Meeting Physical Activity Guidelines and its Relationship to Health and Productivity in a University Employee Population

Emma Strickland, MPH
University of Virginia

Victor Tringali, EdD, CSCS
University of Virginia

Jean Gaare Eby, ScD, MS, MEd
University of Virginia

ABSTRACT

Background: Public adherence to physical activity guidelines is low, and workplaces are uniquely situated to promote physical activity in their communities.
Aims: This quality improvement project assessed adherence to national physical activity guidelines for both aerobic exercise and strength training and its relationship to health and work productivity in a university employee population.
Methods: The analysis used data from 7,666 respondents to a 2022 health risk assessment (HRA). Ordinal regression was used to examine the relationship between adherence to physical activity guidelines and health and productivity outcomes.
Results: Meeting both aerobic and strength guidelines was associated with higher self-perceived health (OR = 4.25; 95% CI [3.88, 4.65]), not missing work due to illness (OR = 1.40; 95% CI [1.25, 1.57]), and greater work productivity (OR = 1.53; 95% CI [1.41, 1.67]). Meeting the aerobic guideline and meeting the strength guideline were each independently associated with higher self-perceived health and greater work productivity and meeting the aerobic guideline was independently associated with not missing work due to illness ($p < 0.0001$ for all).
Conclusions: These findings provide a strong rationale for employers to promote both aerobic exercise and strength training to foster healthy and productive workforces and are especially relevant to nurturing healthier academic communities.

Submitted 19 March 2025; accepted 29 April 2025
Keywords: physical activity, strength training, employee health, work productivity

BACKGROUND

The United States Department of Health and Human Services recommends that adults engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic activity, or an equivalent combination thereof, coupled with at least two days of muscle-strengthening exercises weekly (U.S. Department of Health and Human

Services [HHS], 2018). These guidelines emphasize the importance of both aerobic and strength-training activities for achieving optimal health benefits (Centers for Disease Control and Prevention [CDC], 2023; DiPietro et al., 2019). However, in 2022, only 25.3% of adults in the U.S. met these recommendations, highlighting a critical gap that is a focus of Healthy People 2030 and other public health initiatives (CDC, 2024b; Office of Disease Prevention and Health Promotion, n.d.).

Workplaces represent crucial settings for health promotion initiatives. Employees spend a significant portion of their time at work, making it an ideal environment to encourage healthy behaviors (CDC, 2024a). In addition to improved employee health, organizations stand to gain from increased productivity, reduced absenteeism, and lower healthcare costs (World Health Organization, 2023). In contrast to aerobic exercise, the role of strength training – a key component of the physical activity guidelines – has often been overlooked (Li et al., 2024). Strength training, however, is especially crucial for preventing functional decline and supporting overall well-being (Adams et al., 2023; Momma et al., 2022).

This quality improvement project evaluated the impact of existing physical activity programming and opportunities to promote aerobic exercise and strength training to improve health and productivity in a university employee population; specifically, it assessed the prevalence of employees meeting aerobic and strength exercise guidelines and the relationship between meeting these physical activity guidelines with self-perceived health, absenteeism due to illness, and work productivity.

METHODS

This study involved a cross-sectional analysis of a university employee cohort. The data for this study came from employees who completed a health risk assessment (HRA) in 2022. Employees could earn $100 for completion of the HRA. The analysis included 7,666 employees, after excluding one employee who only provided demographic information. For 37 employees who completed the health risk assessment more than once, only the first submission was used. Upon Institutional Review Board review, this study was determined to be a quality improvement project.

The HRA included questions on demographics, physical activity, health, and productivity. Aerobic exercise was calculated based on responses to questions on days per week of moderate-intensity exercise and time spent in moderate-intensity exercise on those days, as well as days per week of vigorous-intensity exercise and time spent in vigorous-intensity exercise on those days. Individuals were classified as meeting the aerobic exercise guideline (HHS, 2018) if they participated in at least 150 minutes of moderate-intensity exercise, 75 minutes of vigorous-intensity exercise, or an equivalent combination of moderate and vigorous-intensity exercise per week. Respondents were also asked to select the number of days per week they performed strength exercises. Individuals were classified as meeting the strength training guideline (HHS, 2018) if they participated in strength exercises at least two days per week. To measure self-perceived health, employees were asked to rate their health compared to other people their age on a 5-point scale from *very unhealthy* to *very healthy*. Work productivity was assessed by asking respondents to rate on a 5-point scale from *not at all* to *very much* their productivity at work in the previous month. For both self-rated health and productivity, due to low numbers in the bottom two categories, the lowest category was grouped with the category above. To assess absenteeism due to illness, respondents reported the number of days they missed work due to illness in the previous month. There were 30 missing responses for both the absenteeism and productivity variables.

Frequencies and percentages were calculated for categorical variables. Differences in health and productivity outcomes between those who met the physical activity guidelines (for both aerobic exercise and strength training) and those who did not were assessed by performing ordinal regression controlling for age, sex, and race/ethnicity. To determine the independent effects of meeting each of the guidelines (aerobic exercise, strength training), ordinal regression was used that additionally controlled for whether the other guideline was met. Statistical analyses were conducted using SAS Version 9.4 (SAS Institute Inc., Cary, NC, USA). A cut-off of 0.05 was used for statistical significance.

RESULTS

Table 1 provides the descriptive statistics for the overall cohort of respondents. Overall, just 42.00% of respondents met both the aerobic exercise and strength training recommendations. A higher proportion of people met the aerobic exercise guideline (68.11%) than the strength guideline (45.42%).

Table 1

*Population Characteristics (*N = *7,666)*

	n (*%*)
Sex	
Female	5,189 (*67.69*)
Male	2,477 (*32.31)*
Age (years)	
18 – 29	1,280 (*16.70*)
30 – 39	2,408 (*31.41*)
40 – 49	1,645 (*21.46*)
50 – 59	1,536 (*20.04*)
60+	797 (*10.40*)
Race	
Asian	666 (*8.69*)
Black	705 (*9.20*)
Hispanic Latina or Latino	159 (*2.07*)
White	5600 (*73.05*)
Other	301 (*3.93*)

	n (*%*)
Not Reported	235 (*3.07*)
Aerobic Exercise and Strength	
Meets guideline	3,220 (*42.00*)
Does not meet guideline	4,446 (*58.00*)
Strength	
Meets guideline	3,482 (*45.42*)
Does not meet guideline	4,184 (*54.58*)
Aerobic Exercise	
Meets guideline	5,221 (*68.11*)
Does not meet guideline	2,445 (*31.89*)

Table 2 shows the relationship between physical activity and self-rated health. Meeting the combined aerobic exercise and strength guideline was associated with 4.25 odds (95% CI [3.88, 4.65]; $p < 0.0001$) of having higher self-rated health. Meeting the aerobic exercise guideline and meeting the strength guideline were each independently associated with higher self-rated health ($p < 0.0001$).

Table 2

Association between Physical Activity and Health

	Self-Rated Health					
	Very unhealthy or unhealthy n (%) 454 (*5.92*)	Average n (%) 2,088 (*27.24*)	Healthy n (%) 3,169 (*41.34*)	Very healthy n (%) 1,955 (*25.50*)	Odds Ratio (95% CI)	p-value
Aerobic Exercise and Strength						
Meets guideline	52 (*1.61*)	498 (*15.47*)	1,339 (*41.58*)	1,331 (*41.34*)	4.25 (3.88 – 4.65)	<0.0001 *
Does not meet guideline	402 (*9.04*)	1,590 (*35.76*)	1,830 (*41.16*)	624 (*14.04*)		
Strength						
Meets guideline	66 (*1.90*)	586 (*16.83*)	1,453 (*41.73*)	1,377 (*39.55*)	2.43 (2.20 – 2.68)	<0.0001 **
Does not meet guideline	388 (*9.27*)	1,502 (*35.90*)	1,716 (*41.01*)	578 (*13.81*)	-	-
Aerobic Exercise						
Meets guideline	115 (*2.20*)	1,027 (*19.67*)	2,326 (*44.55*)	1,753 (*33.58*)	3.50 (3.14 – 3.89)	<0.0001 **
Does not meet guideline	339 (*13.87*)	1,061 (*43.39*)	843 (*34.48*)	202 (*8.26*)	-	-

* Adjusted for race, age, and sex

** Adjusted for race, age, sex, and meeting the other recommendation

Table 3 shows the relationship between physical activity and not missing work due to illness. People who met the combined aerobic exercise and strength guideline were 40% more likely to take no sick leave than people who did not meet the combined guideline (OR = 1.40; 95% CI [1.25, 1.57]; $p < 0.0001$). Meeting the aerobic exercise guideline ($p < 0.0001$), but not the strength guideline ($p = 0.1815$), was independently associated with not missing work due to illness.

Table 3

Association between Physical Activity and No Missed Work due to Illness

	Number of Sick Days		Odds Ratio (95% CI)	p-value
	0 n (%) 6,016 (*78.78*)	1+ n (%) 1,620 (*21.22*)		
Aerobic Exercise and Strength				
Meets guideline	2,633 (*82.18*)	571 (*17.82*)	1.40 (1.25 – 1.57)	<0.0001 *
Does not meet guideline	3,383 (*76.33*)	1,049 (*23.67*)		
Strength				
Meets guideline	2,825 (*81.53*)	640 (*18.47*)	1.09 (0.96 – 1.24)	0.1815 **
Does not meet guideline	3,191 (*76.50*)	980 (*23.50*)		
Aerobic Exercise				
Meets guideline	4,239 (*81.53*)	960 (*18.47*)	1.52 (1.33 – 1.73)	<0.0001 **
Does not meet guideline	1,777 (*72.92*)	660 (*27.08*)		

* Adjusted for race, age, and sex

** Adjusted for race, age, sex, and meeting the other recommendation

Table 4 shows the relationship between physical activity and work productivity. Meeting the combined aerobic exercise and strength training guideline was associated with 53% (OR = 1.53; 95% CI [1.41, 1.67]; $p < 0.0001$) increased odds of having higher work productivity. Meeting the aerobic exercise guideline and meeting the strength guideline were each independently associated with greater work productivity ($p < 0.0001$).

Table 4

Association between Physical Activity and Productivity

	Self-Rated Productivity					
	Not at all or a little bit n (%) 311 (*4.07*)	Somewhat n (%) 1,229 (*16.09*)	Quite a bit n (%) 2,962 (*38.79*)	Very much n (%) 3,134 (*41.04*)	**Odds Ratio (95% CI)**	**p-value**
Aerobic Exercise and Strength						
Meets guideline	73 (*2.28*)	420 (*13.11*)	1,238 (*38.64*)	1,473 (*45.97*)	1.53 (1.41 – 1.67)	<0.0001 *
Does not meet guideline	238 (*5.37*)	809 (*18.25*)	1,724 (*38.90*)	1,661 (*37.48*)		
Strength						
Meets guideline	85 (*2.45*)	476 (*13.74*)	1,333 (*38.47*)	1,571 (*45.34*)	1.28 (1.16 – 1.40)	<0.0001 **
Does not meet guideline	226 (*5.42*)	753 (*18.05*)	1,629 (*39.06*)	1,563 (*37.47*)		
Aerobic Exercise						
Meets guideline	157 (*3.02*)	749 (*14.41*)	2,007 (S*38.60*)	2,286 (*43.97*)	1.40 (1.26 – 1.55)	<0.0001 **
Does not meet guideline	154 (*6.32*)	480 (*19.70*)	955 (*39.19*)	848 (*34.80*)		

* Adjusted for race, age, and sex

** Adjusted for race, age, sex, and meeting the other recommendation

DISCUSSION

Our findings demonstrated a statistically significant association between meeting physical activity guidelines and improved health and productivity outcomes. These results are consistent with previous studies (Burton et al., 2014; Li et al., 2024), which provide evidence for the positive impact of physical activity, particularly aerobic exercise, on overall health and employee productivity. Burton et al. (2014) found a relationship between sufficient physical activity and reduced absenteeism. Li et al. (2024) reported that physically active employees not only experienced improved health but also increased focus and performance. Our findings expand on prior work by emphasizing the importance of meeting both aerobic and strength training guidelines. These findings are particularly relevant given the aging workforce, as strength training plays a critical role in mitigating functional decline and maintaining long-term health (Adams et al., 2023; U.S. Bureau of Labor Statistics, 2024.).

This analysis offers an evidence-based rationale for targeted workplace interventions. The clear and strong association between physical activity and employee health and productivity provides a potential return on investment

for workplace health promotion programs that encourage both aerobic and strength-based activities. Organizations have an opportunity to leverage these insights to create comprehensive wellness programs that promote aerobic exercise and strength training.

Limitations

This study was observational and cross-sectional, which limits the ability to infer causality. In addition, the study was conducted in a university employee population at a large public university in the southeastern United States, which may affect the generalizability of results.

CONCLUSIONS

This study demonstrates the substantial benefits of meeting physical activity guidelines, both for individual employees and the organizations they serve. Employees who met the physical activity guidelines were healthier and more productive. An important implication of the study is that, while aerobic exercise is critical, the role of strength training in promoting health and productivity should not be overlooked. Employers have an opportunity to foster healthier, more productive workforces by encouraging comprehensive physical activity programs. Recommendations based on these findings include integrating both aerobic and strength training components into workplace wellness initiatives, creating a pathway for improving the health and well-being of employees, organizations, and communities, and are especially relevant for promoting healthier academic communities.

REFERENCES

Adams, M., Gordt-Oesterwind, K., Bongartz, M., Zimmermann, S., Seide, S., Braun, V., & Schwenk, M. (2023). Effects of physical activity interventions on strength, balance and falls in middle-aged adults: A systematic review and meta-analysis. *Sports Medicine - Open*, *9*, 61. https://doi.org/10.1186/s40798-023-00606-3

Burton, W. N., Chen, C.-Y., Li, X., Schultz, A. B., & Abrahamsson, H. (2014). The association of self-reported employee physical activity with metabolic syndrome, health care costs, absenteeism, and presenteeism. *Journal of Occupational and Environmental Medicine*, *56*(9), 919–926. https://doi.org/10.1097/JOM.0000000000000257

Centers for Disease Control and Prevention. (2023, December 20). *Adult Activity: An Overview*. Physical Activity Basics. https://www.cdc.gov/physical-activity-basics/guidelines/adults.html

Centers for Disease Control and Prevention. (2024a, July 15). *CDC Workplace Health Model*. Workplace Health Promotion. https://www.cdc.gov/workplace-health-promotion/php/model/index.html

Centers for Disease Control and Prevention. (2024b, December 30). *Active People, Healthy Nation*℠. Active People, Healthy Nation. https://www.cdc.gov/active-people-healthy-nation/php/about/index.html

DiPietro, L., Buchner, D. M., Marquez, D. X., Pate, R. R., Pescatello, L. S., & Whitt-Glover, M. C. (2019). New scientific basis for the 2018 U.S. Physical Activity Guidelines. *Journal of Sport and Health Science*, *8*(3), 197–200. https://doi.org/10.1016/j.jshs.2019.03.007

Li, Y. N., Cheng, B. H., Yu, B., & Zhu, J. N. Y. (2024). Let's get physical! A time-lagged examination of the motivation for daily physical activity and implications for next-day performance and health. *Personnel Psychology*, *77*(2), 917–955. https://doi.org/10.1111/peps.12585

Momma, H., Kawakami, R., Honda, T., & Sawada, S. S. (2022). Muscle-strengthening activities are associated with lower risk and mortality in major non-communicable diseases: A systematic review and meta-analysis of cohort studies. *British Journal of Sports Medicine*, *56*(13), 755–763. https://doi.org/10.1136/bjsports-2021-105061

Office of Disease Prevention and Health Promotion. (n.d.). *Increase the proportion of adults who do enough aerobic and muscle-strengthening activity—PA-05.*). Healthy People 2030. U.S. Department of Health and Human Services. https://health.gov/healthypeople/objectives-and-data/browse-objectives/physical-activity/increase-proportion-adults-who-do-enough-aerobic-and-muscle-strengthening-activity-pa-05

U.S. Bureau of Labor Statistics. (2024, August 29). *Median age of the labor force, by sex, race, and ethnicity*. U.S. Department of Labor. Retrieved December 3, 2024, from https://www.bls.gov/emp/tables/median-age-labor-force.htm

U.S. Department of Health and Human Services. (2018). *Physical activity guidelines for Americans* (2nd ed.). https://odphp.health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf

World Health Organization, Regional Office for Europe. (2023). *Promotion of health-enhancing physical activity in small-to-medium-sized enterprises* [Document No. WHO/EURO:2023-8209-47977-71019]. https://iris.who.int/handle/10665/373629

Address author correspondence to:
Jean Gaare Eby, ScD, MS, MEd
jmg5b@virginia.edu

Author's Note

These authors declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.