lives.

Overall participants obtained 17.8% of their MVPA from work, males on average obtained 31.4%, and females obtained 4.1% from work. Temple et al. (2000) found two out of six participants (both male) accumulated several hours (over 50%) of their moderate-intense physical activity through work. On average, this study's male participants worked more hours per week compared to females, 13.2 hours compared to 5.0 hours per week for females. However, even though one male participant (A001) worked only two hours per week, he obtained 36.8% of his weekly MVPA from those two hours. A001 had a flyer delivery job, which required a steady walking pace for over two continuous hours, with the majority of it spent in MVPA. Another male participant (A005) had a job as a general labourer, mopping floors and moving heavy equipment, which made up 47.0% of his weekly MVPA. As shown in Table 5, he also worked more hours per week than the other participants, therefore increasing the contribution of work to his weekly MVPA. The female participants (A002, A003, and A006) worked in food services and retail, and their jobs required them standing and/or walking continuously, and the majority of their physical activity was at a light-intensity, as shown in Table 6 and Table 7. Participant A006 had a job as a merchandiser, stacking and facing shelves and pricing items in the store. Little walking was required, as most tasks were done while standing. A006 only worked four hours a week (Table 5), and obtained only 2.1% of her MVPA from her job. Participant A006 may not be getting much MVPA from her job, however, there is a decrease in her sedentary behaviour and a slight increase in her light activity during work compared to non-work (Table 7), which has been shown to be important in decreasing obesity (Levine et al., 2006). Participant A002 walked around the cafeteria carrying a bucket of water,

which may have accumulated MVPA at times, as 5% of her work was spent in MVPA (Table 7). Participant A003 pushed a trolley around, but as shown in Table 7 only 1% of her work was spent in MVPA, while the majority (77%) was in light activity. Even with six participants there was high variability within the employment positions and job task, with some jobs clearly having a higher potential to increase physical activity levels.

Some participant's weekly logs were less detailed, and didn't include any other activities other than work on those days. For one participant, on some days the only activity listed was school. Other participant's weekly logs were very detailed, and included activities such as walking their dog in the morning, transportation to work, work tasks, dinner, dishes, relaxation time, etc. Evidence from a detailed weekly log showed that outside of work lots of errands were done, such as bussing to take back bottles, going to appointments, and dog walking. Two participants (both females) worked only one day a week, but were both involved in many other activities other than work. Activities included the gym, fitness classes, Special Olympics, and a teen group called Victoria Opportunities for Community Youth Leadership (VOCYL), which showed that work was not their only form of physical activity throughout their week. These activities were similar to those found in the literature as enjoyable activities for adults with ID, including dance, walking, bowling, gym, and fitness classes (Temple, 2007).

The study compared the proportion of time spent in sedentary, light, and MVPA during work versus non-work. The results showed no significant differences between work and non-work at any intensity for all participants combined, for males, or for females. There were, however, medium to large effect sizes (Cohen, 1988) for all participants work versus non-work (sedentary, $d = 2.9$; light activity, $d = 1.1$; and MVPA, $d = 0.6$). Participants spent 20% of their work in sedentary behaviour, compared to 55% of their non-work, 62% of their work in light

activity, compared to 37% of their non-work, and 20% of their work in MVPA, compared to 7% of their non-work (Table 6). More specific analysis revealed that this effect was stronger for men than women. For the male participants the effect sizes were: sedentary $d = 5.3$; light activity $d = 1.1$; and MVPA, $d = 0.9$; and for the female participant the effect sizes were: sedentary, $d = 2.3$; light activity, $d = 2.4$; and MVPA, $d = 0.02$. As shown in Table 6, the differences in proportion of time spent in MVPA during work and non-work approached significance ($p = .061$) for all participants combined and for males. The results didn't show an increase in MVPA for females as it did for males, which suggest the female participant's jobs tasks were less physical in nature. These results showed that work decreased sedentary behaviour and increased light activity, suggesting that being employed had a tangible impact on physical activity behaviours, particularly for men. These results also illustrate that the study was underpowered, and suggests that future recruitment of participants may produce significant differences between work and non-work physical activity behaviours. Being employed was a direct source of light or MVPA for participants, but it also required that they got up, got dressed, and travelled to work, all of which contributes to physical activity levels'.

When comparing the work of males and females, results showed that males spent a significantly higher proportion in MVPA during work than females. On average, 37.1% of male's work comprised of MVPA, compared to only 2.5% for females (Table 6). This showed that males had more physically demanding jobs tasks, which required them to spend more time in MVPA than females did. While some of the job tasks for males reached the moderate-vigorous intensity, most job tasks remained in the light intensity for females. However, even the light-intense activities may provide health benefits as Levine and colleagues showed that walking at even a slow pace increases energy expenditure, and walking 1.6 kilometers per hour

instead of sitting can double one's energy expenditure, allowing a 70 kg person to expend an additional 100 kcal (Levine et al., 2006, p. 735). Hamilton et al. (2008) showed that there was a strong inverse relationship between light-intense physical activity and sedentary time, suggesting promoting light activity may be feasible to improve the harmful effects of sedentary behaviour. This shows that even if work can encourage light-intense physical activity, then we may see health benefits, as it decreases the amount of sedentary behaviour.

Results showed that for some participants work had a major contribution to their overall physical activity. As shown in Table 7, the proportion of time spent in MVPA for participant A001 was nearly seven times more during work compared to non-work. For participant A002, the proportion of time spent in MVPA was more than seven times more during work compared to non-work. For other participants, work had no effect on increasing their MVPA; three out of the six participants spent a lower proportion of their time in MVPA during work compared to non-work. Light activity was higher during work compared to non-work for five of the six participants, and for all of the participants their sedentary behaviour decreased during work compared to non-work. This shows that work is benefiting the participants by increasing either their MVPA or light-intensity levels, and by decreasing their sedentary behaviour. This supports research that shows work among adults with ID relates to health (Fernhall, 1993).

The rate of MVPA during work versus non-work was also compared, and similar trends were found. There was variability among the participants, while two of the participant (both males) had higher rates of MVPA during work compared to non-work, while the other four had lower (see Table 8). A participant could have a very physically demanding job, which requires a high rate of MVPA, but if they only work a couple hours per week, their job won't contribute meaningfully to their overall MVPA. Therefore, the job type, as well as the number of hours

worked affects physical activity levels, and potential health benefits. An example of this was participant A001, as he had the highest rate of MVPA during work, but only worked two hours a week; therefore, his work had a smaller contribution to his overall physical activity level. If he could increase his work to two or three days per week, work could have more of a contribution to his overall physical activity. Levine and colleagues showed that the major factor predicting variability in people's energy expenditure not related to exercise is occupation (Levine et al., 2006).

5.4 Conclusions

The physical activity levels of the six participants were highly variable. Despite the variations in participant's jobs, work tasks, and physical activity levels, five of the six participants appear to have met the Canadian physical activity guidelines of 150 minutes of MVPA a week. Results suggest that work has the potential to contribute to physical activity levels among adults with ID; however, it is mostly in the light activity zone. Study results provide a better understanding of the physical activity levels adults with ID can obtain from work, and results imply that work has the potential for some individuals to increase the amount of light and/or MVPA, as well as decrease the amount of sedentary behaviour they obtain throughout the day.

The study had a number of strengths, including using a valid and reliable measurement tool, the GT3X accelerometers. For this population of adults with ID in particular, the accelerometers would have captured the majority of their physical activity, as they did a significant amount of standing and walking activities. Other benefits of using the accelerometer were that they place a very low burden on the participants and can be used on participants with language or literacy barriers (Tudor-Locke & Myers, 2001). The accelerometers were user-

friendly, as they only required to be buckled onto their waist, and once put on in the morning required very little attention throughout the day. Therefore, accelerometry was appropriate for this study as some participants in the study had difficulties communicating and/or remembering instructions. Other strengths included the affordability and flexibility of the data collection. The participants were staggered in the data collection, so the accelerometers were returned and reused on the next participant as the consents were received. The participants were able to wear the accelerometers nearly everywhere they went (excluding water), enabling them to obtain the majority of the participant's physical activity. These strengths allowed for the measurement of physical activity during all of the participant employment environments. Accelerometers weren't in the way or irritating for the participants during work. Another strength to the studies data collection was that job coach questionnaires were used, as well as observations took place in the workplace to help describe the participant's job tasks. Also, the study's participants had a variety of employment, and therefore a range of job tasks were evaluated and compared.

The results of this study should be interpreted with caution, as there were a number of limitations. First of all, the study used convenience sampling, and may not be a representative sample of the working population of adults with ID. All participants were recruited through the Garth Homer Society, a supportive employment organization in Victoria, B.C., and although the clients are employed in a variety of workplaces, all participants were limited to living in Victoria B.C. The study's data collection took place over the winter, and only those employed during January to April were able to participate. This season could have potentially affected the types of employment positions, with less participants with outdoor or weather dependent jobs being employed (such as gardening and paper delivering). Two participants consented but were not able to participant in the study due to their employment ending before data was collected. All job

coaches received the consent material and forwarded them on to their clients. The University of Victoria research team did not know who or how many individuals received consent forms for the study; this prevented the researchers from obtaining a response rate, and being able to follow up with those who received consent forms, and promoting participants. Another limitation to the study was the small sample size. With only six participants, the results could be biased, as the low number of observations increases the chances that these individuals had either extremely high or extremely low physically demanding jobs, not typical of the population, and therefore skewing the results. If one participant's results were significantly higher or lower than the mean, it can have a drastic effect on the group means, skewing the results. There was high variability within the participants, which explains the low statistical differences found in the results. Another limitation is that the accelerometers are limited in their ability to record all the upper and lower body movement and as they were worn only on the hip to record lower body movement, they did not measure the upper limb activity. Accelerometers are also limited in their ability to detect stationary activities accurately, or the additional energy expenditure of upper body movements, such as weight lifting or load carrying (Masse et al., 2005; Colley et al., 2011; Temple et al., 2000), or walking up inclines (Temple et al., 2000; Colley et al., 2011), which may result in underestimating overall physical activity (Colley et al., 2011). An additional limitation of the accelerometers includes that they cannot be worn while swimming (Temple et al., 2000). Compliance to wearing the accelerometers could have been a potential limitation to the study; however, only one participant chose not to wear the accelerometer in the evenings after working hours. The majority of participants were compliant and consistent with their wear-time of the accelerometers. Another limitation to the study is that travel/commuting time was not accounted for. All participants did not document when they left for work, or what mode of transportation

they used. Therefore the physical activity obtained through commuting to work was not known. There was a limitation in the comparison of work versus non-work, as one of the participants (A005) worked a typical workweek (Monday to Friday), leaving his only non-work days the weekends.

5.5 Future Research Directions

With the studies limitations, there are recommendations for the future research in this field. To increase the sample size and the generalizability of the results to the population as a whole, recruiting should be through multiple organizations and centres. If the researchers held information sessions, about the purpose of the study, for the job coaches and potential participants, the response rate may increase. Having two sets of data collection times would be beneficial to account for summer time jobs as well, such as gardening and paper routes outdoors. Providing them with an example of a weekly log would also help them understand what is expected of them. Also having a larger and more detailed weekly log, with more space to record daily activities may be beneficial for keeping track of their daily activities. A larger weekly log would also provide room for transportation modes, as it would be useful to look at physical activity levels during participant commute to work. Literature states that transportation is associated with physical activity (Stanish & Frey, 2008), and therefore it should be taken into consideration when measure physical activity levels.

5.6 Implications for Employment Services for Adults with ID

This study has important implications for employment services, such as the Garth Homer Society. This study provides evidence that work may be a source of physical activity for adults with ID, but not necessarily sufficient MVPA to meet guidelines, as most work tasks were in the

light intensity zone. Therefore clients in employment services should be made aware of guidelines and encouraged to meet these guidelines through multiple sources, such as recreation, work and household chores. Also, obviously some jobs were very physically demanding, therefore it is important to ensure that clients are physically fit enough for the work. Job coaches should be aware of the physical demands of the jobs, to make sure that clients are placed in appropriate jobs that they are able to handle physically. If the job is comprised of primarily sedentary behaviour, then the job coach should be encouraging physical activity elsewhere for their client. Also, the number of hours of work per week was quite limited for many, so increasing clients hours could help accumulate more physical activity, and more MVPA to meet guidelines. Given that when comparing work versus non-work, all participants had higher levels of sedentary behaviour during non-work; more work shifts would be beneficial from a health behaviour perspective.

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Appendix A Ethics Approval



University
of Victoria

Human Research Ethics Board
Office of Research Services
Administrative Services Building
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Victoria British Columbia V8W 2Y2 Canada
Tel 250-472-4545, Fax 250-721-8960
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Modification of an Approved Protocol

PRINCIPAL INVESTIGATOR	Vivienne Temple	ETHICS PROTOCOL NUMBER	12-429
UVic STATUS:	Faculty	ORIGINAL APPROVAL DATE:	23-Nov-12
UVic DEPARTMENT:	EPHE	MODIFIED ON:	06-Dec-12
		APPROVAL EXPIRY DATE:	22-Nov-13
PROJECT TITLE: The contribution of work to overall levels of physical activity			
RESEARCH TEAM MEMBERS: Co-investigators: Dr. Lynne Stuart-Hill (UVic), Dr. Marc Klimstra; Research Assistants: Kayla Rawlings, Sara Sheridan			
DECLARED PROJECT FUNDING: None			
CONDITIONS OF APPROVAL			
This Certificate of Approval is valid for the above term provided there is no change in the protocol.			
Modifications To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.			
Renewals Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.			
Project Closures When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a "Notice of Project Completion" form.			
Certification			
This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.			
			
Dr. Rachael Scarth Associate Vice-President, Research			

Certificate Issued On: 06-Dec-12

12-429 Temple, Vivienne

Appendix B Letters of Invitation to Participants

November, 2012

The contribution of work to overall levels of physical activity project

Dear [participant or caregiver],

This letter invites [you/name] to participate in a study of the physical demands of work and the contribution of work to overall physical activity levels.

This information will show how important work is as a source of physical activity and it may help organizations like the Garth Homer Society prepare individuals physically for the workplace and potentially enhance work safety. The project will require about 2 hours of [your/name's] time during one week.

If [you/name] are interested please provide read and sign the attached consent form.

If you require further information about this opportunity, you can contact Vivienne Temple at the University of Victoria Mary Ann Snowden at the Garth Homer Society

Thank you for your consideration of this request.

Vivienne Temple PhD
Professor
School of Exercise Science, Physical and Health Education

Appendix C Participant's Consent Form



The contribution of work to overall levels of physical activity

You are invited to participate in a study entitled *The contribution of work to overall levels of physical activity* that is being conducted by Dr Vivienne Temple, Dr Lynne Stuart-Hill and Dr Marc Klimstra.

Vivienne, Lynne and Marc work at the University of Victoria in the School of Exercise Science, Physical and Health Education and you may contact Vivienne if you have further questions by telephone (250) 721-7846 or by emailing vtemple@uvic.ca.

Purpose and Objectives

The aim of this study is to examine the contribution of work to overall physical activity levels and to describe the physical demands of work.

Importance of this Research

Work has been identified as a motivating factor for physical activity as well as a place where physical activity occurs. However, the physical demands of work and how active people with intellectual disability are at work has not been established. This information will show how important work is as a source of physical activity and it may help organizations like the Garth Homer Society prepare individuals physically for the workplace and potentially enhance work safety.

What is Involved?

If you agree to be in this project, you will be asked to do the following:

1. Wear something called an activity monitor that tells the researchers how much you move. It is small, about the size of a watch. You will put it on in the morning and take it off when you go to sleep at night, but you will not wear it when you take a bath, shower or when you go swimming. You will wear the monitor for seven days.
2. Have three of your main work tasks videotaped. For example, if someone stacked shelves, we would videotape 2 – 3 minutes of them stacking the shelves.
3. Wear a heart rate monitor on a band around your chest on one day when you were going to work.
4. Before and after work on one day
 - a. Do two arm actions and two leg actions wearing a small device that will measure how much your muscles are working.
 - b. Spit into a cup. Your saliva will show how stressed you are.
 - c. Have your height and weight measured before you leave for work.
5. Allow our research assistants (Kayla and Sara) to watch you on one day at work. You also need to allow your job coach to tell your boss at work that you are in a study so that Kayla and Sara can come and watch you work.



Inconvenience

Participation in this study may cause some inconvenience to you because the study will make use of about 3 hours of your time. You will be asked to meet the researchers and practice doing the activities.

You will need to put the activity monitor on every morning and take it off at night. You will also be observed at work for one hour.

Risks

None of the things you will be asked to do will hurt you but it is possible that you may get stressed because we are asking you to do new things and because Kayla and Sara will watch you at work. You will get to practice with the heart rate, muscle, and activity monitors and doing the arm and leg actions before you start the study. You can ask as many questions as you want. The heart rate monitor is worn on an elastic strap around your chest and touching your skin. You may need assistance to put the heart rate monitor on, which might cause you to feel embarrassed. Kayla or Sara can help you put it on and take it off, and they will do this in a private place. We will also measure your height and weight in privately at home.

Benefits to You

- You will learn how active you are and whether you are participating in enough physical activity to benefit your health, and
- You will receive a movie pass when you return the activity monitor

Voluntary Participation

Participating in this study is your choice; you don't have to participate if you don't want to. You can stop at any time with no consequences. If you decide to stop being in the project, you can decide whether the information we have already collected can be used or whether you want it destroyed. If you decide we can use the data we'll write that in a letter and get you to sign it. If you quit the study but give the activity monitor back to the researcher you will still get a movie pass.

Anonymity and Confidentiality

Vivienne, Lynneth, Marc and their research assistants will not tell anyone you are in the study; however people at your work may know that you are in the study because they will see the research assistants working with you. No one will get to see the information from your video, monitors, or forms except Vivienne, Lynneth, Marc and their research assistants and they will not use your name on anything. Your information will be kept safe in a locked filing cabinet and on a password protected computer for a long time in case the researchers want to look at it again. In five years Vivienne will destroy the information.

Dissemination of Results

After we have collected the information from many different participants, we will share what we learned about how active people are at work. We will also share the information with you. We will talk about it at meetings so other people learn about our project. We will write about it in professional magazines. However, your name will not be used, so no one will know you were in the study.

In addition, you may check the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your signature below indicates that you understand the above conditions of participation in this study, that you have had the opportunity to have your questions answered by the researchers, and that you consent to participate in this research project.

Name of Participant

Participant [Guardian] Signature

Date

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Appendix D Motion Sensor Activity Log



**University
of Victoria**

School of Exercise Science,
Physical & Health Education



Note to Participants/Care Providers

You have been fitted with an accelerometer (motion sensor) to be worn for one week for “**The contribution of work to overall levels of physical activity**” project that you opted into.

The accelerometer is a pedometer like device that measures physical activity. The accelerometer is activated by motion and it will provide us with an idea of your activity patterns on workdays compared to non-workdays during the week. The motion sensor is safe and has been used in research around the world.

For the following 7 days, we would request you to wear the device for at least 10 hours each day, ideally from when you wake up to when you go to bed.

Attached to this letter is an activity log and wear instructions.

Thank you for consenting to this study. Should you have any questions please contact either Kayla Rawlings or Sara Sheridan.

Thank you for your participation in this project

Vivienne A. Temple PhD

Motion sensor activity log

Name: _____

Directions to participants/care providers

1. The accelerometer motion sensor should be worn underneath clothing or over top of lightweight clothing.
2. For accuracy of measurement, the device needs to be snugly fitted to the hip.
3. The motion sensor is to be worn from wake up to bed time, and should be removed only for events such as swimming and bathing as the device is not waterproof.
4. On the reverse side of this page is an activity log. Please record when the belt is fitted in the morning and the time the belt is removed. Should the belt be removed prior to bedtime, please provide a short description of the reasons for its removal.
5. The motion sensor is very expensive and we request that on the day that the motion sensor will be returned you wear it until a researcher collects it.

Thank you for your participation

Day of the week _____

Date _____

Time on: _____ Time off: _____

Did the weather change your usual work activities? YES / NO

If yes please provide a short description of how?

Did any other circumstances change your usual work activities? YES / NO

If yes please provide a short description of how:

Was the motion sensor removed prior to bedtime? YES / NO

If yes please provide a short description of reason for removal

If yes please provide the on and off times of the motion sensor

Off _____ : _____

On _____ : _____

Monitor # _____ - Initials: _____

Appendix F Participant's Job Coach Questionnaires

Job Coach Questionnaire for UVic Work Physical Activity Study

ID of client: A001Employer of client: Costa VerdeOfficial job title of client: Flier DeliveryHow long has the client held this particular job for? 4 months

Is there a job description available for this position: YES

 NO

Please describe what the client does at work: _____
A001 decides his own route to complete within a map
decided by the employer. He delivers a flier to each house
along that route.

What are the three most common tasks the client is required to do at work?

- 1) Decide his own route
- 2) Complete route - delivering a flier to each house
- 3) Monitor level of stock and report back to owner.

What is the most repetitive task the client is required to do at work?

walking

Which task(s) appears to be the most physically demanding of the client?

walking

Which task(s) appears to be the most cognitively demanding of the client?

Deciding his own route

Does this job require bending over and picking things up off the ground? What or how heavy and how often?

His backpack - to retrieve mail fliers

Does this job require lifting things above the head? What or how heavy and how often?

No

Does this job require any twisting or turning movements? YES (NO)

While holding weight? What or how heavy and how often?

Is walking required as part of this job? How far? While holding weight?

Yes - to+from route, along route for 2 hours.
Carries a back pack of water bottle + files.

Is standing stationary and doing manual tasks (like breadng chickens or washing dishes) for long periods of time required by this job? Approximately for how long?

No.

Is there anything that the client has told you that is demanding regarding this job?

Walking.

On the timetable below, please indicate when and for how long the client works.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				12-2 (changes)		

Is there anything you would like to tell us about the client regarding this job?

ACOL has muscle twitches - he identified this
may affect the EMG.

Once completed please email back to Sara at sarsheridan@gmail.com or Kayla at rawling@uvic.ca Thank you.

Job Coach Questionnaire for UVic Work Physical Activity Study

ID of client: A002Employer of client: UVic - Food ServicesOfficial job title of client: Food services workerHow long has the client held this particular job for? 1 year 3 months

Is there a job description available for this position: YES NO

Please describe what the client does at work: A002 wipes tables in Village Greens + Caps, take trays away, fill cutlery, stocking milk in the fridge.

What are the three most common tasks the client is required to do at work?

- 1) wiping tables
- 2) stocking milk
- 3) sweeping

What is the most repetitive task the client is required to do at work?

wiping tables and clearing them

Which task(s) appears to be the most physically demanding of the client?

wiping tables

Which task(s) appears to be the most cognitively demanding of the client?

checking the milk fridge and stocking it.

Does this job require bending over and picking things up off the ground? What or how heavy and how often?

yes. Bending to pick up milk crates off of the ground. Mary also picks up garbage on the ground.

Does this job require lifting things above the head? What or how heavy and how often?

no.

Does this job require any twisting or turning movements? YES NO

While holding weight? What or how heavy and how often?

yes, when stocking milk fridge. 1/2 litre milk cartons per shift. Once to get large milk crate.

Is walking required as part of this job? How far? While holding weight?

yes. 2km/per shift? yes, while holding water bucket (5lbs)

Is standing stationary and doing manual tasks (like breading chickens or washing dishes) for long periods of time required by this job? Approximately for how long?

no.

Is there anything that the client has told you that is demanding regarding this job?

Some what.

On the timetable below, please indicate when and for how long the client works.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		12:00- 2:30pm		12:00- 2:30	12:00- 2:30	

Is there anything you would like to tell us about the client regarding this job?

napp.

Once completed please email back to Sara at sarsheridan@gmail.com or Kayla at rawling@uvic.ca Thank you.

Job Coach Questionnaire for UVic Work Physical Activity Study

ID of client: A003Employer of client: UVic Food Services - Centre CaféOfficial job title of client: Food Services WorkerHow long has the client held this particular job for? 6 yearsIs there a job description available for this position: YES NO

Please describe what the client does at work: A003 fills up a bucket of water and wipes tables in the centre café, remove trays from tables and places them on the karts. Pushes full karts into dish washing area.

What are the three most common tasks the client is required to do at work?

- 1) wiping tables
- 2) removing trays/garbage from table
- 3) pushing karts to dish room.

What is the most repetitive task the client is required to do at work?

pushing the karts and ~~the~~ wiping tables

Which task(s) appears to be the most physically demanding of the client?

pushing karts

Which task(s) appears to be the most cognitively demanding of the client?

pushing karts

Does this job require bending over and picking things up off the ground? What or how heavy and how often?

once in a while A003 picks up garbage off the floor. Usually light garbage i.e. wrapper, juice box.

Does this job require lifting things above the head? What or how heavy and how often?

No.

Does this job require any twisting or turning movements? YES NO

While holding weight? What or how heavy and how often?

Sometimes with bucket of water

Is walking required as part of this job? How far? While holding weight?

yes, just in and around cafe. A003 holds a cloth and a tray with dishes.

Is standing stationary and doing manual tasks (like breadng chickens or washing dishes) for long periods of time required by this job? Approximately for how long?

no

Is there anything that the client has told you that is demanding regarding this job?

yes, pushing large karts in loud, busy environment.

On the timetable below, please indicate when and for how long the client works.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	9:00 - 12:30					

Is there anything you would like to tell us about the client regarding this job?

A003 is a joy to be around! She might need reassurance that she will not be hurt during the study and it is all confidential.

Once completed please email back to Sara at sarsheridan@gmail.com or Kayla at rawling@uvic.ca Thank you.

Job Coach Questionnaire for UVic Work Physical Activity Study

ID of client: A004Employer of client: store manager of Westshore Tim Horton'sOfficial job title of client: Dishwasher / BusserHow long has the client held this particular job for? one year *has worked at Tim Horton's (other location) for 9 years*

Is there a job description available for this position: YES

NOPlease describe what the client does at work: clears garbage and dishes from tables; wipes down tables; washes dishes; ensuring the restaurant appears generally clean and tidy.

What are the three most common tasks the client is required to do at work?

- 1) clear garbage and dishes from tables
- 2) wipe down tables
- 3) wash dishes

What is the most repetitive task the client is required to do at work?

washing dishes

Which task(s) appears to be the most physically demanding of the client?

frequently walking around restaurant to check for and clear away any garbage or dirty dishes.

Which task(s) appears to be the most cognitively demanding of the client?

Remembering to check tables when the restaurant gets busy and there are lots of dishes to wash as well.

Does this job require bending over and picking things up off the ground? What or how heavy and how often?

Yes - if there is any garbage on the ground, A004 is responsible for picking it up and disposing of it. He would likely pick several wrappers/papers up/per shift.

Does this job require lifting things above the head? What or how heavy and how often?

If A004 needed to put some dishes away, he may need to lift them above his head to get them on the correct shelf.

Does this job require any twisting or turning movements? YES NO

While holding weight? What or how heavy and how often?

General twisting/moving necessary to do dishes, pick them up and put them away.

Is walking required as part of this job? How far? While holding weight?

Walking is required to pick up garbage and dishes from tables and bring them to the kitchen.

Is standing stationary and doing manual tasks (like breadng chickens or washing dishes) for long periods of time required by this job? Approximately for how long?

Yes - doing dishes. Time spent doing this would depend on the day/frequency of customers but may be about 2 hours.

Is there anything that the client has told you that is demanding regarding this job?

Staying on his feet for 5 hours/shift and walking around restaurant frequently to clear tables when it gets busy.

On the timetable below, please indicate when and for how long the client works.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			11 a.m. - 4 p.m.	11 a.m. - 4 p.m.	11 a.m. - 4 p.m.	*usually every 2 nd Saturday 11-4 *

Is there anything you would like to tell us about the client regarding this job?

A004 is a hard worker and does well with routine. He needs advance warning and clear explanations if something is going to disrupt this routine.

Once completed please email back to Sara at sarsheridan@gmail.com or Kayla at rawling@uvic.ca Thank you.

Job Coach Questionnaire for UVic Work Physical Activity Study

ID of client: A005Employer of client: manager at Straightline Pro.Official job title of client: General labour/helperHow long has the client held this particular job for? 2 1/2 years

Is there a job description available for this position: YES

NO

Please describe what the client does at work:

general cleaning tasks and working on bikes.

What are the three most common tasks the client is required to do at work?

- 1) clean the shop
- 2) help w bike part assembly.
- 3) organize supplies

What is the most repetitive task the client is required to do at work?

cleaning and general maintenance of the shop

Which task(s) appears to be the most physically demanding of the client?

same as above.

Which task(s) appears to be the most cognitively demanding of the client?

helping w bikes.

Does this job require bending over and picking things up off the ground? What or how heavy and how often?

Yes - periodically pick up parts to move/clean them.

Does this job require lifting things above the head? What or how heavy and how often?

No.

Does this job require any twisting or turning movements? YES NO

While holding weight? What or how heavy and how often?

General twisting/moving to clean and maintain shop.

Is walking required as part of this job? How far? While holding weight?

Yes - walking around the shop to put things in their place.

Is standing stationary and doing manual tasks (like breadng chickens or washing dishes) for long periods of time required by this job? Approximately for how long?

Perhaps during assembly periods.

Is there anything that the client has told you that is demanding regarding this job?

Lots of moving around.

On the timetable below, please indicate when and for how long the client works.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	9:30 am 2:00 p.m.		9:30 a.m. 2:00 p.m.			9:30 a.m. 2:00 p.m. (on and as needed basis)

Is there anything you would like to tell us about the client regarding this job?

AC05 is incredibly independent in his job so I have not seen him working before. Sorry I couldn't provide more detailed answers!

Once completed please email back to Sara at sarsheridan@gmail.com or Kayla at rawling@uvic.ca Thank you.

Job Coach Questionnaire for UVic Work Physical Activity Study

ID of client: A006Employer of client: Great Canadian Dollar StoreOfficial job title of client: merchandizerHow long has the client held this particular job for? ~one monthIs there a job description available for this position: YES NO Please describe what the client does at work: price merchandise, put merchandise out, organize displays, face shelves, take out garbage & recycling, do other tasks as assigned

What are the three most common tasks the client is required to do at work?

- 1) price merchandise
- 2) put merchandise out
- 3) face shelves.

What is the most repetitive task the client is required to do at work?

facing shelves

Which task(s) appears to be the most physically demanding of the client?

carrying boxes when putting out merchandise.

Which task(s) appears to be the most cognitively demanding of the client?

changing prices on the price gun.

Does this job require bending over and picking things up off the ground? What or how heavy and how often?

yes - picking up boxes of merchandise

Does this job require lifting things above the head? What or how heavy and how often?

no.

Does this job require any twisting or turning movements? YES NO

While holding weight? What or how heavy and how often?

Just standard twisting/turning to price merchandise and put it away.

Is walking required as part of this job? How far? While holding weight?

Yes - taking recycling & garbage out and putting merchandise away.

Is standing stationary and doing manual tasks (like breadng chickens or washing dishes) for long periods of time required by this job? Approximately for how long?

Pricing - usually 1 hour max.

Is there anything that the client has told you that is demanding regarding this job?

staying focused during repetitive tasks

On the timetable below, please indicate when and for how long the client works.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						10 a.m. - 2 p.m.

Is there anything you would like to tell us about the client regarding this job?

AOCU enjoys being in the spot light so observers will need to try to stay as "in the shadows" as possible to ensure AOCU stays on task at work.

Once completed please email back to Sara at sarsheridan@gmail.com or Kayla at rawling@uvic.ca Thank you.

Appendix G Participant's Added Activity Minutes

Table A1
Participant's Activity Minutes Added

	D1		D2		D3		D4		D5		D6		D7	
	Sed mins	Light mins	Sed mins	Light mins	Sed mins	Light mins	Sed mins	Light mins	Sed mins	Light mins	Sed mins	Light mins	Sed mins	Light mins
A001	0	0	0	+14	0	+10	0	0	0	0	0	+29	0	+17
A002	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A004	0	0	0	+15	+113	+13	-113	-13	+6	+7	-6	-7	0	+15
								+16				+15		
A005	0	0	0	0	0	+15	0	0	0	+15	0	0	0	+15
A006	0	0	0	0	0	0	0	0	0	+52	0	0	0	+69

For participant A001, 14 minutes of light activity to day 2, 10 minutes to day 3, 29 minutes to day 6, and 17 minutes to day 7 for showering. For participant A004, 15 minutes of light activity were added to day 2 for showering, 113 minutes of sedentary activity and 13 minutes of light activity were subtracted from day 4 and added to day 3 from staying up past midnight on Day 4. 16 minutes of light were also added to day 4 for showering. Again 7 minutes of light and 6 minutes of sedentary were subtracted from day 6 and added to day 5 for staying up past midnight on day 6. Finally, 15 minutes of light activity were added to both day 7 and day 8 for showering. For participant A005, 15 minutes of light activity were added to day 3, 5 and 7 for showering. Participant A006 participated in water activities on day 5 and day 7; 52 minutes of light and MVPA were added to day 5 for aquafit, and 69 minutes of light and MVPA for swimming on day 7.

Appendix H Participant's Minutes of MVPA

Table A2

Participants Minutes of MVPA

	Total Weekly Wear-time (mins)	Total MVPA (mins)	Total Weekly Work (mins)	Total Work MVPA (mins)	Total Weekly Non-work (mins)	Total Non- work MVPA (mins)
A001	6985	544	240	200	6745	344
A002	6837	215	600	15	6237	200
A003	5441	156	420	5	5021	151
A004	6358	333	1200	35	5158	298
A005	6515	1152	2160	542	4355	610
A006	6957	288	480	6	6477	192

Appendix I Description of Participant's Jobs

Table A3
Participant's job description

	Employer	Job Title	Length of employment	Ave length of shift/days per week	Job description	Common work tasks.
A001	Costa Verde	Flier Delivery	4 months	2 hours/1 day	Delivers fliers to houses	Walking and squatting to put flier into mail slot
A002	UVic Food Services	Food Services Worker	1 year, 3 months	2.5 hours/3 days	Cleans tables and restocks food supplies in the school cafeteria	Wipes tables, restocks cutlery, and organizes food stock
A003	UVic Food Services	Food Services Worker	6 years	3.5 hours/1 day	Cleans tables, clears trays from tables onto a food cart	Wipes tables, lifts trays onto food cart, and pushes cart around cafeteria and into the dish washing area
A004	Westshore Tim Horton's	Dishwasher/Busser	9 years	5 hours/3-4 days	Cleaning, wiping tables, and washing dishes	Clears and wipes down tables, picks up garbage and washes dishes
A005	Straightline Pro.	General Laborer	2.5 years	4.5 hours/3 days	Cleaning and working on bikes	Bike part assembly, organizing supplies, and cleaning
A006	Great Canadian Dollar Store	Merchandiser	1 month	4 hours/1 day	General merchandiser of the store	Prices and puts out merchandise and faces shelves

Appendix J Males and Females Physical Activity during Work and Non-work

Table A4 displays males and females proportion of time spent in sedentary, light, and MVPA during work and non-work.

Table A4
Proportion of Time Spent in Each Activity Intensity Zone during Work and Non-work by

		Males (<i>n</i> =3)		Females (<i>n</i> =3)		Sig. (<i>p</i>)
		Mean ± SD		Mean ± SD		
Sedentary (%)	Work	16.37 ±	6.98	23.39 ±	10.35	.517
	Non-work	65.18 ±	10.95	44.13 ±	7.27	.536
Light (%)	Work	48.23 ±	31.70	75.17 ±	9.46	.230
	Non-work	22.22 ±	9.77	52.12 ±	9.92	.892
MVPA (%)	Work	37.12 ±	41.53*	2.48 ±	2.19*	.044*
	Non-work	11.31 ±	6.33	2.52 ±	1.66	.188

sex

T-tests compared males and females average proportion of time spent in each activity intensity zone, and found a significant difference between the proportion of time spent in MVPA during work versus non-work. Males on average spent a significantly higher proportion of their time at work in MVPA ($p = .04$).