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## Using Technology to Increase Physical Activity in Health Profession Students

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## Using Technology to Increase Physical Activity in Health Profession Students

### Abstract

Health profession students may need help establishing and maintaining positive health behaviors when they are in college. This study explored the effectiveness of text messaging as an innovative method for promoting an increase in daily physical activity. A convenience sample (N = 134) was recruited from students at a college of Health and Human Services in Michigan. The participants were randomized into an intervention or control group (n = 67 each). The intervention group received daily affective text messages encouraging more physical activity by taking more steps. The control group received only messages reminding them to report their number of steps. All of the participants received a pedometer, completed a demographics and daily habits questionnaire, and completed the Perceived Stress Scale (PSS). There was no significant difference between the intervention and control groups in their number of daily steps. However, the most inactive participants had a significant increase in steps during the study period. Health profession students' lifestyle behaviors have consequences, as they become caregivers in our dynamic, demanding health-care system. For those with the greatest need for physical activity, encouraging such activity via text messaging may improve their ability to care for themselves and their clients.

### Keywords

health promotion, health profession students, interprofessional, mobile devices, text messaging, physical activity

### Cover Page Footnote

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### Credentials Display and Country

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As health-care profession students balance the demands and stresses of academic performance, the health-care environment, and their personal lives, they may forego some positive health behaviors at the time when they most need to establish healthy habits. A healthy lifestyle is beneficial to everyone's personal health and well-being, but it is especially important to those who care for others. Health profession students may have an increased risk for physical inactivity due to rigorous academic schedules and the time demands of clinical practice. In addition, being in a demanding health-care environment can expose health profession students to added emotional and physical stress. Living a healthy lifestyle, however, may protect their health and contribute to their success as they prepare to be productive professionals in the future.

### **Background and Literature Review**

Approximately 30%-50% of college students do not participate in an adequate amount of physical activity (Hawker, 2012; Kamarudin & Omar-Fauzee, 2007; Keating, Guan, Piñero, & Bridges, 2005). The reasons they cite for inadequate physical activity include not having enough time, wanting to do other things with their time, lack of support from friends and family, embarrassment, and environmental factors (Kamarudin & Omar-Fauzee, 2007; Keating et al., 2005). Clément, Jankowski, Bouchard, Perreault, and Lepage (2002) found that nursing students decreased their physical activity levels to meet important academic time constraints, such as homework deadlines. Finding a practical

intervention that would encourage health profession students to be physically active might reap health benefits while potentially decreasing stress and depressive symptoms (Elliot, Kennedy, Morgan, Anderson, & Morris, 2012). To explore this possibility, several health-promotion interventions for college students have been tested.

Boyle, Mattern, Lassiter, and Ritzler (2011) designed a college class that encouraged enrolled students to increase their physical activity during the semester. The students chose whether they wanted to work with a peer mentor to reach this goal. The researchers found that female students who chose to receive help from a peer mentor increased their physical activity. It is interesting to note that over the course of the semester, physical activity decreased for participants in both groups—those who worked with a mentor and those who did not—but the decrease was less for the participants who worked with a peer mentor. In another study, nursing students were required to set a health-promotion goal of their choosing and make a plan to achieve that goal. This intervention was successful in increasing physical activity as well as several other positive health behaviors (Stark, Manning-Walsh, & Vliem, 2005). These studies suggest that some educational interventions may help promote student health, although, according to Pawloski and Davidson (2003), other attempts have not been effective.

It appears that finding other innovative ways to motivate health profession students is important if they are going to make positive changes in their self-health behaviors. Mobile devices and text

messaging may be a means to reach busy, mobile, young adults (Fjeldsoe, Marshall, & Miller, 2009; Militello, Kelly, & Melnyk, 2012). In a systematic review of studies using text messaging to improve pediatric and adolescent health behaviors, Militello et al. (2012) found that most studies using text messaging as an intervention addressed disease management rather than health promotion. Only three of the studies that met their inclusion criteria used text messaging for improving physical activity. Of these three (Gerber, Stolley, Thompson, Sharp, & Fitzgibbon, 2009; Prestwich, Perugini, & Hurling, 2009; Sirriyeh, Lawton, & Ward, 2010), only one was effective. Militello et al. suggested that the newness of the technology might explain the lack of more studies.

The study by Sirriyeh et al. (2010) looked at four different experimental groups of adolescents between 16 and 19 years of age. They included (a) a control group, (b) a group that received one text message per day over 2 weeks with affective messages, (c) a group that received one text message per day over 2 weeks with instrumental messages, and (d) a group that received one text message per day over 2 weeks with a combination of affective messages and instrumental messages. The groups were then split into physically active and inactive participants. Physical activity increased across the entire sample, including the control group. However, the group of inactive participants receiving affective messages showed the greatest improvement in increasing physical activity. This group's increase in physical activity was significantly higher than the inactive group

receiving instrumental messages or a combination of messages.

Text messages on mobile devices can reach large groups of people who may not be ill and are not regularly seen by a health professional. In their review of studies using mobile devices, Militello et al. (2012) found that text messages tailored to each recipient/participant in specific ways (e.g., using names, participant personal goals, gender, and personal circumstances) were well received and the participants had a low attrition rate. On the other hand, studies using generalized mass text messages that were not tailored to participants were associated with higher attrition rates. Successful text messages were positive and frequent.

### **Study Purpose**

While there are many behaviors that promote a healthy lifestyle, the purpose of this study was to test an intervention to improve health profession students' health behaviors by increasing their physical activity. After reviewing the literature, we designed a study to send affective text messages as the intervention to increase the number of steps participants took daily. We used affective messages as suggested by Sirriyeh et al. (2010), on whose work the current study was modeled. The messages were frequent (daily) and positive. The specific research question for this study was: Is there a difference in the daily number of steps between students who receive positive affective text messages and those who do not?

## Method

### Participants

A convenience sample of 134 participants from a college of Health and Human Services located in southwest Michigan was recruited after the authors obtained institutional IRB approval. Potential participants were notified of the study through an e-mail announcement sent to all students in the college. The researchers also recruited health profession students in a busy atrium in the building where health profession courses are offered. To be included in the sample, a student had to (a) be enrolled in at least one course in one of the college's health profession programs; (b) be able to read, write, and understand English; (c) have a cell phone with text messaging capability; (d) be willing to receive up to two text messages per day for 14 days; and (e) be willing to send at least one text message per day to report the number of his or her steps for that day. Possible participants were excluded if they had faculty or staff status. Those who had a known physical disability that limited mobility also were excluded because steps were being measured for the study. The participants were randomly assigned to the intervention or control group (n = 67 per group).

### Procedure

After health profession students decided to join the study and gave their informed consent, they participated in three data collection processes. First, the participants completed a study-specific questionnaire designed by the researchers; it included demographic information and some questions about their daily life that might influence

their physical activity. To gather data about the number of steps taken each day, the participants were given a pedometer. Finally, the Perceived Stress Scale (PSS) by Cohen, Kamarck, and Mermelstein (1983) was used to measure perceived stress. (Cronbach's alpha for this 10-item scale was 0.87 in this study.)

The study lasted for 14 days, beginning in late January 2013. This study length was chosen because Sirriyeh et al. (2010) found significant changes in behavior during a 14-day period in their study.

When the pedometers were given to the study participants, specific instructions were included in an attempt to promote the likelihood of consistent responses. They were asked to wear the pedometer on the waistband of their pants on the right hip, lined up with the knee. The participants were instructed to attach the pedometer at the start of every day, immediately after arising, and to wear it until bedtime. They were instructed to report the number of steps they recorded each day, text message the number to the researchers before going to bed, and then reset the pedometer to zero so it would start over when they put it on the next morning. The participants reported only their daily number of steps.

The mean from the first two days of the study provided the baseline number of steps for each participant. Starting on the third day of the study, those in the intervention group received one text message each day encouraging them to increase their number of steps for that day. The scripts for the text messages, selected specifically because they

were affective, were developed by modifying the text messages used by Sirriyeh et al. (2010) in their study (see Table 1). The participants in the intervention group received their daily text message at 4 p.m.; the participants in the control group did not receive a text message at that time. This time was chosen to reduce possible contamination with the control group. By 4 p.m., most of the participants in the intervention group would be finished with classes and clinical practice sessions where they might be with participants in the control group. Also, this time was early enough so the participants would have time to exercise or participate in an activity to increase their number of steps. Both groups then received a text message around 9 p.m. reminding them to text message their number of steps for that day.

**Table 1***Affective Text Messages*

1.	Physical activity can make you feel happier. Enjoy your steps!
2.	You can feel proud of yourself for the steps you have taken!
3.	Taking steps today may help you feel that you can cope with problems better.
4.	Increasing your number of steps can make you feel more energized!
5.	The steps you take today may make you feel more confident.
6.	The steps you take each day may help you focus in class.
7.	Enjoy taking those steps today. It may make you feel less stressed.
8.	Increasing your number of steps may put you in a good mood for the day.
9.	Physical activity can make you feel more motivated.
10.	Increasing your number of steps can make you feel more energized!
11.	Physical activity can make you feel in charge of your life!
12.	Increasing your steps each day can increase your self-esteem.

**Data Analysis**

The data were entered, cleaned, and analyzed in SPSS 20.0. Appropriate parametric and nonparametric analyses were conducted to address the research question. An alpha of 0.05 was determined *a priori*.

**Results**

The participants were randomly assigned to the intervention (n = 67) or control (n = 67) group. Of those who enrolled, 13 did not provide any step counts and an additional nine only reported data once. These participants were eliminated from the data analysis, leaving a sample of 112 (see Table 2). There were more participants remaining in the intervention group (n = 58) than in the control group (n = 54). However, the groups were equivalent in age, BMI, employment, and gender.

**Table 2***Description of the Sample (N = 112)*

	Mean (SD)	n (%)
Age	26.1 (9.2)	
Gender		
Female		98 (87.5)
Male		14 (12.5)
Marital Status		
Single		85 (75.9)
Other		27 (24.1)
Degree		
Undergraduate		77 (68.8)
Graduate		35 (31.3)
Program		
Nursing		74 (66.1)
Speech Pathology and Audiology		15 (13.4)
Occupational Therapy		7 (6.3)
Other		16 (14.3)
Work		72 (64.3)
Hours worked per week	20.0 (13.1)	
BMI	23.3 (4.9)	
Hours of sleep/night	6.8 (1.3)	

In addition to demographic variables, several variables thought to influence the number of steps also were collected. BMI was calculated from self-reported height (in inches) and weight (in pounds). Mean BMI was 23.3 ( $SD = 4.9$ ), with a range from 16.1 to 44.0. Self-reported hours of sleep ranged from 2.5 to 12 hours nightly, with a mean of 6.8 ( $SD = 1.3$ ).

### Overall Outcomes

The research question asked if there was a difference in the daily number of steps between those students who received positive affective text messages and those who did not. The mean number of steps reported by the participants for the first 2 days of the study before the intervention started (Time 1- baseline) was calculated for all of the participants. The mean number of steps reported by all of the participants also was calculated for the 12 days after the text messages were received by the intervention group (Time 2).

There was no significant difference between the Time 1 and Time 2 step numbers for all of the participants (paired  $t = 0.216$ ,  $df = 111$ ,  $p = .829$ ). When the Time 1 and Time 2 step numbers for the control group and the intervention group were calculated separately, neither group had a statistically significant change in the number of steps (control paired  $t = -0.013$ ,  $df = 53$ ,  $p = .990$ ; intervention paired  $t = 0.237$ ,  $df = 57$ ,  $p = .813$ ).

### Inactive Participants

Because some of the participants were very active before the intervention, we recognized that they might not increase their number of steps after the intervention began. However, those who were

the most inactive might be the ones who could benefit most from an intervention, consistent with the findings of Sirriyeh et al. (2010). After examining a histogram of the baseline step numbers of all of the participants, we selected those who were the most inactive and were at least one standard deviation below the mean (3,000 or fewer steps a day) to examine whether they increased their number of steps during the course of the study. Since these participants ( $n = 17$ ) were already inactive, increasing their physical activity could be very beneficial. Of this small subgroup, ten were in the intervention group and received the affective text messages. Thirteen of the participants in this subgroup of 17 (76.5%) increased their number of steps while participating in the study. Three of the four participants who did not increase their step numbers were in the control group and did not receive the messages. Thus, only one of the participants who received the intervention in this inactive subgroup did not increase her number of steps. Overall, the inactive subgroup had a significant increase in steps during the study period (paired  $t = -3.89$ ,  $df = 16$ ,  $p = .001$ ). The mean number of steps rose from a baseline of 1,754.3 ( $SD = 942.0$ ) to a mean of 5,645.0 ( $SD = 4,004.3$ ).

### Stress, Sleep, and Steps

Because the participants were all students in rigorous health profession programs, we considered whether there was a relationship between perceived stress and the daily number of steps. Because demands on their time due to educational requirements might cause students stress, we looked at whether higher levels of stress were related to the

number of steps. The mean PSS score for this sample was 15.5 ( $SD = 6.1$ ). When calculated by Pearson's  $r$ , there was no relationship between the mean number of steps and perceived stress ( $r = -.02$ ,  $p = .878$ ).

We also considered whether there was a relationship between sleep and the daily number of steps in the health profession students in this sample. There was a significant and very weak negative correlation between the hours of sleep per night and the baseline number of steps (i.e., before the intervention) ( $r = -.02$ ,  $p = .022$ ). This would have no clinical significance.

### **Health Status Self-Assessment**

When the participants completed the initial demographic questionnaire, they were asked whether they felt they got enough daily physical activity to be healthy. This provided a subjective assessment of their physical activity prior to starting the study. Because these students regularly perform assessments on clients, we believed it was appropriate to ask them for an assessment of their own physical activity.

Two of the 112 participants did not answer the question. Those who answered the question and reported that they did not get enough daily exercise ( $n = 69$ ) had significantly fewer steps per day before the intervention began (mean number of steps = 6,121.9;  $SD = 3,700.9$ ) than those who reported getting enough exercise ( $n = 41$ ; mean number of steps = 8,078.4;  $SD = 3,736.4$ ) ( $t = -2.67$ ,  $df = 83.53$ ,  $p = .009$ ). This indicates that these health profession students had a fairly accurate assessment

of their own physical activity, which may be the first step in improving healthy behaviors.

The participants were asked on the demographic questionnaire for other indicators of their health status. Since being overweight or obese could make physical activity difficult, we calculated BMI for all of the study participants. The mean BMI for the entire sample was 23.3 ( $SD = 4.9$ ); 19.6% ( $n = 22$ ) of the participants were overweight, while 8.9% ( $n = 10$ ) were obese. While some of the participants did not work, nine (8.0%) of the participants worked 40 or more hours per week.

Overall, the picture of this sample of health profession students revealed that some students engaged in unhealthy behaviors, including inactivity, perceived stress, an unhealthy weight, and lack of sleep.

### **Discussion**

Health profession students are valuable to the future health of our country and health-care system. Encouraging physical activity in these students, especially those who are generally inactive, is a worthy goal. The World Health Organization (WHO, 2012) recommends 150 min per week of moderate intensity aerobic activity—which may include brisk walking, housework, or dancing—or 75 min per week of vigorous intensity activity, such as running, competitive sports, or fast cycling. Physical activity of 10,000 steps per day has been recommended to achieve this goal (Albright & Thompson, 2006). Regular physical activity, defined by WHO as bodily movement that requires energy expenditure, is necessary to reduce one's risk for many diseases, such as Type II



diabetes, metabolic syndrome, cardiovascular disease, and several forms of cancer, including colon and breast cancer (Centers for Disease Control and Prevention [CDC], 2011). Physical activity also can help control one's weight and can even help improve mood and mental health while strengthening muscles and bones and increasing longevity (CDC, 2011).

As mentioned previously, the intervention chosen for this study was modeled after Sirriyeh et al. (2010). The results of our study, however, did not match those of Sirriyeh et al. Although the same time period for the study and similar text messages were used, we did not find that physical activity increased with affective text messages in our larger sample. The significant increase in the number of daily steps in the subgroup of participants who, at baseline, were one standard deviation or lower than the mean is a positive finding and this increase in physical activity is similar to the increase reported by Sirriyeh et al.

In previous research, Boyle et al. (2011) reported that students' physical activity decreased over the course of the semester. This may be because academic demands tend to increase. Final exams and deadlines for papers are likely to place demands on time at the end of the semester. Our study was conducted early in the semester, so it is unknown what our findings might have been from a study conducted later in the semester.

While not the primary goal of this study, we found that our sample of health profession students engaged in some unhealthy lifestyle behaviors. In addition to some of the participants being inactive,

the participants' nightly sleep ranged from 2.5 hours to 12 hours. Adequate sleep plays an important role in academic and personal life. Sleep deprivation can lead to depressive symptoms and poor academic performance (Brooks, Girgenti, & Mills, 2009; Buboltz, Brown, & Soper, 2001; Forquer, Camden, Gabriau, & Johnson, 2008). In addition, more than one quarter of our sample ( $n = 32$ , 28.6%) had a BMI above 25, putting them at risk for chronic diseases, such as diabetes and hypertension. Thus, finding interventions that can address other health risks that students may have would also be beneficial.

While the intervention and control groups did not differ in demographic characteristics, some of their attributes might explain why some of the participants have difficulty incorporating healthy behaviors into their daily lives. For example, most were women, who generally are the caregivers when there are children or older family members needing care. All 17 participants in the inactive subgroup were women, and 10 of the 17 were single. This was a lower percentage (58.8%) when compared to the entire sample (75%), perhaps indicating that comparatively more in the inactive group were married and responsible for others in the home.

### **Limitations of Study and Outcomes**

There were several limitations that could have affected the outcomes in this study. First, some pedometers malfunctioned; 24 of the participants reported that their pedometer broke, and they did not report their steps after that. Second, the pedometers were limited to only

counting the number of steps taken. Other forms of physical activity, such as swimming and biking, could not be measured. Third, because the pedometer step counts were self-reported we were unable to independently verify the counts that the participants reported. Also, the participants did not report the length of time they wore the pedometers. Fourth, this study was conducted in Michigan in late January and early February when physical activity can be limited by weather. The cold and snow could have discouraged the participants from walking outside. Also, there was a snow day when the university was closed during the data collection period. If the study had been conducted at a different time, the results might have been different. Fifth, the length of the study may have been a limitation. Two weeks might not be long enough to make a difference in behavior. Finally, only 2 days of pretest baseline data were collected before starting the intervention. The pattern of physical activity each of the participants had prior to enrolling in the study is unknown; by their own admission, many of the participants did not get enough physical exercise.

### **Suggestions for Future Research**

Since using affective text messages is an inexpensive intervention to encourage physical activity, more research is warranted. In the future, personalized and tailored rather than general messages should be used to test their effectiveness, in keeping with the findings of Militello et al. (2012). More research is needed to understand the many factors that influence health behaviors in young health professionals; physical activity is just

one. How to incorporate healthy behaviors into academic preparation is an area of study that should be explored in depth.

### **Conclusion**

The benefits of physical activity may be helpful for students as they prepare to enter the health-care system. Lifestyle decisions they make will affect their future health, productivity, and effectiveness as health-care professionals. With the academic, family, and financial demands that students experience, finding interventions that encourage healthy behaviors may help them establish a healthy lifestyle that will benefit them in the future.

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