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Productivity of transcriptionists using a treadmill desk

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Abstract. *Objective*: Time spent sitting increases all-cause mortality. Sedentary occupations are a major contributor to the obesity epidemic. A treadmill desk offers the potential to increase activity while working; however, it is important to make sure that productivity does not decline. The purpose of this study is to evaluate productivity while using a treadmill desk.
Participants: Eleven experienced medical transcriptionists participated in the study.
Methods: Transcriptionists were given 4 hours training in the use of a treadmill desk. They were asked to transcribe tapes for 8 hours both while sitting and while using the treadmill desk. Speed and accuracy of transcription were compared as were the average expended calories per hour.
Results: The accuracy of transcription did not differ between sitting and walking transcriptions. The speed of transcription was 16% slower while walking than while sitting ($p < 0.001$). The transcriptionists expended 100 calories per hour more when they transcribed while walking than when they transcribed while sitting ($p < 0.001$).
Conclusion: The treadmill desk offers a way to reduce sedentariness in the workplace and has potential to reduce employee obesity and health care costs. However, more than 4 hours of training will be necessary to prevent a significant drop in employee productivity.

Keywords: Obesity, sedentariness, physical activity

1. Introduction

Obesity is a rapidly spreading epidemic. The United States rates of obesity have increased dramatically in every age group from 1970 to 2010 [5]. The cause of these increases is multifactorial, but one of the factors is a decline in physical activity, in particular non-exercise activity [8]. The automobile, television, mechanical aids to household chores, and the nature of the workplace have combined to result in reduction in caloric consumption between 500 and 1000 kcal per day [6]. Although the rate of increase is similar across age groups, the highest prevalence of obesity is seen in age groups between 25 and 70. One way to address obesity in this age group is to increase activity in the workplace.

Physical activity in the work place was first noted to be an important predictor of coronary disease in 1953 when it was demonstrated that sedentary bus drivers had higher rates than active double-decker bus conductors [11]. An autopsy study showed that those in physically active occupations had less atherosclerosis than those in sedentary occupations [12]. Increased leisure time activity [6] and better physical fitness [1] are associated with decreased cardiac and total mortality. Recently, several studies have shown that prolonged time spent sitting or watching television is associated with increased mortality [2,4]. A study of 17,000 Canadian adults demonstrated increased total and cardiovascular mortality over 12 years in those who spent more time sitting (true for both the inactive and active sub-

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jects) [4]. In Minnesota, 66% of adults are employed in sedentary jobs and fewer than half of all workers have places to be active at work [13].

We devised a treadmill desk that allows subjects to conduct their work while walking at low speeds instead of sitting. Individuals with obesity ($n = 15$, BMI 30–35 kg/m^2; 45 $\pm$ (SD) 19% body fat) were asked to test the treadmill desk for ease-of-use and energy efficiency [9]. All subjects tolerated the treadmill desk well and were able to use all of the standard computer functions while walking and working. Mean sitting energy expenditure was 72 $\pm$ 10 kcal/hour, whereas the energy expenditure while walking and working at a self-selected velocity of 1.1 $\pm$ 0.4 mph was 191 $\pm$ 29 kcal/hour. The mean increase in energy expenditure for walking and working over sitting was 119 $\pm$ 25 kcal/hour. If this desk was used for half of the workday, increases in energy expenditure of 500 kcal/day could result.

We then carried out a study in the workplace among 4 groups of employees: appointment secretaries, clinical assistants, nurses, and secretaries [14]. We showed a significant increase in steps taken during work time while using the treadmill desk. The employees indicated that they would use the treadmill desk if it were available. We surveyed the employees and their co-workers regarding productivity in this study. Those employees who used the treadmill desk felt that productivity remained the same, but their co-workers expressed concern that productivity diminished. However, these estimates of productivity were subjective. In the study described in this article, we objectively investigated productivity in a group of employees providing transcription services.

2. Methods

Medical transcriptionists were recruited from Mayo Clinic (Rochester, MN) by describing the study to transcriptionist supervisors via e-mail. If approved by the supervisor, the e-mail was forwarded to the transcriptionists inviting them to participate. Participating transcriptionists transcribed letters for 8 hours (in two 4-hour sessions with a 5-minute work break in between each hour) without phone or other interruptions. This work was part of their normal job. The tapes were saved and one month later the transcriptionists listened and transcribed the tapes again (in two 4-hour sessions). Half of the transcriptionists were randomly assigned to be seated during the first 8 hours and to use the treadmill desk the second 8 hours. The remainder of the transcriptionists transcribed the first 8 hours using the treadmill desk and the second 8 hours while seated. All transcription sessions occurred in the morning during the work week. Since the second 8 hours of transcription was not part of their normal work, the transcriptionists were reimbursed by the study for that time. The treadmill desk consisted of a treadmill, a monitor, and a special keyboard so that the transcriptionist could walk at one mile per hour while typing. A special keyboard was provided because the transcriptionists could not use a foot pedal for stopping and rewinding dictation tapes while walking [14]. The keyboard had special keypads built in for this purpose. Photographs of the system are available [14]. The transcriptionists were given the keyboard four weeks prior to the study to become comfortable with it. The transcriptionists completed a three week walking program before the study began, and they had four hours of practice walking, using the keyboard and transcribing all at once before starting the study.

A medical secretary not participating in the study reviewed the tapes and transcriptions for accuracy. This secretary was blinded to whether or not the tapes were transcribed sitting or using the treadmill desk. The total number of errors made during transcription while sitting was compared with the total number of errors made while using the treadmill desk. The times of each transcription job were recorded both while sitting and walking and compared. The times to complete the entire tape while walking and sitting were compared.

Activity expenditure while performing transcriptions both sitting and walking was measured using the Actical system (Respironics, Murrysville, PA). This device is an accelerometer that monitors movement and accurately estimates physical activity energy expenditure. It is attached to a belt worn around the waist underneath regular clothing. This device is approximately the size of a 50 cent piece and weighs less than an ounce. Energy expenditure was measured using a portable indirect calorimeter at rest, sitting, sitting while transcribing, walking, and walking while transcribing (30 minutes in each state with measurements performed over the last 20 minutes). This information was used to transform the Actical data into calories expended.

All participants were women employed as medical transcriptionists at Mayo Clinic (Rochester, MN). Participants were not eligible if they were pregnant. Participants had to be capable of walking at 1 MPH. Written informed consent was obtained from all participants.

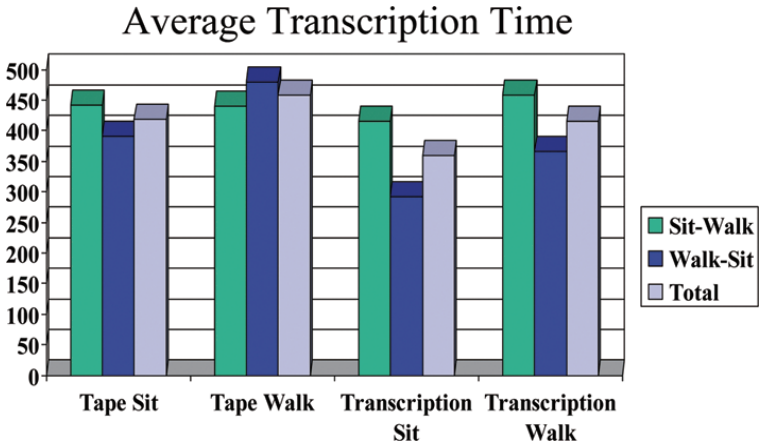

Fig. 1. Average Time (in Minutes) to complete the entire tape (tape sit and tape walk) and the dictations on those tapes (transcription sit and transcription walk) for the 6 subjects who sat and then walked (Sit-Walk), the 5 subjects who walked and then sat (Walk-Sit), and all 11 subjects. The time to complete the tapes took longer while walking then sitting ($p = 0.51$). The time to transcribe all the dictations on the tape took longer walking than sitting ($p < 0.001$).

2.1. Statistical methods

The paired t-test is used to compare errors and transcription times while sitting with those while walking. The paired t-test is also used to compare energy expenditure while sitting with energy expenditure while walking.

2.2. Sample size

Twelve transcriptionists were entered into the study. We assumed a 33% drop out rate; eight transcriptionists (with a total of 16 half-days' transcriptions performed both ways) will provide 80% power to detect a difference of 0.5 standard deviation in average transcription time, and number of errors, and 0.6 standard deviations for energy expenditure ($n = 8$ transcriptionists, with 2 days of transcriptions using each method) using the paired t-test.

3. Results

Twelve subjects began the study. One subject dropped out leaving eleven subjects. The transcription times of the eleven transcriptionists were not compared with each other because some transcriptionists transcribe many very short dictations and others transcribe few very long and complicated dictations. Some transcribe physicians who are easy to understand and others transcribe physicians who are not.

Transcriptionists made approximately 8 errors per hour. There was no difference in the number of errors made while transcribing sitting versus walking ($p = 0.53$). There was a trend ($p = 0.07$) toward fewer errors made the second time the transcription took place. Using the time to complete the tape, there is a strong trend ($p = 0.051$) toward taking longer using the treadmill desk than sitting (see Fig. 1). However, there is an order effect ($p = 0.0035$) in that the group that did the sitting first had much smaller differences than the group that did the walking first. The group that transcribed the tapes first while sitting was able to transcribe the tapes just as quickly 4 weeks later when they walked. However, the group that transcribed the tapes first while walking were able to transcribe the tapes 90 minutes faster when sitting 4 weeks later (average completion time was 390 minutes making for a 23% difference). Using the time to complete the actual dictations, there was a highly significant difference between walking and sitting ($p < 0.001$). No order effect was noted. The subjects were able to complete the actual dictations 16% faster while sitting (about 6 hours of actual dictation time while sitting took close to 7 hours while walking). Subjects expended significantly ($p < 0.001$) more calories walking than sitting. On average, subjects expended 100 calories more per hour when they were using the walking workstation (see Table 1).

The participants were enthusiastic about the treadmill desk (see Table 2). They did not find it too noisy, and they did not feel it interfered with the quality of their work (the objective data on errors confirms their subjective impression). Two subjects indicated that they were more tired using the treadmill, but most disagreed (many felt more energized using the treadmill desk).

Table 1
Average calorie expenditure sitting versus walking

Subject	Order	Average Cal/Hr walking	Average Cal/Hr sitting
1	S-W	147.39	20.16
2	S-W	149.53	24.04
3	S-W	152.35	15.34
4	S-W	153.90	17.95
5	S-W	104.88	18.56
6	S-W	103.11	13.02
7	W-S	69.75	9.13
8	W-S	114.63	71.59
9	W-S	111.27	51.53
10	W-S	166.50	26.10
11	W-S	116.78	20.96

Table 2
Opinions regarding the treadmill desk (Workstation)

	Strongly disagree, n	Disagree, n	Neutral, n	Agree, n	Strongly agree, n
The workstation interfered with quality of work	5	4	2		
The workstation was too noisy	7	3	1		
My productivity declined using the workstation	1	3	4	3	
I was more tired using the workstation	4	5		2	
If the workstation was available, I would not use it regularly	8	3			

The subjective data on productivity was more mixed (here the objective data concurred with those who said productivity declined). All subjects reported that they would use it regularly if it were available. Two subjects indicated that they would use it about 25% of the time, and the rest indicated they would use it at least half the time.

4. Discussion

Transcription of dictation is an excellent example of the increasing sedentariness of the population over the last century. This increased sedentariness has lead to increases in obesity, diabetes, heart disease, stroke, and total mortality. Leisure-time physical activity can make up for part of the drop in calorie expenditure, but even active people have a higher risk of death if they spend a lot of time sitting [4]. People spend 110 minutes more sitting on work days than they do on leisure days [10]. A treadmill desk allowing one to work while walking is a way to reduce sedentariness in the workplace. This desk has been used by secretaries, appointment coordinators, nurses, accountants, and radiologists [3,14].

We measured speed and accuracy of transcription while using the treadmill desk. Accuracy was similar, but speed declined significantly when using the treadmill desk. It should be noted that these were experienced transcriptionists who had been transcribing dictation while seated for a minimum of 4 years (average 14). In addition to having to walk, the transcriptionists had to learn to use a specially built keyboard to start and stop tapes instead of the foot pedals to which they were accustomed. While they were given the keyboards a month in advance, they only had 4 hours of practice using the whole system. While there was individual variation (subject 5 was able to transcribe faster using the treadmill desk), it is clear that most transcriptionists will require some practice for this system to be practical. Studies to determine how much training would be required are needed.

The potential benefits of using such a system are shown by the number of calories expended per hour. Subjects expended 100 calories per hour more while walking. If subjects spent 2.5 hours per day transcribing while using a treadmill desk, they would lose 1 pound every other week or 25 pounds in one year if other energy expenditure and caloric intake remained stable. Although the transcriptionists all volunteered to be in the study, it is notable that all indicated that they would use such a system if it were available. Long-term studies of treadmill desks are needed to see if the potential benefit can be transformed into actual weight loss and improved health.

5. Summary

Based on the results of this study, the treadmill desk did not compromise accuracy for the transcriptionists.

However, more than 4 hours of training is required in order to not compromise the speed of transcription. While a formal cost-benefit analysis is necessary for the treadmill desk, the cost of sedentary work is enormous. Employers should consider treadmill desks for their employees.

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