

The University Faculty Physical Activity Inventory (UFP AI): A Preliminary Assessment of Physical Activity among Faculty at a Private University

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Abstract Physical activity (PA) is decreasing, with the work environment being particularly influential on reduction in PA. However, physically active lifestyles meeting or exceeding 150 minutes/week have been linked to reductions in multiple deleterious chronic health conditions. University educators are inundated with University work as well as promotional challenges that may act as barriers to achieving recommended daily levels of PA. Currently, very few research studies have evaluated PA among University faculty. Thus, the purpose of this exploratory investigation was to evaluate self-reported levels of PA among faculty members at Biola University. Eligible survey respondents (N = 138) were men (n = 72, 48.7 ± 11.7 years of age, 179.3 ± 8.5 centimeters in height, 86.3 ± 16.1 kilograms in weight, and an average body mass index (BMI) of 26.8 ± 4.6 kg/m²) and women (n = 66, 44.8 ± 11.7 years of age, 166.2 ± 8.2 centimeters in height, 69.3 ± 13.2 kilograms in weight, and an average body mass index (BMI) of 25.1 ± 4.8 kg/m²) faculty members from Biola University. Participants completed the International Physical Activity Questionnaire (IPAQ), using the SurveyMonkey® platform. Total daily sitting time and metabolic equivalent (MET) minute activity-specific (leisure, household, occupational, and transport) were calculated. One way ANOVAs revealed significant (p = 0.02) main effects for job title and total minutes of PA per week. The post-hoc analysis revealed that adjuncts were significantly more physically active than full professors. Although the only statistically significant differences were between adjuncts and full professors, we observed a downward trend in median physical activity. Independent measures t-tests revealed a significant (p = 0.004) difference between men and women for total minutes of PA per week. Women were significantly more physically active than men. Only 5.1% of faculty reported below 150 min of cumulative PA within a week. Total median PA for faculty was 3,133.5 MET*min/week. 52.9% of faculty reported a high categorical score above 3,000.0 MET*min/week of activity with a median of 4,757.0 MET*min/week. Of the four domains, leisure activity had the greatest median at 1,169.5 MET*min/week and active transport had the least at 462.0 MET*min/week. Faculty surveyed in this study exceeded the ACSM minimum weekly recommendations for PA and lower faculty ranks were the most active.

Keywords: active, lifestyle, academia, walking, leisure, activity template

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1. Introduction

On a global scale, physical activity (PA) is declining. It is estimated that in the United States alone, less than 5% of adults are achieving at least 30 minutes of PA per day [1]. However, physically active lifestyles meeting or exceeding 150 minutes of PA per week have been linked to positive improvements in mental health [2] and reductions in conditions such as type-II diabetes, some types of cancer, cardiovascular disease, premature mortality, chronic debilitating diseases, and multi-morbidity [2,3,4,5,6]. Some investigators have reported the gravity of the situation is of pandemic scale; necessitating the action of public

health practitioners to increase action [7,8]. The most recent economic burdens of physical inactivity and major non-communicable illness provide additional support for the severe classification of decreases in PA. Ding et al. [9] found that even under the most conservative estimates, physical inactivity may negatively influence global health systems upwards of \$54 billion annually. Furthermore, inactivity-related deaths have been associated with an annual loss of approximately \$14 billion in productivity and 13 million disability-adjusted life years in 2013 [9]. The economic burden, premature mortality, and chronic debilitating diseases linked to physical inactivity have been well established and necessitate a call for action [10]. It is reasonable to suggest that these multifaceted societal/behavioral

changes have a major impact on the decreases in currently observed physical activity.

Physical activity, by definition, is inclusive of activities that may include occupation, transportation, yard work, household activities, as well as leisure components [11,12]. The American College of Sports Medicine (ACSM) recommends a minimum of 150 minutes of at least moderate and vigorous PA each week. One of the nation's health goals according to *Healthy People 2020* [13] is to increase moderate and vigorous physical activity among all persons. Some of the factors that may limit physical activity and influence sedentary behavior may include the workplace environment, technology, sitting time, perceived lack of time, socioeconomic status, occupational background and level of education achieved [14,15,16,17,18]. Shaw and Spokane [19] found the odds of engaging in PA was greater for people with more education than less education at any point in time and the inverse relationship between age and PA decreased as education level increased. University faculty have degrees ranging from baccalaureate to doctorates, therefore, they should have at least some sort of awareness about the recommended levels of PA required for healthy living. Yet, faculty, are often pressured by University workload and promotional demands that achievement of recommended daily PA might be inhibited. Kirk and Rhodes [20] reported that untenured, full-time assistant professors in Canada reported reductions in PA by approximately 31% as they transitioned from new hire into full-time employment. While working in academia, faculty have an influential role in the lives of college-age adults and should aim to be leaders in the promotion of positive health behaviors. Sparling [21] noted positive PA behaviors adopted while in college will most likely be maintained beyond graduation. Our group surmised that highly educated faculty may actually epitomize the embodiment of positive health behaviors specifically because the nature of their profession requires active consumption and translation of current research literature. However, very few studies have evaluated and quantified the adherence to recommended PA levels among University faculty members. Therefore, the purpose of this exploratory investigation was to evaluate self-reported PA among faculty members at a private University in Southern California. The investigators hypothesized that participant PA levels would meet or exceed recommended levels of PA in the United States and higher faculty ranks would demonstrate a lower amounts of PA.

2. Methods

2.1. Participants

Of the 472 faculty who received the survey, 158 completed it, which equates to a 33.5% response rate. However, following exclusion of outlying or missing data (discussed in subsequent paragraphs) 138 participant surveys were considered eligible for analysis. Participants were men ($n = 72$, 48.7 ± 11.7 years of age, 179.3 ± 8.5 centimeters in height, 86.3 ± 16.1 kilograms in weight, and an average body mass index (BMI) of 26.8 ± 4.6 kg/m²) and women ($n = 66$, 44.8 ± 11.7 years of age, 166.2 ± 8.2 centimeters in height, 69.3 ± 13.2 kilograms in

weight, and an average body mass index (BMI) of 25.1 ± 4.8 kg/m²) faculty members from Biola University; a private Christian University in La Mirada, CA. Participants' educational attainment and job titles are reported in Table 1. Since this is an initial evaluation of exploratory nature, power analyses and estimated effect sizes were not conducted. Participants were recruited via a University mass email listing.

Table 1. IPAQ Respondent Demographic and Descriptive Characteristics

Characteristic	Mean (SD)	Frequency (%)
Sex		
Women		66.0 (47.8)
Men		72.0 (52.2)
Age, years		
Women	44.8 (11.7)	
Men	48.7 (11.7)	
Height, centimeters		
Women	166.2 (8.2)	
Men	179.3 (8.5)	
Weight, kilograms		
Women	69.3 (13.2)	
Men	86.3 (16.1)	
Body Mass Index		
Women	25.1 (4.8)	
Men	26.8 (4.6)	
Educational Status		
Baccalaureate Degree		4.0 (2.9)
Masters Degree		54.0 (39.1)
Doctoral Degree		80.0 (58.0)
Job Title		
Adjunct Instructor		37.0 (26.8)
Instructor		8.0 (5.8)
Assistant Professor		21.0 (15.2)
Associate Professor		50.0 (36.2)
Full Professor		22.0 (15.9)

Note: Percentage values have been rounded up.

2.2. Theoretical Framework

The Health Belief Model (HBM) guided the design of this study. Constructs that were most pertinent were susceptibility, cues to action, and seriousness as potential influencers on individual capacity to screen, act, or aim to increase physical activity [22]. These HBM constructs influenced the direction of this study in a few ways, 1) physical inactivity is increasing globally, 2) physical inactivity has been linked to a host of debilitating health conditions including cancer 3) academic demands often require a substantial amount of sedentary behavior, and 4) educated faculty charged with educating the next generation of scholars may (or may not) be as physically inactive as the general population, and may or may not be providing a tangible example of living a healthy lifestyle. By exploring and examining self-reported levels of physical activity among faculty members, future interventions may be developed to compare this sample to the general population and develop specifically-targeted interventions to either maintain or increase physical activity among faculty.

2.3. Data Collection

This study followed guidelines and was approved by the Biola University Protection of Human Rights in Research Committee (PHRRC, [F17-016_JB]). A link to

electronic questionnaires were sent out via email over the course of two weeks. Weekly emails were sent to remind faculty of the assessment. Detailed study explanations, time required to complete the survey, and proposed usage of data were sent via email with a digital link to begin the assessment. All respondents who consented to participate completed the long-form IPAQ, which was adapted for online completion using the SurveyMonkey® platform. The IPAQ has been designed for use with both male and female, and youth and middle-aged adults (ages 15-69 years). The long version is composed of 27 items that cover a breadth of PA domains. The long-form IPAQ has been reported as having very good test-retest reliability (r_s of 0.8), reasonable concurrent validity (r_s of 0.67) and fair criterion related validity (r_s of 0.33) when assessing all domains of PA and sedentary behaviors across 12 countries [11]. Total daily sitting time and activity-specific MET-minutes per week (leisure, household, occupational, and transport) were calculated using the IPAQ protocol for scoring of assessments [23].

2.4. Scoring and Data Handling

All exploratory data are reported as either means (\pm SD) and/or medians (\pm IQR). Preliminary data frequency and descriptive analyses were conducted to visually represent the raw dataset to address possible inconsistencies or anomalous numerical occurrences that may arise. Data exploration procedures were then conducted following initial observations of anomalous occurrences. Exploration procedures revealed extreme outlying or missing data

occurrences which were subsequently excluded from analysis. Data from the long form of the IPAQ were summated by each domain segment of PA for the estimation of time spent in totality during occupational, transport, leisure, household, and time spent sitting per week (Table 2). The IPAQ Metabolic Equivalence (MET-minute) values have been based on estimated values obtained from the 2011 compendium of physical activities [23]. One MET is equivalent to 3.5 ml of O₂ consumed per kg of body mass per minute of time [25]. Following established categorization by IPAQ protocols, MET values that have been pre-assigned for specific components are as follows: walking (3.3 METs), moderate inside chores (3.0 METs), moderate work and leisure PA (4.0 METs), moderate yard chores (4.0 METs), vigorous yard chores (5.5 METs), cycling (6.0 METs), and vigorous work and leisure PA (8.0 METs). The total minutes of PA for each domain sub component was multiplied by the MET equivalent then summed to find a Domain MET min/week total and the MET min/week for type of PA (Walking, Moderate and Vigorous). Moderate activities included biking for transport, yard and household chores, and other light tasks during work and leisure time. Vigorous PA was calculated for difficult tasks during work or leisure such as running, fast swimming and heavy lifting. The IPAQ also included 3 questions on sedentary behavior. Although respondents in this study completed the survey, not all question categories were completed by the total N and thus, are reported with the number of respondents that completed each category and the individual domain in Table 1.

Table 2. Self-reported Physical Activity

Characteristic	Mean (SD)	Median (IQR)
Total Activity, min/wk	829.8 (557.7)	720.0 (340.0 - 1,118.8)
Occupational Activity, min/wk	309.3 (357.8)	167.5 (70.0 - 420.0)
Non-occupational Activity, min/wk		
Leisure	308.8 (280.9)	210.0 (120.0 - 442.5)
Transportation	171.1 (169.6)	140.0 (60.0 - 210.0)
Domestic	302.6 (373.4)	155.0 (80.0 - 330.0)
Total Activity, MET min/wk	3,595.3 (2,417.8)	3,133.5 (1,440.0 - 4,922.3)
Occupational Activity, MET min/wk	1,256.9 (1,417.6)	585.8 (247.5 - 1,981.5)
Non-occupational Activity, MET min/wk		
Leisure	1,717.2 (1,697.5)	1,169.5 (528.8 - 2,359.5)
Transportation	602.2 (622.4)	462.0 (198.0 - 749.3)
Domestic	1,150.4 (1,394.5)	592.5 (277.5 - 1,387.5)
Job Title		
Adjunct, min/wk	1,029.8 (621.2)	920 (570.0 - 1,515.0)
Instructor, min/wk	1,055.0 (782.0)	840 (697.5 - 1,270.0)
Assistant Professor, min/wk	856.7 (586.1)	735 (365.0 - 1,205.0)
Associate Professor, min/wk	764.4 (580.2)	615 (330.0 - 982.5)
Full Professor, min/wk	537.7 (395)	438 (266.3 - 750.0)
Educational Status		
Baccalaureate Degree, min/wk	1,007.5 (312.1)	980 (787.5 - 1,200.0)
Masters Degree, min/wk	978.3 (628.7)	855 (541.3 - 1,348.8)
Doctorate Degree, min/wk	720 (565.2)	515 (325.0 - 905.0)
Job Title		
Adjunct, MET min/wk	4,439.2 (2,827.5)	4,204 (2,277.0 - 6,128.0)
Instructor, MET min/wk	4,000.8 (2,585.3)	3,341 (2,716.5 - 4,991.3)
Assistant Professor, MET min/wk	3,458.6 (2,227.5)	3,047 (1,539.0 - 5,615.0)
Associate Professor, MET min/wk	3,420.9 (2,729.5)	2,694 (1,516.5 - 2,729.5)
Full Professor, MET min/wk	2,555.5 (2,106.6)	1,789 (1,179.8 - 3,274.5)
Educational Status		
Baccalaureate Degree, min/wk	4,142.3 (1,134.1)	4,436 (3,719.3 - 4,859.0)
Masters Degree, MET min/wk	3,936.6 (2,368.1)	3,695 (2,217.8 - 5,741.8)
Doctorate Degree, MET min/wk	3,337.6 (2,824.1)	2,298 (1,298.8 - 4,232.3)
Sitting time min/wk	2,425.2 (1,086.7)	2,280.0 (1,725.0 - 3,097.5)

Note: IQR = interquartile range, MET = metabolic equivalent.

3. Statistical Analysis

A priori Kolmogorov-Smirnov and Shapiro-Wilk tests were used to determine normality for sex and job title (independent variables), as well as total minutes of PA per week and total MET minutes of PA per week (dependent variables). For each analysis significance ($p < .05$) was reached, thereby violating the assumption of normality for multivariate analyses of variance (MANOVA). Therefore, a one-way analysis of variance (ANOVA) was conducted on job title, total minutes of PA per week, and total MET minutes per week. In the appearance of significant main effects, Tukey post hoc pairwise comparisons were employed. An independent measure t-test was run on (sex) total minutes of PA per week and total MET minutes per week. All procedures were performed on the Statistical Package for the Social Sciences version 21 (SPSS, Armonk, NY). A familywise error rate of 0.05 was utilized to determine statistical significance.

4. Results

One way ANOVAs revealed significant ($p = 0.02$) main effects for job title and total minutes of PA per week. The post-hoc analysis revealed that adjuncts were significantly more physically active than full professors (Figure 1).

Although the only statistically significant differences were between adjuncts and full professors, we observed a downward trend in median physical activity. What this suggests is that as faculty advanced in job title PA decreased (Table 2). Faculty with doctoral degrees reported engaging in approximately 2,298 MET*min/week (515 min/week), which was the lowest recorded total physical activity score (Table 2). Independent measures t-tests revealed a significant ($p = 0.004$) difference between men and women for total minutes of PA per week. Women were significantly more physically active than men (Figure 2).

The median total physical activity including all domains for faculty was 3,595.3 MET*min/week (720.0 min/week). Only 5.1% of faculty reported below 150 min of cumulative PA within a week. Of the four domains, leisure activity had the greatest median at 1717.2 MET*min/week (210 min/week) while active transport had the least at 602.2 MET*min/week (140 min/week) (Table 2). Median moderate physical activity levels were greater 1050.0 MET*min/week (250 min/week) than walking and vigorous activity 1440 MET*min/week (180 min/week) (Table 3). Seventy-three University faculty (52.9%) were in the “high” categorical ranking (4,757.0 MET*min/week) having recorded PA exceeding 3,000.0 MET*min/week (Table 4). Respondents (89.9%) completed questions about sitting time and reported median sitting time of approximately 325.7 min/day.

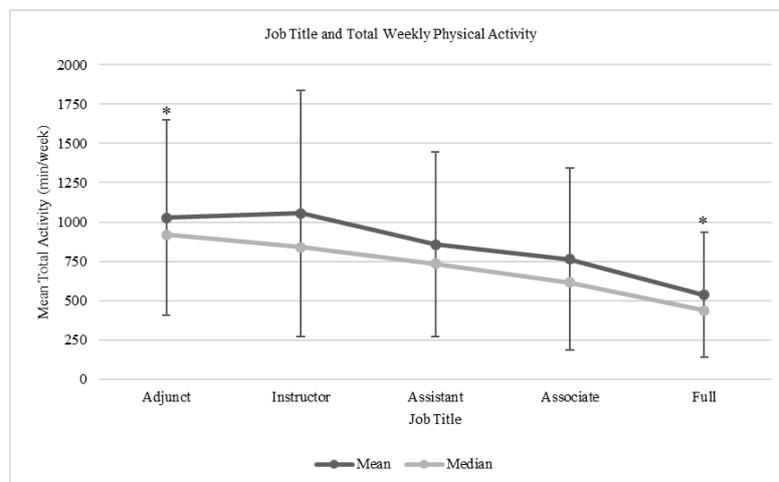


Figure 1. Job title comparisons and total self-reported physical activity from all IPAQ domains. Physical activity data are mean \pm SD. * indicates significant differences ($p < 0.05$)

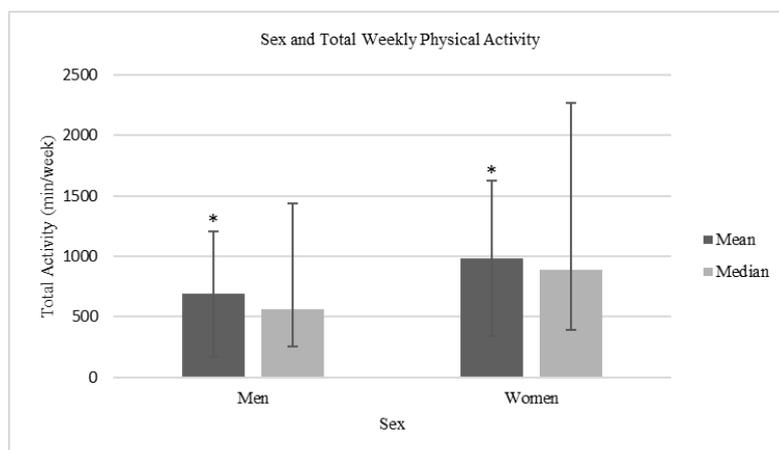


Figure 2. Sex comparisons total self-reported physical activity. Physical activity are mean \pm SD. * indicates significant differences ($p < 0.05$)

Table 3. Total Scores of Physical Activities

Component	n	Median (MET-min/wk)	Median (min/wk)
Walk	127	792	240
Moderate	133	1,050	250
Walk + Moderate	138	1,888	533
Vigorous	77	1440	180

Table 4. Total Physical Activity Categorical Score

Category	n	Median (MET-min/wk)
Low	12	519
Moderate	53	1,572
High	73	4,757

Note: Categorical score was determined by meeting MET thresholds for each level. Low = below 600 MET-min/wk and High = above 3,000 MET-min/wk.

5. Discussion

Until recently, very few studies have highlighted the PA levels among faculty members working in the University setting. Some investigations highlighted in this study suggested that work demands and the promotional challenges were potential barriers to achieving ACSM recommended levels of PA. Yet, in this investigation the results revealed that although PA followed a step-wise decrease as faculty members gained in professional stature, only 5.1% were not reportedly meeting at least 150 minutes of PA per week. This suggests that regardless of positional stature, faculty sampled in this study were mostly physically active according to ACSM minimum recommendations. These job title-related decreases in PA may be, in part, explained as a factor of age, as it often takes many years to achieve the status of full professor. However in this investigation we did not adjust for age. Multiple investigators have reported on the aspects of the inverse relationship between age and PA levels [26,27,28,29,30]. Although declines in PA were observed in this study, faculty were still reporting PA values above ACSM minimum recommendations. The investigators of this study surmised that because the nature of the University is such that active consumption of current literature is a requirement of the job, it is a requirement to engage with current literature on a daily basis. By doing so, faculty members may, to some extent, inevitably interact with health-related information.

It was also hypothesized that faculty members inherently play a leadership role as mentors in the lives of students because of the nature of the job itself. Although not assessed in this study, perhaps faculty at Biola University experience greater levels of self-efficacy because the institution is supportive and promotes a more-relational cultural interaction between faculty and students. Whipple, Kinney, and Kattenbraker [31] reported that in a survey of the maintenance of physical activity behavior among faculty and staff at three universities, those with higher levels of self-efficacy and plans to participate in exercise were more likely to actually be physically active. However, there may be more societally-related factors that may impact a person's health-related behavior besides high self-efficacy and the ability to make plans. For example, Bot et al. [32] examined the impact of lifestyle

behaviors and social networking on health outcomes in a sample of 50 participants at risk for cardiovascular or metabolic conditions, and 170 members of their social circles. The investigators concluded that those with close and densely packed relational circles were found to be more physically active. Perhaps, components of faculty members' social network are, in-part, better able to explain the higher than average amount of reported PA than self-efficacy alone. Or, it may be that a combination effect is occurring such that physically active faculty may have high self-efficacy, but may also have vibrant social lives that may cyclically increase self-efficacy and PA.

The majority of Faculty that were surveyed in this study exceeded recommended levels of PA per day at work, but also in their personal lives. As positive as the results appear, the possible impact of instrument-related issues, unfortunately, cannot be overlooked. The IPAQ questionnaire has been reported to be gaining in popularity and prevalence for its ease of use, but is a self-report measure, which, like other self-report measures of PA, may result in social desirability-skewed values that tend to be overestimated [33,34]. In addition, our group utilized the IPAQ as the sole assessment tool. Neil-Stramko et al., [35] however, examined self-reported PA via the IPAQ among physiotherapists, but also monitored PA directly with accelerometers. The investigators reported that although physiotherapists were a physically active group, there was some inflation of self-report PA compared to the accelerometer data. The investigators summarized that active physiotherapists were superbly positioned to lead by example in the promotion of recommended PA among their colleagues and patients. Similarly, university faculty are also uniquely positioned to do the same with the relational nature of academic interaction between faculty and students. Additionally, a bias toward high PA may be present within faculty self-reported PA. Future studies are necessary to evaluate demographic, behavioral, and philosophical motivating factors that have influenced the amount of reported PA in faculty at Biola University. Additionally, our group has planned follow-up studies to also investigate staff PA, but also PA among universities at differing geographic locations across the United States.

6. Conclusion

Aside from the observed step down relationship observed between faculty job title and reported PA, a majority of faculty members at Biola University were still exceeding ACSM recommendations for minimal levels of PA.

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