

Otterbein University

Digital Commons @ Otterbein

---

Health and Sport Sciences Faculty Scholarship

Health and Sport Sciences

---

10-4-2018

## Health-enhancing Physical Activity During Practice Among Student Football Managers at a Division I University

Eugene C. Fitzhugh

Robin Hardin

William Boyer

Emily M. Post

Zach Behnke

Follow this and additional works at: [https://digitalcommons.otterbein.edu/hsports\\_fac](https://digitalcommons.otterbein.edu/hsports_fac)



Part of the [Sports Sciences Commons](#)

---

MAJOR ARTICLE



## Health-enhancing physical activity during practice among student football managers at a Division I university

Eugene C. Fitzhugh, PhD<sup>a</sup> , Robin Hardin, PhD<sup>a</sup> , William Boyer, PhD<sup>b</sup> , Emily Post, MS<sup>c</sup>, and Zach Behnke, BS<sup>d</sup>

<sup>a</sup>Department of Kinesiology, Recreation, and Sports Studies, The University of Tennessee, Knoxville, Tennessee, USA; <sup>b</sup>Department of Kinesiology, California Baptist University, Riverside, California, USA; <sup>c</sup>Department of Human Sciences, The Ohio State University, Columbus, Ohio, USA; <sup>d</sup>Creative Artists Agency, Memphis, Tennessee, USA

### ABSTRACT

**Objective:** Student football managers have demands on their time that may pose barriers to meeting recommended current physical activity (PA) guidelines. The study sought to assess the amount of PA obtained by student football managers at a NCAA Division I Football university. **Participants:** Subjects were student football managers ( $n = 14$ ) with data collected in the fall 2015. **Methods:** Participants wore an Omron HJ-720ITFFP pedometer for seven consecutive days during football activities only, while self-reporting their overall PA on day 7. Measures were analyzed using repeated measures and mixed-design ANOVAs. **Results:** Managers averaged 8474 steps/day for each practice/game. All PA measures significantly varied by day and manager experience. Overall PA equated to 78 hours of walking. **Conclusions:** Student football managers easily met and surpassed the recommended aerobic health-enhancing PA guideline. While their manager-related PA was 140 minutes per week, other PA allowed them to easily reach significantly healthy levels of PA.

### ARTICLE HISTORY

Received 5 April 2018  
Revised 23 May 2018  
Accepted 9 July 2018

### KEYWORDS

Athletics; epidemiology;  
health education;  
physical activity

### Introduction

Student football managers at the Division I University-level often have extreme demands on their time: academic, football, and social demands.<sup>1</sup> While their responsibilities as football managers are carefully defined by the National Collegiate Athletic Association (NCAA) to only focus on duties related to equipment, laundry, and hydration-related activities, these students also participate in noncoaching activities within practices and competitions.<sup>2</sup> Students managers, much like the football student-athletes they support, are also expected to be full-time students that meet all academic requirements of their respective university. While there is no available research that highlights the amount of total time that football student managers spend on athletic and academic-related responsibilities, one could assume that this time mirrors the time required of student-athletes and student athletic-trainers, another group that provides support to athletic programs.

In a 2011 survey of student-athletes conducted by the NCAA, football players within the Division I

Football Bowl Subdivision (FBS) reported an average time commitment of 43.3 hours per week for football related activities during the season. Furthermore, these football players reported that their academic studies consumed another 38.0 hours per week. In total, Division I FBS football players spend nearly 80 hours per week on combined academic and athletic pursuits.<sup>3</sup> Similarly, graduate-level student athletic trainers (AT) have also reported working an average of 40 hours per week on AT-related responsibilities, while simultaneously balancing their academic requirements.<sup>4</sup> Perhaps as a result of these large commitments on time, FBS football student-athletes are recognizing the need for time management workshops, while student-ATs are recognizing the potential for early-career burnout.<sup>4,5</sup>

Sacrificed as a result of these demands may be the time to participate in leisure-time physical activity (LTPA). The lack of time is the most common barrier to exercise among college students.<sup>6</sup> It is recommended that college-age adults participate in at least

150 minutes of moderate- or vigorous-intensity aerobic physical activity (MVPA) each week, including at least two days of strength training activities.<sup>7</sup> Specific to the aerobic guidelines, in 2015 only 47.2% of undergraduate college students reported meeting the guidelines.<sup>8</sup> However, this estimate of compliance with the aerobic guidelines is based upon self-reported leisure-time physical activity (LTPA). There are three other domains in which college students can acquire aerobic physical activity (PA): through domestic activities (eg, cleaning their apartment), transportational physical activity (eg, walking and cycling to class), and occupational related physical activity.<sup>9</sup>

The purpose of this study is to assess the amount and pattern of aerobic PA obtained by football student managers at a Division I FBS university across the various domains of PA. We hypothesized that football student managers would acquire most of their PA through their occupational physical activity – managing and organizing football practices. Among the student football support staff (eg, student ATs, marketing, ticket sales), managers were perceived by the investigators to be the most active individuals on a daily basis. This study will be the first to examine the health-related PA among Division I college athletics support staff.

## Methods

### Procedures

Eligible subjects for this study were football student managers ( $n=14$ ) at a Division I FBS university. Permission was obtained from both the athletic administration and the Institutional Review Board at the university and performed in accordance with the Declaration of Helsinki. Informed consent was obtained from all individual participants included in this study.

The investigators conducted two visits to the student manager conference room, one week apart. During the first visit, participants were consented and assigned a study ID coded pedometer that had step length calculated specific to that participant. Participants were also instructed to only wear the device during an official practice or competition. In order to ensure that each participant would only wear their assigned pedometer during their official student manager duties each participant was instructed in placing their device in a specially marked plastic container labeled by participant ID as they finished their duties and left the manager locker room. The student head manager monitored removal of the device over the

following week. During the first visit each participant also had their height and weight measured. During the second visit, 8-days after visit one, participants returned their pedometer and completed a 10-minute self-report PA survey, including demographic information. The investigators then downloaded the pedometer data for analysis.

### Instruments and surveys

The pedometers used in this study were the Omron HJ-720, a downloadable pocket pedometer that has been validated in both lab-based and free-living conditions.<sup>10</sup> This pedometer automatically stores step counts, energy expenditure, and minutes of movement at the moderate and vigorous intensity levels. Height and weight were measured with the Health o meter<sup>®</sup> Professional 597KL heavy duty eye level digital scale.

The survey used in this study to measure PA was the self-administered long-version of the International Physical Activity Questionnaire (IPAQ).<sup>11</sup> The IPAQ survey has been demonstrated to be reliable and valid among adults and assesses PA across all domains of physical activity – leisure-time, domestic, occupational, and transportational.<sup>12</sup>

### Measures

The pedometer allowed several measures to be downloaded and analyzed, including the following: total steps per day, aerobic steps per day at or above moderate-intensity, percent of aerobic steps per day, the minutes of aerobic activity per day, the estimated PA energy expenditure per day, and the distance walked per day in miles. Seven days of data from the pedometer were downloaded allowing for comparisons of PA by day of the week.

The IPAQ, which asked the participant to recall the frequency and duration of moderate and vigorous aerobic physical activity across all domains, was recoded to calculate MET-minutes specific to their work-related football activities (occupational), leisure-time, domestic, and transportational physical activities. A MET-minute is based upon the MET score of an activity's intensity as identified in the Compendium of Physical Activities.<sup>13</sup> For instance, walking was assigned a MET-value of 3.3, which means that a person expended 3.3 times the energy of their resting metabolic rate. Therefore, if this person walked for 30 minutes on 4 days during the past week they would acquire 396 MET-minutes for their walking activity during the past week. As a frame of reference, if a

person were to meet the guideline for aerobic physical activity of 150 minutes per week of moderate-intensity walking at 3.3 METs a person would acquire approximately 500 MET-minutes.<sup>7</sup> A total MET-minute score was created by combining the walking, moderate-intensity, and vigorous-intensity MET scores.

Demographic measures included gender, class rank (eg, Freshman), the number of seasons as a football student manager (ie, one season vs. two or more seasons), the player position they were assigned to assist (ie, offensive line, running backs), and whether they had played high school football (ie, yes or no).

### Statistics

Descriptive statistics were examined across all demographic, pedometer, and IPAQ measures. All continuous measures were deemed to be normally distributed, leading to the adoption of the Pearson correlation parametric procedures for examining the relationships between pedometer and IPAQ continuous measures. Independent sample t-tests were utilized to initially examine differences between the demographic categorical measures across the pedometer and IPAQ continuous measures. When examining the pedometer continuous measures across days, repeated measures ANOVAs and mixed-design ANOVAs (ie, within-subjects effect repeated measure and a between-subject effect) were utilized with the level of significance alpha set at .05. All analysis was conducted using SPSS software, version 22.0.<sup>14</sup>

### Results

In total, all eligible participants ( $n = 14$ ) consented to participate in this study. The demographic profile of the student football managers is found in Table 1. All of the managers were men and represented all academic-years. Forty-three percent ( $n = 6$ ) reported being first-year managers, with 71.4% being assigned offensive team responsibilities.

#### Objective physical activity (pedometer)

The student managers wore their pedometers for a total of 34 hours during the week of recording, an average of four hours per practice (Monday through Friday and Sunday) and 10 hours during a game day (Saturday). The pedometer profile during these times are found in Table 2. On average, student managers acquired 8,474 steps per day with 21.3% (1,926 steps per day) of those steps being at the moderate- to vigorous-intensity level,

**Table 1.** Football manager demographics ( $n = 14$ ).

	<i>n</i>	%
Gender (men)	14	100.0
Year in school		
Freshman	3	23.1
Sophomore	4	28.6
Junior	3	21.4
Senior	3	21.4
Seasons as manager		
One	6	42.9
Two	2	14.3
Three	5	35.7
Four	1	7.1
Position		
Defense	4	28.6
Offense	10	71.4
Played HS football (Yes)	11	78.6
Body mass index (Mean)	14	
Mean	25.9	
SD	2.8	

**Table 2.** Pedometer profile of student manager physical activity during football practice<sup>1</sup> and game.<sup>2</sup>

	Mean	SE
Total steps/day	8474.2	654.6
Aerobic steps/day	1926.3	311.9
Percent aerobic steps/day	21.3	2.6
Aerobic minutes/day	20.0	3.1
PA energy expenditure/day	307.8	22.9
Distance walked/day (miles)	3.5	0.3

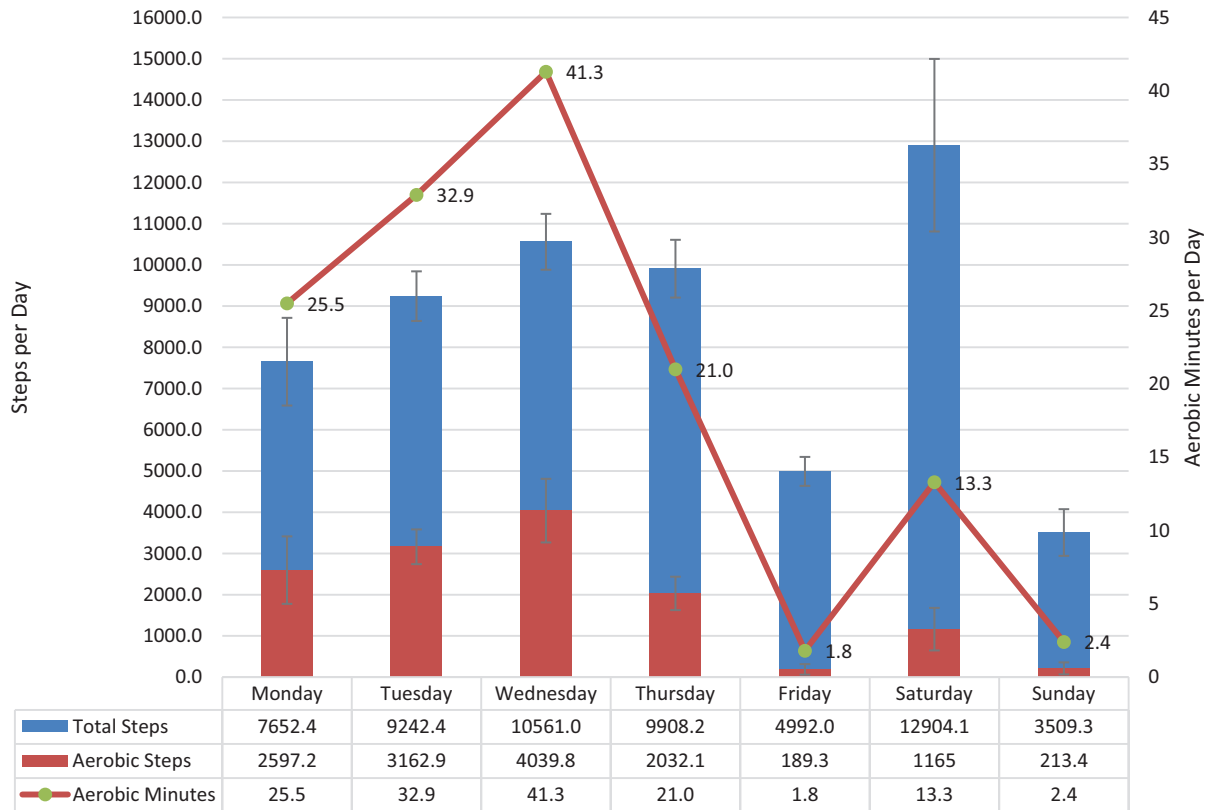
Notes. 1Practice (2-6 PM each day); 2Game (8 AM-6 PM).

which equates to an average of 20 minutes of MVPA per day. During practice and games, the managers expended an average of 307.8 kilocalories per day while walking an average of 3.5 miles per day.

When examining the objective PA measures by days across the week, day of the week was found to have a significant effect for all measures, including total steps ( $F_{1,8,20.2} = 16.0$ ,  $p < .000$ , partial  $\eta^2 = .593$ ), aerobic steps ( $F_{2,7,30.1} = 12.0$ ,  $p < .000$ , partial  $\eta^2 = .523$ ), percent aerobic steps ( $F_{2,9,31.9} = 13.1$ ,  $p < .000$ , partial  $\eta^2 = 0.543$ ), aerobic minutes ( $F_{3,0,33.5} = 11.7$ ,  $p < 0.000$ , partial  $\eta^2 = 0.516$ ), PA energy expenditure ( $F_{1,8,19.8} = 14.6$ ,  $p < .000$ , partial  $\eta^2 = .571$ ), and distanced walked in miles ( $F_{1,8,20.3} = 15.9$ ,  $p < .000$ , partial  $\eta^2 = .591$ ). Table 3 provides details on these pedometer-based metrics by day with detail on posthoc tests. Figure 1 provides trends of total steps, aerobic steps, and the minutes spend in MVPA. In terms of overall PA volume, Saturday, a 10-hour game day, had the most volume and Sunday, the day after the game day, had the least volume (Saturday total steps 12,904 vs. Sunday 3,509 steps; energy expenditure – 468.2 vs. 126.8; and, distanced walked – 5.4 miles vs. 1.5 miles). Wednesday was the day with the largest amount of MVPA as reflected by aerobic steps (4,040 steps), percent aerobic steps (35.5%), and aerobic minutes

**Table 3.** Pedometer profile by day of the week for student football managers.

	Monday (M)		Tuesday (T)		Wednesday (W)		Thursday (Th)		Friday (F)		Saturday (S)		Sunday (Su)	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Total steps	7652.4 <sup>W,S</sup>	1063.8	9242.4 <sup>F,Su</sup>	602.0	10561.0 <sup>M,F,Su</sup>	677.9	9908.2 <sup>F,Su</sup>	700.6	4992.0 <sup>T,W,Th</sup>	351.1	12904.1 <sup>M,Su</sup>	2092.5	3509.3 <sup>T,W,Th,F</sup>	566.1
Aerobic steps	2597.2	818.7	3162.9 <sup>Th,F,S,Su</sup>	421.1	4039.8 <sup>F,S,Su</sup>	771.6	2032.1 <sup>T,F</sup>	404.9	189.3 <sup>T,W,Th</sup>	128.0	1165.0 <sup>T,W</sup>	515.8	213.4 <sup>T,W</sup>	146.0
Percent aerobic steps (%)	26.1	8.0	33.0 <sup>Th,F,S,Su</sup>	4.3	35.5 <sup>F,S,Su</sup>	5.8	20.0 <sup>T,S</sup>	4.0	2.9 <sup>W,Th</sup>	2.0	5.9 <sup>T,W,Th</sup>	2.4	3.2 <sup>T,W</sup>	2.2
Aerobic minutes	25.5	8.0	32.9 <sup>Th,F,Su</sup>	4.3	41.3 <sup>F,S,Su</sup>	7.7	21.0 <sup>T,S</sup>	4.2	1.8 <sup>T,W,Th</sup>	1.2	13.3 <sup>W</sup>	5.9	2.4 <sup>T,W,Th,F</sup>	1.7
PA energy expenditure	273.0 <sup>W</sup>	38.1	346.0 <sup>F,Su</sup>	24.0	391.2 <sup>M,F,Su</sup>	24.9	362.2 <sup>F,Su</sup>	27.7	183.2 <sup>T,W,Th</sup>	13.8	468.2 <sup>Su</sup>	79.8	126.8 <sup>T,W,Th,F</sup>	21.8
Distance walked (miles)	3.2 <sup>W,S</sup>	0.4	3.9 <sup>F,Su</sup>	0.2	4.4 <sup>S,Su</sup>	0.3	4.1 <sup>F,Su</sup>	0.3	2.1 <sup>T,W,Th</sup>	0.1	5.4 <sup>M,Su</sup>	0.8	1.5 <sup>T,W,Th,F</sup>	0.2



**Figure 1.** Total steps, aerobic steps, and aerobic minutes per day.

(41.3 minutes). Conversely, Friday had the smallest amount of MVPA, specific to aerobic steps (183 steps), percent aerobic steps (2.9%), and aerobic minutes (1.8 minutes).

Further examination across demographics found only one factor, years as a student manager, to significantly interact with pedometer-related measures by day of the week. This significant interaction between the days of the week (within-factor) and years as a student manager (between-factor) were found across all objective PA measures: total steps ( $F_{6,60} = 6.6, p < .000, \text{partial } \eta^2 = 0.398$ ), aerobic steps ( $F_{6,60} = 2.8, p = .017, \text{partial } \eta^2 = .221$ ), percent aerobic steps ( $F_{6,60} = 3.9, p < .003, \text{partial } \eta^2 = .279$ ), aerobic minutes ( $F_{6,60} = 3.1, p < .010, \text{partial } \eta^2 = .236$ ), PA energy expenditure ( $F_{2,4,24,3} = 6.7, p < .003, \text{partial } \eta^2 = .401$ ),

and distance walked in miles ( $F_{2,4,24,3} = 6.0, p < .005, \text{partial } \eta^2 = .374$ ). Figure 2 illustrates the interaction seen across these measures. Compared to managers with two or more years of experience first-year student managers, accumulated greater levels of total steps at MVPA levels on Monday, Tuesday, Wednesday, and Saturday. On the days before (Friday) and after (Sunday) a game there were no differences between first-year and more experienced managers for any of the objective pedometer measures.

### Self-reported physical activity (IPAQ)

The self-reported PA of the managers during the week of wearing a pedometer can be found in Table 4. In total, the self-reported MVPA of student managers

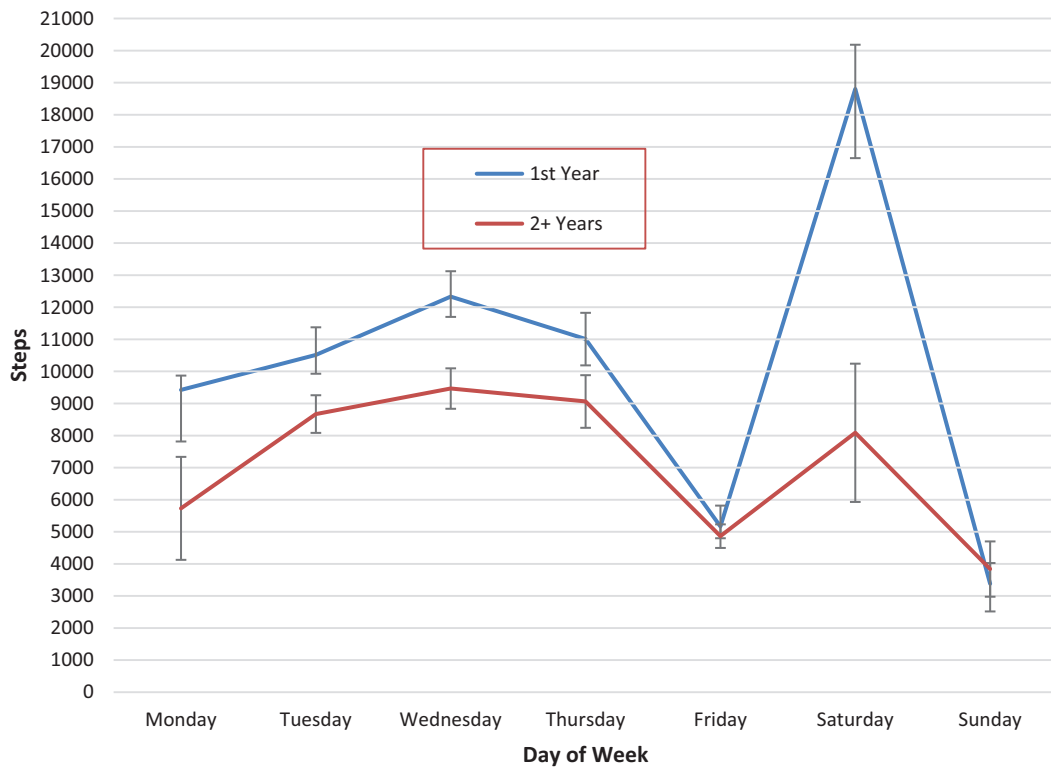


Figure 2. Total steps by day and years as manager.

Table 4. Overall self-reported physical activity in the past week (GPAQ) by years managing experience.

	Overall		First-year		2 + Years	
	Mean	SE	Mean	SE	Mean	SE
Total MET-minutes	16465.8	1761.8	20245.2	3357.0	13631.2	1171.5
Work MET-minutes <sup>1</sup>	10853.5	1416.6	13238.5	3025.5	9064.8	742.6
Percent Work-MET	65.9	4.2	63.2	7.2	68.0	5.2
Leisure MET-minutes	3717.1	716.2	4192.2	1027.5	3360.8	1029.2
Transportation MET-minutes	1603.7	446.9	2614.5	889.0	845.6	184.4
Domestic MET-minutes	291.4	133.3	200.0	110.8	360.0	222.6

Note. <sup>1</sup>Work related to football manager role.

across all domains equated to 16,456 MET-minutes for the week. The highest amount of MVPA was reported in the football-related work domain (10,854 MET-minutes), or 65.9% of the total MET-minutes, and the lowest was reported in the domestic PA domain (291 MET-minutes). All of the football managers surpassed the 500 MET-minute criteria for meeting the recommended aerobic guideline of an equivalent of 150 minutes of moderate-intensity PA. Unlike the objective pedometer measures, there were no significant differences by years of football manager experience.

### Objective pedometer and self-reported physical activity

The relationship between the objective pedometer measures and the self-reported PA obtained from the

IPAQ uncovered two distinct trends. There were strong correlations of self-reported walking MET-minutes with both total daily steps ( $r = .545, p = .44$ ) and MVPA minutes per day ( $r = .538, p = .47$ ) that were obtained by pedometer. Also, the daily MET-minute average was significantly associated with MVPA-related measures, including aerobic steps per day ( $r = .612, p = .020$ ), MVPA minutes per day ( $r = .608, p = .021$ ), and the percent of total steps per day that were at the MVPA level ( $r = .535, p = .049$ ).

### Comment

The results of this study provide several insights into the physical activity volume and patterns of student football managers at a NCAA Division I-FBS university. First, football managers, as part of their official duties, come very close to meeting the 2008 aerobic physical activity guideline for adults.<sup>7</sup> Based upon the pedometer-based MVPA data, the average manager accumulates 140 minutes of MVPA each week, 10-minutes shy of the recommended 150 minutes of aerobic PA per week. However, when one considers the IPAQ self-report data across the various PA domains, it becomes apparent that they easily surpass this recommended level of aerobic MVPA. For instance, based upon this sample of student managers, if one converts the overall 16,466 moderate- and



vigorous-intensity MET-minutes for the week to a moderate-intensity equivalent (walking at a moderate pace of 3.5 METs), we find that their total self-reported PA equates to walking 78.4 hours during the week. This overall MET average could also be converted to an equivalent vigorous-intensity activity (jog/walk combination at 6.0 METs) of 47.7 hours during the week. Clearly, football managers are physically active at a health-enhancing level of aerobic PA.

Second, it appears that not all days of a student football manager provide opportunities for this level of health-enhancing physical activity during practices or games. Clearly, the game day (Saturday) that lasted 10-hours for the student managers had the highest level of total steps. However, only 5.9% of those steps were at the MVPA intensity-level according to the objective pedometer data. Conversely, Friday and Sunday were days when the least amount of PA, both overall and MVPA, was found to occur. During this study, Friday during this study was a walk-thru practice day of low-intensity and Sunday was a day when the student managers were focused on unloading game-day equipment while getting ready for the upcoming week's practices. Related to intensity, as measured by the MVPA pedometer measures, Monday (film review day for players) was a day when PA steps and MVPA began to increase. This increase in steps and MVPA was also noted on Tuesday (game-plan installation day for players) and Wednesday (heavy practice day for players). In fact, Wednesday was the most vigorously-intense day for the football managers. While Friday and Sunday may have been low PA days, it might be that this provided the student managers with opportunities for other types of physical activity, such as leisure-time physical activity (LTPA), which averaged 3,717 MET-minutes according to the IPAQ self-report survey. Assuming that these managers were more active at the vigorous-intensity level when enjoying their LTPA (6.0 METs), this volume of MET-minutes indicates that the managers were able to fit roughly 10 hours of LTPA into their week. Perhaps Friday and Sunday provided them with the best opportunity to fit this into their schedule.

A third insight relates to football manager assignments and the volume and MVPA. First-year managers were clearly more physically active than their experienced counterparts, who had managed for two or more seasons. On five of the seven days of this study, those days where players had an active practice or game day, 1st year managers acquired more total steps and steps at a higher intensity. Further investigation within this sample of student football managers

found that 1st year managers were all assigned to special team drills (eg, kickoffs, punts) scheduled at the end-of-practice. The more experienced student managers did not actively take part in these drills, which might explain the lower amount of PA. In addition, only experienced managers were assigned to "position group" responsibilities (eg, offensive line, linebackers, quarterbacks), while the 1st year managers were assigned to generally assist position groups as needed. Thus, 1st year managers were constantly on the move during practice while the more experienced managers tended to be anchored to one section of the practice. Still, regardless of being a 1st year or veteran manager, all the student football managers in this study were found to accumulate high levels of PA.

Another observation worthy of comment is the amount of time, roughly 34 hours per week, that student managers spent on their athletic responsibilities. This amount of time is very close to that of Division I FBS student-athletes and graduate-level student athletic trainers.<sup>3,4</sup> Clearly, despite the time demands of these student football managers related to the athletic and academic responsibilities, they were able to fit in adequate levels of health-enhancing LTPA.

### Limitations

While this is the first study on the physical activity of football student managers, it does have its limitations. First, while the objective measures of physical activity in this study were obtained from a valid and reliable pedometer, a more precise research-grade object accelerometer would have been preferred.<sup>15</sup> However, practical considerations and access to the accelerometers were limited to the research team at the time of the study. Second, the subjects could have been instructed to wear the pedometer during all hours of being awake. This would have provided much more detail on the overall physical activity patterns of the student managers. While this would have been insightful, the primary purpose of the study was to explore the volume and intensity of physical activity while performing actual manager responsibilities during a typical week of the football season.

### Conclusion

While being a student football manager demands a great deal of time, the implications of this study reside in the knowledge that the student assuming this role does not sacrifice their opportunities to acquire adequate levels of health-enhancing physical activity.

While future research could enhance the methods of assessing physical activity, it may also focus on the broader student support staff surrounding football programs, such as athletic trainers and marketing interns. In the same sense, the stress and time management research seen among athletic trainers and athletes could be expanded to measure the stressors associated with being a student football manager across a variety of NCAA divisions.

### Conflict of interest disclosure

The authors have no conflicts of interest to report.

### Funding

No sources of funding were used in during the research process or preparation of this article.

### ORCID

Eugene C. Fitzhugh  <https://orcid.org/0000-0002-8033-6596>

Robin Hardin  <https://orcid.org/0000-0002-6638-2246>

William Boyer  <https://orcid.org/0000-0001-9743-6086>

### References

- Samuels B. Football student managers balance academics, working for team. *The Daily Orange* October 16, 2014.
- NCAA Academic and Membership Affairs Staff. NCAA Division I Manual 2016–2017. In. Indianapolis, IN: NCAA; 2016: 414.
- NCAA Research. *Division I results from the NCAA GOALS study on the student-athlete experience*. FARA Annual Meeting and Symposium; 2011. Available at: [https://www.ncaa.org/sites/default/files/DI\\_GOALS\\_FARA\\_final\\_1.pdf](https://www.ncaa.org/sites/default/files/DI_GOALS_FARA_final_1.pdf)
- Mazerolle SM, Monsma E, Dixon C, Mensch J. An assessment of burnout in graduate assistant certified athletic trainers. *J Athl Train*. 2012;47(3):320–328.
- NCAA Research. *Results of Division I SAAC Athletic Time Commitments Survey*. Indianapolis, IN: NCAA; 2015.
- Ebben E, Brudzynski L. Motivations and barriers to exercise among college students. *J Exercise Physiol*. 2008;11(5):1–11.
- U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. 2008; 61. [www.health.gov/PAGuidelines/Report/Default.aspx](http://www.health.gov/PAGuidelines/Report/Default.aspx). Accessed November 17, 2010.
- American College Health Association. *American College Health Association - National College Health Assessment II: Undergraduate Study Reference Group Executive Summary Spring 2015*. Hanover, MD: American College Health Association; 2015.
- Bauman A, Reis R, Sallis J, et al. Correlates of physical activity: why are some people physically active and others not? *Lancet*. 2012;380(9838):258–271.
- Lee J, Williams S, Brown D, Laurson K. Concurrent validation of the Actigraph gt3x+, Polar Active accelerometer, Omron HJ-720 and Yamax Digiwalker SW-701 pedometer step counts in lab-based and free-living settings. *J Sports Sci*. 2015;33(10):991–1000.
- IPAQ Research Committee. *Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire*. Geneva, Switzerland: World Health Organization; 2005.
- Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. *Med. Sci. Sports Exercise*. 2003;35(8):1381–1395.
- Ainsworth B, Haskell W, Herrmann S, et al. 2011 compendium of physical activities: a second update of coes and MET values. *Med. Sci. Sports Exercise*. 2011;43(8):1575–1581.
- IBM SPSS Statistics for Windows, Version 22.0 [Computer Program]. Armonk, NY: IBM Corp; Released 2013.
- Ward D, Evenson KR, Vaughn A, Rodgers A, Troiano R. Accelerometer use in physical activity: best practices and research recommendations. *Med. Sci. Sports Exercise*. 2005;37(Supplement):S582–S588.



Copyright of Journal of American College Health is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.