Social and Occupational Ergonomics, Vol. 106, 2023, 14–19
https://doi.org/10.54941/ahfe1003961

Student Perception on Acceptability and Usefulness of Sit-Stand Desks in College Classrooms

Arijit K. Sengupta and Abiola Kuilan

New Jersey Institute of Technology, Newark, NJ 07079, USA

ABSTRACT

Given that full-time college students spend more than 15 hours per week sitting in a college classrooms, it may be an ideal setting for the implementation of Sit-Stand Desk (SSD) to reduce their sedentary time. Graduate and undergraduate college students (N = 178) were randomly recruited to complete the survey. Participants' mean(sd) age was 22.4(4.7) years old, 63% identified as male, 33% identified as female while 4% were of the other gender class. Among the participants, 44.3% of students self-reported to be overweight or obese according to their BMI, 76% students led an inactive lifestyle, and 63.5% students did not meet physical activity guidelines. Students' perceived acceptability of SSD in classrooms was strongly favorable. Over 70% students favored the opportunity of having a SSD in classrooms and most of the students (85% - 99%) predicted either no change or positive change (get better) in all academic factors (focus, restlessness, attention, engagement and boredom) and health factors (physical health, fatigue and back pain), if SSD is introduced in classrooms. Collectively, the findings of this study strongly support the acceptability of introducing SSD in college classrooms. The results of this study should be useful for policy makers regarding classroom designs. Future studies are needed to test the viability and efficacy of introducing sit-stand desks in college classrooms.

Keywords: College classrooms, Sit-stand desks, BMI, Sedentary, Student acceptability

INTRODUCTION

Sedentariness is associated with increased risk of chronic diseases – obesity, cardiovascular disease, type II diabetes and even cognitive performance (Benzo et al. 2016). The typical temporal pattern of a college student who attends class, completes homework, and relaxes via screen-based leisure, suggests college students appear to be at a high risk of too little exercise and too much sitting (Fountaine et al. 2016). A cross-sectional study of sedentary time among undergraduate college students (n = 102) found that students spent an average of 11.88 ± 3.46 hours per day engaged in sedentary behaviors (Moulin & Irwin 2016), which is 2.48 hours more sedentary time from a sample of 883 overweight men and women (Rosenberg et al. 2010). Moulin & Irwin (2016) identified that a major barrier for the students to engage in a less sedentary lifestyle is the amount of sitting they do when in class. A study (n = 96) by Finch et al. (2017) found that standing at a desk did not impair (or

enhance) performance on reading comprehension or creativity tasks relative to sitting at a desk. The outcome of the study suggested that "...if university students choose to use standing desks in an effort to reduce sitting time or promote health, doing so may increase their short-term task engagement without undermining work performance".

A randomized, crossover trial conducted by Butler et al., (2018) assessing healthy college students ($n = 21$) who attended at least two courses per week (a minimum of 5 hours) in a university building with standing desks was studied. The participants were randomly assigned to the phase of intervention of which they should start (sitting or standing), and concluded that a standing desk in the classroom paradigm was found to significantly improve cardiometabolic health throughout a short 3 weeks' time span. Given that a full-time college student in the US spends more than 15 hours per week sitting in a college classroom, it may be an ideal setting for implementation of SSD to reduce college students' sedentary time.

We found only two studies investigating and testing SSD use in college classroom settings. Benzo et al. (2016) conducted a survey ($n = 993$) to explore the acceptability and feasibility of introducing standing desks in college classrooms. The large majority of students (95%) reported they would prefer the option to stand in class. More than half of the students predicted having access to standing desks in class would improve student's physical health, attention in class, and restlessness in class. Jerome et al. (2017) reported equipping one classroom with 25 standing desks and comparing student sitting and standing behavior with a classroom with standard seating desks, over a 12-week period. When provided access to standing desks, students stood 6.2 min/hr./student ($p < 0.001$) more compared to when they had only access to a seated desk. At the end of the twelfth week, students participated ($n = 143$) in a post intervention online survey and reported strongly favorable responses for perceived change engagement (reduction in restlessness, boredom, fatigue and joint pain) and affective outcomes (increased attention, class participation) while using the SSD.

This paper presents a comprehensive survey to explore on the acceptability of SSD among college students of a predominantly technological university in New Jersey, USA. The outcome would provide a baseline measure of college students' sedentary habits, physical inactivity and activity levels, acceptance level of SSD in classrooms, and perceived effects of SSD on their health and educational outcomes.

QUESTIONNAIRE SURVEY

The questionnaire was prepared to obtain student perception and feedback using an online survey via google form. The survey was reviewed and approved by the University's Institutional Review Board before it was sent out to the students. The demographics part of the questionnaire included age, gender, height, weight, class status, and full-time/part-time student status. From the self-reported height and weight, Body Mass Index (BMI) was calculated. Sedentary behaviors were estimated using a tool based on the Rapid Assessment of Disuse Index (RADI) which has been demonstrated as a reliable

measure of sedentary behavior (Shuval et al. 2014, Benzo et al. 2016). Sedentariness is assessed by two questions on daily activity, moving around and climbing stairs, and one question on daily inactivity, sitting down. Participants were asked to estimate their daily activity and inactivity levels resulting in a possible score of 3-14. Higher sedentariness score has been significantly correlated with increased sedentary time, fewer sedentary breaks and reduced physical activity (Nader et al. 2008). Based on the RADI literature, a score of 9 or higher is indicative of sedentary behavior and should benefit from reducing sedentariness and increasing physical activity.

Physical activity and fitness level were estimated by using a validated five item single response questionnaire (PA5) on their exercise habits (Jackson et al. 2007). The outcome of this questionnaire is positively correlated to cardiorespiratory fitness levels. A physically active individual is classified as performing minimum 20 minutes of vigorous exercise 3 days a week or performing a minimum of 30 minutes of moderate like jogging, running, aerobics, swimming laps, fast cycling, singles tennis, and racquetball. Any activity that makes one work as hard as jogging at least 20 minutes at a time is considered vigorous physical activity. These types of activities increase one's heart rate and make one sweat or out of breath (not including weightlifting exercise). Moderate physical activity includes activities such as brisk walking, gardening, slow cycling, dancing, double tennis, or yard work around the house. Any activity that makes one work as hard as brisk walking in bouts of at least 8–10 minutes accumulating to at least 30 minutes a day. Performing vigorous physical exercise at least 3 days a week or perform a moderate exercise at least 5 days a week for last month or more is considered to be a physically active individual (Jackson et al. 2007).

Students' opinions about SSD in the classroom were explored by two questions: (1) if SSD was made available in their classrooms, would you prefer to sit or stand in the class, and (2) the percentage of class time they would stand if SSDs were available in their classroom. Students who don't want to stand at all would be considered to have unfavorable opinions about SSD. Students' opinion about educational outcomes (focus, restlessness, attention, engagement, boredom, and academic performance) and health outcomes (physical health, fatigue, and back pain) if SSD was available in the classroom were assess in terms of "get worse", "no change" and "get better".

RESULTS

A total of 178 undergraduate and graduate students completed the survey for this study. Participants' mean (standard deviation) age was 22.4(4.7) years old, 63% identified as male, 33% identified as female while 4% were of the other gender class. The male-female gender ratio observed is typically found in a technological school. Participants self-reported their height and weight as part of the questionnaire. The mean (standard deviation) of male and female students' heights were 69.2(3.0) and 64.1(2.3) inches, respectively and weights were 169.7(30.0) and 140.4(30.0) lbs., respectively. Mean (standard deviation) of male and female participants' BMIs were comparable

to each other, 24.9 (4.0) and 24.0 (4.9), respectively. A two tailed t-test determined that the difference in the mean BMI for male and female students are not statistically different ($p = 0.25$), and the mean (standard deviation) of BMI of the student population was 24.7 (4.4). According to the BMI weight category, 6.3% of the respondents were underweight, 49.4% healthy weight, 32.4% overweight, and 11.9% obese.

Majority of the students (76%) were classified as leading an inactive or sedentary lifestyle, having RADI scores of more than 9. The average (standard deviation) of the RADI score was 9.8(1.9). In terms of PA-5 instruments, 63.5% of the students did not meet the physical activity guideline. On a scale of 1-5, a score of 4 or more meets the guideline for physical activity. The average (standard deviation) PA-5 score was 3.3(1.1).

Student's opinions regarding preference for SSD in College classrooms were assessed using the survey questionnaire (Table 1). More than half, 69% of the students reported a preference to have the option to sit part of the time and stand part of the time, as opposed to 29% preferred to sit the entire class time, and while 3% preferred to stand the entire time. Overall, over 70% of the students opted for an opportunity to have the ability to alternate between sitting and standing the entire class time. If SSD were made available in a class that students are currently taking, only about 11% participants preferred not to stand at all during the class time, and 89% students preferred to stand for at least 10% of class time.

Students' prediction of changes in academic and health outcomes if SSDs were made available in college classrooms was assessed as part of the survey questions. Most of the students predicted either no change or positive change (get better) in all academic and health factors (Table 2). 66% projected that restlessness during class time will get better, focus during class will get better with 49% response rate, 55% of participant's attention during class time will increase, 46% believe engagement during class will be increased. The boredom rate during class time will get better with 55% response rate, fatigue

Table 1. Students' opinion and acceptability of sit-stand desks in classrooms.

Questions	Responses (n = 178)
If given the option by your instructor, would you prefer to sit or stand in the class?	
Sit entire class time	28.7%
Sit part of the time and stand part of the time	68.5%
Stand entire class time	2.8%
If sit-stand desks are made available in a class you are taking, what percentage of class time do you predict you would stand on average?	
0% of the time	10.7%
25% of the time	44.9%
50% of the time	31.5%
75% of the time	10.1%
100% of the time	1.7%
Other (10%, 20%)	1.2%

Table 2. Students' predicted changes in academic and health outcomes if SSD were made available in classrooms (n = 178). All results are presented as percentages.

Factor	Get worse	No change	Get better
Focus	7.9	43.3	48.9
Restlessness	10.7	23.6	65.7
Attention	6.2	38.8	55.1
Engagement	3.4	50.6	46.1
Boredom	7.9	37.1	55.1
Academic Performance	2.8	51.7	45.5
Physical Health	1.1	16.3	82.6
Fatigue	14.6	38.2	47.2
Back pain	9.6	15.2	75.3

normally experienced by students is projected to improve by 47%, and academic performance levels will increase by 46%. 83% of participants agreed that overall physical health will get better while 75% will see a reduction in the level of back pain experienced by students.

However, engagement of students with SSD in college classrooms might not be significantly changed with 51% of response projecting implementation of SSD may not have an impact on the level of student engagement during class time. 15% of students do anticipate that the level of fatigue may get worse, while 38% projected no changes will be felt if a sit- stand desk is introduced in the classroom.

DISCUSSION AND CONCLUSION

This study further builds on previous studies conducted to explore the acceptability of Sit-Stand Desks both in kindergarten and college classrooms (Benzo et al., 2016; Clemes et al., 2015; Raulli 2017). Similar to the previous studies, the outcome of this questionnaire survey is largely in favor of introduction of SSD in college classrooms. Acceptance of SSD in classroom indicated by the fact that over sixty percent of students will prefer the option to have an adjustable SSD in college classrooms, 89% of the students would prefer to stand for at least 10% of class time, thus providing opportunities to reduce the pattern of sedentariness often observed in college students without interfering with the regular class activities. The perception was that proposed introduction of Sit-stand desks in college classrooms will greatly improve physical health (82.6%), especially back pain alleviation (75.3%) which is often caused by prolonged sitting and sedentariness observed in college students. Students' mood improvement and expectations to be more proactive during class would be greatly improved with 55.1% expecting that with the introduction of Sit-stand desks in college classrooms, the boredom rate will get better.

The study strength includes randomization of the participants which ensured that all races, ethnic groups and genders were given the same opportunity to participate in the study. Future research studies may focus more on conducting pilot study in some classrooms after implementing SSD in the classrooms to see the physical outcome and observe students' perception.

ACKNOWLEDGMENT

This publication was supported by the Grant Number, T42OH008422, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

REFERENCES

Benzo, R. M., Gremaud, A. L., Jerome, M., & Carr, L. J. (2016). Learning to stand: The acceptability and feasibility of introducing standing desks into college classrooms. International Journal of Environmental Research and Public Health, 13(8).

Butler, K. M., Ramos, J. S., Buchanan, C. A., & Dalleck, L. C. (2018). Can reducing sitting time in the university setting improve the cardiometabolic health of college students? Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 11, 603–610.

Clemes, S. A., Barber, S. E., Bingham, D. D., Ridgers, N. D., Fletcher, E., Pearson, N.,... Dunstan, D. W. (2016). Reducing children's classroom sitting time using sit-to-stand desks: Findings from pilot studies in UK and australian primary schools. Journal of Public Health (United Kingdom), 38(3), 526–533.

Finch, L. E., Tomiyama, A. J., & Ward, A. (2017). Taking a stand: The effects of standing desks on task performance and engagement. International journal of environmental research and public health, 14(8), 939.

Fountaine, C. J., Johann, J, Skalko, C., & Liguori, G. A. (2016). Metabolic and energy cost of sitting, standing, and a novel sitting/stepping protocol in recreationally active college students. International journal of exercise science vol. 9(2), 223–229.

Jackson, A. W., Morrow, J. R., Bowles, H. R., FitzGerald, S. J., Blair, S. N., & Blair, S. N. (2007). Construct validity evidence for single-response items to estimate physical activity levels in large sample studies. Research Quarterly for Exercise and Sport, 78(2), 24–31.

Jerome, M., Janz, K. F., Baquero, B., & Carr, L. J. (2017). Introducing sit-stand desks increases classroom standing time among university students. Preventive Medicine Reports, 8, 232–237.

Moulin, M. S., & Irwin, J. D. (2016). An assessment of sedentary time among undergraduate students at a Canadian university. International journal of exercise science, 10, 1116–1129.

Nader, P. R., Bradley, R. H., Houts, R. M., McRitchie, S. L., & O'Brien, M. (2008). Moderate-to-vigorous physical activity from ages 9 to 15 years. JAMA, 300(3), 295–305.

Raulli. (2017). intervention to enhance the use of sit-stand desks in college students. University of Iowa. https://iro.uiowa.edu/view/pdfCoverPage?instCode=01IOWA_INST&filePid=13811796770002771&download=true

Rosenberg, D. E., Norman, G. J., Wagner, N., Patrick, K., Calfas, K. J., & Sallis, J. F. (2010). Reliability and validity of the sedentary behavior questionnaire (SBQ) for adults. Journal of Physical Activity and Health, 7(6), 697–705.

Shuval, K., Kohl III, H. W., Bernstein, I., Cheng, D., Gabriel, K. P., Barlow, C. E., DiPietro, L. (2014). Sedentary behavior and physical inactivity assessment in primary care: The rapid assessment disuse index (RADI) study. British Journal of Sports Medicine, 48(3), 250–255.