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Effect of Face-to-Face vs. E-mail Communication on Fitness and Quality of Life in an Employee-Based Walking Program

Amy L. Chrisfield

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Abstract

E-mail delivery of workplace wellness programming has become an increasingly popular, cost-effective, and efficient means of disseminating information. In light of that trend, this study compared the effect of face-to-face interventions and email interventions on fitness, quality of life, and maintenance of an exercise program. Twenty previously sedentary employees, age 49 +/- 6.8 years, at Messiah College participated in a 10-week progressive walking program. Prior to the intervention, all subjects performed the Rockport Walk Test and a constant-speed treadmill test, filled out the WHOQOL-BREF, and had their resting blood pressure recorded. Participants were asked to walk four days per week, at a moderate intensity, with duration progressing from 20 to 45 minutes, and report to the researcher via weekly workout logs. Weekly motivational information and walking prescriptions were delivered to 11 of the 20 participants via e-mail. The other 9 met with the researcher and several other subjects for one walk per week, during which the researcher verbally delivered the same messages. All testing measures were repeated at the end of the 10-week program. All participants showed significant (p<0.05) improvement on Rockport time, and the general, physical, psychological, and environmental health measures of the WHOQOL-BREF. There were no significant differences between groups in any measure. However, a 3-month follow-up survey indicated that individuals in the face-to-face group maintained a significantly greater level of exercise after the walking program than the e-mail group. Researchers concluded that technology based and face-to-face interventions are equally effective in improving fitness and quality of life during a 10-week employee-based walking program, but face-to-face interventions may be more effective in promoting long-term exercise adherence.
Introduction

In a society struggling with serious preventable health concerns, the necessity of regular physical activity has become increasingly apparent. A large body of research has demonstrated that regular moderate intensity exercise, such as walking, can greatly reduce health risks. Consistent walking routines can lead to weight loss, reduced blood pressure, improved self-esteem, reduced caloric intake, higher VO$_2$max, and significantly lower risk of coronary heart disease (Faghri, Omokaro, Parker, Nichols, Gustavesen, & Blozie, 2008; Chyou, Scheuer, & Linneman, 2006; Murphy, Murtagh, Boreham, Hare, & Nevill, 2006; Wilbur, Chandler, & Miller, 2001; Porcari, Ebbeling, Ward, Freedson, & Rippe, 1989). Walking has been named the preferred method of exercise among adults and promotes high compliance, attributed to its accessibility, achievability, and low risk of injury (Murphy, Murtagh, Boreham, Hare, & Nevill, 2006; Napolitano, Fotheringham, Tate, Sciamanna, Leslie, Owen, Bauman, & Marcus, 2003; Porcari, Ebbeling, Ward, Freedson, & Rippe, 1989).

Facing mounting healthcare costs, many organizations have sought to improve employee well-being by incorporating walking programs into their wellness programs. Previous research has suggested tangible benefits of workplace wellness programs including reduced absenteeism, greater job satisfaction, increased productivity, and lower health care costs for the company (Faghri, Omokaro, Parker, Nichols, Gustavesen, & Blozie. 2008; Chyou, Scheuer, & Linneman, 2006; Prien & Prien, 2003; Nurminen, Malmivaara, Ilmarinene, Ylöstalo, Mutanen, Ahonen, & Aro, 2002; Proper, Staal, Hildebrandt, van der Beek, & Mechelen, 2002; Peterson & Dunnagan, 1998). Pre-existing modes of communication within the workplace, such as work e-mail systems, have been repeatedly identified among reasons for the success of these programs (Murphy, Murtagh, Boreham, Hare, & Nevill, 2006; Plotnikoff, McCarger, Wilson, & Loucaides, 2005).
Since e-mail is one of the most widely used forms of inter-office communication, several previous studies have sought to determine the efficacy of e-mail based physical activity programs implemented in the workplace (Gilson et al., 2009; Taylor, 2008; Chyou, Scheuer, & Linneman, 2006; Plotnikoff, McCarger, Wilson, & Loucaides, 2005; Fotheringham, Owies, Leslie, & Owen, 2000). Research has found that technology-based interventions, in which information is relayed solely via e-mail or an internet website, have a measurable positive impact on the health of participants and also overcome the common exercise deterrents of availability and time (Webb, Yardley, & Michie, 2010; Gilson et al., 2009; Faghri, Omokaro, Parker, Nichols, Gustavesen, & Blozie, 2008; Taylor, 2008; Yap, Hemmings, & Davis, 2008; Chyou, Scheuer, & Linneman, 2006; Plotnikoff, McCarger, Wilson, Loucaides, 2005; Wantland, Portillo, Holzemer, Slaughter & McGhee, 2004; Napolitano, Fotheringham, Tate, Sciamanna, Leslie, Owen, Bauman, & Marcus, 2003). Fotheringham, Owies, Leslie, & Owen (2000) suggest that the affordability and convenience of online interventions may make them more advantageous than face-to-face programs. Steele, Mummery, & Dwyer (2007) directly compared an e-mail based intervention and a face-to-face intervention, reporting similar adherence in both groups. Despite the apparent success of e-mail based programs, researchers found that social support is a powerful motivating factor (Gilson et al., 2009). In a society becoming increasingly dependent on technology, and less dependent on one another, are face-to-face interventions still a viable method of encouraging physical activity in employees?

The purpose of this study was to further the existing body of research to address these concerns. The researcher sought to determine the effect of once weekly face-to-face interaction compared to a program delivered via e-mail on the fitness level, blood pressure, and quality of life outcomes of a 10-week employee-based walking program.
Methods

Participants

Participants were recruited via an e-mail sent to all faculty and staff by the wellness director of Messiah College. Thirty-three faculty and staff members responded with interest. Nine were turned away because they were already participating in regular physical activity. The remaining 24 subjects were randomly assigned to either a face-to-face interaction (intervention) (11) or e-mail (control) (13) group. During the 10-week program, 4 subjects withdrew due to schedule conflicts (2) and health complications (2). At post-testing, 9 subjects remained in the intervention group, and 11 in the control group. The average age of participants was 49 years (+/- 6.8). The majority of participants were female; however, there were two male subjects in the e-mail group. All subjects were sedentary Caucasian employees at Messiah College, a small private liberal arts college in Central Pennsylvania. The study was approved by Messiah College’s Institutional Review Board. All participants gave their informed consent prior to participation.

Pre-Testing:

Participants completed a preliminary session prior to the commencement of the walking program. During this session, physical fitness was estimated via the Rockport Walk Test and a constant-speed treadmill test. Resting blood pressure readings were taken. Quality of life was measured via the WHOQOL-BREF (Bonami & Patrick, 1997).

The Rockport Walk Test, which fit the needs of the participants recruited for this study well, was performed individually on an indoor track. It has been validated, for a wide variety of populations, as a useful field test for accurate estimation of VO₂max (Chyou, Scheuer &
Linneman, 2006; Byars, Greenwood, Greenwood & Simpson, 2003; Dolgener, Hensley, Marsh & Fjelstul, 1994; Kittredge, Rimmer & Looney, 1994; Fenstermaker, Plowman & Looney, 1992). The test requires subjects to walk a mile at maximal effort, immediately followed by heart rate measurement. Research has shown that a steady sub-maximal pace will also elicit an accurate result (Byars, Greenwood, Greenwood, & Simpson, 2003). The Rockport Walk Test has proven to be an appropriate tool for exercise prescription amongst novice exercisers; it is easily administered, requires minimal equipment and time, is non-threatening, and can be controlled by the exerciser (D’Alonzo, Marbach, & Vincent, 2008; Kline, Porcari, Hintermeister, Freedson, Ward, McCarron, Ross, & Rippe, 1987). In this study, participants were instructed to walk at a steady high-intensity pace on an indoor track for exactly one mile. An Acumen Eon Basix ES heart-rate monitor with a watch read-out was worn during the test. The researcher recorded the time elapsed and heart rate immediately upon completion. Fitness level, defined as low, below average, average, above average, or high, was estimated by plotting mile walk time and heart rate on 1 of 10 age and gender specific Rockport graphs (Heyward, 2006). Walking program progressions was assigned based upon this estimated fitness level.

Following a recovery period, participants were asked to walk on a Precor treadmill for 5 minutes. The incline was set at 1% grade and the speed at 3.5 miles per hour. This speed was chosen because it was achievable by all, but intense enough to elicit health benefits. Porcari, Ebbeling, Ward, Freedson, & Rippe (1989) established that 3.5-4.5 miles per hour is the walking speed required to achieve cardiorespiratory benefits, and Dal, Erdogan, Resitoglu, Beydagi (2010) found that 2.2-3.8 miles per hour is the normal preferred walking speed of adults. Heart rate was recorded (Acumen Eon Basix ES) by the researcher at the end of each minute. This trial,
controlled for speed, allowed for between-subject comparison of heart rate response to moderate intensity exercise.

Resting blood pressure was recorded by registered nurses at the college’s health center. Subjects were asked to report to the health center within one week of their testing session, prior to the commencement of the walking program, to have the measurement taken. All blood pressure results were reported directly to the researcher.

Finally, the WHOQOL-BREF survey was administered to subjects as a measure of global quality of life, unlike other commonly used instruments that only measure health-related quality of life (Cruz, Camey, Fleck, & Polanczyk, 2009). The World Health Organization, which created this questionnaire, defines quality of life as “individuals’ perceptions of their position in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (The WHOQOL Group, 1998). The WHOQOL-BREF is a highly correlated shortened field version of the validated WHOQOL-100 (The WHOQOL Group, 1998). This questionnaire was developed based on the participation of 20 field centers in 18 countries which assessed it in various populations and settings (The WHOQOL Group, 1998). The WHOQOL-BREF consists of 26 questions which fall under the domains of general health, physical health, psychological health, and the often overlooked domains of social and environmental health. Domain scores from WHOQOL-BREF are transformed to a 1-100 scale for comparison with the full-length version of the questionnaire. A higher score in any domain indicates a greater quality of life in that area (The WHOQOL Group, 1998). Subjects completed the survey in a private location, without outside assistance. The researcher was blinded to the identity of individual responses to protect confidentiality and encourage honest responses.
**Intervention**

The 10-week walking program began following pre-testing. Based on the estimated fitness levels determined by the Rockport Walk Test results and subsequent graphical estimation, the researcher prescribed one of two exercise progressions. All participants were asked to walk at least 4 days per week, with the exception of week one. The program began by requiring 20 minutes of walking a day for 3-4 days per week. By the final week, subjects were required to walk 4 days per week, for 35-50 minutes a day, depending on initial fitness level. Each week, intensity in terms of rating of perceived exertion (RPE) ranging from 12-14 was assigned (Borg, 1990; Glass, Knowlton, & Becque, 1992). Subjects were instructed on the use of RPE during pre-testing. Walk duration and intensity (RPE) increased on alternate weeks. Participants wore a pedometer during each walk, and completed weekly walking logs. Previous research has shown that pedometer use encourages program adherence because of its clear quantification of an individual’s effort (Faghri, Omokaro, Parker, Nichols, Gustavesen, & Blozie, 2008). Walking logs were designed in accordance with conclusions of research on their successful use (Johnson-Kozlow & Matt, 2009; Murphy, Murtagh, Boreham, Hare, & Nevill, 2006; Wilbur, Chandler, & Miller, 2001). Each week subjects recorded days walked, walk duration, steps taken, and RPE. They also rated their physical and psychological satisfaction on a Likert scale of 1 to 10 for each walk. Data from weekly walking logs was compiled to measure program adherence.

During the walking program, subjects in the control group received an e-mail message at the beginning of the week that instructed them regarding the frequency, intensity, and duration of walks required for the week. Each e-mail also included motivational and educational information. Topics included the physical and psychological benefits of exercise, proper walking form, personal motivation, effective goal setting, stress relief, stretching, exercise maintenance
strategies, nutrition, and exercise as medicine. Subjects were responsible to complete all walks on their own time and submit weekly walking logs to the researcher via e-mail or inter-campus mail.

The intervention group met with the researcher and 3-4 other subjects once a week to walk on an indoor track. This group walk counted as one of the walks required for the week. During these sessions, the researcher verbally conveyed the same motivational messages as were included in the week’s e-mail, which this group did not receive. Subjects began the walk together for a brief time of social interaction, but were then encouraged to walk at their own pace to reach the desired intensity. The researcher took time to individually speak with and address the questions of each subject. Paper copies of weekly exercise prescriptions and walking logs were delivered at the meeting, and logs were returned to the researcher during the following week’s meeting. All other walks for the week were completed on the subject’s own time.

Post-testing

At the conclusion of the 10-week program, subjects repeated the preliminary testing session. This included the Rockport Walk Test, steady state treadmill test, resting blood pressure reading, and the WHOQOL-BREF. Three months following program completion, participants were sent a post-participation survey. The survey assessed weight loss, perceived enjoyment, perceived benefit, and current walking habits of subjects in both groups. Additionally, those in the face-to-face group were asked to rate the value of the weekly meeting, while those in the e-mail group were asked if they felt a weekly meeting would have been valuable.
Statistics

Data recorded in pre- and post-testing, from workout logs, and from the post-participation survey were entered into SPSS 18.0. ANOVA with repeated measures was used to compare pre- and post-data within and between each group for mile walk time, treadmill test heart rate (minute 5), systolic and diastolic blood pressure, and the five domains of the WHOQOL-BREF: general health, physical health, psychological health, environmental health, and social health. A t-test was used to compare the minutes walked by each group during the intervention. Chi-square analysis compared the groups’ responses on the post-participation survey regarding weight loss, program enjoyment, perceived benefit, physical activity levels 3 months post-completion, and perceived value of face-to-face meetings.

Results

Combined, the groups showed significant (p< 0.05) improvement in mile walk time, and the WHQQL-BREF measures of physical health, general health, psychological health, and environmental health. A trend toward significance was apparent for the social health measure of the WHOQOL-BREF (see table 1.0). There was no significant improvement pre-post in heart rate during the steady state treadmill test, systolic blood pressure, or diastolic blood pressure. Heart rates were within normal ranges at both pre- and post-testing. There was a trend toward significant difference between groups for diastolic and systolic blood pressure, with the intervention group reporting lower numbers. However, these measurements were not controlled for time of day or inter-rater reliability and neither group showed significant improvement, so the applicable significance is limited. There was no significant difference between groups for any
measure at pre- or post-testing. The similarity between groups continued throughout the intervention, leading to comparable outcomes.

Total minutes walked during the intervention were compared using a t-test. There was no significant difference in total minutes walked over the ten weeks between groups. The fact that there was no significant difference in adherence, fitness, and quality of life outcomes between groups suggests that the method of communication had no impact on outcomes when controlled for adherence. The body responds positively to exercise despite the method of communication.

Table 1.0: Pre and Post-test within-subject results for all participants (n=20)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Pre-test mean</th>
<th>Post-test mean</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mile Time (min)</td>
<td>15.89</td>
<td>14.56</td>
<td>1</td>
<td>0.000*</td>
</tr>
<tr>
<td>Treadmill HR (bpm)</td>
<td>128.20</td>
<td>125.80</td>
<td>1</td>
<td>0.362</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>125.20</td>
<td>121.20</td>
<td>1</td>
<td>0.201</td>
</tr>
<tr>
<td>Diastolic BP (mmHg)</td>
<td>79.60</td>
<td>79.50</td>
<td>1</td>
<td>0.966</td>
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<tr>
<td>General Health</td>
<td>61.88</td>
<td>75.63</td>
<td>1</td>
<td>0.000*</td>
</tr>
<tr>
<td>Physical Health</td>
<td>75.36</td>
<td>82.14</td>
<td>1</td>
<td>0.016*</td>
</tr>
<tr>
<td>Psychological Health</td>
<td>65.21</td>
<td>73.13</td>
<td>1</td>
<td>0.005*</td>
</tr>
<tr>
<td>Social Health</td>
<td>69.17</td>
<td>75.42</td>
<td>1</td>
<td>0.060*</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>77.34</td>
<td>82.19</td>
<td>1</td>
<td>0.036*</td>
</tr>
</tbody>
</table>

*denotes significance
+denotes a trend toward significance

Chi-square tests were run on the data from the post-participation survey, which asked about weight loss, extent of enjoyment and benefit, continuation of walking 3-months post-intervention, and perception of helpfulness of a face-to-face meeting. Eighteen of the twenty participants completed the survey. Data was absent for two members of the e-mail group. The survey included five Likert scale ratings from 1-5. Responses of one and two, and four and five, were collapsed for analysis. No significant difference existed between groups for weight loss, program enjoyment, or perceived benefit. There was a significant (p<0.05) difference between
groups regarding current walking status, with the intervention group walking more than the control group (see table 2.0). 44.4% of participants in the face-face group reported walking 4 or more days per week, while 0.0% of the e-mail group walked that frequently. This is an important distinction, because to meet ACSM recommendations of 150 minutes of moderate exercise per week, we would like to see individuals striving to walk most days (“ACSM: Physical activity,” 2007). There was also a significant difference in perceived meeting helpfulness between groups (p<0.05). 100% of the face-to-face group reported that the weekly meeting was helpful or very helpful, whereas as only 22.2% of the e-mail group believed a meeting would have been helpful or very helpful. This suggests a disconnect between perception and experience of instructor-led exercise. Without a meeting, individuals do not believe they would benefit from interaction, but once the interaction occurs, individuals consider it invaluable.

<table>
<thead>
<tr>
<th>Table 2.0: Participant responses to Post-participation survey</th>
</tr>
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<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Weight Loss/Gain**</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Perceived Enjoyment**</td>
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<td></td>
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<tr>
<td>Perceived Benefit**</td>
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<tr>
<td></td>
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<tr>
<td>Current Walking**</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Meeting Helpfulness**</td>
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<td></td>
</tr>
</tbody>
</table>

*group 1 represents the e-mail group, group 2 represents the face-to-face group

**For weight loss/gain: 1 represents loss, 2 represents no change, 3 represents gain; For perceived enjoyment: 1 represents not at all–very little, 2 represents moderately enjoyed, 3 represents enjoyed–greatly enjoyed; For perceived benefit: 1 represents not at all–very little, 2 represents moderately benefited, 3 represents benefited–greatly benefited; For current walking:1 represents 0-1 days, 2 represents 2-3 days, 3 represents 4+ days; For meeting helpfulness: 1 represents not helpful, 2 represents no effect, 3 represents helpful/very helpful

*denotes significance
Discussion

These findings suggest that face-to-face and e-mail deliveries of a walking intervention are equally beneficial for measures of fitness and quality of life. Subjects in both groups showed improvements in mile walk time. Improved walking speed is an indicator of fitness (Hardy, Perera, Roumani, Chandler & Studenski, 2007; Bohannon, 1997; Mattsson, 1989; Cunningham, Rechnitzer, Pearce & Donner, 1982). Subjects in both groups also demonstrated an improved quality of life score according to the WHOQOL-BREF in the areas of general health, physical health, psychological health, and environmental health. This data supports previous research that demonstrates the physical and psychological benefits of regular walking (Murphy, Murtagh, Boreham, Hare, & Nevill, 2006; Napolitano, Fotheringham, Tate, Sciamanna, Leslie, Owen, Bauman, & Marcus, 2003, Porcari, Ebbeling, Ward, Freedson, & Rippe, 1989).

There was no significant difference between the face-to-face and e-mail group in any measure of fitness or quality of life. This finding agrees with studies that concluded that e-mail is an effective means of program delivery and is comparable to traditional interventions (Gilson et al., 2009; Jenkins, Christensen, Walker, & Dear, 2009; Faghri, Omokaro, Parker, Nichols, Gustavesen, & Blozie, 2008; Taylor, 2008; Yap, Hemmings, & Davis, 2008; Chyou, Scheuer, & Linneman, 2006; Plotnikoff, McCarger, Wilson, Loucaides, 2005; Napolitano, Fotheringham, Tate, Sciamanna, Leslie, Owen, Bauman, & Marcus, 2003). It appears that in an increasingly independent and technology-dependent society, personal interaction has little effect on the quantitative outcomes of fitness and quality of life of an employee-based exercise program.

A significant result of this study lies within the responses to the post-participation survey. Those in the intervention group continued walking significantly more often than those in the control group 3 months after the intervention ended. This would suggest that face-to-face
interventions may be more effective in forming long-term health habits. A meta-analysis of the effects of physical activity interventions on exercise maintenance agrees, reporting that trials achieving maintenance were more likely to include some face-to-face interaction (Fjeldsoe, Neuhaus, Winkler, & Eakin, 2011). Future studies that examine this potential effect over a long-term basis are needed. Further data will help us understand whether adherence would be maintained if the e-mails had continued, or if it was the relationship formed with an instructor that led to greater adherence and appreciation of physical activity.

The survey also indicated that individuals who did not attend a weekly meeting did not think it would have been helpful, but 100% of those who did attend a meeting considered it helpful. This leads to the inference that there is a shift in perception once a face-to-face program is experienced. In this individualistic society, it is not necessarily surprising that so few subjects in the e-mail group thought meeting with others would have played a positive role in their journey. It appears that once face-to-face interaction in experienced, greater value is placed upon it. Dawson, Tracey, & Berry (2008) found that internet-based interventions may have the ability attract and reach more individuals, but face-to-face interventions lead to a greater level of self-confidence. This augmented self-efficacy may be one explanation for the improved adherence found in the present study with the face-to-face group.

This study had several limitations. Due to a limited interest and availability of resources, the study employed a small sample size. A larger sample size may have uncovered significance in subtle differences between groups. Also, the homogeneity of the subjects in terms of gender, ethnicity, and workplace environment limits our ability to generalize the results to a more diverse population. Although this study found no significant difference between groups in fitness measures, future studies may consider including a measurement of body mass in order to
calculate more precise VO₂ max values to closely examine fitness outcomes. In this study, Rockport graphs were used as an estimate of fitness level. Finally, all subjects in the present study volunteered in order to contribute to a student’s research, and subjects in both groups reported a sense of motivation based upon that factor. This may have had an effect on adherence that would be absent in the average corporate wellness setting.

Conclusions

We conclude that technology based and face-to-face interventions are equally effective in improving fitness and quality of life during a 10-week employee-based walking program. Both methods of communication lead to significant improvements in health measures. Also, the value of face-to-face interaction is not perceived until experienced, but appears to have a positive effect on long-term maintenance of an exercise program. The results of this study can be applied as a reference for future employee wellness program design. When faced with limited resources, technology-based interventions may offer a cost-effective alternative to face-to-face programming. However, when striving for long-term adherence to wellness programming, interventions involving personal interaction may prove more beneficial.
References


