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Exploring the Occupational Physical Activity Levels in young Adult Restaurant Servers.

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Abstract

Physical activity (PA) decreases in late adolescence and young adulthood when this age cohort enters the workforce with many being employed in the foodservice industry. Daily energy expenditure can be divided between occupational physical activity (OPA) and leisure-time physical activity (LTPA). Although LTPA is known to be associated with positive health benefits, a limited number of studies have investigated the influence of OPA on LTPA in young restaurant servers. This study measured via accelerometry, OPA and LTPA for a 7-day period from a sample of young adult servers (n = 7, 23-29 years old) from two restaurants. Resting metabolic rate was measured via indirect calorimetry and inputted into the AMP 331 accelerometer for energy expenditure calculations. Energy expenditure patterns were compared to age- and sex-specific normative data, occupational classifications, and the Canadian PA Guidelines to Healthy Active Living (CPAG). Energy expenditure results and step count values were higher for working versus non-working days and working versus non-working periods. Daily, working energy expenditure was approximately equal to normative data, while non-working daily energy expenditure was lower. The working period energy expenditure placed this population in the 'exceptionally active' OPA classification. Minimum PA levels, based on CPAG were met each day, however 10,000-steps-per-day were only achieved on working days. None of the participants logged LTPA and therefore 100% of their PA came from OPA. More research is needed over a longer duration and at different times in the year to identify the effect OPA has on LTPA in this population.

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Introduction

Physical activity (PA) has a considerable focus with respect to health benefits in the literature [1, 2]. Several epidemiological studies highlight the age-related decline of PA [3-5], with the greatest declines often occurring in late adolescence and young adulthood [6]. During this transition period many young people enter the workforce for the first time and their daily energy expenditure becomes a combination of leisure time physical activity (LTPA) and occupational physical activity (OPA). LTPA is known to be associated with positive health benefits [1, 2], however the role of OPA is less clear [7]. Not surprising is that those with low fitness levels are most at risk for negative changes to their health when entering the workforce and this is well documented in men [8-10].

The decline in PA can be attributed to the changing patterns of OPA, which are influenced by time and scheduling restraints from other commitments outside of employment [11] and the fact that health habits are likely still developing in this age group. Despite the importance of OPA during late adolescence and young adulthood, there is an absence of studies that have focussed on this role and the potential influence of different occupations on total daily energy expenditure during this transitional period [12].

Currently, there are over one million employees in the food and beverage industry (https://www.restaurantscanada.org/about-us/), with wait staff or servers accounting for the largest percentage, at nearly 20%. The industry is also the largest employer for young adults in Canada providing one in five jobs [13]. This employment presents an opportunity to observe whether young people involved in OPA meet daily PA recommendations.

Over the past decade translations of PA guidelines have emerged, and these changes encompass total daily activity recommendations. The newest Canadian Physical Activity guidelines (http://csep.ca/CMFiles/Guidelines/CSEP_PAGuidelines_0-65plus_en.pdf) recommend that those aged 18-64 years old accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity (MVPA) per week, in bouts of 10 minutes or more. The older guidelines [14] include metabolic equivalents (i.e., a single MET value is the energy cost that is equal to the amount of oxygen consumption required at rest) for each intensity category [12, 15]. The CPAG recommended that all Canadians accumulate 60 minutes of light intensity PA and (males = 1.6-3.9 METS; females = 1.2-2.7 METS), 30-60 minutes of moderate intensity PA (males = 4.0-5.9 METS; females = 2.8-4.3 METS), or 20-30 minutes of vigorous intensity PA (males = 6.0+ METS; females = 4.4+ METS) most, but preferably all days of the week [3, 16]. Other approaches that have become popular from a health promotion strategy include counting steps per day, which are measured with wearable devices, such as pedometers and accelerometers. We recognize that reaching 10,000 steps/day has been a goal perpetuated by the lay press and that there is limited information on how many daily steps are needed for health [17]. According to the Centers for Disease Control and Prevention in the USA, walking about 7,000 to 8,000 steps per day will meet the CPAG [18]. In terms of walking pace, 100 steps per minute is equal to a moderate intensity level [19], which maybe similar to a serving shift at a very busy restaurant.

Occupational indexes of PA classify restaurant service as an 'exceptionally active' or 'vigorous' occupation [12, 15, 20]. The origins of these classifications are based on the subjective experience (self-report questionnaire) of workload [20], or the MET; estimated energy cost of the workload [12, 15]. MET descriptions range from two METs, to describe 'exceptionally active' occupations [15], to seven-plus METs, to describe 'vigorous' occupations [12]. In 2011 the Compendium of Physical Activities [21], was updated from the 1993 and 2000 versions with additional occupational descriptions that were both estimated and had MET values supported from the published literature (downloaded from https://sites.google.com/site/compendiumofphysicalactivities/Activity-Categories/occupation). No category included food serving, however there was a column devoted to walking on the job below 2.5 mph and carrying light objects less than 25 pounds with an assigned MET value of 3.5. This is likely the closest occupational category to food serving as it is similar to the walking pace of a server who would be carrying and removing plates and trays from a table in a timely manner.

Purpose

The study purpose was to describe the contribution of OPA and LTPA from accelerometry and self-reported daily PA from a sample of young adult restaurant servers. The research aims were to: objectively identify patterns of energy expenditure using a measured value of resting metabolic rate (RMR) in this population and compare these to healthy PA recommendations and patterns of age- and sex-specific normative data as they relate to occupational classifications.

Methods

Convenience sampling was employed to recruit healthy servers (N=10; Male 80%) ranging in age from 18-30 years. Field recruitment occurred via personal communication with management from two full-service restaurants and, following managerial consent, communication with restaurant service staff occurred. Participant selection was based on the degree of positive response and exclusion criteria which included pregnancy (n=1) and smoking, (n=2), as these factors significantly influence RMR [22]. Written informed consent was obtained from each participant (n = 7, 85% M).

Measurement Tools

We selected a device (accelerometer) based on the following criteria: 1) allowed input of participant's RMR, had low power consumption, and not wrist based because the servers felt it would interfere with carrying dishes and plates. The AMP 331 [23] triaxial accelerometer met the above criteria and it had been validated for walking [24] in both the lab [25] and field setting with a young adult population [26]. The AMP 331 was also reported to estimate energy expenditure better than other wearable sensors at the time of this data collection (comparing with the reference energy expenditure from indirect calorimetry) during walking [27]. Each participant was fitted with the AMP 331 which was worn on the back of the ankle and the number of steps, distance, stride length and speed were determined by tracking the path of the lower limb and foot through space based on Dynastream patented SpeedMax Technology [23, 28].

Resting Metabolic Rate Determination

Each participant's RMR was measured to ensure that the conversion of METs to kilocalories was not under or over-estimated, as this occurs when using standard conversion factors [29]. This measurement was completed via indirect calorimetry using a Parvomedics TrueMax 2400 metabolic cart with a ventilated hood system in the Human Performance Laboratory, at the University of Calgary in Alberta. Participants fasted for 12 hours and refrained from exercise for 48 hours prior to the assessment. Respiratory exchanges measures were collected for 30 minutes, with mean averages every five minutes for oxygen consumption (VO_2), carbon dioxide production (VCO_2) and respiratory exchange ratio (RER) was calculated. The Weir formula was used to convert the VO_2 and VCO_2 values to ml/min [30].

Data Collection

The RMR value and the participant's biometrics (age, height, weight and sex) were inputted into the AMP 311 prior to data collection. Participants were provided with a detailed booklet that included specific directions on the accelerometer use and were instructed to wear the AMP 311 from morning wake up to evening bedtime for seven consecutive days. The data was uploaded and analyzed via AMP Ware Minute Software designed to compute: 1) resting energy expenditure, 2) MET values according to activity class and walking speed, and 3) time in each class/speed [31]. Participants also maintained a two-column daily journal of: 1) working and non-working hours (day off or at college) and 2) volume (slow, average, busy, or very busy) to assist with delineating energy expenditure associated with OPA and LTPA.

Analysis

The data was analyzed based on calculated means (SD; ±) for the men and by individual as there was a single, woman participant. The accelerometer data for working and non-working days was used to determine if energy expenditure differences existed between days and then analyzed for hourly energy expenditure to determine if differences remained consistent. Daily and hourly energy expenditure values for working and non-working periods were compared to age- and sex-specific normative values [32]. Hourly working energy expenditure values were converted to METs (based on the conversion factor of 1 kcal/kg/hour = 1 MET) to assess working intensity [33] and compared to OPA classifications [12, 15, 20]. The classifications for comparison were the 'exceptionally active' class (2.0-2.1 METs), and the 'vigorous' class, (7-plus METs). Hourly MET values were also compared to healthy PA recommendations from CPAG [14]. Daily step counts were obtained for both working and non-working days and working and non-working periods and compared to the health promotion strategy of 10,000-steps-per-day [18].

Results

Energy Expenditure

The mean age and resting energy expenditure of the participants was 27 ± 2.16 yrs. (range 23-29) and 1297.3 ± 283.5 kcal (range 941-1787) respectively, and all PA came from OPA, as none of the participants self-reported any LTPA.

There were substantial differences between working and non-working daily energy expenditure (men 3100, 2500 kcal/day; woman 2350, 1850 kcal/day respectively). The men on average expended approximately 26% or 598 kcals more on working days than non-working days and the woman expended approximately 25% or 457 kcals more on working days than non-working days.

When comparing hourly working energy expenditures to hourly non-working energy expenditures (both working and non-working days), the differences were greater still. Hourly working energy expenditures for the men, on average, were approximately 84% or 82 kcals higher than hourly non-working energy expenditures (Figure 1), and the woman was approximately 79% or 61 kcals higher (Figure 2).

Daily energy expenditure during working days in the participants were slightly higher than the daily energy expenditures of their age- and sex-specific cohorts. Men on average, were approximately 1% or 38 kcals higher than normative data and the woman was approximately 5% or 101 kcals higher than normative data. Daily energy expenditures values during non-working days in the participants were noticeably lower than that for the age- and sex-specific cohorts. Men, on average, were approximately 19% or 559 kcals lower in daily energy expenditures than normative data and the woman was approximately 16% or 356 kcals lower in daily energy expenditures than normative data.

When comparing hourly working energy expenditures to hourly non-working energy expenditures (both working and non-working days), the differences were considerably greater. Hourly working energy expenditures for the men, on average, was approximately 48% or 58 kcals higher than hourly energy expenditures in their age- and sex-specific cohorts and the woman was approximately 50% or 46 kcals higher. However, non-working hourly energy expenditures was approximately 20% or 24 kcals lower than hourly energy expenditures in their age- and sex-specific cohorts for men, on average and approximately 16% or 15 kcals lower for the woman participant.

During periods of working, men, on average, maintained a level of approximately 2.4 METs, and the woman maintained a level of approximately 2.3 METs. These results placed these restaurant servers in the 'exceptionally active' occupation category (2.0-2.1 METs); however, they did not achieve the 'vigorous' standards (7+ METs) [12, 15, 20].

According to CPAG [14], participants met the minimal requirements by accumulating at least 60 consecutive minutes of light intensity activity each day (men ≥ 1.6 METs; woman ≥ 1.2 METs). Maximal activity intensities for men ranged from a minimum of 1.6 METs to a maximum of 3.2 METs. Maximal activity intensities for the woman ranged from a minimum of 1.9 METs, to a maximum of 2.7 METs. It should be noted, however, that mean hourly MET values were noticeably lower during non-working periods, with men, on average, expending approximately 1.4 METs, and the woman expending approximately 1.2 METs. Participants did not perform moderate or vigorous intensity PA on either working or non-working days.

The servers exceeded 10,000-steps-per-day on working days (M 18,682; W 19,753) (Figure 3) and fell below this on non-working days (M 6138; W 6403). During work hours the men, accumulated approximately 73% of their total daily step count, exceeding the 10,000 steps per day by approximately 36% (steps =

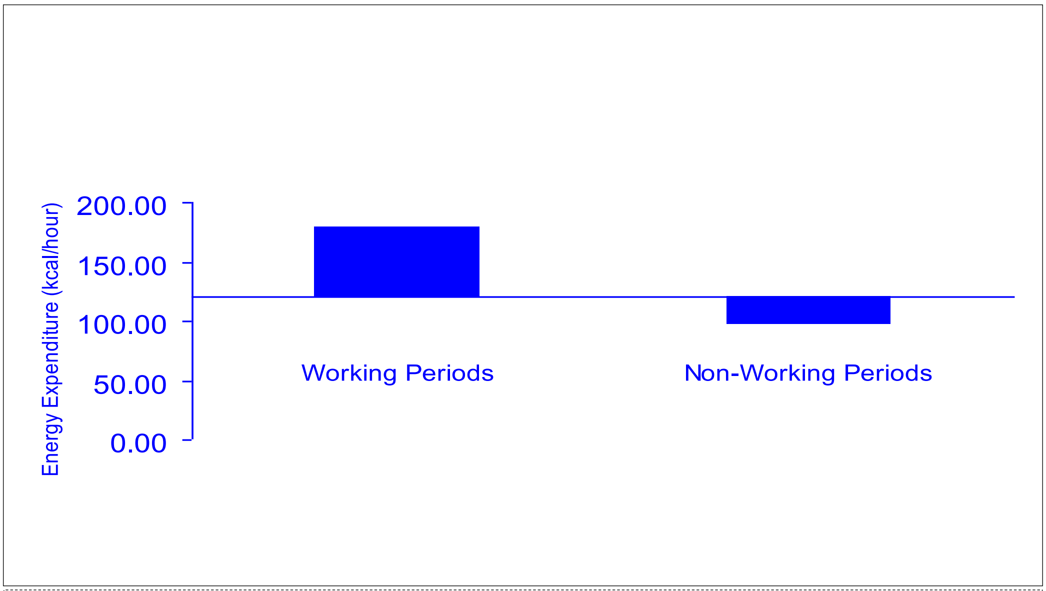

Figure 1. Mean hourly energy expenditure for male young adult restaurant servers relative to age- and sex-specific cohort as represented by horizontal axis: working and non-working periods.

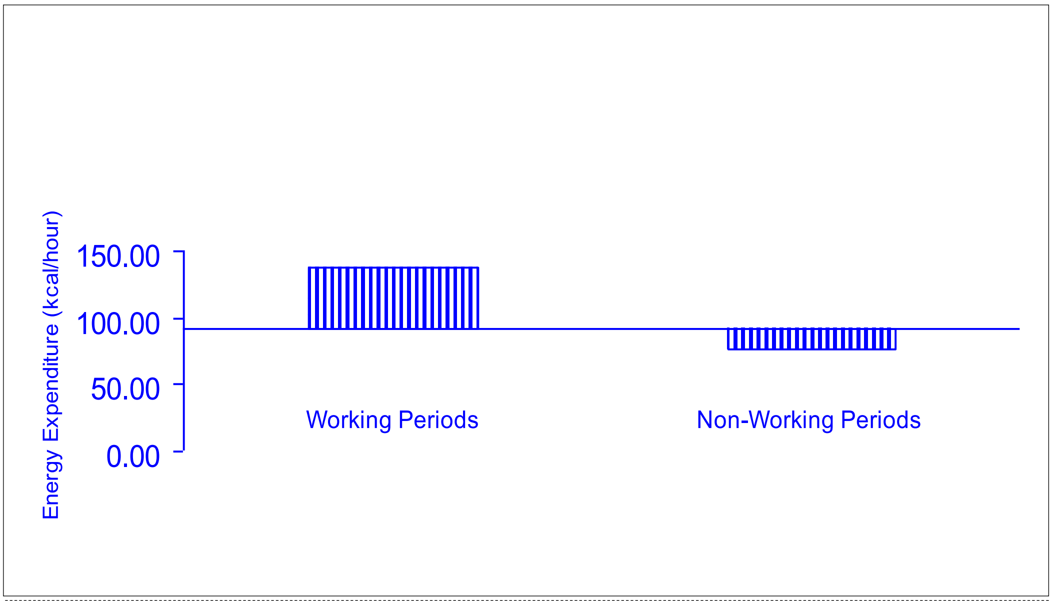

Figure 2. Hourly energy expenditure for female young adult restaurant server relative to age- and sex-specific cohort as represented by horizontal axis: working and non-working periods.

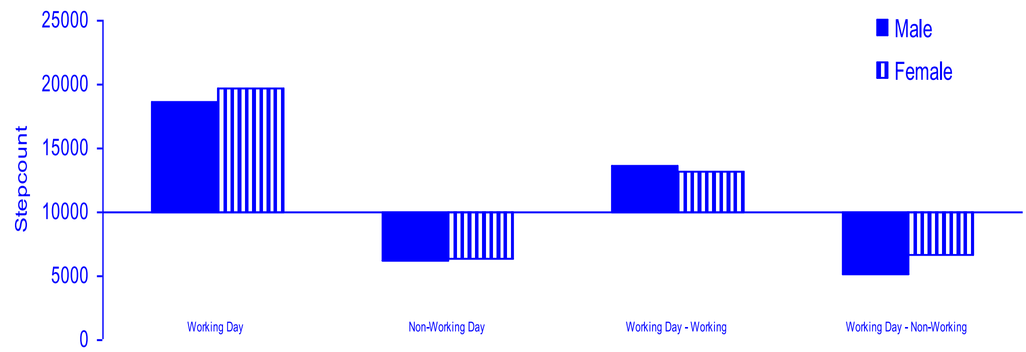

Figure 3. Step counts for male (n=6 mean) and female (n=1) young adult restaurant servers, relative to 10,000-steps-per-day (horizontal axis): working and non-working days and working and non-working periods of working days.

13,589), and the woman accumulated approximately 67% of their total daily step count, exceeding the goal by approximately 31% (steps = 13,141). When not working the participants accumulated a much smaller percentage of their overall daily step count (M = 27%; W = 33%).

Discussion

In this study young adult restaurant severs' PA over one week was comprised totally of OPA. This finding emphasizes the importance of addressing OPA as an essential component in PA assessment, particularly in this occupation. However, it also introduces the need for identification of other potential sources of energy expenditure in this population (e.g., commuting to and from work or college) so as to provide a more comprehensive analysis [34]. Further analysis of PA patterns showed that energy expenditure in this group was substantially higher on working versus non-working days, and hourly energy expenditure was considerably higher for working versus non-working periods. Additionally, daily stepcounts showed substantially higher values on working versus non-working days. These observations collectively provide evidence that individuals employed in this occupation experience considerably higher levels of PA at work than during other daily activities. From an epidemiological perspective, the analyses of these patterns are most useful when compared to age- and sex-specific normative values. Our results indicate that, while these servers achieved relatively normal PA levels during working days, they were substantially below normal levels on non-working days. These PA patterns may provide important information on how intervention strategies should be directed in this working age group. It would seem most appropriate to target non-working days since the servers had their lowest levels of energy expenditure then.

Based on the OPA classifications, there are two opposing interpretations. For the 'exceptionally active' classification, this occupation meets the standard of 2.0-2.1 METs, however, based on the 'vigorous' classification, it does not meet the standard of 7+ METs [12, 15, 20]. The former interpretation supports the inclusion of restaurant serving in the highest OPA category, while the latter challenges this. This inconsistency is likely due to differences between the classification systems. The 'exceptionally active' system may be based on *accumulated* energy expenditure above resting values, as opposed to the *hourly* energy expenditure above resting values, for which the 'vigorous' system is based on. As periods of working typically last longer than one hour, the former approach may be more appropriate for the classification of OPA. By using this approach, the total volume of PA (i.e. net energy costs), incorporating both duration and intensity, could provide a more appropriate assessment of true OPA levels. Based on the results of this study, it would seem that the 'vigorous' system of classification may be misguided in its approach to occupational energy expenditure.

Comparisons to healthy PA recommendations further supported earlier interpretations regarding PA patterns. Based on CPAG [14], restaurant servers achieved the recommended PA levels for light intensity activity (i.e. 60 minutes) on both working and non-working days; however, this group did not achieve the recommended PA levels for moderate (i.e. 30-60 minutes) or vigorous intensity activities (20-30 minutes). In terms of steps/day servers generally exceeded 10,000 on working days but were noticeably unsuccessful at doing so during non-working days. These findings suggest that this group is achieving health benefits from the PA levels of their occupation alone.

Overall, young adult restaurant servers achieve important health benefits from their PA levels, but primarily from OPA. This is of concern given that foodservice employees are typically transient and temporary, often leaving the industry within a five-year period [13]. The notable absence of LTPA is likely to persist following departure from this industry, creating a critical decline in PA that is potentially similar to that normally seen in late adolescence and young adulthood. Strategies aimed at preventing this trend should be appropriately directed at this occupational population.

Strengths and Limitations

A strength of this study was the measurement of RMR however, the nature of the protocol required an early morning arrival at the Human Performance Lab. This was an immediate flag for potential participants as most stated they were not early risers due to working late night shifts and therefore they would need to take the previous day off work for this early start. This time constraint limited our recruitment success and therefore our low response rate may reflect some of the similarities associated with investigating rotating shift work. Additionally, the use of a single restaurant establishment in a pilot study such as this would have been preferred, to ensure that: server responsibility, typical clientele volume and the restaurant floor square-footage were similar across participants shifts. In future studies the addition of several restaurants would be important as it would provide the opportunity to reduce isolated or atypical observations, thereby increasing external validity and generalizability. The study was conducted over a university semester and therefore a larger recruitment timeframe may have resulted in an increased participant rate. Also, the time of year that the study was conducted may have influenced the results as the winter may be less busy than serving in the summer months. Another limitation involved a failed battery on one AMP 311 which interrupted the consecutive seven-day period data. However, as the weeks of collection did not differ in typical work and LTPA levels, and data for each day of the week (e.g., Monday, Tuesday, etc.) were still obtained, we believe the results were not adversely affected. Apart from this the AMP 311 performed well and participant burden was minimal.

Conclusion

Surveillance research on PA patterns is critical for providing direction to prevention and intervention strategies, and for identifying determinants and correlates of PA for specific populations [33]. This study is to the best of our knowledge the first to provide PA surveillance data for a population of young adult restaurant servers. The results show that, while this group is successful at meeting and exceeding their age- and sex-specific norms and PA recommendations during working days, this is not typically the case on non-working days. During periods of full-time employment restaurant servers derive health benefits from their PA levels from work alone. However, if and when this group ceases employment in the industry, LTPA would be become the major contribution to their daily energy expenditure. Our participants' LTPA was non-existent and this may have been influenced particularly by the cold winter weather during this period of data collection. A future mixed method study with a larger sample, at different times of the year and in different cities, is needed to confirm our results.

The age-related decline in PA is an ongoing health challenge in this younger generation. The impact of the foodservice industry on this critical period of late adolescence and young adulthood is far-reaching, and therefore merits much greater exploration. Ideally, research in this specific population should progress to establishing patterns and correlates of PA, so as to improve PA messaging specific to this age group and occupation, which may include obtaining PA on their nonworking days.

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