

The Effect of Tailored E-mails in the Workplace

Part I. Stage Movement Toward Increased Physical Activity Levels

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RESEARCH ABSTRACT

The purpose of this study was to evaluate the impact tailored e-mail messages, based on participants' identified needs, have on intentional physical activity. A quasi-experimental design (two groups, repeated measures) in a population of manufacturing workers (73 employees from two distribution plants of a multi-national manufacturer) was used. Significant differences were found between contemplation-staged participants in the intervention and the comparison groups. In the intervention group, 53.3% of the workers moved forward, as opposed to 19.2% in the comparison group (medium effect size = 0.353). Although both the intervention group and the comparison group increased their number of steps, the comparison group's improvement was most likely attributed to a Hawthorne effect. These results are highly promising given the small sample size and limited "dose." The intervention is one most industries could feasibly implement. Such efforts have the potential to significantly impact public health.

Although the benefits of physical activity are well-known, most adults in the United States lead a relatively sedentary lifestyle. The United States moved from an agrarian society, where the intent of physical activity was to meet material needs, to a post-industrial society, where individuals are not active enough to achieve health benefits associated with physical activity. Sixty percent of American adults are not regularly active,

and 25% of those are not active at all (Centers for Disease Control and Prevention [CDC], 1999). This inactive population is at both health and financial risk for chronic diseases and conditions (e.g., heart disease, stroke, obesity, myocardial infarction, diabetes, hypertension, colon cancer, osteoporosis, depression, anxiety, and premature death) (CDC, 1999; U.S. Department of Health and Human Services, 2002). An increase in physical activity provides health benefits (e.g., managing or reducing the effects of chronic disease and improving weight control, flexibility, and mood). Because working-age individuals are a large segment of the U.S. population, a more active lifestyle should be aggressively promoted to this group, impacting both mental and physical functioning of workers and positively affecting their productivity. Reliable and cost-effective approaches are needed to move these individuals to more intentional physical activity.

One way to increase physical activity is through the

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Applying Research to Practice

Tailored messages delivered via e-mail by the occupational health nurse have the potential to positively impact intentional physical activity by influencing health behavior choices. By individualizing messages based on identified needs, the occupational health nurse can influence those workers who are contemplating changing their behavior by engaging in physical activity.

use of health promotion materials. Historically, generic health promotion materials were developed, either targeting individuals' readiness to change or personalizing the materials by adding individuals' names, giving the illusion of personally relevant information. These approaches were not wholly successful. One current strategy for promoting physical activity is using tailored messages; these messages have been shown to effectively change behavior (Bock, Marcus, Pinto, & Forsyth, 2001; Fahrenwald, Atwood, Noble-Walker, Johnson, & Berg, 2004). The goal of using tailored messages is to produce individualized communication, so that the participant can say, "This applies to me." Furthermore, because computers are ubiquitous in this society, health care promoters should harness them in the workplace to make a difference in health behavior choices. To impact the entire worker population, tailored e-mail messages are a potentially cost-effective educational approach if assessment needs, complexity of layout or design and graphics, and use of web-based systems are balanced between budget and participants (Yap, Hemmings, & Davis, 2009).

Plotnikoff, McCargar, Wilson, and Loucaides (2005) evaluated and found that e-mail was an effective physical activity intervention, albeit tailoring e-mail messages was not implemented in the study. Marshall, Leslie, Bauman, Marcus, and Owen (2003) successfully used e-mails to supplement their physical activity intervention. Dinger, Heesch, Cipriani, and Qualls (2007) used weekly e-mail reminders containing Transtheoretical Model (TTM) stage-based strategies for increasing physical activity, revealing that e-mail-delivered, pedometer-based interventions may positively impact walking among inactive women. Kreuter, Farrell, Olevitch, and Brennan (2000) noted an increasing number of well-designed studies have addressed a range of health-related behaviors. They found that tailored health communications materials outperformed non-tailored materials and advised that the efficacy of the tailoring approach be maximized. To date, no study was found that used e-mail as a stand-alone intervention to promote physical activity. Consequently, using tailored e-mail messages to communicate with and educate employees regarding their intentions to reduce the risk of injury and illness and enhance well-being through physical activity was the overall purpose of this health communication research study.

In a preliminary study, Yap et al. (2009) used health care experts and focus groups to develop a series of theory-based tailored e-mail messages designed to increase intentional physical activity. Using that intervention, the objective of this study was to evaluate an innovative method of delivering the tailored messages—the occupational health nurse delivering messages by e-mail. The specific aims of the study were to examine the e-mail messages' effects on TTM stage progression and increasing intentional physical activity in a group of manufacturing workers.

THEORETICAL FRAMEWORK

Understanding individuals' potential to change their behavior requires a theoretical model. According to Yap and Davis (2007), the process of behavior change toward intentional physical activity is best guided by a model that synthesizes the TTM and Maslow's Hierarchy of Needs. In brief, the model assumes that individuals, recognizing their need to change, progress through a series of stages over time. This temporal construct is from the TTM, a comprehensive model integrating important behavioral constructs from multiple behavior change theories. The *stages-of-change* is an important construct within the TTM; behavior change occurs in five separate stages (Prochaska, Redding, & Evers, 2002), precontemplation (no intention to change behavior); contemplation (aware problem exists but have not taken steps for correction); preparation (intending to take action within the next month); action (presently attempting to modify the behavior); and maintenance (working to prevent relapse of behavior change). In addition to the stages-of-change, the TTM has the concept of *decisional balance*, which is concerned with balancing the advantages (pros) and costs (cons) of behavior change. The TTM is not a parsimonious theory; however, empirical research supports such theorizing—the vast majority of it in relation to health-related behaviors (Grant & Franklin, 2007).

When applying the TTM to the phenomenon of intentional physical activity, the stages-of-change provide a temporal view of behavior change. The decisional balance concept, although logical, is too broad because the many pros and cons are not all applicable to a single individual. However, the concept of decisional balance plus Maslow's Hierarchy of Needs (Maslow, 1970) provides an explanation of the cognitive and motivational shifts between the stages. Maslow postulates that "needs" motivate behavior. Although Maslow's theory does not have a temporal dimension, it allows for a narrowing of the decisional balance concept so that the pros can be addressed via language geared toward a particular need, in turn motivating behavior change. Subsequently, once readiness-to-change is understood, the need-level language can be applied to potentially tip the decision in favor of engaging in behavior change. A case in point is employees, who during these tough economic times are concerned about eliminating injuries at the workplace that could cost days away from work. The occupational health nurse may be able to motivate workers to increase physical activity by informing them that a reduction in injuries (a safety need) can result from being physically fit, a fact that could tip

Table 1
Demographics of the Intervention and Control Groups

	<i>Intervention Group (n = 37)</i>		<i>Control Group (n = 36)</i>		χ^2	t	p
	%	n	%	n			
Marital status					3.400		.183
Single	16.2	6	8.3	3			
Married	73.0	27	88.9	32			
Divorced	10.8	4	2.8	1			
Children living at home						-0.409	.684
0	48.7	18	36.1	13			
1	13.5	5	22.2	8			
2	27.0	10	30.6	11			
3	5.4	2	11.1	4			
4	5.4	2	0	0			
Years of education						-2.907	.005
12 to 14	73.0	27	47.2	17			
15 to 16	16.2	6	50.0	18			
18	10.8	4	2.8	1			
Employment					0.517		.472
Salaried	32.4	12	41.7	15			
Hourly	67.6	25	58.3	21			

the decision in favor of increasing intentional physical activity.

HYPOTHESIS

The following hypothesis was tested: Individuals in the contemplation and preparation stages-of-change who receive tailored e-mail messages are more likely to progress in stage movement toward increased activity levels than individuals who do not receive tailored messages.

Next issue, Part II of this two-part series will focus on the hypothesis that individuals who receive tailored e-mail messages will have a greater increase in overall activity (measured both objectively [accelerometer] and subjectively [self-report questionnaire]) than those who do not.

METHODOLOGY

Design

Approved by the University of Cincinnati Institutional Review Board, this study used a quasi-experimental design (two groups, repeated measures) in which the participants were in either the contemplation or the preparation stage-of-change. Recruitment of participants began in mid-August and ended in late September. A priori power analysis was conducted based on the premise that participants in both groups were in either one of the two stages-of-change. The a priori power analysis suggested a sample size of 32 participants per group ($N = 64$), as-

suming equal allocation under hypothesis H_2 for the compound symmetry correlation model, a two-sided test at $\alpha \leq .05$, power of 0.80, and medium effect size ($\Delta = 0.50$) (Rochon, 1991).

A total of 73 participants, age 23 to 59 years, were recruited from two manufacturing distribution plants ($N = 393$, $N = 225$). These plants were part of the same multi-national corporation, but in different locations in the same state.

Inclusion Criteria

The participants included men and women who were 18 years or older; fluent in English—because the e-mails were in English; capable of receiving computer e-mail messages; in either the contemplation or the preparation stage-of-change; and free of any condition that precluded physical activity. Of the 73 participants recruited, 36 were in the comparison group and 37 were in the intervention group. Tables 1 and 2 show the demographics and characteristics of the sample, respectively. The groups consisted primarily of married individuals who had at least some college education.

Instruments

Demographics. Demographics collected included age, gender, marital status, number of children living at home, salaried or hourly paid employee, level of educa-

Table 2

Physical Characteristics of the Intervention and Control Groups

	<i>Intervention Group (n = 37)</i>	<i>Control Group (n = 36)</i>	<i>t</i>	<i>p</i>
Mean age (yr)	38.4 ± 11.2	38.8 ± 10.2	-0.163	.871
Women	37.1 ± 11.7	37.9 ± 11.8	-2.42	.81
Men	40.5 ± 10.6	39.6 ± 8.6	0.245	.808
Mean height (inches)	66.9 ± 4.2	68.1 ± 4.2	-1.114	.269
Mean weight (pounds)	193.0 ± 56.9	187.7 ± 40.3	0.469	.641
Mean body mass index	29.9 ± 7.0	28.6 ± 5.8	0.81	.42

tion, whether the worker was dieting, height, and weight (to calculate body mass index for messages, as well as for deciding if the two groups were comparable in body mass index). The first seven variables were self-report data; the last two variables were measured by the researchers.

Stages-of-Change Behavior Questionnaire. A physical activity staging questionnaire was used to classify participants' stage-of-change. The stages-of-change questionnaire used by Marcus, Selby, Niaura, and Rossi (1992) tends to result in similar scores during a 2-week period, providing evidence that this questionnaire measures individuals' intentions and actual behavior, not just the moment in time that individuals are completing the questionnaire (Marcus & Forsyth, 2003; Marcus et al.). Concurrent validity for the scale has been demonstrated with the Seven Day Recall Physical Activity Questionnaire (Marcus & Simkin, 1993). A Kappa index reliability of 0.78 ($n = 20$) during a 2-week period was reported using a working population (Marcus et al.).

Need-Level Questionnaire. A need-level questionnaire was developed in the preliminary pilot study conducted by Yap et al. (2009) using focus groups to establish content validity. The questionnaire was used for self-classification into a need category reflecting Maslow's Hierarchy of Needs (one global statement was used for each of the five levels of needs as identified by Maslow). This questionnaire was used for both baseline data collection and at the final login.

Procedure

Recruitment involved a plant-wide e-mail that was circulated at both sites, 3 times during 6 weeks, announcing the study and inclusion criteria. Additionally, posters with cards containing the phone number of the principal investigator or the employee health center were placed in high-traffic areas around the plant. Anyone interested in participating in the study signed the consent form and answered four questionnaires (stages-of-change, need-level, demographics, and the Stanford Brief Activity Survey). The questionnaires required between 5 and 10 minutes to complete. All those who responded received a \$5 Starbucks gift card for their time. On the basis of their responses to the stages-of-change questionnaire, the participants were invited to participate further if they were

in either the contemplation or the preparation stage-of-change. Individuals who met the preliminary criteria and completed a consent form were admitted to the study.

In mid-September, the principal investigator spent 1 day at each site meeting with research assistants, occupational health nurses, and participants who were able to attend to discuss the study. During these meetings, the principal investigator discussed study procedures with the research assistants and any attending participants, the nuances of using the accelerometer, and the importance of weighing and measuring the participants consistently. Each participant demonstrated command of the accelerometer to the principal investigator or research assistant. Additionally, an instruction tip-sheet describing the accelerometer and a company website for more information was shared. Thereafter, the research assistants at both sites continued the baseline data-gathering process until all data were collected. One 24-hour period of baseline data from the accelerometer for each participant was collected. The study began at both sites the first week of October.

The intervention group received a tailored e-mail message every Tuesday for 6 weeks. Additionally, they had access to a comprehensive website with both physical activity and nutrition information. The comparison group was sent weekly, untailored, general health e-mail messages without physical activity information or website access. A read-receipt was requested from each participant to verify that the message was received. Every other week, the participants wore the accelerometer for 24 hours (except while sleeping) after receiving the e-mail, for a total of four repeated measures. Participants who did not submit data were contacted and reminded. Questionnaires were again administered at the end of the study. For their time, participants received a \$35 Wal-Mart gift card (per their request) at the final login. Those who did not complete the study were partially compensated.

Statistical Analysis

Statistical analyses were performed using SPSS software, version 15. Ordinal regression was used to test the hypothesis. Additionally, a two-way contingency table analysis was used to examine overall stage movement between the intervention and the comparison groups.

Table 3

Movement Within the Stages-of-Change for the Intervention and Control Groups

Stage-of-Change	Intervention Group (n = 37)		Control Group (n = 36)	
	n	%	n	%
Contemplation	(n = 15)		(n = 10)	
Baseline	15	40.5	10	27.8
Forward movement to preparation stage	1	2.7	5	13.9
Forward movement to action stage	7	18.9	0	0
Stayed within the contemplation stage	7	18.9	4	11.1
End of study	11	29.7	11	30.6
Missing	0	0	1	2.7
Preparation	(n = 22)		(n = 26)	
Baseline	22	59.5	26	72.2
Forward movement to action stage	6	16.2	5	13.9
Backward movement to contemplation stage	4	10.8	7	19.4
Stayed within the preparation stage	11	29.7	11	30.6
End of study	12	32.4	16	44.4
Missing	1	2.7	4	11.1
Action	13	35.1	5	13.9

RESULTS

Six participants left the study: one in the intervention group and five in the comparison group. The intervention group participant who left was in the preparation stage-of-change, whereas the comparison group had two participants in the contemplation stage and three in the preparation stage who left the study. After deleting these 5 cases, data from 68 participants were available for analysis—36 from the intervention group and 31 from the comparison group.

Ordinal regression analysis was used to assess stage movement. The dependent variables were movement to a higher stage-of-change, measured by a staging questionnaire; and an increase in intentional physical activity among intervention group members, measured by an accelerometer. The pseudo R squares of McFadden (0.018), Cox and Snell (0.039), and Nagelkerke (0.044) in the complete model show a small effect size of 0.02 to 0.04 (Cohen, 1992). The parameter estimates for the Wald test results have a positive direction at 0.642 with a significance level of .08. Table 3 presents the movement between the stages-of-change—from baseline measurement to the end of the study.

Of those participants in the intervention group at the beginning of the study who were only thinking of engaging in physical activity (contemplation stage-of-change, $n = 15$), 8 moved forward—1 participant moved toward physical activity (preparation stage-of-change) and 7 moved to engaging in physical activity on a routine basis (action stage-of-change). Of those participants in the comparison group who were considering engag-

ing in physical activity (contemplation stage-of-change, $n = 10$), only 5 moved forward and they moved only one stage (preparation stage).

Furthermore, of those participants in the intervention group who considered themselves to already be engaged in some form of physical activity, just not on a regular basis (preparation stage-of-change, $n = 22$), 6 moved forward to being regularly physically active (action stage) and 4 regressed a stage, perhaps realizing they were not as active as they thought. Similarly, in the comparison group ($n = 26$), 5 participants moved forward a stage and 7 regressed a stage.

General movement forward was examined for both the intervention group and the comparison group. Using a two-way contingency table, the stages-of-change were collapsed for each group to identify those individuals who moved forward as opposed to those who stayed at the same stage or moved backward. No significant difference was found between the intervention and comparison groups [$\chi^2 (1, N = 67) = 0.433, p = .511$]. Next, forward movement was examined for those participants who were contemplators. The researchers found the intervention group was significantly different from the comparison group [$\chi^2 (1, N = 67) = 5.036, p = .024$], with 53.3% of the intervention group moving forward as opposed to 19.2% of the comparison group for a medium effect size of 0.353 (Cohen, 1992). Similarly, forward movement was examined between the two groups for participants who were in the preparation stage-of-change and no significant difference was found [$\chi^2 (1, N = 67) = 2.73, p = .601$].

DISCUSSION

This was a theory-driven, worksite physical activity intervention study that used principles of cognitive behavior modification and tailored e-mail messages based on the participants' identified needs. The study's goal was to modify behavior through tailored e-mail messages that addressed participants' needs and tapped into their epistemology (i.e., how individuals acquire knowledge), expanding it and thus influencing their perception of the importance of physical activity.

Participants were initially classified into two ordered stages-of-change (contemplation and preparation as defined by the TTM). However, by the end of the study, participants were in one of three ordered stages-of-change: contemplation, preparation, and action. Because this was a pilot study using a relatively small sample ($n = 73$) and the groups were categorized in two to three stages by the end of the study, the interpretation of ordinal regression was done with caution because some assumptions were violated (a priori analysis was based on only two stages). However, the overall pattern appears to be promising. It is likely that by increasing the sample size (increasing power) to accommodate three groups, a statistically significant change in behavior (progression in stage movement) may be found for those who received the tailored e-mail messages. Therefore, it is imperative that future studies increase the sample size for adequate power. Contemplation-staged (those who were only considering increasing physical activity) individuals in the intervention group were influenced more by the messages than were participants in the comparison group ($\Delta = 0.353$). However, the participants who were in the preparation stage-of-change (those who were beginning to be active but were not regular about the behavior) were not significantly affected by the tailored messages. Perhaps the messages were better suited for contemplation-staged participants who needed information, rather than for preparation-staged participants who may have required an additional component, such as tracking movement attempts and more feedback (e.g., posting weekly means of coworkers' steps and comparing to personal steps).

Because stage movement is based on participants' perceptions of their physical activity levels and because the researchers believe perception results from consciousness raising or environmental triggers, the more data input the participants had (whether received from the tailored e-mails alone or in combination with accelerometer data), the more they moved. The results indicate that measurements have the potential to influence the perception of physical activity level. Furthermore, because the accelerometer allowed participants to accurately quantify their steps (activity level) and compare them to the goal of 10,000, it may have shown the participants that they were not as active as they first thought, causing what may be interpreted as stage regression when actually the change is just a correction.

A longer intervention may allow for an increase in knowledge, number of steps, and physical activity, especially for those participants who either stayed in or moved back a stage. Because this is the first time these messages

were tested, it could be that the preparation group did not receive a strong enough message to provide either the needed knowledge or motivation for behavior change. This limitation would best be addressed by re-examining and modifying the messages using methods similar to those of Yap et al. (2009). Furthermore, the "dose" from the messages was small (6 messages) over a short period (6 weeks). Therefore, if the messages were delivered over a longer time period, continually reminding participants to move and to consider their excuses for not moving, a greater effect could be achieved. The contemplation group messages were effective, and there is potential for expansion. However, using underlying theory to re-evaluate the preparation-stage messages will enhance the researchers' and clinicians' abilities to design more effective physical activity promotion programs.

IMPLICATIONS FOR OCCUPATIONAL HEALTH NURSES

Tailored e-mail messages based on an identified need-level hold potential for the occupational health nurse to positively impact behavior change and increase the intentional physical activity of workers. Furthermore, it is important to consider that e-mail messages are a very small part of workers' lives, yet they can result in workers' engaging in more movement—an overall positive direction toward behavior change and improvement in public health. This type of intervention could be a cost-effective approach and one that would be feasible for most industries to implement. It is an optimal way of both communicating with and educating employees regarding healthy lifestyle choices.

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