

Research

Efficacy of a standing desk intervention on college students engagement and academic performance: A pilot study

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ABSTRACT

Rethinking traditional classroom design to maximize student-learning outcomes is not a new concept, but how to achieve these outcomes remains a topic of both pragmatic and fiscal concern with naysayers wondering if the costs outweigh the benefits.

KEY WORDS: Standing desk intervention; Academic performance; Behavioral observation assessment; Off-task passive behavior.

INTRODUCTION

Rethinking traditional classroom design to maximize student-learning outcomes is not a new concept, but how to achieve these outcomes remains a topic of both pragmatic and fiscal concern with naysayers wondering if the costs outweigh the benefits. With recent cost projections of classroom modifications ranging from \$40 k - \$50 k on the low end to nearly 10 times that cost on the high end,¹ administrators have reason for concern. However, despite these cost projections, recent evidence in favor of such change is difficult to ignore.

In a series of studies conducted by the Steelcase Education group, researchers considered the effects of a variety of classroom modifications deviating from a traditional row-by-column design. A comparison of student engagement across multiple self-report measures revealed that both faculty and students supported changes over the traditional classroom configuration.² Modifications to the physical space are inspiring and have been shown to increase self-reported engagement affecting the student's emotional and psychological state.³⁻⁵

More recently, a meta-analysis investigating the effects of active learning on student performance reported that not only does academic performance increase by a half letter grade, but more importantly the failure rate of students in traditional classroom settings is nearly 60% greater than in an active-learning classroom environment.⁶

While the basic elements of a classroom that promotes active, engaged learning are well known, many colleges and universities find such changes cost prohibitive or impractical. A potentially cost effective approach for augmenting existing classroom structure while promoting a more engaging learning environment is by providing standing desks.⁷ The average cost of a standing-desk can range from \$29 for Oristand's mobile standing desk to approximately \$240 for a more fixed option from Uplift desk. The addition of a standing desk to the classroom promotes both a sociological and behavioral modification to an existing structured environment that encourages standing rather than sitting during normal classroom activities. Emerging research is revealing that standing desks result in reduced sedentary behavior, increased caloric expenditure, and improved classroom behavior in elementary students⁸⁻¹⁰ and improved cognitive function in high school students.¹¹ However, there remains little evidence regarding the impact of standing desks on students learning and academic achievement and there is a need to determine the impact of

standing desks on college student's academic performance and in-class behavior.¹⁰

Despite reports that suggest that 95% of college students would prefer the option to stand in class,¹² standing desks in college classrooms are rare and furthermore research has yet to examine the impact of standing desks in college classrooms. Indeed, the college classroom provides an ideal environment to intervene because most students (83%) currently sit for the entirety of their college classes due in large part to the lack of access to standing desk options class.¹²

Aside for the many health benefits associated with standing more and sitting less, standing may promote engagement and active learning along with the many associated benefits such as retention, knowledge acquisition, problem solving and academic performance. We contend that providing standing desks may have a similar impact to other ergonomic and classroom design changes that have resulted in significant academic improvement.⁶

The purpose of this pilot study was to examine the feasibility and efficacy of a standing-desk intervention on university student's engagement, attention, and academic performance. We hypothesized that students in the standing desk classroom would be more engaged and attentive as evidenced by their frequency of observed on-task behaviors and academic performance compared to the traditional classroom over the course of a semester.⁹

METHODS

Participants

Participants were 29 undergraduate university students (55.2% female; M age=19.12, SD =1.78) from two sections of a common-core class that was taught by the same instructor in the Fall of 2016 at a small private southeastern university. Most of the students were freshman (55.2%), followed by sophomores (13.8%), seniors (13.8%), and juniors (3.4%). Thirty-one percent of the participants were student-athletes. The students exercised an average of 4.3 times a week (SD =2.68) for an average of 75.70 minutes per session (SD =55.42).

Procedures

Prior to study enrolment both the students and course instructor completed a university approved IRB informed consent. Students in the standing-desk classroom (N =18) were provided with Oristand standing desks that they could voluntarily use during class (i.e., the experimental condition). The standing desks are an easy to assemble cardboard pop up desk that the students placed on top of their traditional desks. Students in the traditional classroom (N =11) were not provided with the standing desks (i.e., the control condition). The classroom content, location (i.e., same classroom), and instructor were identical in both classroom conditions and times were similar (both classes were taught in the early morning). During the semester the classes met twice a week for 75 minutes per class meeting.

During the semester, observations of the students' on-task and off-task classroom behaviors were recorded unobtrusively by two research assistants. At the end of the semester the instructor provided the students' academic performance.

MEASURES

Behavioral Observations of Students in Schools (BOSS)

A behavioral observation assessment was used during class time to determine the students' on-task and off-task behaviors.¹³ The BOSS uses time-sampling to record the frequency of behaviors that students exhibit within a 15-second interval. During each class the observational assessment was independently completed by two trained research assistants. The on-task behaviors observed included active-engaged and passive-engaged time. Active-engaged time described a student who was taking notes, nodding or participating in the class discussion, or actively contributing to the class. Passive-engaged time described a student who was paying attention in class and watching the instructor, but not verbally participating, taking notes, or making any movements.

The off-task behavior included off-task motor behavior, off-task verbal behavior, off-task passive behavior, and cell phone use. Off-task motor behavior described a student who was fidgeting in class, shaking his/her foot, playing with his/her pen or pencil, or constantly shifting. Off-task verbal behavior described a student who was talking to other students in class that was off the topic of the classroom discussion. Off-task passive behavior described students who were sleeping or dozing in class, resting their head, or staring at random places in the room. The ratio of on-task behavior time versus off-task behavior time was then determined by dividing the total on-task behavior number by the total off-task behavior number.

Demographic Questionnaire

The demographic questionnaire assessed the students' age, year in school, exercise habits, and major.

Academic Performance

The students' final course grade was provided by the course instructor as an indicator of academic performance.

RESULTS

Regarding attention, the standing-desk classroom students were 1.49 times more likely to engage in on-task behavior than off-task behaviors compared to the traditional classroom, $CI=\pm 0.15$, $p<0.01$.

Regarding academic performance, the standing desk students had a higher final grade average (M =86.54%, SD =10.14) than the traditional desk students (M =81.54%, SD =15.11), $t(28)=1.13$, $p=0.26$, with a Cohen's d of 0.43.

Comment

The needs of contemporary students are not being met by the traditional classroom structure, failing to provide an environment that is stimulating, rewarding, and engaging. University students are highly susceptible to spending extended periods of time sitting in an antiquated classroom environment or while studying.¹⁴ Because university students spend a large portion of their week in lecture (an average of 15 hours a week), it provides an ideal environment to intervene and explore the potential benefits of standing over other more costly environmental changes to the classroom environment. Standing desks are a low-cost intervention that can be easily implemented in a college classroom environment to increase engagement, attention and academic performance.

The purpose of this pilot study was to examine the efficacy of a standing-desk intervention on university student's engagement, attention, and academic performance, with a secondary benefit of decreased sitting behavior. Study findings and limitations as well as future research directions are discussed below.

First, consistent with our hypothesis the students in the standing desk classroom demonstrated more engagement and attention compared to the traditional classroom students. More specifically, the students in the standing desk classroom had more on-task than off-task behaviors compared to the students in the traditional classroom. In other words, the standing desk classroom students were more likely to be taking notes, nodding or participating in the class discussion, and actively or passively contributing to the class compared to the traditional classroom students. As well, the standing desk students were less likely to be engaged in cell phone use, talking about off topic material to other students, sleeping or dozing off in class, resting their head, or staring at other places in the room compared to the traditional classroom students.

Second, consistent with our prediction, the students in the standing desk classroom had better academic performance compared to the traditional classroom students. With a Cohen's *d* of 0.43, we can estimate that approximately 67% of the standing desk group will outperform the traditional classroom group, a finding consistent with Freeman.⁶

This is the first study to our knowledge that has examined the effects of standing desks on attention and academic performance. Our study findings add to the existing literature that has found that standing desks can increase productivity, energy, and focus.^{15,16} With increased attention comes increased productivity which may be reflected in the higher performance average in the standing desk compared to the traditional classroom students. This initial evidence supports integrating standing desks into the classroom environment as a cost-effective sociological and behavioral intervention.

LIMITATIONS

Given the exploratory nature of this pilot study, light was shed

on the strength of habitual sitting in our classrooms and culture. Although the pilot study was carried out over the course of one 16-week semester, students demonstrated a propensity for sitting post study. It is recommended that future research consider shorter class periods that meet more frequently or expose students to a standing desk option over an extended period beyond a traditional 16-week semester to explore the lasting effects of standing behavior on academic performance and health.

CONCLUSION

In summary, this pilot study provides evidenced-based support for the positive academic, attentional, and behavioral effects of standing desk classrooms with college students. Strength of our study is its high external validity which enables generalizability to other populations. If college students stand during class time, they may become more actively-engaged in their learning process, increasing knowledge acquisition, knowledge retention and application, which theoretically may provide a mechanism for enhanced information processing and decision-making beyond the classroom. Larger scale interventions in a variety of college classroom environments are needed to determine the academic and behavioral effects of standing desk classrooms with college students.¹⁷ These efforts are critical for informing institutional policies regarding classroom designs for learning, engagement and student success.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

- Schaffhsauer D. 6 secrets of active learning classroom design. 2015; Web site. <https://campustechnology.com>. Accessed November 22, 2017.
- Scott-Weber L, Strickland A, Kapitula LR. How classroom design affects engagement. 2014; Web site. <https://www.steelcase.com>. Accessed November 22, 2017.
- Jankowska M. Use of creative space in enhancing students' engagement. *Innovations in Educations and Teaching International*. 2008; 45(3): 271-279. doi: [10.1080/14703290802176162](https://doi.org/10.1080/14703290802176162)
- Kumar R, O'Malley P, Johnston L. Association between physical environment of secondary schools and student problem behavior. A national study, 2000-2003. *Environment and Behavior*. 2008; 40(4): 455-486. doi: [10.1177/0013916506293987](https://doi.org/10.1177/0013916506293987)
- Schneider M. Do school facilities affect academic outcome? National clearinghouse for educational facilities. 2002; Web site. <http://www.ncef.org>. Accessed November 22, 2017.
- Freeman S, Eddy LE, McDonough M, et al. Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Science of the United States*. 2014; 111(23): 8410-8415. doi: [10.1073/pnas.1312448111](https://doi.org/10.1073/pnas.1312448111)

[pnas.1319030111](#)

7. Hinckson E, Salmon J, Benden M, *et al.* Standing classrooms: Research and lessons learned from around the world. *Sports Medicine*. 2016; 46(7): 977-987. doi: [10.1007/s40279-015-0436-2](#)
8. Benden ME, Zhoa H, Jeffrey CE, *et al.* The evaluation of the impact of a stand-biased desk on energy expenditure and physical activity for elementary school students. *Int J Environ Res Public Health*. 2014; 11(9): 9361-9375. doi: [10.3390/ijerph110909361](#)
9. Minges KE, Chao AM, Irwin ML, *et al.* Classroom standing desks and sedentary behavior: A systematic review. *Pediatrics*. 2016; 137: e20153087. doi: [10.1542/peds.2015-3087](#)
10. Reiff C, Marlatt K, Dengel, DR. Difference in caloric expenditure in sitting versus standing desks. *J Phys Act Health*. 2012; 9(7): 1009-1011.
11. Mehta RK, Shortz AE, Benden ME. Standing up for learning: A pilot investigation on the neurocognitive benefits of stand-biased school desks. *Int J Environ Res Public Health*. 2015; 13(1). doi: [10.3390/ijerph13010059](#)
12. Benzo RM, Gremaud AL, JeromeM, *et al.* Learning to stand: The acceptability and feasibility of introducing standing desks into college classrooms. *Int J Environ Res Public Health*. 2016; 13(8): 823. doi: [10.3390/ijerph13080823](#)
13. Shapiro E. *Behavioral Observation of Students in Schools (BOSS): Users Guide*. Bloomington, MN, USA: Pearson, Inc.; 2013.
14. Loprinzi PD, Nooe A. Executive function influences sedentary behavior: A longitudinal study. *Health Promot Perspect*. 2016; 6(4): 180-184. doi: [10.15171/hpp.2016.29](#)
15. Chau JY, Sukala W, Fedel K, *et al.* More standing and just as productive: Effects of a sit-stand desk intervention on call center workers' sitting, standing, and productivity at work in the Opt to stand pilot study. *Prev Med Rep*. 2015; 3: 68-74. doi: [10.1016/j.pmedr.2015.12.003](#)
16. Pronk NP, Katz AS, Lowry M, *et al.* Reducing occupational sitting time and improving worker health: The Take-a-Stand Project, 2011. *Preventive Chronic Disease*. 2012; 9: 110323. doi: [10.5888.pcd9.11032](#)
17. Sherry AP, Pearson N, Clemes SA. The effects of standing desks within the school classroom: A systematic review. *Preventive Medicine Reports*. 2016; 3: 338-347. doi: [10.1016/j.pmedr.2016.03.016](#)