Worksite Wellness: A Preliminary Study Utilizing E-mail Health Messages for City Employees

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Abstract

The purpose of this 38-week, quasi-experimental study was to determine the effectiveness of one weekly e-mail health (e-health) message that utilized the World Health Organization's seven dimensions of wellness. Employees from a large Midwestern city were recruited and divided into two groups based on their desire to receive additional health information. The participants in each group were then randomly assigned to receive basic or detailed e-health messages. The basic e-health message consisted of an e-mail with health tips for the specific topic; whereas the detailed message included the basic message plus links to games, surveys, and websites to supplement the basic message. Those lacking an e-mail address comprised the control group, and did not receive any e-health messages. A total of 46 employees completed both assessments and comprised the analytic sample. Systolic blood pressure significantly decreased in unmotivated participants receiving the detailed messages (-2.1 mmHg, p=0.04). Across all groups, at-risk participants (blood pressure ≥ 140/90 mm/Hg or body mass index ≥ 25 kg/m2) showed greatest improvement with significant drops in both systolic and diastolic blood pressure. Detailed e-health messages may be an effective approach to assist employees who are at-risk for chronic disease.

Keywords: blood pressure, body mass index, dimensions of wellness, e-health messages, worksite wellness

Introduction

"Wellness" is a commonly utilized term. Often people associate wellness with exercising and eating a balanced diet, but there is more to wellness than just diet and exercise. According to the World Health Organization (WHO) (2008), wellness is a dynamic process of becoming aware of and making conscious choices toward a more balanced, healthy lifestyle. Wellness includes learning new life skills that address both the positive and negative aspects of human existence. Over the past decade, the concept of wellness has expanded into seven dimensions: physical, occupational, environmental, social, spiritual, emotional, and intellectual (WHO, 2008). It is the integration of these seven interactive dimensions that continually influence and balance each other to create overall wellness. Over-emphasis on just one or two dimensions results in a life that is out of balance (Swarbrick, 2006).

Definitions

Worksite wellness programs refer to various initiatives implemented in a workplace to produce a healthier workforce. Healthy People 2010 recognized five key elements for a comprehensive worksite wellness program. These include health education, links to related employee services, supportive physical and social environments for health improvement, integration of health promotion into the organization's culture, and employee health screenings with adequate treatment and follow-up (U.S. Department of Health and Human Services, 2000). As early as the 1970s, some companies began providing at least some worksite wellness programming to their employees (Edington, 2006). This has expanded to the point that most companies with > 50 employees offered at least one health-promotion activity (Linnan, Bowling, Childress, et al, 2008). Nevertheless, only 6.9% of the worksites surveyed (n=730) offered all five key elements

that were defined as a "comprehensive" worksite health promotion program (Linnan et al., 2008).

Benefits of Worksite Wellness Programs

There are many reasons why worksite wellness programs should be encouraged. The return on investment for employers who invest in worksite wellness programs can be measured in several ways: decreased direct health care costs, improved healthcare utilization, increased performance measures, lower rates of absenteeism/presenteeism, and reduced prevalence of chronic disease. Chapman (2006) conducted a meta-analysis of 56 published studies on worksite health promotion programs and found a 27% reduction in sick leave absenteeism and a 32% reduction in workers' compensation and disability costs after the implementation of wellness programs. Aldana et al.'s (2005) study of 6,246 employees found an average of three fewer missed workdays per year for those individuals who participated in the wellness program than those who did not. This study also noted that the decrease in absenteeism translated into a cost savings of $15.60 U.S. dollars for every dollar spent on wellness programming.

Productivity is lost when the employee is at the job, but is not working to expectations because of a health problem (presenteeism). Often the costs associated with presenteeism are more than those of absenteeism. For example, one business estimated costs due to presenteeism accounted for 63% of their total medical costs (direct and indirect), whereas absenteeism accounted only 6% their total medical costs (direct and indirect) (Hemp, 2004). Having a worksite wellness program assists with employee recruitment and retention, and bolsters morale, leading to future positive outcomes for both employees and employers (Chapman, 2005; Goetzel & Ozminkowski, 2008; Linnan et al., 2008).

Some employers have made funding cuts for existing worksite wellness programs in spite of the compelling data that showed these programs achieved reduced absenteeism, presenteeism and health care costs and improved health (Goetzel & Ozminkowski, 2008). Commonly cited reasons for limited programming include lack of employee interest, lack of staff resources and funding in general, lack of high-risk employee participation, and lack of management support (Linnan et al., 2008). Other reports found a variety of reasons explaining why employers decline to provide worksite wellness programs. Employers may be philosophically opposed to interfering with their workers' private lives, health habits, and medical decision-making, considering such actions as playing the role of "big brother" (Goetzel & Ozminkowski, 2008).

Not all benefits are seen quickly when wellness programs are implemented, which is perhaps why employers abandon or do not invest is worksite wellness programs. The Capital Metropolitan Transportation Authority of Austin, Texas, implemented a worksite wellness program in an effort to stem growing absenteeism and health care costs of their 1,282 employee workforce. The program started with just one dedicated employee who provided education, designed brochures, and conducted health seminars/workshops. From 2003-2006, healthcare costs increased by progressively smaller rates, and then it decreased from 2006 to 2007. As worksite wellness offerings expanded to include on-site fitness centers and dietary counseling, absenteeism decreased by approximately 25%, and the overall return on the investment was calculated to be $2.43 for every dollar spent (Davis et al., 2009).

Worksite Wellness Programming

Worksite wellness programming utilizes many methods of communication including print materials, in-person sessions, telephone, and the internet (Linnas et al., 2008). Health messages (e-health messages) sent as e-mails or newsletter attachments are a low-cost wellness initiative that may improve employees' health and have an even larger return on investment for businesses (Pew Internet & American Life Project, 2010). One e-health message can reach a large number of individuals quickly, with little effort and expense. E-health e-mail can also be forwarded multiple times to benefit more than the originally intended recipient. It is estimated that between 75% and 79% of adults are regular internet users (people who use the internet and send/receive e-mail "at least occasionally") and

that 92% of American adults between the ages of 18 and 29 access the internet (Pew Internet & American Life Project, 2010). Because the majority of adults are employed and use the internet, workplaces where computers are easily accessible provide an excellent opportunity to expose a large number of adults to health-promotion information (Young, 2006). Many companies require employees to use computers frequently, so providing health and wellness information utilizing this technology may prove beneficial. According to the Harris Poll conducted in 2010 (n=1,066), the proportion of adults who are online and have ever used the internet to look up health information had increased from 72% in 2005 to 88% in 2010 (Harris Interactive, 2010).

Compared to print materials, the effectiveness of multimedia web-based wellness interventions has shown promising results (Cook, Billings, Hersch, Back, & Hendrickson, 2007). Delivery modes for interventions vary considerably in the technology required. The easiest (and least expensive) intervention is to send e-mail health messages to all employees encouraging healthy behaviors. Sending newsletters as attachments are another low technology option. From this point, many other methods of internet delivery have been developed. Development of multiple webpages with interactive activities and tailored messaging require more commitment from the employer than simple e-mail health messages. The use of e-mail about MyPyramid, food labels, healthier lifestyles, and physical activity improved dietary intake and physical activity as evidenced by an average weight loss of eight pounds in 36 weeks among those who were overweight or obese (Nyquist, Rhee, Brunt, & Garden-Robinson, 2011). An analysis of internet interventions from 1996-2003 demonstrated an increase in exercise time, knowledge of nutritional status, and knowledge of asthma treatment when web-based interventions were used (Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). In a meta-analysis of pre-2007 studies, results suggested that internet-based physical activity interventions are more effective compared to those individuals who were not involved with the intervention (Van Den Berg, Schoones, & Vlieland, 2007). In addition, Neville, O'Hara, and Milat (2009) conducted a review of the computer-tailored physical activity behavioral changes that were published between 1996 and 2008. Of the 16 interventions identified, 10 (63%) of the computer-tailored interventions were found to have significant, positive effects on physical activity or weight reduction. However, in a more recent meta-analysis of 85 studies, web-based interventions had a small yet significant effect on health behavior (Webb, Joseph, Yardley, & Michie, 2011).

Efforts to reduce chronic disease risk factors have potential benefits for employees and their employers. Nevertheless, employers, who do not currently offer worksite wellness programs, are reluctant to spend funds for worksite wellness programming (Goetzel & Ozminkowski, 2008). In this situation the lowest cost method of programming may appeal to these employers.

The purpose of this study was to determine the effectiveness of a low-cost, low-time commitment, worksite wellness strategy of e-mail health messages that addressed the overall wellness of the participants. The e-health messages were based on the seven dimensions of wellness as identified by the World Health Organization (WHO, 2008). All seven dimensions were used equally, because each aspect of wellness can affect overall quality of life. This study is unique in that the intervention was delivered using only e-mail health messages that included the World Health Organization's seven dimensions of wellness.

Methods

This quasi-experimental protocol was approved by the North Dakota State University Institutional Review Board.

Sample

The study population was comprised of employees in a city located in Midwestern United States. The city employs a total of 818 full-time and part-time individuals (264 female and 554 male). Participants were recruited at the 2009 annual Benefits Fair, which included approximately 20 booths related to health

promotion and employee benefits. At the time of this study, no other wellness programing was provided to the employees. Attendance at the Benefits Fair varies annually from 37-46% (300-375) of all employees. The majority of the marketing materials for the Benefits Fair encouraged employees to have their weight, blood pressure measured and body mass index (BMI) calculated at the wellness booth.

Employees visiting the wellness booth were invited to participate in the study, and those individuals who agreed were given an informed consent form to sign. Criteria for participation included having blood pressure, height, and weight measured. The participants were given a folder with various health and wellness brochures along with a ticket that made them eligible to win a $20 gift card in a drawing. On this ticket, participants were asked if they desired to receive health information and tips through their work e-mail account. Those individuals who desired e-mail health messages were categorized as motivated participants, whereas those who did not indicate a desire to receive e-mail health messages were classified as unmotivated. Motivated and unmotivated participants were randomly assigned to receive either basic or detail e-mail health messages. Those individuals who did not complete the drawing ticket were placed in the control group. Study participants were specifically invited via e-mail to attend the 2010 Benefits Fair to have follow-up biometric measurements taken.

Initially, 105 employees started the study, which included 14 participants in the control group. There were 48 (22 male, 26 female) motivated participants, and 43 unmotivated participants (33 male, 10 female). Table 1 further describes baseline study participants. Of these 105 participants, 46 (44%) completed the post-study biometric measures. The post study screening was completed by 11 motivated basic participants, 8 unmotivated basic participants, 12 motivated detailed participants, 7 unmotivated detailed participants, and 8 control participants. The division of gender in this study was similar to the overall division of total employees for the city (67.7% male and 32.3% female).

Biometric Measures

Using either a regular (Tycos) or large (Welch Allyn) size sphygmomanometer, blood pressures of participants were measured once by trained volunteers while the participants were seated. The arm used for the blood pressure measurement was the one preferred by the participant. Height and weight were measured using a digital Healthometer Professional scale model 500KL (Sunbeam Products, Inc.). Weight was measured to the nearest 0.1 pound, and height was measured to the nearest ¼ inch. BMI values were calculated using standard procedures (kg/m2) (Garrow & Webster, 1985). BMI is a widely used measure for estimating body composition. Individuals who have a BMI $\geq$ 25 kg/m2 are categorized as overweight, while individuals with a BMI $\geq$ 30 kg/m2 are categorized as obese. Individuals who are overweight and obese are at increased risk for many diseases and chronic health conditions, including hypertension (CDC, 2011).

Intervention

Since January is an optimal time to initiate wellness strategies and programs, (Norcross, Mrykalo, & Blagys, 2002), participants received a weekly e-mail health message starting January 2010. As seen in Table 2, the basic messages (sent to the motivated-basic and unmotivated-basic groups) contained information about the wellness dimension assigned for that week. As seen in Table 3, detailed messages (sent to the motivated-detailed and unmotivated-detailed groups) contained links to a variety of assessments, quizzes, videos, and/or more information in addition to the basic message. The information for all the messages was from websites that presented easy to understand information consistent with current research. A total of 38 messages had the same subject line (Weekly Health and Wellness Tip) and focused on one dimension of wellness, physical, intellectual, emotional, spiritual, social, environmental, or occupational wellness. A total of five to six e-health messages for each wellness dimension were sent by a scheduled rotation, which was Friday, Tuesday, Thursday, Wednesday, and Monday.

Table 1

Baseline Study Participants and Biometric Measures

	Motivated		Unmotivated		Control
	Basic	Detailed	Basic	Detailed	
	n (%)	n (%)	n (%)	n (%)	n (%)
Overall (N=105)	23 (22)	25 (24)	23 (22)	20 (19)	14 (13)
Male (n=61)	10 (16)	11 (18)	20 (33)	14 (23)	6 (10)
Female (n=44)	13 (30)	14 (32)	3 (7)	6 (14)	8 (18)
Overall SBP (mm Hg) N=105	121.7± 13.3	132.9± 12.8	134.0± 14.7	130.5±16.9	130.3± 13.4
Overall DBP (mm Hg) N=105	78.8± 9.4	83.3±5.7	83.6± 7.9	83.5±7.8	83.0 ±5.6
Overall BMI ($kg/m^{2)}$ N=105	29.6±6.4	28.9±5.4	26.2± 3.2	28.9±6.3	34.3 ± 6.1
At risk Systolic BP (mm Hg) (n= 20)	143.0±4.2	147.7±6.2	150.7±7.0	166.0±12.5	151.2±8.9
At risk Diastolic BP (mm Hg) (n= 17)	91.0±1.4	91.2±1.1	93.0±4.2	92.4±4.3	94.0±0.0
At risk BMI (kg/m^2) (n= 28)	32.0±5.7	29.8±5.1	28.1±1.8	32.0±4.5	36.2±3.3

Table 2

Examples of Basic Messages

EMOTIONAL WELLNESS FACTS AND TIPS
• Physical health is connected to mental and emotional health. • Taking care of your body is a powerful first step towards mental and emotional health. The mind and the body are linked. When you improve your physical health, you'll automatically experience greater mental and emotional well-being. For example, exercise not only strengthens our heart and lungs, but also releases endorphins, powerful chemicals that energize us and lift our mood
INTELLECTUAL WELLNESS FACTS & TIPS
• Read for fun. By choosing books just for fun, you not only learn about a subject or particular interest, you learn about how others express themselves. • Develop the curiosity of a child. Children have a knack for being curious about everything around them. Try to regain this curiosity about the world. You may be amazed by what you learn • Feeling and thinking together lead to communication • Your brain cells communicate with each other through fiber-like branches called dendrites. When brain cells are stimulated, dendrites grow, increasing the number of connections between cells. This improves your memory, attention span, and ability to learn. • If your mind is stuck on a problem, ask around for other opinions, then disregard them and form your own. When your brain is full, try to digest a little before consuming more • You can't have intellectual wellness without physical, emotional, environmental, social, and spiritual wellness too. It's a package deal.

Statistical Analysis

The data were analyzed using SAS (version 9.2.2, SAS Institute, Cary, NC). Fisher's exact test was used to determine differences in gender, baseline systolic blood pressure (SBP), diastolic blood pressure (DBP), weight, and BMI between those who completed the post study screening and those who did not. Since there were no significant differences between completers and non-completers on these baseline variables including gender, no covariates were included in subsequent analyses. Analysis of variance (ANOVA) was used to determine differences between the five groups at baseline and post intervention for SBP, DBP, weight and BMI. Repeated-measures analysis of variance (ANOVA) was used to determine post intervention differences of the five groups over time for SBP, DBP, weight and BMI.

Since not all individuals have elevated blood pressure or weight, only the individuals who presented with elevated blood pressures or BMI were analyzed. A person with a blood pressure of 140/90 mmHg or more was considered to have hypertension (CDC, 2012), and thus classified as "high risk" (n=28). A BMI of $\geq$ 25 kg/m2 was also identified as "high risk" (n=28). Repeated-measures analysis of variance (ANOVA) was performed between the at-risk groups based on level of motivation or type of message received to determine differences over time for SBP, DBP, weight and BMI.

Table 3

Information Added to Basic Messages to Make the Detailed Message

BASIC MESSAGE ADDED TO "EMOTIONAL WELLNESS FACTS AND TIPS"
• An important process in making positive behavioral changes in intellectual wellness or any dimension of wellness is to reaffirm your goals and commitment to change. • The activities you engage in and the daily choices you make affect the way you feel physically and emotionally. • Get enough rest. To have good mental and emotional health, it's important to take care of your body. That includes getting enough sleep. Most people need seven to eight hours of sleep each night in order to function optimally. • Learn about good nutrition and practice it. The subject of nutrition is complicated and not always easy to put into practice. But the more you learn about what you eat and how it affects your energy and mood, the better you can feel. • Exercise to relieve stress and lift your mood. Exercise is a powerful antidote to stress, anxiety, and depression. Look for small ways to add activity to your day, like taking the stairs instead of the elevator or going on a short walk. To get the most mental health benefits, aim for 30 minutes or more of exercise per day. • Get a dose of sunlight every day. Sunlight lifts your mood, so try to get at least 10 to 15 minutes of sun per day. This can be done while exercising, gardening, or socializing. • Limit alcohol and avoid cigarette and other drugs. • For more information, go to: http://www.helpguide.org/mental/mental_emotional_health.htm
BASIC MESSAGE ADDED TO "INTELLECTUAL WELLNESS FACTS & TIPS"
• For additional information, go to http://www.for.gov.bc.ca/hrb/hw.intellectal/inventory.htm

Results

Participation Rates

Of the 105 participants who completed baseline measures, 46 completed the study (43.8%). Complete data for 40 participants was available, since some participants refused to be weighed (38.1%). Follow-up measures were completed by 48% of the motivated individuals, 35% of the unmotivated individuals, and 57% of the controls (p=0.68). The attrition rate did not differ between men and women or between any of the groups based on e-health messages received or level of motivation.

Blood Pressure

The overall mean blood pressure for the participants at baseline was 129.8/81.8 mmHg and 128.7/79.7 mmHg post intervention. As seen in Table 4, the unmotivated group receiving detailed messages showed a decrease in SBP (p=0.03). There was an overall drop in DBP among participants in all groups (p=0.04). Otherwise there were no other significant changes regardless of the type of message sent or level of motivation of the participants.

Body Mass Index

As seen in Table 5, control group had significantly higher BMI than any of the four intervention groups. No groups significantly changed their BMI from pre-test to post regardless of the type of message sent or level of motivation of the participants.

Table 4

Pre and Post Blood Pressure (mmHg) of Participants

	Pre SBP Mean (SD)	Post SBP Mean (SD)	Change Mean (SD)	p-value[a]	Pre DBP Mean (SD)	Post DBP Mean (SD)	Change Mean (SD)	p-value[a]
Overall (N=46)	129.8 (15.2)	128.7 (13.2)	-1.1 (9.4)	0.29	81.8 (8.3)	79.7 (7.2)	-2.1 (6.5)	0.04
Motivated* Detailed** (n=12)	134.5 (14.0)	133.8 (10.0)	-0.7 (8.8)	0.70	84.2 (6.3)	81.5 (6.6)	-2.7 (5.9)	0.15
Motivated Basic (n=11)	120.7 (15.1)	122.9 (12.7)	+2.2 (10.5)	0.51	78.7 (11.1)	77.5 (9.0)	-1.2 (6.7)	0.54
Unmotivated Detailed (n=7)	126.4 (5.9)	120.3 (10.1)	-6.1 (5.9)	0.03	81.1 (7.0)	78.3 (6.0)	-2.8 (4.6)	0.15
Unmotivated Basic (n=8)	133.8 (18.4)	130.5 (17.1)	-3.3 (11.1)	0.47	81.5 (9.1)	82.0 (8.9)	+0.5 (8.0)	0.86
Control (n=8)	134.3 (16.0)	134.5 (11.7)	+0.2 (9.6)	0.94	83.3 (7.2)	79.3 (4.3)	-4.0 (7.6)	0.18
p-value[b]	0.07	0.07	0.09		0.25	0.59	0.64	

[a] difference between baseline and completion

[b] difference between groups

*Motiviated individuals wanted to receive additional health information via e-mail vs. unmotivated individuals did not.

**Basic messages consisted of an email with health tips for the specific topic; whereas the detailed message included the basic message plus links to games, surveys, and websites to supplement the basic message.

Table 5

Weight (pounds) and BMI (kg/m^2) of Participants

Group	Pre Weight Mean (SD)	Post Weight Mean (SD)	Change Mean (SD)	p-value[a]	Pre BMI Mean (SD)	Post BMI Mean (SD)	Change Mean (SD)	p-value[a]
Overall (N=40)	192.5 (42.1)	188.8 (38.8)	-3.7(11.7)	0.06	28.5 (5.4)	28.0 (4.9)	-0.5 (1.9)	0.13
Motivated Detailed (n=9)	193.0 (39.5)	193.9 (42.4)	+0.9 (4.8)	0.27	28.7 (4.4)	28.9 (4.7)	+0.2 (1.0)	0.60
Motivated Basic (n=10)	184.9 (51.9)	174.5 (43.8)	-10.4 (17.8)	0.10	28.4 (5.6)	26.8 (4.4)	-1.6 (2.6)	0.08
Unmotivated Detailed (n=7)	183.6 (39.9)	182.9 (39.9)	-0.7 (3.3)	0.62	26.8(4.4)	26.8 (4.1)	-0.1 (0.9)	0.84
Unmotivated Basic (n=8)	192.7 (34.4)	192.0 (32.2)	-0.7 (5.7)	0.73	25.3 (3.2)	25.5 (3.3)	+0.2 (1.6)	0.75
Control (n=6)	214.7 (45.6)	207.8 (33.2)	-6.8 (15.0)	0.32	34.2 (6.7)	33.3 (5.2)	-0.9 (2.3)	0.34
p-value[b]	0.70	0.55	0.64		0.03	0.02	0.02	

[a] difference between baseline and completion
[b] difference between groups

Blood Pressure and BMI in High-Risk Participants

Of the 46 participants who had baseline and post-study blood pressures measured, 31 (67.4%) were found to have either a blood pressure measurement and/or BMI that put them at risk for having a chronic disease. All participants who had either a high SBP or DBP also had a BMI >25 kg/m2. At the end of the study, most of the at-risk participants [80.6% (n=25)] decreased either blood pressure or weight, including 80% (n=20) of the participants who received the intervention.

At baseline, 23.9% (n=11) had a SBP of ≥ 140 mmHg and 20% (n=9) had a DBP ≥ 90 mmHg. Among those high-risk individuals who received e-health messages, mean blood pressure decreased 4.6/3.5 mmHg (p=0.04). As seen in Table 6, unmotivated individuals had the largest drop in SBP [9.6 mmHg (p=0.04)], whereas motivated individuals had the largest drop in DBP [4.0 mmHg (p=0.03)].

Of the 40 participants who completed both weight pre and post measurements, 28 (65%) had BMI of ≥ 25 kg/m2. Weight change ranged from +10.6 to -52.6 pounds with losers outnumbering gainers. Five of six participants in the control group were obese (83.3%) at baseline. Considering just both intervention groups at baseline, 14 (60.8%) participants were overweight, and nine were obese (39.2%). BMI and weight specifics for at-risk participants are provided in Table 7. Only considering the intervention at-risk participants, BMI decreased in by an average of 0.65.2 kg/m2.

Longitudinal analysis demonstrated that 70.4% (n=64) of participants actively opened at least one e-health message, and of those individuals, 57.1% (n=36) opened at least half of the e-health messages sent during the course of the study. However, opening e-health messages does not mean they acted on, read, or changed behavior.

Discussion

This study is unique in that it assessed the change in blood pressure and BMI in employees who were sent e-mail health messages. Also unique about this study was that the e-mail health messages used of all the WHO's dimensions of wellness instead of focusing on just physical or emotional areas.

The results of the current study are consistent with past research related to use of web-based interventions. Weight loss among those who needed to lose weight is slightly less than those found by Nyquist et al. (2011). Positive results were found in the high-risk participants, which are similar to the results found by Wantland et al. (2004). Wantland et al. (2004) found improved outcomes for individuals using web-based interventions versus non-web based interventions to achieve specific knowledge and/or behavioral health change.

There was a significant decrease in systolic blood pressure among those who received detailed messages. There were no significant changes occurring in BMI or weight among any of the five groups. It is positive that even though there was no significant weight loss between pre and post intervention, none of the high risk participants in the intervention group gained weight, although gain was likely to occur (Valdez et al., 1994). It is believed that the lack of significant change is due to limited time between baseline and the end of the study. This theory is supported by the research done by Davis et al. (2009) that indicated positive benefits from worksite wellness interventions have been shown to improve over time and can take years to be significant.

There are several limitations noted in this study. The study population is relatively small, and a limited number of individuals completed the post assessment. The high attrition rate may have resulted due to the participants' needed to come to the 2010 Benefits Fair to be measured. All participants were encouraged to attend; however, fewer people overall attended the 2010 Benefits Fair, compared to 2009 As a result, the sample may not be representative of the workplace population and actual differences between the study groups may not have been determined.

Table 6

Blood Pressure (mm Hg) of High Risk Participants.

Group	Pre SBP Mean (SD)	Post SBP Mean (SD)	Change Mean (SD)	p-value[a]	Pre DBP Mean (SD)	Post DBP (Mean (SD)	Change Mean (SD)	p-value[a]
Overall (n=16)	144.1 (13.3)	138.8 (12.4)	-5.3 (8.2)	0.007	88.4 (5.0)	85.1 (4.9)	-3.3 (5.8)	0.09
Motivated (n=8)	141.5 (13.1)	140.0 (8.6)	-1.5 (8.5)	0.630	89.8 (3.1)	85.8 (5.5)	-4.0 (4.1)	0.03
Unmotivated (n=5)	144.0 (15.7)	134.4 (17.3)	-9.6 (7.3)	0.04	88.0 (6.2)	85.4 (5.1)	-2.6 (9.1)	0.56
Control (n=3)	151.3 (11.0)	142.7(14.7)	-8.6 (5.0)	0.01	85.3 (7.6)	82.7 (3.1)	-2.6 (5.0)	0.46
Detailed (n=7)	141.7 (13.2)	136.3 (15.4)	-5.4 (8.7)	0.15	89.4 (2.8)	85.0 (5.9)	-4.4 (4.5)	0.04
Basic (n=6)	143.3 (15.1)	139.7 (8.2)	-3.6 (9.5)	0.39	88.7 (6.0)	86.3 (4.5)	-2.4 (8.0)	0.51
p-value[b]	0.60	0.76	0.72		0.52	0.60	0.82	

[a] difference between baseline and completion
[b] difference between groups

Table 7

Weight (pounds) BMI (kg/m^2) of High Risk Participants

Group	Pre Weight Mean (SD)	Post Weight Mean (SD)	Change Mean (SD)	p-value[a]	Pre BMI Mean (SD)	Post BMI Mean (SD)	Change Mean (SD)	p-value[a]
Overall (N=28)	212.8 (31.8)	207.3 (29.1)	-5.5 (3.3)	0.50	31.0 (4.3)	30.3 (3.8)	-0.7 (2.0)	0.06
Motivated (n=13)	210.4 (37.9)	203.6 (36.8)	-6.8 (16.8)	0.17	31.1 (3.8)	30.0 (3.7)	-1.1 (2.5)	0.17
Unmotivated (n=10)	207.4 (23.6)	205.6 (23.0)	-1.8 (5.0)	0.29	28.3 (2.2)	28.2 (2.0)	-0.1 (1.0)	0.72
Control (n=5)	230.2 (27.9)	220.5 (13.4)	-9.7 (14.8)	0.21	36.5 (3.9)	35.2 (2.8)	-1.3 (2.3)	0.27
p-value[b]	0.40	0.54	0.54		0.0006	0.0006	0.91	
Detailed (n=12)	205.6 (27.6)	205.8 (30.5)	+0.3 (4.7)	0.93	29.9 (3.1)	29.8 (3.6)	-0.1 (1.0)	0.88
Basic (n=11)	212.8 (36.9)	203.(1 32.8)	-9.7 (17.2)	0.09	29.9 (3.9)	28.6 (2.7)	-1.3 (2.6)	0.14
Control (n=5)	230.2 (27.9)	220.5 (13.4)	-9.7 (14.8)	0.21	36.5 (3.9)	35.2 (2.8)	-1.3 (2.3)	0.27
p-value[b]	0.36	0.54	0.15		0.004	0.002	0.30	

[a] difference between baseline and completion
[b] difference between groups

Lack of knowledge about the study participants' medical history can pose another limitation. It is unknown if any of the study participants had a history of hypertension, were currently taking medications to control blood pressure, or had genetic and/or medical factors which could cause an elevated blood pressure or BMI. Future studies should assess the participants' medical history and establish baseline criteria for study participation.

Using height and weight to calculate BMI is also a limitation, although this is commonly used as a screening method. Due to the busy venue where the Benefits Fair was hosted, it was decided to not measure skin folds or to ask study participants to remove their shoes before being weighed. In a smaller and more private screening area, study participants may feel more comfortable, be less hurried, and be more receptive to having skin folds measured and removing their shoes before being weighed. Because participants came at their convenience, the time of day may have influenced differences in blood pressure readings. Setting appointment times may have reduced this variation, but would have also decreased participation in follow-up measures.

Implications

This study demonstrated that the use of e-health messages alone may be an effective means to encourage employees to make health changes regardless of whether the messages are brief or more detailed. Furthermore, it is believed that incorporating low-cost, weekly e-health messages that contain the seven dimensions of wellness can assist employees (especially higher-risk individuals) to lower their BMI and blood pressure. Future research should assess the effect of e-mail messaging when implemented in conjunction with other worksite wellness initiatives, such as supportive physical and social environments, wellness screenings, and adequate treatment and follow-up. These initiatives, which do not require a great deal of time to incorporate, can help to lower blood pressure and may lower BMI, which can then lower the risk of chronic disease.

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