Improving Exercise Adoption:

The Effects of Social Support, Personalized Goal Setting and Feedback and Prompting

in a Community Walking Program

by

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IMPROVING EXERCISE ADOPTION: THE EFFECTS OF SOCIAL SUPPORT, PERSONALIZED GOAL-SETTING AND FEEDBACK AND PROMPTING IN A COMMUNITY WALKING PROGRAM

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ABSTRACT

Assessed the effects of frequency of prompting (phone calls once a week versus once every three weeks) and content of prompting (feedback and goal setting versus "touching base") in a walking program designed to meet ACSM's cardiovascular exercise goals. Survival analysis using six months of data points and using the criteria of walking at least 20 minutes a day for a at least three times per week indicated an effect for more frequent versus less frequent prompting (50% and 15%), but not for feedback and goal setting versus "touching base" prompting (31% and 30%). The results suggested the efficacy of frequent prompting delivered in inexpensive ways as a means to increase exercise adherence and the further parametric study of other basic behavior change strategies.

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As the evidence supporting the many benefits of regular physical activity continues to mount, investigators have increasingly recognized physical activity as an important preventive health-related behavior. Researchers found participation in physical activity is important for the prevention and management of coronary heart disease (CHD) (Powell, Thompson, Casperson & Kendrick, 1987), hypertension (Siscovick, LaPorte & Newman, 1985), noninsulin-dependent diabetes mellitus (Siscovick et al., 1985), osteoporosis (Siscovick et al., 1985), obesity, and weight loss or weight control (Blair, Jacobs & Powell, 1985). Furthermore, there is increasing evidence showing inactivity is an independent risk factor for cardiovascular disease and colon cancer. Other benefits derived from regular physical activity include lower rates of stroke (Paffenbarger & Hyde, 1984) and some forms of cancer (e.g., lung, colon, pancreas, and prostate) (Kohl, LaPorte, & Blair, 1988). In addition, Katz, Branch, Branson, Papsidero, Beck, and Greer (1983) found regular physical activity aids in prolonging the functional independence of aging individuals and enhances their quality of life. Furthermore, Paffenbarger, Hyde, Wing, and Hsieh (1986) found individuals who are physically active live longer than those who are inactive.

Participation in regular physical activity also appears beneficial for mental health (Morgan & Goldstein, 1987; Moses, Steptoe, and Edwards, 1989; Shepard, 1990; Taylor, Sallis & Needle, 1985). This suggests physical activity may be useful in the treatment of some psychological disorders. In fact, Moses, Steptoe, &

Edwards (1989) and Steptoe and Cox (1988) showed physical activity enhanced an individual's ability to handle stressful life events. These findings suggest physicians can use physical activity prescriptively for improving mental health. Indeed, Morgan and Goldstein (1987) found 85% of 2000 physicians surveyed prescribed physical activity in their treatment of depression.

Although there is mounting evidence for the both health and mental health benefits of physical activity, the number of adults who engage in physical activity resulting in benefits is low. In fact, Caspersen, Christenson, and Pollard (1986) estimated less than 10 percent of the U. S. adult population exercises at the level recommended by the American College of Sports Medicine to produce health benefits.

Prevalence

When using the strict definition of physical activity prescribed by the American College of Sports Medicine (1990) (exercising 3-5 times per week, 20-30 minutes per session, 50 to 85% of maximum capacity), Caspersen, Christenson, and Pollard (1986) estimated less than 10% of all adults are physically active to the extent necessary to reduce their risk of disease. Thus, approximately 90% of individuals do not engage in enough physical activity to produce health or fitness benefits. Importantly, the prevalence of physical inactivity is much greater than the prevalence of other risk factors for disease. For example, researchers estimate approximately 30% of the population smokes (Dishman, 1988), 10% to 40% are hypertensive (Kannel, 1978), whereas 80% - 90% are physically inactive (Blair, 1988). Thus, physical inactivity represents a substantial public health concern.

Relative Risk

In a recent prospective study, Blair, Kohl, Paffenbarger, Clark, Cooper and Gibbons (1989) assessed physical fitness and risk of all-cause mortality (the proportion of deaths from all causes relative to the whole population) in a large community population. They found 17.1% of men and 19.3% of women fell into the low fitness category. When compared to the highest fitness category, the low fitness category was associated with relative risks for all cause mortality of 3.44 and 4.65 for men and women, respectively. This means the risk of death for those in the lowest fitness category is three to four times greater than those in the highest fitness category. Thus, increasing an individual's physical activity level can result in a lower risk of death.

Population Attributable Risk and Related Estimates

Paffenbarger et al. (1986) calculated the population attributable risk (the number of excess cases of disease in a population that can be contributed to a particular risk behavior, exposure, trait, or intervention) for all-cause mortality related to physical inactivity to be 16%, compared with 6% for hypertension, 22% for cigarette smoking, and 5% for positive family history of early parental death. Blair et al. (1989) found inclusion in the lowest fit quintile was associated with population attributable risks of 9% in men and 15% in women. Again, these estimates were similar to or higher than estimates for other risk factors, such as, cigarette smoking 2.1% for men and 2.7% for women, hypertension, 2.4% for women, 4.6% for men and hyperlipidemia, 11.2% for men and 7.1% for women.

Most significantly, Blair et al.(1989) found great risk reduction even if individuals increased their activity only minimally. That is, when the lowest fit group is compared with the next higher fit group the relative risk declined 3.44 to

1.37 and 4.65 to 2.42 for men and women, respectively. This is important as most individuals are able to increase their activity to the level necessary to achieve risk reduction (e.g., brisk walking several hours per week). In addition, Blair et al. (1989) estimated physically active people live two years longer than sedentary people and have greater productivity in daily tasks (DHHS, 1990).

Further, Fiatarone, Marks, Ryan, Meredith, Lipsitz, and Evans (1990) found consistent participation in a strength building program increased functional independence for older adults through increased strength and mobility. Evans and Rosenberg (1991) also concluded physical activity could increase the functional mobility of older adults. Thus, even moderate physical activity, regardless of age, results in significant health and quality of life benefits.

Summary

The prevalence, relative risk and population-attributable risk estimates for physical inactivity indicate a significant public health concern comparable to cigarette smoking, hypertension, hyperlipidemia, and obesity. Importantly, the prevalence of physical inactivity increases with advancing age (Casperson, Christenson, & Pollard, 1989). In addition, not only are risks for chronic disease reduced with regular physical activity, but quality of life and protection against disability improve . Thus, there is an important need for effective interventions to increase physical activity.

Inactivity: Incidence and Prevalance of Specific Diseases

Physical activity has been associated with the prevention of several diseases including coronary heart disease, hypertension, osteoporosis, obesity, colon cancer, and stroke. Furthermore, physical activity was shown to improve

management of noninsulin-dependent diabetes mellitus and pregnancy (Rippe et al., 1988; Blair et al., 1989). Thus, physical activity can have health benefits for both men and women.

Coronary Heart Disease

A meta-analysis of 43 studies indicated inactive individuals have a 1.9 time more chance of developing CHD than active individuals (Powell, Thompson, Caspersen, & Kendrick, 1987). Additionally, two cohort studies indicated inactive individuals have a 35% to 52% greater risk of developing hypertension than physically active people (Paffenbarger, Wing, Hyde, & Jung, 1983; Blair, Goodyear, Gibbons, & Cooper, 1984).

Unfortunately, the majority of these studies had only men as their subjects. Other studies indicated women's cardiovascular responses to exercise are similar to men's (Getchell & Moore, 1975; Jette, Sidney & Campbell, 1988). Furthermore, Dubbert and Martin, (1988) found sharp increases in cardiovascular disease in post menopausal women over 50. Thus, exercise, could be used to prevent cardiovascular disease in women, especially woman over 50.

Diabetes

Physical activity may prevent or ameliorate the effects of diabetes. Physical activity has been associated with increased insulin sensitivity and improved glucose clearance for both men and women (Rauramaa, 1984; Laws & Reaven, 1991). Laws and Reaven (1991) indicated exercise must be performed regularly to be of benefit. Thus, long-term physical activity can reduce the risk for diabetes.

Osteoporosis.

Several studies indicated physical activity can prevent or reverse osteoporosis. Bedridden patients and astronauts who lost trabecular bone mass reestablished normal bone density through weight bearing activities (Mazess & Wheedon, 1983). Physical activity retarded bone loss in post menopausal women (Smith, Redden, & Smith, 1981). Furthermore, Nilsson and Westlin (1971) found bone density to be greater in athletes than in nonathletes. Thus, regular physical activity, especially for post menopausal woman, can prevent bone loss and osteoporosis.

Weight Loss

Research indicated regular activity increased weight loss. Epstein and Wing (1980) found physical activity correlated with weight loss even when diet was controlled. Brownell and Stunkard (1980) stated a lack of exercise was a causal factor in the development of obesity. Several studies have shown exercise needs to be incorporated for weight management programs to be even moderately successful (Dahlkoetter, Callahan & Linton, 1979; Dubbert & Wilson, 1984; Epstein, Wing, Koeske, Ossip, & Beck 1982). Furthermore, researchers now understand resistance training is important for maintaining muscle mass which is related to maintaining a higher metabolic rate.

Pregnancy

Light to moderate intensity exercise was shown to be safe and beneficial for pregnant women. Rippe et al. (1988) stated brisk walking would be an appropriate low impact exercise for pregnant women. Furthermore, they stated the aerobic capacity of pregnant women who exercised increased compared to a decrease in

non-exercising pregnant women. Thus, exercise is safe and beneficial to pregnant women and may help reduce problems in labor and post delivery recovery.

Summary

Physical activity has been associated with the prevention of several diseases including coronary heart disease, hypertension, osteoporosis, obesity, colon cancer, and stroke. Furthermore, physical activity was shown to improve management of noninsulin-dependent diabetes mellitus and pregnancy (Rippe et al., 1988; Blair et al., 1989). Thus, promoting regular exercise will increase individual's health and overall quality of health. For these reasons, Healthy People 2000 created several goals for exercise promotion.

Goals and Guidelines

Given the mounting evidence for the myriad health benefits of physical activity, several organizations have forwarded goals and recommendations concerning physical activity. The two most prominent organizations forwarding these statements are the United States Department of Health and Human Services (USDHHS) and the American College of Sports Medicine (ACSM).

Goals for the Nation

The U. S. government's goals for the nation recognized the need for continued development of successful physical activity programs (DHHS, 1990). The "Goals for the Nation" mandated four physical activity related goals (see Table 1).

Insert Table 1 about here.

The first goal recommends increasing to at least 30% the proportion of individuals aged six and older who engage regularly, ideally daily, in light to moderate physical activity for at least 30 minutes per day. Presently, only 22% of this population reaches this goal. This objective defined physical activity as any bodily movement produced by skeletal muscles resulting in caloric expenditure (Caspersen et al., 1986). This type of activity is the equivalent of a sustained walk, but includes any activity producing increased caloric expenditure (e.g., cleaning house, gardening). This is an important point because it means individuals can engage in any sustained activity, at their convenience, and at a preferred intensity.

The second goal is to increase to at least 20%, the proportion of individuals aged 18 and older and to at least 75% the proportion of individuals aged 6 through 17 who engage in vigorous physical activity promoting cardiorespiratory fitness three or more days per week for 20 or more minutes per occasion. Vigorous physical activity aids cardiorespiratory fitness to a greater extent than light to moderate physical activity (Blair et al., 1989). In addition, these higher levels of fitness help individuals perform daily tasks and leisure activities more easily. These fitness levels can be reached by various combinations of frequency, duration and intensity of aerobic activities. For example, one could bicycle over hills for 30 minutes four times per week, or speed walk for 40 minutes three times per week, or swim 20 minutes three times per week. Any of these combinations would meet this goal.

The third goal is to reduce to no more than 15% the proportion of individuals aged 6 and older who engage in no leisure-time physical activity. While the protective effect of physical activity occurs for both occupational and leisure-

time physical activity, the amount of physical activity at work and outside work has steadily declined (National Health Interview Survey, 1985). Most individuals hold somewhat sedentary jobs, so leisure-time activity is especially important. Presently, approximately 24% of individuals in the U. S. over 18 years old report no leisure-time physical activity.

The fourth goal is to increase to at least 40%, the proportion of individuals aged 6 and older who regularly perform physical activities enhancing and maintaining muscular strength, muscular endurance, and flexibility. Participation in such activities as vacuuming, yard work, gardening, walking a flight of stairs and other lifestyle activities serve to satisfy this objective. Increasing muscular strength, endurance and flexibility aids the performance of everyday tasks, thus increasing quality of life.

Other exercise related goals include: 1) reduce coronary heart disease deaths from 135/100,000 to 100/100,000; 2) reduce the rate of obesity from 27% to 20% among women aged 20 and older; and 3) increase to 50% the proportion of overweight individuals 12 and older who have combined sound dietary practices and regular physical activity to attain an appropriate weight.

ACSM Guidelines for Physical Activity.

The American College of Sports Medicine was the first scientific organization to publish an official recommendation for exercise prescription. The ACSM modified these statements throughout the years in response to increased knowledge of physical activity and physical fitness and their health benefits. Their most recent statements include recommendations for aerobic activity, flexibility and strength training (ACSM, 1990, see Table 2).

Insert Table 2 about here.

The ACSM guidelines recommend individuals exercise at a moderate intensity between 50 to 85% of maximal capacity (VO_{2max}: maximal aerobic power or maximal oxygen uptake) or 60 to 90% of maximum heart rate (HR_{max}). Furthermore, the individual's response to exercise training is dependent more on the total energy expended and not necessarily intensity, as long as the minimum intensity threshold is reached (i.e., 60% HR_{max}). Also, how an individual reaches their minimum intensity threshold (the intensity where health benefits occur) may vary depending upon the intensity of the exercise session, the initial fitness level of the individual, the length of the training period and other individual characteristics (ACSM, 1990). The ACSM does recommend exercising at a moderate intensity for a long duration over exercising at a high intensity for a shorter duration mainly due to the increased risk for injury with high intensity exercise (ACSM, 1990).

The ACSM guidelines recommend individuals exercise for a duration of 20-60 minutes of <u>continuous</u> aerobic activity for each exercise session (ACSM, 1990). Furthermore, the activity should use large muscle groups in a continuous, rhythmic and aerobic manner. The ACSM guidelines suggest a relationship between intensity and duration and their effects on fitness. For example, individuals who could not perform high intensity exercise could perform a lower intensity activity for a longer period of time to increase their aerobic power (Blair, Kohl, Gordan and Paffenbarger, 1992).

The ACSM guidelines recommend individuals exercise three to five days per week (ACSM, 1990). When exercise is performed less than three days per week (unless the exercise is very strenuous), studies have found only minimal change in fitness. Furthermore, ACSM noted exercising greater than five days per week does not produce greater improvement in fitness than training five days per week.

The ACSM guidelines also recommended individuals perform resistance training of 8-12 repetitions for 8-10 exercises involving large muscle groups at least twice each week. Furthermore, exercise sessions should have appropriate warm-up and cool-down periods, including flexibility exercises (American College of Sports Medicine, 1990).

In sum, the ACSM recommends physical activity performed at an intensity of at least 50 to 85% maximal capacity, for at 20-60 minutes,3-5 days per week and include some form or resistance and flexibility training with appropriate warm up and cool down periods.

Summary. The exercise related goals for the nation exist because of the increasing evidence of the multiple health benefits of regular physical activity. The ACSM guidelines were developed to encourage regular participation in physical activity to promote fitness benefits. However, even with programs encouraging the national goals and ACSM guidelines, Americans have not reached designated levels of activity. In fact, the National Heath Interview Survey (1985) reported only 8% of the men and 7% of the women were exercising at the level suggested in the 1990 objectives for the Nation. Furthermore, promotion programs designed to meet these goals have met with limited success. The public health need for successful

physical activity promotion programs is evident. Thus, a review of past successful behavior change programs and, specifically, physical activity promotion programs may indicate those strategies most appropriate for increasing physical activity.

Prior Research

Two main types of prior research on exercise have been most prominent. The first line of research has focused on the determinants of exercise behavior. The second line of research has entailed assessing the efficacy of behavior change strategies on exercise adoption and adherence, both in supervised and unsupervised programs. Although the two lines of research vary in both methodology and goals, they both identified social support for exercise as an important variable in the prediction of long-term exercise behaviors.

Determinants of Exercise Behavior.

Dishman (1985) and Sallis and Hovell (1990) reviewed the research on the determinants of exercise behavior. Their reviews indicated those determinants both positively and negatively associated with physical activity (see Table 3). Furthermore, Dishman (1985) indicated the determinants a researcher could most easily and directly modify or manipulate; social support and self-efficacy. Thus, their research indicated those determinants important for a physical activity promotion program.

Insert Table 3 about here.

Through a series of studies, Sallis and Hovell (1990) assessed the relationship between 24 potential determinants and the frequency exercise. Self-

efficacy and social support consistently had a high correlation with exercise frequency. Smoking and being over-weight were negatively correlated with vigorous activity. When assessing the relationship between determinants and relapse from activity, they found injury as an adult, education, and history of exercise were the most significant determinants for relapse.

Sallis, Hovell and Hofstetter (1991) assessed gender differences in the prediction of vigorous activity adoption. The predictors for men were age, self-efficacy for exercise, home equipment, neighborhood environment, convenience of facilities, benefits of exercise, and physical activity history. The predictors for women were education, self-efficacy, friend support, family support, exercise models, alcohol consumption, smoking and physical activity history. Thus, they found gender specific determinants were important for exercise adoption.

Dishman (1985) reviewed 72 physical activity promotion studies to assess the determinants predictive of exercise behavior. Similar to Sallis and Hovell, he also found social support, self-efficacy, availability of equipment and facilities, education, and exercise history important predictors of exercise. Furthermore, Dishman found several determinants negatively associated with exercise; blue-collar occupation, low income level, high risk for coronary heart disease, smoking, being over-weight, disruptions in routine, mood disturbances, and perceived discomfort of physical activity.

Dishman (1985) also noted one other class of determinants related to physical activity, behavior modification techniques. Dishman stated these included: prompting, self-monitoring, feedback, goal-setting, and behavior contingent lotteries. Dishman indicated these determinants are very important as they are easily

manipulated by the researcher, whereas other determinants (e.g., occupation, past exercise history) are not. Furthermore, Dishman indicated, although smoking status and weight can be changed, they are as difficult or more difficult than exercise behavior to change. Thus, Dishman recommended researchers address those determinants most easily manipulated (e.g., social support).

Summary. The findings from the determinants of exercise research indicated important predictors of exercise behavior (see Table 3). Furthermore, this research delineated modifiable from non-modifiable determinants. Since exercise promotion programs attempt to manipulate those variables that will increase adoption and adherence, researchers should address those determinants that are modifiable. Thus, by manipulating social support and behavior modification techniques (e.g., prompting, feedback, goals-setting, self-monitoring) researchers should be able to increase physical activity adoption and adherence rates..

Behavior Change Strategies

For decades, researchers have used behavior change strategies successfully to change a wide variety of behaviors, from autism to speeding to elevator use to physical activity. Several of the most often used strategies include: prompting, feedback, goal-setting, self-monitoring, and social support. Generally, these studies have found good success for initiation, but poor maintenance of effects. Furthermore, there does not appear to be much of a difference in effectiveness between the procedures. But, of the behavior change strategies tested in this area, prompting, social support, self-monitoring, and feedback and goal-setting appear successful.

Prompting. Kazdin (1989) defined prompting as behavior initiation through antecedent events. A prompt is delivered immediately before the opportunity for the behavior. Several areas, including energy conservation (Brownell, Stunkard, & Albrum, 1980), shoplifting (McNees, Egli, Marshall, Schnelle, & Risley, 1976), and physical activity promotion (King, Taylor, Haskell & DeBusk, 1988; Wankel & Thompson, 1977) have successfully used prompting to alter behaviors.

King, Taylor, Haskell and DeBusk (1988) found the addition of weekly phone calls to a home based intervention had good effects for adoption of physical activity and for fitness levels. In their enhanced condition, the average frequency of "exercise bouts" was 11.4 compared to the less intensive condition with an average of 7.5. Thus, they concluded prompting, in addition to their intervention strategies, was effective in increasing exercise behavior.

Wankel and Thompson (1977) found similar findings using telephone prompts. By using standardized telephone prompting, they increased attendance and maintenance at a health club. Also, Acquista et al. (1988) found telephone prompts increased adherence to a home-based physical activity program. Thus, across physical activity promotion studies, researchers have found telephone prompting effective in increasing adoption and early adherence.

Although telephone prompting was effective across studies, there are a few important elements of prompting to keep in mind. First, the prompt should be directly linked to the target behavior. For example, if the target behavior is walking, the prompt should be "How is your walking going?" not "How is you exercise program going?" This subtle difference could have an effect on a program's outcome. Second, to increase the overall effectiveness of a program, the

telephone prompt could be combined with feedback and goal-setting. By giving feedback and goal-setting, the researcher increases the time duration of the prompt. By increasing the time duration, the researcher may increase the effectiveness of the telephone prompt. Thus, by addressing these two elements of prompting, researchers could increase the influence of prompting on physical activity.

Goal-setting and Feedback. Kazdin (1989) defined goal-setting as specification of a behavior or set of behaviors to be performed during a specified period of time. Bandura (1986) indicated goal-setting is most effective when individuals set challenging but achievable goals. Kazdin (1989) defined feedback as information about performance. Feedback is more influential when given for an explicitly defined performance criterion (e.g., physical activity goal). Research shows feedback to be less effective when applied alone than in combination with other reinforcers or behavioral strategies (Kazdin, 1989). Researchers have used goal-setting and feedback to alter several different health behaviors including reduction of driving speed (Van Houten & Nau, 1981; Van Houten et al. 1985), reduction home energy use (Hayes & Cone 1981; Winett, Neale, & Grier, 1979) decreasing skin cancer risk behaviors (Lombard, Neubauer, Canfield, & Winett 1991) and increasing physical activity (Martin et al., 1984; Reid & Morgan, 1979).

Geller et al. (1990) pointed out several important elements for a community intervention using prompting and feedback. They indicated that the impact of an intervention is related to the amount of participant involvement, amount of social support, increasing the saliency of the information presented, decreasing the proximity between the behavioral change request and the opportunity to display the

behavior, increasing the amount of extrinsic control over rewards or penalties, and creating a high level of individual self efficacy regarding the behavior change.

Within the physical activity area, researchers have examined the differential effectiveness of researcher chosen goals versus subject chosen goals. The results of these studies indicated subject chosen goals were more likely to lead to longer program adherence.

Researcher chosen goals. Several past physical activity promotion studies used prescribed physical activity goals with limited results. Reid and Morgan (1979) compared three treatments: prescription only (suggested), prescription plus health education and, individually designed exercise program with prescription plus health education. All subjects mailed in self-monitoring sheets weekly to the investigators. Reid and Morgan found greater adherence and change in aerobic points for the enhanced condition. Furthermore, only 29% of individuals in the prescription only group complied compared to 56% and 55% in the enhanced conditions at three months. Yet, when Rhodes and Dunwoody (1980) used prescription only within a worksite setting, they found the subjects' self-report data indicated a 62% adherence rate. Thus, while some studies found researcher chosen goals less effective than enhanced conditions, investigator chosen goals may be somewhat effective.

Subject chosen goals. Martin et al. (1984) conducted a series of studies to assess the differential effects of individual goal-setting. Study 1 examined the effect of distance goals (i.e., miles walked) versus time goals (i.e., minutes walked) on adherence. Adherence required class attendance plus a third day run outside of class. Results indicated greater adherence for time goals (76.4%) than

for distance goals (67.3%). But, 3 month follow-up data indicated similar maintenance rates across conditions (23% vs. 29%).

Study 2 examined distance goals (i.e., miles) within a fixed-goal (i.e., consistent goal over time) or a flexible-goal condition (i.e., goal changes over time). Flexible goal-setting showed a greater effect (83.7%) than fixed goal-setting (67.8%). In addition, the flexible goal-setting condition showed the lowest dropout rate (0%).

Study 3 examined the effect of distal (mileage goals set at the beginning and middle of program) versus proximal (new mileage goals set each week) goal-setting with a flexible-distance goal. Results indicated greater adherence for the distal goal setting condition (83%) than for the proximal goal-setting condition (71%). Investigators found this difference was more dramatic at follow-up: distal (67%) and proximal (33%). This result is interesting as behavior change techniques for initiation stress continual reinforcement and proximal goal-setting for continued success. However, this study showed greater short-term and long-term effects for a distal goal. Perhaps, initiation with distal goals generalized better for longer term adherence than initiation with proximal goals.

Several conclusions can be drawn from the reviewed physical activity studies using goal-setting. First, when subjects set their own goals, adherence was better. Second, while time goals were effective initially, results did not hold for maintenance. Third, distance goals were more convenient to administer and thus, more practical while showing only slightly less adherence rates than time goals. Fourth, flexible, distal goals showed greater initiation and maintenance rates than fixed or proximal goals. Thus, a study promoting walking by using flexible, distal

distance goals chosen by the participant may have a high adherence rate compared to past studies.

Feedback. Historically, physical activity promotion research has provided feedback through one of four different modalities: results of a fitness test or a medical exam, physiological monitoring, group performance results or, individual performance results. For the purposes of this review, only a review of those studies using group or individual performance feedback is included.

Martin et al. (1984) systematically assessed group versus individual feedback in a series of studies. They encouraged individuals to participate in pairs or small groups. Investigators defined group feedback as information about performance given at the end of a group session and individual feedback as praise twice per exercise session. Individual feedback showed a greater effect on adherence than did group feedback, 77.2% versus 65.8%, respectively. At three month follow-up the individual feedback condition decreased significantly less than the group feedback condition, 54% and 17%, respectively.

Weber and Wertheim (1989) compared three conditions: 1) standard treatment (fitness exam, encouragement and assessment); 2) self monitoring plus goal-setting; and 3) self-monitoring, goal-setting plus individual positive feedback. They indicated 78% of participants completed at least 4 weeks of the program in both the self-monitoring and the self-monitoring plus feedback group, with 42% completing at least 10 weeks. Unexpectedly, self-monitoring alone had a greater effect on attendance than self-monitoring plus feedback. This finding may be explained by the fact that if subjects self-monitor, then they are providing

themselves with a means for private feedback. Thus, the feedback given by the investigators may have been redundant.

Summary. Individual feedback shows greater initiation and three month maintenance effects compared with group feedback, but not higher than self-monitoring alone. Thus, feedback, when appropriately used, and applied with a specific performance criteria (e.g., goal-setting) may be effective in increasing and maintaining exercise. Therefore, using individual feedback (e.g., feedback the number of days and miles a participant walked over the past week) may be effective in maintaining adoption of physical activity .

Although past physical activity research has shown the effectiveness of feedback on adherence, some steps could be taken to increase its effectiveness. First, past research has shown that personal feedback is more effective than group feedback. Thus, finding a way of obtaining accurate individual data is very important. Thus, using exercise logs (data sheets participants fill-out each day indicating their physical activity for that day) may obtain the data needed for effective feedback. Second, the feedback needs to be relevant to some chosen goal. For example, if the goal is to walk 20 minutes three times a week, then feedback should be given in terms of minutes and frequency, not miles or calories. These two steps may help increase the effectiveness of feedback given to participants.

Self-Monitoring. Several researchers used self-monitoring to increase adherence to exercise programs. Reid and Morgan (1979) used weekly self-monitoring of physical activity mailed to the experimenter to increase adherence. They found self-monitoring increased exercise adherence rates to 55% compared to only 29% in non-self-monitoring subjects. Oldridge and Jones (1983) found

similar results using daily self-monitoring and recording of heart rate while exercising. Those who self-monitored had a 12% higher adherence rate than those who did not self-monitor. Belisle, Roskies and Levesque (1987) and Weber and Wertheim (1989) found self-monitoring of physical activity levels an important component in a multicomponent intervention to increase exercise adherence. Other researchers have found combining self-monitoring with other behavior change strategies effective in a variety of settings: worksite (Durbeck et al., 1972), physician's office (Epstein et al., 1980), and home-based (King, Taylor, Haskell, & DeBusk, 1988).

Self-Monitoring as Data. The use of self-monitoring raises more than the question of its effectiveness as an intervention strategy, as several studies have used the self-monitoring data as an outcome measure. This raises the question of self-monitoring of physical activity's validity and reliability. In the past, some researcher have raised concern with using self-monitoring as an outcome measure. For example, Geller (1981) raised the question of the accuracy of self-reports in the area of energy conservation research. In his study, he found large discrepancies between self-reports and actual behavioral observations. Thus, Geller recommended using actual energy bills as behavioral checks of self-report indices.

In the physical activity area, Ainsworth, Jacobs, and Leon (1992) assessed the validity and reliability of self-reported physical activity status. They compared their subjects' self-reports with a maximal treadmill graded exercise test and body composition study. They found their subjects' self-reports validated by the physiological testing. Sallis, Buono, Roby, Micale, and Nelson (1992) assessed the reliability and validity of seven-day exercise recall. They found test-retest

reliabilities ranging from .77 to .93. Thus, they concluded the seven-day recall was reliable.

Although past physical activity research has supported the use of self-reports as an outcome variable, some conservative steps can be taken to increase this data's accuracy. First, instead of a seven-day recall, researchers could have the subjects fill out the self-report measure daily to reduce any possibility of errors. Second, if possible, subjects can exercise in pairs or groups. Then one can compare self-reports within exercise groups for consistency. Third, if the participants exercise with someone, a researcher could obtain permission to periodically contact a subject's "exercise partner" to validate his/her self-report. These three steps may help increase the validity and reliability of self-monitoring as an outcome measure.

Social support. King and Frederikson (1984) defined social support for exercisers as "the presence of interpersonal liking, attraction, and group cohesiveness among individuals exercising together." Most physical activity studies using social support used a group format (e.g., walking groups and aerobics classes). However, use of a "group" does not meet the definition of social support. But, a group format allows ease of program implementation and offers the possibility of social support. Some data show attendance in group programs is superior to individual programs (Massie & Shephard, 1971; Wankel, Yardley & Graham, 1985). Yet, other researchers show similar adherence for social support (group) and individual conditions (King & Frederikson, 1984).

Wankel, Yardley, and Graham (1985) designed a program for an aerobic dance class using social support. All individuals danced 1.25 hours per week for

ten consecutive weeks while receiving an educational component (e.g., nutrition, proper exercise habits and guidelines to help exercise outside of class). Individuals randomly assigned to the social support condition received social support in the form of a "class, buddy, leader and home support elements (e.g., booklet) designed to assist individuals in developing their own support system to encourage continued attendance of the exercise class" (Wankel, Yardley, & Graham, 1985). Instructors gave personal attention, encouragement, support and reinforcement during class. The social support condition received separate classes to facilitate implementation. The investigators found social support facilitated higher class attendance than the non-social support condition.

Other investigators found social support facilitated initiation through consistent attendance (Massie & Shephard, 1971; Wankel, Yardley, & Graham, 1985). Also, researchers have noted a possible indication of maintenance effects with continual group participation. For example, Martin et al., (1984) found similar maintenance effects in three comparison groups. However, they noted in two groups where continued contact was not part of the intervention, an "overzealous research assistant" had continued to hold group meetings following program end (control group) and members of another group continued to meet on their own. Thus, social support was effective in increasing both initiation and maintenance of an exercise program.

Even though social support was effective in increasing initiation and adherence, exactly how social support is created and used is very important to a study's outcome. First, as noted earlier, simply placing individuals together in a group to exercise does not equal social support. There has to be some interpersonal

liking or cohesion between individuals. Second, creating "liking and cohesion" in a group of strangers may take time and be difficult to create. Thus, researchers should tap social support that already exists. For example, to create social support in a walking program, participants can walk with friends or family members. These individuals already represent the participant's social support network. Thus, by taping this support network, the researcher could increase the effectiveness of an intervention.

There are two areas of concern about using social support in this manner. First, will participants be willing to approach their friends or family about exercising with them? Furthermore, will their friends or family consent. If not, than this method would not be useful. But, if participants were willing to ask and those they asked consented, this would represent a quick and effective way to create social support within a physical activity program. Second, will participants get social support for slacking-off by their exercise partners? More research is need to answer these questions.

Walking as A Target Behavior

The first and most important decision in conducting physical activity research is what type of physical activity to promote. Different types of activity have varying response costs and can influence the overall effectiveness of the intervention strategies used. Thus, researchers want to choose those activities that are easy to initiate and have low response costs, while still achieving some relative health benefit if performed regularly. Walking meets these criteria.

Rippe, Ward, Porcari, and Freedson (1988) reviewed the physical and psychological benefits of low to moderate intensity exercise, such as walking.

They found physical activity at this level had several health benefits including: decreases in cholesterol level (Goldberg & Elliot, 1987), control of hypertension through lower blood pressure (Blackburn, 1986), increases in VO_{2max} (Dehn & Bruce, 1972), control of weight loss through decreased appetite (Rippe et al., 1985), and increases in overall mood state (Porcari et al., 1988). Furthermore, Rippe, Ward, Porcari and Freedson (1988) indicated walking is an ideal target behavior for people with varying medical conditions including: diabetes (Laws & Reaven, 1991), pregnancy (Kashiwa & Rippe, 1987), and cardiac rehabilitation (Rippe, Maher, & Ockene, 1985).

Walking also has several other benefits when used as the target behavior. It has a low monetarily cost. There is no need for expensive facilities, membership fees, or equipment. All one needs is comfortable shoes and clothing. In addition, individuals can choose to walk almost anytime, anywhere, and even when out of town on trips. Thus, they have the ability to maintain their exercise program even when their schedule or location varies. Lastly, from a data perspective, walking is ideal because walking maps can be created and given to participants to keep track of the miles they walked. Thus, researches can obtain some fairly accurate data on distance and use distance goal-setting which, as stated earlier, was found to be as effective as than time goals for adherence (Martin et al., 1984).

Conclusions

Decades of epidemiological research on the effects of physical activity on health have repeatedly shown its benefits. Furthermore, inactivity is clearly an independent risk factor for disease and its population attributable risk is high. So strong is this evidence, that both the United States Department of Health and

Human Services and the American College of Sports Medicine have forwarded goals and recommendations for physical activity. Yet, the percentage of the US population who exercise regularly is very low, approximately 20%.

A review of the determinants of exercise literature indicated social support was important for long term adherence. Furthermore, a review of the behavioral strategies used in the exercise area indicated several conclusions: 1) telephone prompting can be effective, 2) individual feedback can be effective, 3) goal-setting, specifically, individualized, flexible, distal goals, can increase adherence, 4) self-monitoring can both increase adherence and offer outcome data, 5) exercising with others may offer social support that, in turn, increases adherence. Thus, a physical activity program incorporating these behavioral strategies and social support may be more effective than a program without these procedures.

However, a few questions remain to be answered. First, what frequency of prompting is necessary for program adherence, once a day, once a week, or once a month? This has not yet been studied in exercise promotion. Second, when using telephone prompting, would feedback and goal-setting increase adherence or is the prompt per se all that matters? Third, does researcher-delivered feedback influence adherence when the program participant is already self-monitoring and thus has a private means for feedback? Fourth, can participants be trained to be exercise group leaders to create social support?

The "Walking for Everyone" program was designed to answer some of these questions. In this study, frequency of contact was varied from once per every week to once per every third week. Feedback and goal-setting was done by research assistants and was compared to a contact control. Furthermore, all

participants were required to walk with at least one "buddy", to self-monitor their daily exercise, and to send in these logs weekly. Finally, the different procedures were compared to a more usual, minimal intervention, such as might be given in a physician's office or through a flier at a health fair.

Methods

Recruitment and Participants

Newspaper. The Spectrum, a campus newspaper for faculty and staff at VPI&SU, printed an article promoting walking on the VPI&SU campus and the "Noontime Walkers" program (see Appendix A). The article announced the program and that it offered a variety of strategies for beginning and maintaining a walking program, cited the different walking paths, the simplicity of walking, explained the benefits of walking in groups, and gave a phone number to call sign-up. A photograph of some walkers (pilot subjects) accompanied the first article. (The article did contain some inaccurate information as this article was not proofed by the researcher. The inaccuracies included; statement of a proposed lottery for walking and ticket drop boxes around campus).

Posters. Posters announcing the walking program and offering free information about walking and creating walking groups were placed in all buildings around the campus. These posters were of high quality and were up for three weeks (see Appendix B).

The author recruited participants (132 women and 3 men) from within the Virginia Polytechnic Institute and State University campus through the newspaper article and posters. All participants were given informed consent forms and questionnaires (including the PARQ for screening) to fill-out. The author contacted

any walking participants who did not meet the PARQ requirements and asked them to get a release from a physician before beginning Only one subject needed to be contacted and she received a release from her physician.

The author defined participation in the study as the continued sending in of walking logs each week. If participants missed three weeks of sending in their logs and/or indicated they were not willing to send in their logs, they were considered a drop-out and were removed from the remaining portion of the study and the data set. Subjects who were not walking, but still sent in their logs indicating they were not walking, were still considered participants throughout the study.

Design

The project's design was a 2X2 plus one control groups (see Figure 1). The two dependent variables were frequency of contact and content of contact. The two cells for the frequency of contact were once a week phone contact versus once every three weeks. The two cells for content of contact were a two minute phone call to "touch base" versus a ten minute phone call to give feedback on walking logs, set goals, and offer information and answer questions. The control condition received no intervention strategies after being assigned to conditions.

Insert Figure 1 about here.

Intervention strategies

Intervention agents. The program recruited individuals from within the campus community to act as "intervention agents" to organize office walking groups and promote the idea of walking for exercise. These walking group

organizers were recruited through the newspaper articles, posters and face-to-face contact on the VPI&SU campus. Once they agreed to join the program, they filled-out an informed consent form (Appendix C), the Physical Activity Readiness Questionnaire (PARQ, see Appendix D), an informational and stages of readiness questionnaire (see Appendix E), attended a short one-on-one training session with the researcher on how to organize a walking group, and were given informed consent forms and questionnaires (including the PARQ for screening) for anyone they walked with to fill-out. (Note: The group participants sent these forms to the researcher when completed.)

The information covered in this one-time, one-on-one training session is described in Appendixes C-F. Briefly, the author reviewed the "How to Organize a Walking Group or Buddy System" flier with the subjects. This included information on who to ask, when, where, and how to walk and how to fill out the weekly group walking logs. Next, the author reviewed the "What if..." flier with the subject. This included information on how to deal with several likely problems encountered when organizing a walking group (e.g., what to do if it rains, if people miss or if they get bored). Lastly, the author reviewed the "Benefits of Walking" flier with the subjects. This included information on the physical and psychological benefits of exercise and why walking is a good exercise to choose. The researcher gave the group organizers a copy of these fliers for themselves and several copies of the benefits flier to give to potential walking partners. This one time training session took an average of 15 minutes to complete and, typically, a participant only asked one or two questions.

The researcher also reviewed the "Weekly Walking Logs" in depth with the group organizers. The researcher asked the researcher to fill out these logs weekly and mail them to the researcher through campus mail. To fill out the log, the group organizer entered the date, the duration, the place, and the names and office telephone numbers of those individuals the group organizer walked with. The researcher informed the group organizers that randomly, throughout the program, the researcher would call the individuals listed as walking partners to offer them information and verify the accuracy of the exercise logs.

Once trained, the walking group organizers attempted to organize walking groups with their co-workers or friends. The researcher suggested the initial goal of walking at least twice a week with one to two other people.

Feedback. In the high content condition, the researcher gave the group organizers feedback based on information obtained from a review of all their available weekly walking logs. During each telephone contact, the researcher reviewed with the organizer: 1) how often their group walked last week compared to the week before, 2) the duration they walked last week compared to the week before, 3) over how many weeks they have consistently walked, and 4) any past goals set by the walking group and whether they achieved these goals (all past monthly goals are noted on past telephone contacts).

Goal Setting. In the high content condition, the researcher conducted monthly goal setting with the group organizers after giving detailed feedback about their group's walking. The researcher allowed the group organizers to set their individual goals in terms of frequency and duration of walking each week, or number of individuals they walked with. Thus, their goals, and subsequent

feedback, were on the individual not group level. The researcher suggested each group organizer's goal at least meet the criteria of 20 minutes, twice a week with one other person. But, the group organizers made any other monthly goals if they wished.

Group organizers set their monthly goals and weekly sub-goals during the telephone contacts with the researcher. Each month, the researcher helped the organizer choose a monthly goal through a specific standardized procedure. First, the researcher reviewed any past goals the organizer set and noted if they met these goals. Second, if the organizer met these goals, the researcher asked if they wished to increase these goals in some way or keep them the same. If they did not meet their last goal, the researcher asked if the goal was too difficult. If the organizer indicated it was too difficult, the researcher suggested changing the goal to a slightly lower goal. If the organizer indicated the goal was not too difficult, the researcher recommended keeping last month's goal and making a stronger attempt to reach their goal. Once the organizer had chosen a goal, the researcher noted the goal on the organizer's telephone contact sheet.

Experimental Conditions

Randomization. Once all the walking group leader were signed-up and trained, the researcher randomly assigned 27 participants to each program condition. This included: two feedback conditions (touching base versus feedback and goal setting), two prompting conditions (once a week versus once every three weeks), and a control condition. Thus, 135 participants were randomly assigned to conditions.

The researcher used matched random assignment to assign participants to conditions. The matching variables included: exercise stage of readiness and weight. Exercise stage of readiness was calculated from the participants' questionnaire data (see Appendix E) Questions 1 through 5 indicated the participant's stage of readiness. The furthest question down the list a participants answered with a "TRUE" indicated their score. For example, if a participant indicated true to items 1 through 3, but false on items 4 through 5, they received a 3 for stage of readiness. This score was used as the stage of readiness matching variable. The other matching variable, weight, was obtained from their questionnaire data.

Frequency of contact. There were two conditions for frequency of contact; once a week phone contact versus once every three weeks. The researcher randomly assigned group organizers to one of the two telephone contact conditions. The content of these telephone contacts were determined by the participant's assigned condition.

Telephone Appointments. In order to facilitate the phone contacts, during the initial training, the researcher scheduled a phone contact time with each group organizer. Thus, both the researcher and the group organizer knew on what day and at what time the phone contact would occur. The researcher suggested the group organizer call him if they knew in advance they would not be able to receive the call at that time. Then, the researcher rescheduled with the subject. The researcher found this telephone appointment procedure successful in this project and in a pilot study.

On only 31 out of 721 occasions was a participant not available for their appointment on their appointment day. On 7 occasions, the participant was ill and not at work (2 times in the frequent contact and feedback and goal-setting condition and 5 times in the frequent contact and touching-base condition). On 24 occasions, the participant could not take the call and had to be called on the next day (7 in the frequent contact and feedback and goal-setting condition, 10 times in the frequent contact and touching-base condition, 3 in the infrequent contact and feedback and goal-setting condition and 4 times in the infrequent contact and touching-base condition). Thus, the researcher found this telephone appointment procedure a practical one in this project.

Content of contact. The researcher randomly assigned each walking group organizer to one of two conditions for content of contact. In the first condition, (low content), a researcher called the subject and asked him/her how their walking program had been going and recommended they continue with it. The duration of this contact was approximately 1 minute (see Appendix G for example content sheets).

In the second content condition (high content), a researcher called the subject and asked him/her how their walking program had been going, offered individual feedback based on their walking logs, worked on setting individual walking goals, answered questions, and offered support for their attempts and indicated a belief in their future success (see Appendix H). The duration of these contacts was approximately 3 minutes.

Control. The control condition consisted of 27 group organizers recruited and trained. After the initial training, the researcher only contacted these individuals

to prompt them to send in their weekly walking logs, when necessary. They received no other intervention strategies. This group reflects what individuals generally receive from a more minimal health promotion program and serves as the comparison group.

Duration.

The study consisted of four phases (see Figure 2). Phase 1 included recruitment and intervention. Phases 2,3, and 4 are follow-up phases.

Insert Figure 2 about here.

Phase 1. The first phase, the intervention, lasted 3 months (Oct. 1, 1992 to Dec. 31, 1992). During the first two months of this period, the participants in the four intervention conditions received the intervention strategies appropriate to their group.

Fading. During the last month of this phase, the intervention strategies were faded in the "once a week" contact condition to once every two weeks and in the "once every three weeks" condition were faded to once every four weeks during this period. At the end of the third month, the intervention strategies were removed with the participants prior knowledge.

Phases 2, 3, &4. The second, third and fourth phases of this study are follow-up phases. During each of these follow-up phases, the researcher will ask the participants to fill out 1 weekly walking log and a stages of change for exercise questionnaire and send it to the program director through campus mail. Follow-up 1, occurred 1 month after the termination of the intervention (Jan 25-31, 1993).

Follow-up 2, will occur 4 months after the first follow-up. Follow-up three, will occur 4 months after the second follow-up.

As agreed in the committee meeting, completion of the first 2 phases, intervention and follow-up 1, is what is required for completion of the dissertation. But, the second two follow-up phases will be conducted to show long-term effects for publication.

Measures

Weekly Logs. Each week, the walking group organizers and their walking partners filled out a detailed 'Weekly Walking Log' and sent it through campus mail to the researcher (see Appendix F). During their initial 20 minute training session, the researcher trained the group leaders on how to correctly enter these logs and how to teach their partners how to use them. For each time the group walked, the participant entered the date, time, duration, place, distance, the names and office numbers of those who walked with them and any comments. The organizer knew that the researcher needed the names and telephone numbers of their walking partners to randomly call them to verify the weekly walking logs.

To facilitate the sending in of weekly walking logs, the researcher prompted subjects with phone calls when needed. If they did not send in their logs, they were called and notified we did not receive it and reminded of the importance of sending in their logs.

Reliability. On each 'Weekly Walking Log' the group organizer listed the names and office phone numbers of those who walked with her/him. Each week, the researcher randomly selected 15% of that week's weekly logs. The researcher then conducted two types of verification procedures on these logs.

For the first reliability procedure, the researcher selected one day that the organizer walked with someone and called the individual to verify if that day's walking log was accurate. The researcher asked the individual the place, time and duration they walked. The coding of these questions were: 1) for place, the partner's answers must match exactly the organizer's log, 2) for time, the partner's answer must be within 2 hours of the organizer's log and 3) for duration, the partner's answer must be within 20 minutes of the organizer's log to be considered correct. Reliability was the number of correct answers divided by three. For example, if they answered two question correctly, the reliability estimate for that day would be 2/3 = .67. The reliability estimate for this measure was .90, ranging from .33 to 1.0. Table 4 shows the reliability estimates did not vary significantly by condition (see Table 4).

Insert Table 4 about here.

The researcher conducted the second reliability check by matching the walking group leaders' walking log with one of their group's participant's logs. The researcher selected one day that the leader walked with a particular participant and compared them to see if they matched on: 1) the time of day (within 2 hour), 2) the duration (within 20 minutes), and 3) place (must match exactly). Reliability is the number of correct answers divided by 3. The reliability estimate for this measure was .97, ranging from .67 to 1.0. Table 5 shows the reliability estimates did not vary significantly by condition (see Table 5).

Insert Table 5 about here.

Phone contacts. For each phone content condition, the researcher filled out phone contact sheets during each phone contact (see Appendix G-H), On these sheets, the researcher listed the walking group organizer called, the researcher assistant's name, the date, and duration of the call. The contact sheet listed the specific items to be talked about with the walking group organizer. For example, in the more in depth content condition, the researcher: 1) asked "How is your walking program going?" 2) "Do you have any problems?" 3) following a standardized protocol, gave feedback on last weeks log and whether or not they met their goals for the past week, 4) asked "How about setting some goals for this week?" 5) following a standardized procedure, set and noted any goals decided upon by the subject, 6) asked if the subject needs any more weekly walking logs.

Research assistants. The researcher trained 14 research assistants (11 women and 3 men) to conduct the telephone contacts. These were undergraduate psychology students ranging from 18 to 22 years old. Training consisted of three-one hour sessions. During the first session, the researcher described in detail and modeled the two different telephone contacts (touching-base and goal-setting and feedback). The researcher reviewed the telephone contact sheets (see Appendix G-H) and how to use them with the research assistants. The assistants then spent 20 minutes practicing. During the second two training sessions, the researcher had the assistants repeatedly practice the two different telephone contacts and he corrected

mistakes he noticed. At the end of the third session, the researcher conducted a manipulation check to assess the reliability of the assistants' telephone calls.

During the intervention, the research assistants were randomly given different participants each week to call. The researcher did this to avoid any possible individual assistant confounding of the intervention and results. Furthermore, although the assistants could identify if the participant to be called was in the touching-base versus the feedback and goal-setting condition, they could not tell if the participant was in the once every week or once every third week contact condition. Thus, the researcher did attempt, as much as possible, to avoid any research assistant bias effects.

Manipulation check. The researcher conducted reliability tests on the phone callers' content both before and three times during the study. The researcher had the phone callers perform staged calls to assess the percentage of information they were correctly reviewing from the phone contact forms. The information reviewed during the telephone contacts differed from the high content to the low content condition. In the low content condition, there are only three items of information (how's walking going, are you having any problems, do you need logs). Thus, the researcher calculated reliability for these telephone contacts by dividing the number of items reviewed correctly by three.

In the high content condition, there were nine items to review (how's walking going, are you having any problems, need logs, four steps for giving feedback, two steps for setting goals). Thus, the researcher calculated reliability by dividing the number of items reviewed correctly by nine.

The researcher only allowed those research assistants with a reliability of .95 or better on each type of call (high and low content) to conduct calls. The reliability assessments were repeated three times during the study. The reliability estimate before the study was .98, ranging from .96 to 1.0. All three reliability estimates during the study were 1.0.

Major Dependent Measures

Repeated measures The first major dependent measure is the number of days each week each of the participants walked over the 13 weeks of measurements. The researcher calculated this by simply adding up the number of days each week the participant walked. Instead of averaging across subjects and weeks, the data was entered in a repeated measures format, with week as a time variable, to allow for testing of trends. The other major dependent measures were also maintained as repeated measures.

The second major dependent measure was the number of weeks each participant walked over the course of the 13 weeks of measurement. The researcher calculated this by noting each week whether a participant walked or not walked.

The third major dependent measure was the number of partners the participant walked with each week. The researcher calculated this value by counting the number of partners the participant listed on their logs each week over the 13 week period.

The fourth major dependent measure was the number of weeks each participant walked with a partner over the course of the 13 weeks of measurement. The researcher calculated this by noting each week whether a participant walked with a partner or not.

The fifth major dependent measure was the number minutes the participant walked each week. The researcher calculated this value by counting the number of minutes the participant listed on their logs each week over the 13 week period.

The sixth major dependent measure was the number of weeks each participant met the ACSM goals over the course of the 13 weeks of measurement. The researcher calculated this by noting each week whether a participant met these goals or not.

Survival analysis measures. Researchers originally created survival analysis to statistically compare the rates at which participants drop-out of the data set (die) across different treatment conditions. But, survival analysis can be used to assess how long it takes for any event to occur, such as dropping-out of an exercise program. Dishman (1982) indicated drop-out rates are very high in exercise promotion research, approximately 60-80% drop-out. Therefore, because decreasing this high drop-out rate is a research priority, using survival analysis will show if the different treatment conditions had different effects on the drop-out rate.

In traditional survival analysis, once a subject is dropped out, they do not return at a later point (usually because they have died). But, in this study, subjects can appear to have dropped out because they have not walked for weeks, but then begin walking after a month's break. Thus, this data set did not meet the traditional criteria for survival analysis.

To address this issue, is was possible to perform non-parametric survival analysis (LIFETEST, SAS, 1992). To perform this test, a definition of "dead" had to be chosen and then the number of weeks each subject lasted until they met this

definition was entered as their data point. If a subject never met the definition of "dead", the number of weeks in the study, 13, was entered for that subject.

The researcher chose three different definitions of "dead" to test. The researcher defined "Dead1" as the first week a subject did not walk. For example if a subject walked weeks 1 to 3, missed week 4, and walked weeks 5 to 13, they were coded as dying week 4 and a 4 was entered for that subject. The researcher defined "Dead2" as the week concluding a period of having not walked for three weeks. For example, if a subject walked weeks 1 through 5, but missed weeks 6 through 9, they were coded as dying week 9 and a 9 was entered for that subject. The researcher defined "Dead3" as the week after the last week a subject walked. For example, if a subject walked weeks 1 through 3, missed week 4, then walked weeks 4 though 6, but did not walked after week 6, they were considered dying in week 7. A 7 was entered as their data point. By creating these three definitions of "dead", the research had a variety of ways to look at the survival of subjects in this study.

Results

Demographics

Initial sample. There were 135 participants in the initial sample, 27 in each treatment condition. Table 6 summarizes the demographic information of the entire initial sample by treatment condition (see Table 6). Ages ranged from 21 to 63 with an average age of 40.11 ($s^2 = 10.3$). Participants weight ranged from 105 to 255 with an average of 153.1 ($s^2 = 32.2$). Their scores on the readiness for exercise behavior change ranged from 1 to 5 (precontemplation to maintenance) with an

average of 3.3 (between preparation for action stage to action stage). The overall number of smokers in the program was 16.

Insert Table 6 about here.

Final sample. There were 122 participants in the final sample (see Table 7 for N in each condition). There were 12 participants dropped out of the data set because their data had three or more missing weeks of data. Of these 12 participants, two dropped out due to medical concerns. The other ten indicated they had not necessarily stopped walking but they were not willing to continue sending in data. The drop-outs only differ from the rest of the sample in that 4 of the drop-outs were smokers.

Insert Table 7 about here.

Table 7 summarizes the demographic information of the final data sample used for analyses (see Table 7). Ages ranged from 22 to 63 with an average age of 40.35 (s^2 = 10.1). Participants' weight ranged from 105 to 255 with an average of 152 (s^2 = 31). Their scores on the readiness for exercise behavior change ranged from 1 to 5 (precontemplation to maintenance) with an average of 3.9 (between preparation for action stage to action stage). The overall number of smokers in the final sample was 12.

Major Dependent Measures

Days walked. The first major dependent measures was the number of days a participant walked each week. The researcher conducted several statistical tests on this measure. First, the researcher conducted a RMANOVA to test for differences on "treated" (being in the control group versus the intervention groups, see Table 8). There was a significant difference between the control and intervention groups ($F(1,120)=4.04$, $p=.05$). There was also a significant effect for time ($F(12,1440)=14.1$, $p=.0001$) and the treated*time interaction ($F(12,1440)=3.0$, $p=.0004$.

Second, the researcher conducted RMANOVA to test for differences on frequency of contact (every week versus every third week, see Table 9). There was a significant difference between the frequency groups ($F(1,100)=19.8$, $p=.0001$). There was also a significant effect for time ($F(12,1200)=14.9$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=2.3$, $p=.0008$. Third, the researcher conducted RMANOVA to test for differences on content of contact (feedback and goal-setting versus touching base, see Table 10). There was a not significant difference between the content groups ($F(1,100)=1.4$, $p=.24$). There was a significant effect for time ($F(12,1200)=14.9$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=2.66$, $p=.0016$.

Next, the researcher created an average score for each subject across the 13 weeks by adding up the number of days walked each week and dividing this number by 13. The researcher conducted a 2-way ANOVA on this variable with the 2 sources being content and frequency of contact (see Table 11). There was a significant main effect for frequency ($F(1,98)=18.51$,$p=.001$), but not for content

($F(1,98)=1.64$, $p=.20$) or the interaction of the frequency and content ($F(1,98)=1.63$, $p=.20$).

Lastly, the researcher tested for main effects and the interaction on the follow-up point for this measure (see Table 12). There was a significant main effect for frequency ($F(1,98)=16.56$,$p=.0001$), but not for content ($F(1,98)=.0001$, $p=.99$) or the interaction of the 2 ($F(1,98)=.76$, $p=.39$).

Insert Tables 8, 9, 10, 11, & 12 about here.

Weeks walked. The second major dependent measures was the whether or not a participant walked each week. The researcher conducted several statistical tests on this measure. First, the researcher conducted a RMANOVA to test for differences on "treated" (being in the control group versus the intervention groups, see Table 13). There was a significant difference between the control and intervention groups ($F(1,120)=17.65$, $p=.0001$). There was also a significant effect for time ($F(12,1440)=21.95$, $p=.0001$) and the treated*time interaction ($F(12,1440)=2.55$, $p=.0024$.

Second, the researcher conducted RMANOVA to test for differences on frequency of contact (every week versus every third week, see Table 14). There was a significant difference between the frequency groups ($F(1,100)=28.0$, $p=.0001$). There was also a significant effect for time ($F(12,1200)=21.58$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=2.3$, $p=.0068$. Third, the researcher conducted RMANOVA to test for differences on content of contact (feedback and goal-setting versus touching base, see Table 15). There was a not

significant difference between the content groups ($F(1,100)=.78$, $p=.38$). There was a significant effect for time ($F(12,1200)=21.49$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=1.88$, $p=.0324$.

Next, the researcher created an cumulative score for each subject by adding up the number of weeks each participant walked across the 13 weeks. The researcher conducted a 2-way ANOVA on this variable with the 2 sources being content and frequency of contact (see Table 16). There was a significant main effect for frequency ($F(1,98)=27.57$,$p=.0001$), but not for content ($F(1,98)=.765$, $p=.384$) or the interaction of the 2 ($F(1,98)=1.13$, $p=.29$).

Lastly, the researcher tested for main effects and the interaction on the follow-up point for this measure (see Table 17). There was a significant main effect for frequency ($F(1,98)=17.95$,$p=.0001$), but not for content ($F(1,98)=.253$, $p=.616$) or the interaction of the 2 ($F(1,98)=.005$, $p=.943$).

Insert Tables 13, 14, 15, 16, & 17 about here.

Number of partners walked with each week. The third major dependent measures was the number of partners a participant walked with each week. The researcher conducted several statistical tests on this measure. First, the researcher conducted a RMANOVA to test for differences on "treated" (being in the control group versus the intervention groups, see Table 18). There was not a significant difference between the control and intervention groups ($F(1,120)=3.16$, $p=.078$). There was a significant effect for time ($F(12,1440)=14.56$, $p=.0001$) and the treated*time interaction ($F(12,1440)=2.64$, $p=.0017$.

Second, the researcher conducted RMANOVA to test for differences on frequency of contact (every week versus every third week, see Table 19). There was a significant difference between the frequency groups ($F(1,100)=12.95$, $p=.0005$). There was also a significant effect for time ($F(12,1200)=15.89$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=2.5$, $p=.0031$. Third, the researcher conducted RMANOVA to test for differences on content of contact (feedback and goal-setting versus touching base, see Table 20). There was a not significant difference between the content groups ($F(1,100)=.609$, $p=.437$). There was a significant effect for time ($F(12,1200)=15.7$, $p=.0001$) , but not the frequency*time interaction ($F(12,1200)=1.31$, $p=.207$.

Next, the researcher created an average score for each subject across the 13 weeks by adding up the number of partners a participant walked with each week and dividing this number by 13. The researcher conducted a 2-way ANOVA on this variable with the 2 sources being content and frequency of contact (see Table 21). There was a significant main effect for frequency ($F(1,98)=12.01$,$p=.0008$), but not for content ($F(1,98)=.861$, $p=.356$) or the interaction of the 2 ($F(1,98)=.984$, $p=.324$).

Lastly, the researcher tested for main effects and the interaction on the follow-up point for this measure (see Table 22). There was a significant main effect for frequency ($F(1,98)=11.35$,$p=.0011$), but not for content ($F(1,98)=1.26$, $p=.264$) or the interaction of the 2 ($F(1,98)=.315$, $p=.576$).

Insert Tables 18, 19, 20, 21, & 22 about here.

Weeks walked with a partner. The fourth major dependent measures was whether or not a participant walked with a partner each week. The researcher conducted several statistical tests on this measure. First, the researcher conducted a RMANOVA to test for differences on "treated" (being in the control group versus the intervention groups, see Table 23). There was a significant difference between the control and intervention groups ($F(1,120)=9.94$, $p=.002$). There was also a significant effect for time ($F(12,1440)=18.76$, $p=.0001$) and the treated*time interaction ($F(12,1440)=2.86$, $p=.0007$.

Second, the researcher conducted RMANOVA to test for differences on frequency of contact (every week versus every third week, see Table 24). There was a significant difference between the frequency groups ($F(1,100)=25.51$, $p=.0001$). There was also a significant effect for time ($F(12,1200)=19.0$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=2.58$, $p=.0022$. Third, the researcher conducted RMANOVA to test for differences on content of contact (feedback and goal-setting versus touching base, see Table 25). There was a not significant difference between the content groups ($F(1,100)=.048$, $p=.827$). There was a significant effect for time ($F(12,1200)=19.04$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=2.77$, $p=.001$.

Next, the researcher created a cumulative score for each subject across the 13 weeks by adding up the number of week each participant walked with a partner. The researcher conducted a 2-way ANOVA on this variable with the 2 sources being content and frequency of contact (see Table 26). There was a significant main effect for frequency ($F(1,98)=24.93$,$p=.0001$), but not for content ($F(1,98)=.02$, $p=..887$) or the interaction of the 2 ($F(1,98)=.036$, $p=.85$).

Lastly, the researcher tested for main effects and the interaction on the follow-up point for this measure (see Table 27). There was a significant main effect for frequency ($F(1,98)=21.5, p=.0001$), but not for content ($F(1,98)=.1.29$, $p=.259$) or the interaction of the 2 ($F(1,98)=.477$, $p=.492$).

Insert Tables 23, 24, 25, 26, & 27 about here.

Number of minutes walked each week. The fifth major dependent measures was the number of minutes a participant walked each week. The researcher conducted several statistical tests on this measure. First, the researcher conducted a RMANOVA to test for differences on "treated" (being in the control group versus the intervention groups, see Table 28). There was not a significant difference between the control and intervention groups ($F(1,120)=1.38$, $p=.243$). There was a significant effect for time ($F(12,1440)=12.54$, $p=.0001$) and the treated*time interaction ($F(12,1440)=2.404$, $p=.0044$.

Second, the researcher conducted RMANOVA to test for differences on frequency of contact (every week versus every third week, see Table 29). There was a significant difference between the frequency groups ($F(1,100)=9.31$, $p=.0029$). There was also a significant effect for time ($F(12,1200)=13.65$, $p=.0001$). But there was not a significant frequency*time interaction ($F(12,1200)=.965$, $p=.481$. Third, the researcher conducted RMANOVA to test for differences on content of contact (feedback and goal-setting versus touching base, see Table 30). There was a not significant difference between the content groups ($F(1,100)=.037$, $p=..848$). There was a significant effect for time

($F(12,1200)=13.86$, $p=.0001$) and the frequency*time interaction ($F(12,1200)=2.45$, $p=.0037$.

Next, the researcher created an average score for each subject across the 13 weeks by adding up the number of minutes walked each week and dividing this number by 13. The researcher conducted a 2-way ANOVA on this variable with the 2 sources being content and frequency of contact (see Table 31). There was a significant main effect for frequency ($F(1,98)=8.41$,$p=.0046$), but not for content ($F(1,98)=.003$, $p=.956$) or the interaction of the 2 ($F(1,98)=1.38$, $p=.243$).

Lastly, the researcher tested for main effects and the interaction on the follow-up point for this measure (see Table 32). There was a significant main effect for frequency ($F(1,98)=9.51$,$p=.0027$), but not for content ($F(1,98)=.902$, $p=.345$) or the interaction of the 2 ($F(1,98)=.05$, $p=.824$).

Insert Tables 28, 29, 30, 31, & 32 about here.

Met ACSM goals for frequency and duration. The sixth major dependent measure was whether or not a participant's reported activity for a week met the ACSM goals (at least 20 for at least 3 times per week). The researcher conducted several statistical tests on this measure. First, the researcher conducted a RMANOVA to test for differences on "treated" (being in the control group versus the intervention groups, see Table 33). There was a significant difference between the control and intervention groups ($F(1,120)=4.19$, $p=.043$). There was also a significant effect for time ($F(12,1440)=6.47$, $p=.0001$) and the treated*time interaction ($F(12,1440)=1.8$, $p=.044$.

Second, the researcher conducted RMANOVA to test for differences on frequency of contact (every week versus every third week, see Table 34). There was a significant difference between the frequency groups ($F_{(1,100)}$=11.89, p=.0008). There was also a significant effect for time ($F_{(12,1200)}$=6.39, p=.0001) and the frequency*time interaction ($F_{(12,1200)}$=2.29, p=.007. Third, the researcher conducted RMANOVA to test for differences on content of contact (feedback and goal-setting versus touching base, see Table 35). There was a not significant difference between the content groups ($F_{(1,100)}$=1.56, p=.215). There was a significant effect for time ($F_{(12,1200)}$=6.44, p=.0001) and the frequency*time interaction ($F_{(12,1200)}$=3.08, p=.0003.

Next, the researcher created a cumulative score for each subject by adding up the number of weeks each participant met these goals. The researcher conducted a 2-way ANOVA on this variable with the 2 sources being content and frequency of contact (see Table 36). There was a significant main effect for frequency ($F_{(1,98)}$=11.92,p=.0008), but not for content ($F_{(1,98)}$=1.51, p=.222). But, the interaction was significant ($F_{(1,98)}$=4.45, p=.038).

Lastly, the researcher tested for main effects and the interaction on the follow-up point for this measure (see Table 37). There was a significant main effect for frequency ($F_{(1,98)}$=8.4,p=.0046), but not for content ($F_{(1,98)}$=.032, p=.858) or the interaction of the 2 ($F_{(1,98)}$=1.12, p=.293).

Insert Tables 33, 34, 35, 36, & 37 about here.

Subject chosen goals met. Within the two feedback and goal-setting conditions, each participant was required to choose a goal for the subsequent week(s). The participants were required to set goals during each telephone contact (10 times in the high frequency condition and 4 times in the low frequency condition. Therefore, to compare across these two condition, a "percentage of goals met" variable (# of times goals were met / # of times goals were set) was created.

The researcher conducted a 1-way ANOVA on this variable to test for differences by frequency condition (see Table 38). There was a significant effect for frequency of contact ($F_{(1,50)}=14.125, p=.004$).

Insert Table 38 about here.

Survival Analyses.

Dead 1. The researcher conducted the nonparamentric analysis LIFETEST on the dependent variable "Dead 1." There different stratification variables were; treated, frequency of contact, content of contact, and condition (see Table 39). There was a significant difference between the survival curves for treated ($Chi^2_{(1)}=24.5$, p=.0001) and frequency ($Chi^2_{(1)}=18.7$, p=.0001) and condition ($Chi^2_{(4)}=40.6$, p=.0001), but not for content ($Chi^2_{(1)}=1.35$, p=.2451). Figures 3-6 show the survival curves and hazard functions for these tests.

Insert Table 39 & Figures 3, 4, 5, & 6 about here.

Dead 2. The researcher conducted the nonparamentric analysis LIFETEST on the dependent variable "Dead 2." There different stratification variables were; treated, frequency of contact, content of contact, and condition (see Table 40). There was a significant difference between the survival curves for treated ($Chi^2_{(1)}$=20.9, p=.0001) and frequency ($Chi^2_{(1)}$=25.3, p=.0001) and condition ($Chi^2_{(4)}$=40.4, p=.0001), but not for content ($Chi^2_{(1)}$=1.26, p=.2626). Figures 7-10 show the survival curves and hazard functions for these tests.

Insert Table 40 & Figures 7, 8, 9, & 10 about here.

Dead 3. The researcher conducted the nonparamentric analysis LIFETEST on the dependent variable "Dead 3." There different stratification variables were; treated, frequency of contact, content of contact, and condition (see Table 41). There was a significant difference between the survival curves for treated ($Chi^2_{(1)}$=21.6, p=.0001) and frequency ($Chi^2_{(1)}$=20.7, p=.0001) and condition ($Chi^2_{(4)}$=37.4, p=.0001), but not for content ($Chi^2_{(1)}$=.008, p=.9289). Figures 11-14 show the survival curves and hazard functions for these tests.

Insert Table 41 & Figures 11, 12, 13, & 14 about here.

Discussion

Summary of Major Findings

The results from this study indicated consistent findings for the effects of high frequency contact versus low frequency contact and of time for all outcome

measures. Over time, participants walked less across all measures. The data also indicated no significant effect for goal-setting and feedback versus a contact control. Furthermore, being in a treatment versus a control condition was significant for some outcome measures but not for others. Lastly, the interaction of content and frequency of contact was significant for only one outcome measure, cumulative weeks a participant met ACSM guidelines. Thus, the tested intervention had some significant and fairly consistent findings across the outcome measures.

Treatment versus control. Interestingly, being in a treatment condition versus the control condition was significant for all three definitions of dead in the survival analyses, but was only significant for some of the outcome measures tested by RMANOVA: days walked, weeks walked, weeks walked with a partner, and met ACSM guidelines for frequency and duration. The non-significant RMANOVA's were: number of partners walked with each week and number of minutes walked each week. These non-significant findings reflected the poor outcomes found in the content conditions compared to the contact conditions. The averages in the content groups were too similar to the values in the control groups. These values decreased the overall "treated" condition average.

Frequency of contact. The frequency of contact showed significant differences for all of the outcomes variables. The more frequent contact conditions (once a week) compared to the less frequent conditions (once every three weeks) were associated with higher values on the various outcome measure. This pattern was found for days walked, weeks walked, number of partners walked with each week, weeks walked with a partner, number of minutes walked each week, met ACSM goals for frequency and duration, and met subject chosen goals. The

survival analysis also displayed this pattern across all three definitions of dead. Thus, frequency of contact showed significant affects across all outcome measures tested.

Time. Time was also a significant independent measure across all the outcome measures reflected by decreases in each value over time. The weekly values in the RMANOVA's were based on averages within groups. Recall, the researcher only dropped participants out of the data set if they did not send in their walking logs. Some participants sent in logs indicating they had not walked at all during a week. Thus, over time the effect eroded, but was due to the dropout, or discontinuation of walking, rate.

Content. Surprisingly, content of the telephone contacts (feedback and goal-setting versus "touching base") was not a significant independent predictor for any of the outcome measures. This included: days walked, weeks walked, number of partners walked with each week, weeks walked with a partner, number of minutes walked each week, met ACSM goals for frequency and duration, and met subject chosen goals. Survival analysis by content was also not significant.

Summary. The data indicated a fairly consistent pattern of findings for the independent variables treated, frequency, content, and time. The significant effects found for frequency of prompting were consistent across measures. The lack of significant findings for content of contact may suggest not using feedback and goal-setting in future studies. But, before any recommendations can be made, a more thorough review of this study's outcome is required, including its research and clinical relevance.

Relevance of Findings to The Field of Physical Activity Research.

This study furthered research in physical activity promotion in a number of areas including: the effects of various prompting frequencies on adherence rates, the lack of effects of feedback and goal-setting on adherence rates, the use of telephone delivered interventions, self-monitoring logs as data, and the importance of social support.

Prompting frequency. The impact of frequency of prompting was found across all outcome measures. The more frequent the prompting, the longer the continuation of the target behaviors, in addition, with more frequent prompting, participants walked more frequently per week and for more minutes. This finding is very encouraging for several reasons. First, prompting is a fairly simple and easy intervention strategy to implement. In this study, the prompt was a telephone call lasting only a few minutes. Second, the short calls (2 minutes, low content conditions) were as effective as the longer calls (4 minutes, high content conditions). Thus, increasing the frequency of such a short telephone call represents an easy way to increase a programs effectiveness without a large increase in overall time needed for each participant.

Third, prompting is a simple strategy to teach a research assistant to implement. Given the concern for reliable implementation of intervention strategies when using multiple research assistants, a simple strategy makes reliable implementation easier to obtain. Fourth, if the frequency of the prompt is what matters, then increasing the frequency to daily may increase the effectiveness beyond what was found in this study. Furthermore, computer mail or telephone mail boxes could be used to deliver the prompts each day. Fifth, the more frequent prompting helped the participants meet their individually set goals. Thus,

prompting influenced the strategy of goal-setting by helping participants reach their goals, thus perhaps making goal-setting a more reinforcing activity.

Lastly, comparison of the survival analysis for the frequent prompting condition (40%) to the average survival rate reported by Dishman (20% at 6 months) is encouraging. Although this study does not yet have six month data, the four month data are a reasonable comparison point. When using the strictest definition for survival, missing one week is dead (Dead 1), the survival rate was 40% in the high frequency condition and 12% in the low frequency condition. Thus, the more frequent prompting condition had a survival rate twice that of the average found in other physical activity promotion research.

Even given all the encouraging findings for frequent prompting and its potential usefulness, the question remains, why did frequent prompting work? There are several possible explanations. First, the prompt may have served as a reminder to walk. Thus, the more frequent the prompt, the more frequent the reminder to walk Second, the prompt may have served as a method of creating a negative reinforcement situation for the participant if he/she did not walk that week. A participant may have felt as if he/she let the program down if he/she had not walked when prompted. Thus, to avoid any future negative consequences (the bad feelings or guilt), the participant walked. Third, the prompt may have served as a reminder of their commitment in a student's dissertation. Although this was not planned, most of the participants knew this study was a dissertation though the questions they asked during recruitment. One participant even noted "I better keep walking or I'll screw-up your dissertation." Thus, the more frequent prompts may

have reminded the participants of their commitment more often and, thus, influenced their behavior.

Overall, the finding for increased frequency of prompting is very encouraging. Most encouraging is frequent prompting's effect on survival rates. Given its simplicity to implement and the ability for daily prompts, prompting may become one of the most useful intervention strategies for future physical activity research and possible commercial fitness programs. Future commercial fitness program participants may want to pay a little more to be prompted. The prompting may keep them maintaining their activity and thus getting more use out of their expensive fitness club membership.

Why was the content of the prompt ineffective? The researcher originally hypothesized the feedback and goal-setting conditions would have a larger effect on physical activity than the "touching base" conditions; the results did not support this hypothesis. Rather, the results indicated they were equally ineffective. There are several possible reasons for these findings.

First, the self-monitoring all participants did throughout the study may have decreased the incremental effectiveness of the telephone feedback. If a participant did their self-monitoring, they could have had their own method of feedback on performance. Furthermore, as all participants conducted self-monitoring, they all could have had their own feedback system. Therefore, the feedback offered to participants may not have given them anything more than they already had. Thus, one would not expect the feedback given during telephone prompts to increase the target behaviors.

Second, there may not have been enough of a difference between the two content conditions. The high content condition gave feedback and set goals. The low content condition primarily asked "How's your walking program going?" It is possible this simple question prompted the participant to recall their walking for the week, thus, giving themselves feedback on how well they did. If this was the case, then both the high and low content conditions contained feedback. The only difference would be the high content condition contained goal-setting.

Third, goal-setting may not have been done in the most effective manner. To add ownership of the program to the participant, each participant chose their own goals when prompted by a research assistant during a telephone contact. Some participants chose to increase their goals each time they set a goal, others only increased their goals every other time, while others chose to maintain their same goal for the duration of the study. This variability in setting goals may have had an effect on goal-setting's influence on the behavior.

These three explanations are only hypotheses. But, they do suggest the need to control these factors in future research to understand their effects. For example, changing the prompt in the low content condition from "How's your walking program going?" to "Just called to remind you to walk." may help to maximize the difference between the high and low content conditions by controlling for possible prompting of participant self-directed feedback. Furthermore, given past researcher's successful use of feedback and goal-setting, further study is needed to understand why they did not work in the present study.

Minimal treatment. The control group represented the minimal treatment group. The only intervention the researcher gave these participants was the

recruitment information and the self-monitoring logs. Their data indicated this intervention package had little to no effect for them. For example, only two participants in this group continued were walking during the follow-up period. The minimal treatment group's results are important as their program is similar to some commercial and "do-it-yourself" programs. Given the findings for the minimal treatment group, these types of programs are apparently not enough to maintain physical activity.

Social support. Although, social support was not varied across conditions, this study suggested social support is important in promoting physical activity. First, during recruitment, the majority of potential participants, almost primarily women, stated they found the idea of walking with a partner acceptable. Several noted they knew they would only maintain their walking if they had someone depending on them. Thus, using walking partners to create social support was acceptable to the female participants in this study. Second, during recruitment, most participants indicated they had friends or family at home they could ask to walk with them. This was important because if participants had no one they could ask, there would not have been a social support component. Furthermore, it indicates this type of social support is a viable option for future research because, at least for some women, it is easy to implement.

Third, the data indicated those participants in the high frequency of contact condition were more likely to walk with a partner and walk more days each week with a partner, thus making more use of the social support. This is significant as it shows how other intervention strategies, in this case, prompting, can successfully influence and maintain social support. Lastly, after the end of the initial

intervention phase, several participants noted they felt having a walking partner was both pleasant and effective in keeping them walking.

Given the impact and acceptability of walking partners, social support could be an effective intervention strategy for future physical activity promotion programs. Furthermore, future researchers could use prompting to remind the participants to use walking partners, thus increasing an intervention's effectiveness and the participants' ultimate enjoyment of the program. The participant's enjoyment of the program appears essential to any program's success (i.e., behavioral maintenance).

The telephone as a delivery system. Testing the effectiveness and participant acceptance of using the telephone as a delivery system could have major implications for physical activity promotion. The telephone offers a low cost, fairly personal method for delivering intervention strategies. By using set telephone appointments, research assistants in this study were able to contact participants to deliver the intervention. Some participants noted they enjoyed the telephone contacts stating "just keep calling me, it keeps me going." These findings support King et al (1988) findings for a telephone delivered physical activity intervention. Given the acceptance of the telephone calls by the participants, the low cost of local telephone calls, and the finding of frequent prompting's effect on physical activity, telephone delivered interventions may be an important delivery method for future physical activity research.

Self-monitoring logs as data. Many researchers have successfully used self-monitoring logs of physical activity as an intervention strategy. But, only a few have also used these logs as data. The reliability estimates conducted in this

study indicate these logs can be a reliable method for gathering detailed physical activity data. In addition, the use of exercise partners offers a nice way to obtain reliability data for the self-report logs. Thus, future research can use self-monitoring logs as both an intervention strategy and as a reliable method of data collection.

Meeting ACSM goals and related health benefits. The present study was not only important from a research perspective, but also from a clinical health benefit perspective. The outcome measure "cumulative weeks a participant met ACSM goals for frequency and duration" of activity indicated the more frequently contacted higher content condition did better than the other conditions. The ACSM set these goals because they are related to health benefits (ACSM, 1990). The researcher concluded those in the high intensity conditions, on average, obtained a level of physical activity related to a higher health benefit than those in the other conditions. Furthermore, those in the most intensive condition (high frequency/high content) met the ACSM goals more than twice as often as the control condition, 7.22 weeks and 2.55 weeks, respectively. Thus, for some participants, the intervention not only increased activity, but may have decreased their risk for various disease states (e.g., heart disease, hypertension, obesity, osteoporosis, and colon cancer) if they continue to maintain the same frequency and duration of walking.

Cost effectiveness. Cost effectiveness is an important concern for any health promotion program. Funding agencies want to know if conducting an intervention makes fiscal sense. To answer this question, the researcher needs to calculate the cost ratios for the different intervention conditions, the differential

effectiveness of each intervention condition, and each condition's related monetary savings. This researcher chose the outcome measure of "met ACSM goals" during follow-up to determine the intervention's effectiveness. Table 42 indicates the number of participants meeting these goals during follow-up (see Table 42).

Insert Table 42 about here.

The researcher calculated the effectiveness ratios as the ratio of the least effective condition (low frequency/low contact) to the other conditions. Table 43 shows the effectiveness ratios for each intervention condition (see Table 43). For example, the high frequent/low content intervention was 3.25 times more effective than the low frequency/low content intervention on meeting the ACSM goals. The order of effectiveness, from most effective to least effective intervention, was high frequency/low content (3.25), high frequency/high content (2.75), low frequency/high content (1.5), and low frequency/low content (1.0).

Insert Table 43 about here.

Next, the cost ratios between conditions were estimated. First, the costs for recruitment, materials, and initial training of participants and research assistants for each condition was estimated. These costs were constant across all conditions and thus, were not entered into the ratio. Second, the time required to implement each intervention condition was obtained to estimate the cost, in salary, needed to pay research assistants to make telephone calls. Table 44 indicates the average number of minutes each condition required to implement the intervention (see Table 44). Using an average hourly wage of $5.00 per hour, the researcher calculated the costs of implementing each condition (see Table 45). For example, the high

frequency/low content condition required 600 minutes or 10 hours to implement at a rate of $5.00 per hour. Thus, this condition cost $50.00 to implement.

Insert Tables 44 & 45 about here.

To compare the cost of the different intervention conditions, Table 45 shows the cost ratios between conditions. The researcher calculated these values by dividing the lowest cost condition (low frequency/low content) into the costs of the other conditions (see Table 46). For example, the high frequency condition cost $50.00 to implement. Thus, its cost ratio would be $50.00/$16.67 or 3.0 times as much as the low frequency/low content condition.

Insert Table 46 about here.

The last element to calculate is the cost benefit due to the health benefits caused by the different intervention conditions. Unfortunately, this value is not easy to determine in the physical activity area for two reasons. One, although physical activity has been found to be an independent predictor for some disease states, it is also an intervening variable for several other disease states. Thus, calculating the money saved for each disease state prevented is difficult. Second, in this study, the participants did not note the intensity of their activity sessions. Intensity of activity performed is important in determining relative benefit (Blair et al., 1989) Thus, a true estimate of the health benefit from this study is difficult to determine.

Although monetary savings due to the intervention can not be accurately calculated, there is another way to calculate the relative cost effectiveness of the intervention conditions. Since the purpose of the study was to increase activity to met the ACSM goals, the researcher calculated the costs per participant in each treatment condition meeting the ACSM goals at follow-up (see Table 47). For example, 13 participants met the goals in the high frequency/low content condition at follow-up. As the implementation cost for this condition was $50.00, the cost per successful participant was $50.00/13 or $3.85. Table 47 indicates the values for different conditions.

Insert Table 47 about here.

Conclusions. The high frequency/low content condition was the most cost effective intervention condition. This condition had the largest impact on its participants in reaching the ACSM goals. Furthermore, although this was not the most inexpensive treatment condition to implement, the estimate cost per participant to meet their goals was the lowest in high frequency/low content condition. Thus, from a cost effectiveness view, the high frequency/low content condition was the most successful.

Gender. By far, women were more inclined to respond to the recruitment information than men.. Out of a potential population of over 20,000 residents, only 3 men inquired about the walking program, while over 150 women inquired about the program. All 3 men joined the program. As the ratio of males to females in the intervention community was closer to 1 to 1, this finding needed to be addressed.

The researcher conducted an informal verbal survey of 22 men within the targeted community. The majority of the men (21) indicates they did not believe walking was "exercise." Furthermore, most (15) believed walking offered no health benefits. Given these findings and the name of this program ("NoonTime Walkers"), the researcher concluded men did not join because they did not believe they would benefit from a walking exercise program. Therefore, to target men for recruitment, future research needs to offer physical activities men believe are "exercise" and offers them health benefits or start with information and education for them about the benefits of walking.

Conclusions

This study yielded some useful findings for future projects promoting physical activity. First, increasing the frequency of prompting from once every three weeks to once every week was a successful strategy for increasing the occurrence of the target behavior, walking. Second, the more frequent prompting without feedback and goal-setting was equally effective as the frequent prompting with feedback and goal-setting. Thus, feedback and goal-setting were not successful in increasing the target behavior incrementally when added to frequent prompting. The use of self-monitoring logs, however, may have obviated the use of feedback and goal-setting.

Third, feedback and goal-setting were not significantly more effective in increasing the target behavior compared to simply asking the participants "How's your walking program going?" This result does not indicate feedback and goal-setting are not effective applied strategies for the exercise area, but may reflect a shortcoming in the program's research design. Possible explanations include: 1)

the self-monitoring was a form of feedback all participants had, thus there was no difference across conditions or 2) the question asked in the "touching-base" condition prompted participants to reflect on their past week of exercise, thus giving themselves feedback.

Fourth, the acceptance of both the social support component (walking with a partner) and the telephone delivery aspect of this program was encouraging. Social support alone was effective in increasing physical activity in other studies. The manner used in this study to create social support, indicates social support could be a simple, yet powerful intervention strategy for future programs. Furthermore, the ability of prompting to essentially maintain the social support component suggests a package approach using both strategies. In addition, the acceptance, effectiveness, and low cost of the telephone delivery system indicates this method of delivery could become widely used in this area. In sum, the results of this study are encouraging and suggest several different further research directions.

Future Research Directions

The results from this study raised several questions suggesting several different possible future research directions. First, at what level of frequency of prompting do you maximize its effectiveness? Once a week was more effective than once every three weeks. A future study could assess the effects of daily or bi-weekly prompting on physical activity.

Second, was the interaction between the participant and the research assistant during the telephone prompt important? For example, the enthusiasm of the prompter could influence the impact of the prompt. To answer this question,

the researcher could compare personally delivered telephone prompts to either voice mail or computer mail delivered prompts. If the voice mail or computer mail prompts were equally effective as the personally delivered prompts, this would offer an effective low monetary and time cost delivery system.

Third, would simplifying the prompts reduce their effectiveness? As noted earlier, the low content prompt included the question "How's you walking program going?" Asking this question goes beyond simply prompting. Therefore, a study is needed to assess how effective a simpler prompt ("Just called to remind you to walk.") is compared to the low content and high content prompts used in this study.

Fourth, would the package approach used in this study be successful for other target populations (e.g., men) and other target physical activities (e.g., running, biking, aerobics)? As noted earlier, men were significantly underrepresented in this study, possibly because of their perceptions of walking as not being "exercise." Therefore, a future study could determine an activity more perceived as "exercise" by men or try to convince them walking is exercise. Then, the researcher could assess the effectiveness of this package approach on this population.

Fifth, as should be done with all other studies, this study should be replicated. The consistency of the pattern of findings across all the outcome variables gives the researcher confidence in the present findings and conclusions, but only replication of the findings can truly confirm them and further suggest future research directions.

Lastly, given the findings for behavioral techniques used in this study, future physical activity promotion researchers may want to conduct more studies

applying specific behavior techniques. Many past physical activity researchers have used behavior change strategies in an "apply it and see if it works" manner. If a strategy did not work, they concluded it was an ineffective strategy and applied another strategy. If a strategy did work, they recommended everyone else use it. The present study suggests a return to looking more closely at the strategies used in the applied area and assessing why they do or do not work. These behavior techniques came from the conceptually based learning and applied literature where their effectiveness was repeatedly shown (Kazdin, 1989). Therefore, if these behavioral techniques are not working in the applied area, maybe it is not that they are ineffective techniques, per se but rather, they are being implemented in an ineffective manner. Clearly, the results in this study for frequency of contact (prompting) most strongly suggests the benefits for promoting exercise adherence when specific parameters of techniques are implemented and assessed for efficacy.

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Table 1. Goal for the Nation related to exercise.

Goal 1	Increase to at least 30% the proportion of individuals aged 6 or older who engage regularly in light to moderate physical activity for at least 30 minutes per day. Presently, only 22% do.
Goal 2	Increase to at least 20% the proportion of individuals aged 18 and older and to at least 75% the proportion of individuals aged 6 through 17 who engage in vigorous physical activity three or more days per week.
Goal 3	Reduce to no more than 15% the proportion of individuals aged 6 and older who engage in no leisure-time activity. Presently, 24% of those 18 and older report no leisure-time activity.
Goal 4	Increase to at least 40% the proportion of individuals aged 6 and older who perform strength, endurance and flexibility activities regularly.
Goal 5	Reduce coronary heart disease deaths from 135/100,000 to 100/100,000.
Goal 6	Reduce the rate of obesity to 20% among those aged 20 and older. Presently, the rate is 27%.
Goal 7	Increase to 50% the proportion of overweight individuals 12 and older who have combined sound dietary practices and regular physical activity to attain an appropriate weight.

Table 2. The American College of Sports Medicine guidelines for physical activity.

Recommendation 1	Intensity of training should be between 60-90% maximum heart rate or 50 to 85% of maximum capacity.
Recommendation 2	The duration of training should be between 20-60 minutes of continuous aerobic activity for each exercise session.
Recommendation 3	The frequency of training should be between 3 to 5 days per week.
Recommendation 4	Individuals should perform resistance training of 8-12 repetitions for 8-10 exercises involving large muscle groups at least twice per week.
Recommendation 5	Exercise session should have appropriate warm-up and cool-down periods, including flexibility exercises.

Table 3. A review of the significant exercise determinants compiled from Dishman (1985), Sallis and Hovell (1990) and Sallis, Hovell and Hofstetter (1991).

Modifiable		Non-Modifiable	
Self-Efficacy	+	Past Participation	+
Social Support	+	Blue-Collar Occupation	-
Spousal Support	+	High Risk For Coronary Heart Disease	-
Self-Motivation	+	Low Income Level	-
Perceived Benefits of Exercise	+	Smoking	-
Behavior Modification Skills	+	Over-Weight	-
		Type A Behavior	-
		Pro Exercise Family Influences	+
		Pro Exercise Peer Influences	+
		Disruptions in Routine	-
		High School Athlete	+
		Mood Disturbance	-
		Education Level	+
		Time Available	+
		Access to Facilities	+
		Perceived Discomfort of Activity	-

Note: "+" indicates the variable relates to increased probability of adherence to a physical activity program. "-" indicates the variable relates to decreased probability of adherence to a physical activity program.

Table 4. Reliability estimates of telephone verifications of participant's logs, by treatment condition.

Condition	Mean	High	Low
Control	.91	1.0	.67
High Frequency Feedback & Goal-Setting	.90	1.0	.33
High Frequency Touching Base	.92	1.0	.67
Low Frequency Feedback & Goal-Setting	.90	1.0	.67
Low Frequency Touching Base	.89	1.0	.33

Table 5. Reliability estimates of partner walking log verifications of participant's logs, by treatment condition.

Condition	Mean	High	Low
Control	.98	1.0	.67
High Frequency Feedback & Goal-Setting	.98	1.0	.67
High Frequency Touching Base	.96	1.0	.67
Low Frequency Feedback & Goal-Setting	.97	1.0	.67
Low Frequency Touching Base	.95	1.0	.67

Table 6. Demographic statistics of all initial participants.

		Treatment Condition				
		Control	Frequent Feedback Goal-setting	Frequent Touching Base	Infrequent Feedback Goal-setting	Infrequent Touching Base
N		27	27	27	27	27
Age	X	40.1	36.7	41	39.5	42.3
	s^2	13	10.6	7.3	8.2	9.7
Weight	X	140	150	147	152	167
	s^2	33	21	21	34	38
Stage Of Readiness	X	3.6	3.9	3.5	3.8	3.6
	s^2	2.6	1.1	1.7	1.0	1.3
Smokers	X	3	3	6	2	2

Table 7. Demographic statistics of the all participants in the final data set.

		Treatment Condition				
		Control	Frequent Feedback Goal-setting	Frequent Touching Base	Infrequent Feedback Goal-setting	Infrequent Touching Base
N		20	27	25	25	25
Age	X	41.8	36.7	40	40.8	43.1
	S2	13	10.6	7.3	8.2	9.7
Weight	X	140*	150#	147	152	167*#
	S2	33	21	21	34	38
Stage Of Readiness	X	2.7*	3.9*	3.7	4.0*	3.7
	S2	4.1	1.1	1.6	.87	1.1
Smokers	X	3	3	6	0	0

Note: * indicates a .05 level significant difference between groups. # indicates a .05 level significant difference between groups. Chi-square for smokers was significant at .02.

Table 8. RMANOVA with dependent measure days walked each week and independent measure treated.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
TREATED (A)	1	112.754	112.754	4.04	.04567
Subjects w/ groups	120	3349.554	27.913		
Repeated Measure (B)	12	271.344	22.612	14.092	.0001
AB	12	56.926	4.744	2.956	.0004
B x Subjects w/ groups	1440	2310.653	1.605		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	1.6	1.35	1.15	.6	1.4	1	1.7	.6	.6	1.3	1.3	.6	.55
High	2.44	2.76	2.1	1.85	1.64	2.01	1.74	1.74	1.67	1.37	1.08	1.08	1.59

Table 9. RMANOVA with dependent measure days walked each week and independent measure frequency of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Frequency (A)	1	412.321	412.321	19.762	..0001
Subjects w/ groups	100	2086.484	20.865		
Repeated Measure (B)	12	285.585	23.799	14.872	.0001
AB	12	43.663	3.639	2.274	.0075
B x Subjects w/ groups	1200	1920.29	1.6		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	2.42	2.18	1.44	1.38	1.06	1.32	1.06	1.1	.92	.9	.58	.52	.84
High	2.46	3.31	2.73	2.31	2.19	2.78	2.39	2.35	2.4	1.83	1.56	1.62	2.32

Table 10. RMANOVA with dependent measure days walked each week and independent measure content of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	34.316	34.316	1.392	..2408
Subjects w/ groups	100	2464.488	24.645		
Repeated Measure (B)	12	285.585	23.799	14.928	.0001
AB	12	50.875	4.24	2.659	.0016
B x Subjects w/ groups	1200	1913.078	1.594		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	2.6	2.68	1.92	1.38	1.3	2.14	1.62	1.78	1.56	.92	.66	.84	1.58
High	2.29	2.83	2.27	2.31	1.96	2.0	1.84	1.69	1.77	1.81	1.48	1.31	1.61

Table 11. 2-Way ANOVA with the dependent measure average days walked over the 13 weeks and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	2.60	2.60	1.643	.203
Frequency (B)	1	29.33	29.33	18.508	.0001
AB	1	2.30	2.60	1.643	.203
Error	98	155.29	1.58		

	High Frequency	Low Frequency	Totals
Low Content	1.99	1.24	1.62
High Content	2.63	1.24	1.96
Totals	2.32	1.24	1.79

Table 12. 2-Way ANOVA with the dependent measure days walked during the follow-up week and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	2.83E-4	2.83E-4	8.362E-5	.9927
Frequency (B)	1	56.045	56.045	16.559	.0001
AB	1	2.554	2.554	.755	.3871
Error	98	331.68	3.384		

	High Frequency	Low Frequency	Totals
Low Content	2.48	.68	1.58
High Content	2.17	1.0	1.61
Totals	2.32	.84	1.59

Table 13. RMANOVA with dependent measure walked or not each week and independent measure treated.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
TREATED (A)	1	30.403	30.403	17.647	.0001
Subjects w/ groups	120	206.743	1.723		
Repeated Measure (B)	12	24.188	2.016	21.951	.0001
AB	12	2.814	.235	2.554	.0024
B x Subjects w/ groups	1440	132.229	.062		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.35	.25	.25	.1	.3	.2	.3	.1	.1	.2	.2	.1	.1
High	.863	.745	.667	.647	.578	.637	.559	.539	.5	.441	.373	.363	.5

Table 14. RMANOVA with dependent measure walked or not each week and independent measure frequency of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Frequency (A)	1	39.624	39.624	28.002	.0001
Subjects w/ groups	100	141.507	1.415		
Repeated Measure (B)	12	25.056	2.088	21.577	.0001
AB	12	2.669	.222	2.299	.0068
B x Subjects w/ groups	1200	116.121	.097		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.8	.62	.42	.44	.4	.44	.4	.36	.26	.28	.2	.2	.3
High	.923	.865	.904	.846	.75	.827	.712	.712	.731	.596	.538	.519	.692

Table 15. RMANOVA with dependent measure walked or not each week and independent measure content of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	1.406	1.406	.783	.3785
Subjects w/ groups	100	179.725	1.797		
Repeated Measure (B)	12	25.056	2.008	21.49	.0001
AB	12	2.196	.183	1.883	.0324
B x Subjects w/ groups	1200	116.594	.097		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.88	.78	.62	.58	.48	.62	.52	.54	.48	.38	.28	.3	.52
High	.85	.71	.71	.72	.67	.65	.59	.54	.52	.5	.46	.42	.48

Table 16. 2-Way ANOVA with the dependent measure number of weeks walked over the 13 weeks and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	14.088	14.088	.765	.3838
Frequency (B)	1	507.515	507.515	27.569	.0001
AB	1	20.802	20.802	1.13	.2904
Error	98	1804.039	18.0409		

	High Frequency	Low Frequency	Totals
Low Content	8.76	5.2	6.98
High Content	10.407	5.04	7.827
Totals	9.615	5.12	7.412

Table 17. 2-Way ANOVA with the dependent measure walked or not during the follow-up week and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	.055	.055	.253	.6164
Frequency (B)	1	3.941	3.941	17.946	.0001
AB	1	.001	.001	.005	.9429
Error	98	21.52			

	High Frequency	Low Frequency	Totals
Low Content	.72	.32	.52
High Content	.667	.28	.481
Totals	.692	.3	.5

Table 18. RMANOVA with dependent measure number of partners walked with each week and independent measure treated.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
TREATED (A)	1	31.554	31.554	3.163	.0778
Subjects w/ groups	120	1196.93	9.974		
Repeated Measure (B)	12	144.301	12.025	14.563	.0001
AB	12	26.189	2.182	2.643	.0017
B x Subjects w/ groups	1440	1189.048	.826		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	1.0	.95	.75	.1	.8	.6	.1	.1	.1	.8	.8	.2	.2
High	1.78	1.33	1.08	1.10	.82	1.06	.961	.794	.657	.755	.608	.559	.824

Table 19. RMANOVA with dependent measure number of partners walked with each week and independent measure frequency of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Frequency (A)	1	104.006	104.006	12.952	.0005
Subjects w/ groups	100	803.016	8.03		
Repeated Measure (B)	12	137.637	11.47	15.886	.0001
AB	12	21.646	1.804	2.498	.0031
B x Subjects w/ groups	1200	866.41	.722		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	1.74	1.04	.5	.76	.7	.68	.68	.46	.52	.5	.34	.26	.46
High	1.83	1.62	1.65	1.44	.942	1.42	1.23	1.12	.788	1.0	.865	.846	1.17

Table 20. RMANOVA with dependent measure number of partners walked with each week and independent measure content of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	5.489	5.489	.609	.4371
Subjects w/ groups	100	901.534	9.015		
Repeated Measure (B)	12	137.637	11.47	15.701	.0001
AB	12	11.466	.955	1.308	.2073
B x Subjects w/ groups	1200	876.59	.73		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	1.7	1.42	1.0	.9	.62	.9	.84	.76	.6	.7	.54	.58	.94
High	1.87	1.25	1.17	1.31	1.02	1.21	1.07	.827	.712	.808	.673	.538	.712

Table 21. 2-Way ANOVA with the dependent measure average number of partners walked with over the 13 weeks and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	.536	.536	.861	.3556
Frequency (B)	1	7.475	7.475	12.014	.0008
AB	1	.612	.612	.984	.3236
Error	98	60.976	.622		

	High Frequency	Low Frequency	Totals
Low Content	1.073	.687	.88
High Content	1.373	.677	1.038
Totals	1.229	.682	.961

Table 22. 2-Way ANOVA with the dependent measure number of partners walked with during the follow-up week and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	1.467	1.467	1.261	.2642
Frequency (B)	1	13.205	13.205	11.351	.0011
AB	1	.367	.367	.315	.5757
Error	98	114	1.163		

	High Frequency	Low Frequency	Totals
Low Content	1.36	.52	.94
High Content	1.0	.4	.712
Totals	1.173	.46	.824

Table 23. RMANOVA with dependent measure walked with a partner or not each week and independent measure treated.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
TREATED (A)	1	17.109	17.109	9.937	.002
Subjects w/ groups	120	206.6	1.722		
Repeated Measure (B)	12	21.762	1.813	18.756	.0001
AB	12	3.318	.277	2.86	.0007
B x Subjects w/ groups	1440	139.228	.097		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.3	.25	.25	.1	.3	.2	.3	.1	.1	.2	.2	.1	.1
High	.784	.598	.588	.57	.40	.51	.47	.45	.41	.35	.29	.28	.43

Table 24. RMANOVA with dependent measure walked with a partner or not each week and independent measure frequency of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Frequency (A)	1	36.749	36.749	25.506	.0001
Subjects w/ groups	100	144.081	1.441		
Repeated Measure (B)	12	23.395	1.95	19.002	.0001
AB	12	3.175	.265	2.579	.0022
B x Subjects w/ groups	1200	123.122	.103		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.7	.48	.32	.38	.32	.32	.3	.26	.2	.18	.14	.12	.22
High	.87	.71	.85	.75	.48	.69	.64	.64	.62	.52	.44	.44	.64

Table 25. RMANOVA with dependent measure walked with a partner or not each week and independent measure content of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	.086	.086	.048	.8273
Subjects w/ groups	100	180.744	1.807		
Repeated Measure (B)	12	23.395	1.95	19.037	.0001
AB	12	3.405	.284	2.771	.001
B x Subjects w/ groups	1200	122.892	.102		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.82	.7	.58	.52	.3	.48	.42	.44	.46	.32	.26	.26	.48
High	.75	.5	.59	.62	.5	.54	.52	.46	.37	.38	.33	.31	.39

Table 26. 2-Way ANOVA with the dependent measure number of weeks over the 13 weeks walked with a partner and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	.39	.39	.02	.8867
Frequency (B)	1	476.178	476.178	24.929	.0001
AB	1	.683	.683	.036	.8505
Error	98	1871.959	19.102		

	High Frequency	Low Frequency	Totals
Low Content	8.12	3.96	6.04
High Content	8.407	3.92	6.25
Totals	8.269	3.94	6.147

Table 27. 2-Way ANOVA with the dependent measure walked with a partner or not during the follow-up week and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	.266	.266	1.287	.2594
Frequency (B)	1	4.446	4.446	21.498	.0001
AB	1	.099	.099	.477	.4915
Error	98	20.267	.207		

	High Frequency	Low Frequency	Totals
Low Content	.72	.24	.48
High Content	.56	.2	.38
Totals	.64	.22	.43

Table 28. RMANOVA with dependent measure number of minutes walked each week and independent measure treated.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
TREATED (A)	1	114930.631	114930.631	1.379	.2426
Subjects w/ groups	120	9999756.17	833331.301		
Repeated Measure (B)	12	552271.62	46022.635	12.535	.0001
AB	12	105936.5	8828.042	2.404	.0044
B x Subjects w/ groups	1440	5287037.57	3671.554		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	54.5	66.5	46.3	28.2	79	42.5	39.6	40	29.8	41.7	65	27	28.5
High	90.7	112.4	98.29	73.9	67.3	68.4	66.3	67.7	63.5	51.3	36.8	39.4	51.5

Table 29. RMANOVA with dependent measure number of minutes walked each week and independent measure frequency of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Frequency (A)	1	663331.03	663331.03	9.311	.0029
Subjects w/ groups	100	7124084.16	71240.842		
Repeated Measure (B)	12	592407.66	49367.305	13.654	.0001
AB	12	41852.7	3487.725	.965	.4809
B x Subjects w/ groups	1200	4338622.3	3615.519		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	76.5	86.2	61.4	56.5	40.9	43.2	43.6	46.9	35.3	35.3	17.3	17.9	30.1
High	104.3	137.6	133.8	90.7	92.7	92.7	88.1	87.7	90.6	66.7	55.5	60.2	72.0

Table 30. RMANOVA with dependent measure number of minutes walked each week and independent measure content of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	2892.2	2892.2	.037	.8475
Subjects w/ groups	100	7784522.97	77845.23		
Repeated Measure (B)	12	592407.658	49367.305	13.856	.0001
AB	12	104898.195	8741.516	2.453	.0037
B x Subjects w/ groups	1200	4275576.76	3562.98		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	111.7	112.5	101.2	68.2	65.2	74.8	65.3	71.1	64.3	35.4	24.6	29.0	44.5
High	70.5	112.4	95.5	79.3	69.3	62.3	67.3	64.4	62.7	66.5	48.5	49.6	58.2

Table 31. 2-Way ANOVA with the dependent measure average number of minutes walked over the 13 weeks and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	18.658	18.658	.003	.9558
Frequency (B)	1	50695.758	50695.758	8.408	.0046
AB	1	8307.202	8307.202	1.378	.2433
Error	98	590871.415	6029.3		

	High Frequency	Low Frequency	Totals
Low Content	81.9	55.3	68.6
High Content	100.8	38.1	70.7
Totals	91.7	46.7	69.7

Table 32. 2-Way ANOVA with the dependent measure number of minutes walked during the follow-up week and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	4182.95	4182.95	.902	.3447
Frequency (B)	1	44111.70	44111.70	9.508	.0027
AB	1	231.52	231.52	.05	.8237
Error	98	454684.3	4639.6		

	High Frequency	Low Frequency	Totals
Low Content	63.8	25.2	44.5
High Content	79.6	35	58.2
Totals	72	30.1	51.5

Table 33. RMANOVA with dependent measure met ACSM goals or not each week and independent measure treated.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
TREATED (A)	1	5.657	5.657	4.186	.043
Subjects w/ groups	120	162.173	1.351		
Repeated Measure (B)	12	9.255	.771	6.473	.0001
AB	12	2.566	.214	1.795	.0441
B x Subjects w/ groups	1440	171.564	.119		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.35	.25	.25	.1	.3	.2	.3	.1	.1	.2	.2	.1	.1
High	.38	.55	.41	.37	.3	.46	.36	.36	.37	.28	.2	.26	.33

Table 34. RMANOVA with dependent measure met ACSM goals or not each week and independent measure frequency of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Frequency (A)	1	14.515	14.515	11.893	.0008
Subjects w/ groups	100	122.046	1.22		
Repeated Measure (B)	12	9.875	.823	6.388	.0001
AB	12	3.544	.295	2.293	.007
B x Subjects w/ groups	1200	154.581	.129		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.4	.4	.32	.3	.16	.3	.2	.28	.2	.22	.14	.14	.2
High	.37	.69	.5	.44	.44	.62	.52	.44	.54	.35	.25	.37	.46

Table 35. RMANOVA with dependent measure met ACSM goals or not each week and independent measure content of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	2.096	2.096	1.559	.2148
Subjects w/ groups	100	134.465	1.345		
Repeated Measure (B)	12	9.875	.823	6.438	.0001
AB	12	4.731	.394	3.084	.0003
B x Subjects w/ groups	1200	153.395	.128		

Tx	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	FUP
Low	.42	.52	.36	.2	.24	.48	.3	.4	.36	.16	.1	.24	.34
High	.35	.58	.46	.54	.37	.44	.42	.33	.39	.4	.29	.27	.33

Table 36. 2-Way ANOVA with the dependent measure number of weeks over the 13 weeks met the ACSM goals and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	23.042	23.042	1.511	.2219
Frequency (B)	1	181.736	181.736	11.919	.0008
AB	1	67.768	67.768	4.445	.0376
Error	98	1494.267	15.248		

	High Frequency	Low Frequency	Totals
Low Content	4.64	3.6	4.12
High Content	7.222	2.92	5.154
Totals	5.981	3.26	4.647

Table 37. 2-Way ANOVA with the dependent measure met ACSM goals during the follow-up week and the 2 independent measures frequency and content.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P-value:
Content (A)	1	.007	.007	.032	.8583
Frequency (B)	1	1.771	1.771	8.395	.0046
AB	1	.236	.236	1.119	.2926
Error	98	20.679	.211		

	High Frequency	Low Frequency	Totals
Low Content	.52	.16	.34
High Content	.407	.24	.327
Totals	.462	.2	.333

Table 38. 1-Way ANOVA with the dependent measure percentage of subject chosen goals met and the independent variable frequency of contact.

Source:	df:	Sum of Squares:	Mean Square:	F-test:
Between Groups	1	1.422	1.422	14.125
Within Groups	50	5.033	.101	p = .0004
Total	51	6.454		

Comparison	Mean Diff	Fisher PLSD	Scheffe F	Dunnett t
Frequency	.331	.177*	14.125*	.3758

Note: * significant at 95%.

Group	Count	Mean	Std. Deviation	Std Error
High Frequency	27	.556	.349	.067
Low Frequency	25	.225	.278	.056

Table 39. Chi^2 values from LIFETEST analyses performed on the dependent variable Dead 1 with the independent variables treated, frequency, content, and condition.

Stratifier	df:	Chi^2	P Value
Treated	1	24.5	.0001
Frequency	1	18.7	.0001
Content	1	1.35	.2451
Condition	4	40.6	.0001

Table 40. Chi^2 values from LIFETEST analyses performed on the dependent variable Dead 2 with the independent variables treated, frequency, content, and condition.

Stratifier	**df:**	Chi^2	**P Value**
Treated	1	20.0	.0001
Frequency	1	25.3	.0001
Content	1	1.26	.2626
Condition	4	40.4	.0001

Table 41. Chi^2 values from LIFETEST analyses performed on the dependent variable Dead 3 with the independent variables treated, frequency, content, and condition.

Stratifier	df:	Chi^2	P Value
Treated	1	21.6	.0001
Frequency	1	20.7	.0001
Content	1	.008	.9289
Condition	4	37.4	.0001

Table 47. Cost estimates in dollars per participant in each treament condition meeting the ACSM goals at follow-up.

	High Frequency	Low Frequency
Low Content	$ 3.85	$ 4.17
High Content	$ 9.82	$ 5.56

Table 46. Cost ratios by condition for cost effectiveness estimates using low frequency/low content as the set point.

	High Frequency	Low Frequency
Low Content	3.0	1.0
High Content	6.48	2.0

Table 45. Average cost required to implement each intervention condition using the rate of $5.00 per 60 minutes..

	High Frequency	Low Frequency
Low Content	$ 50.00	$ 16.67
High Content	$ 108.00	$ 33.33

Table 44. Average time in minutes required to implement each intervention condition.

	High Frequency	Low Frequency
Low Content	600	200
High Content	1296	400

Table 43. Effectiveness ratios by intervention condtition using low frequency/low content as the set point.

	High Frequency	Low Frequency
Low Content	3.25	1.0
High Content	2.75	1.5

Table 42. Number of participants in each intervention condition meeting the ACSM goasl for frequency and duration at follow-up..

	High Frequency	Low Frequency
Low Content	13	4
High Content	11	6

	Frequency Of Contact	
Content	**Once a Week**	**Once every Three Weeks**
Touching Base	**N=27**	**N=27**
In depth Call	**N=27**	**N=27**

Controls

N=27

Figure 1. Experimental Design

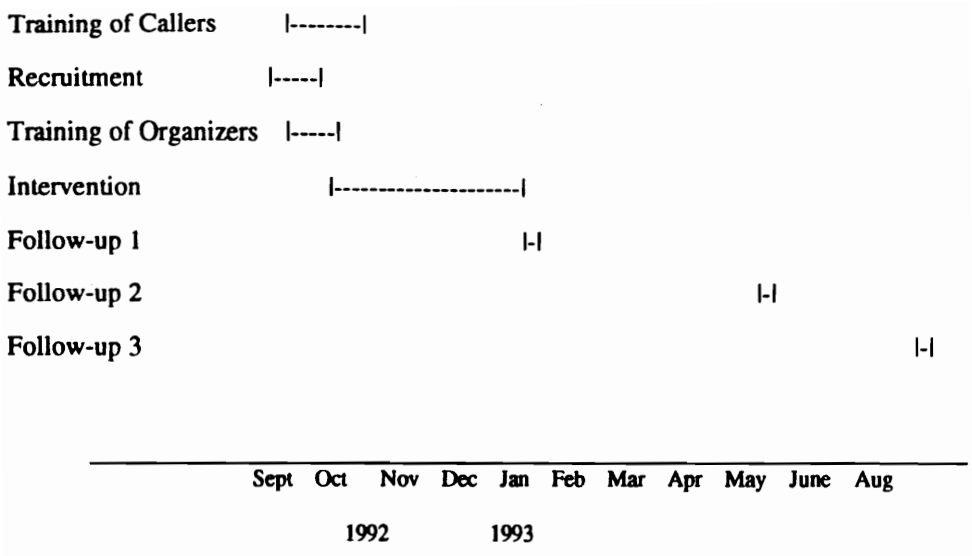
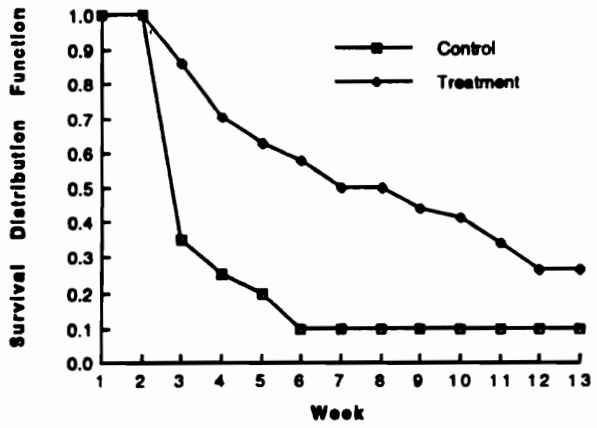


Figure 2. Time Line



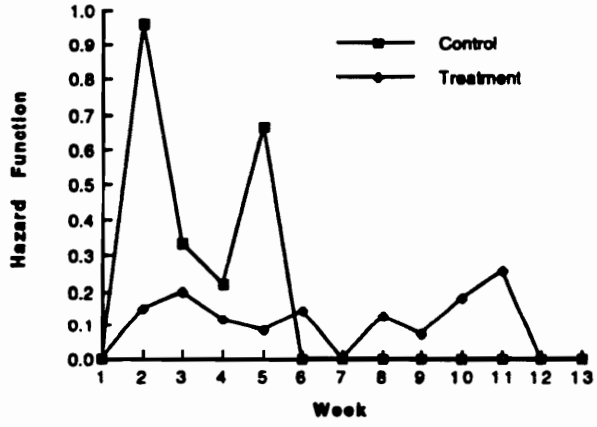
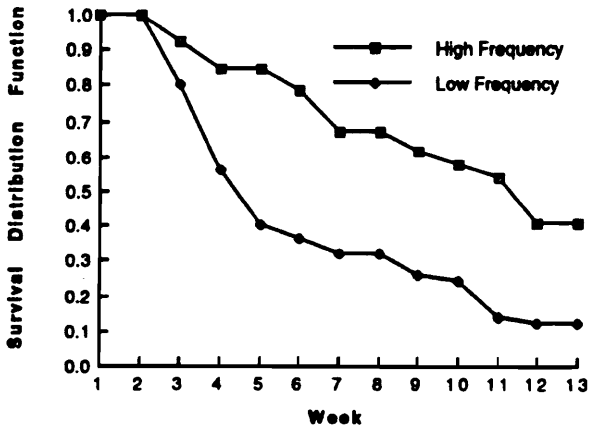


Figure 3. Survival and hazard functions for Dead 1 by treated.



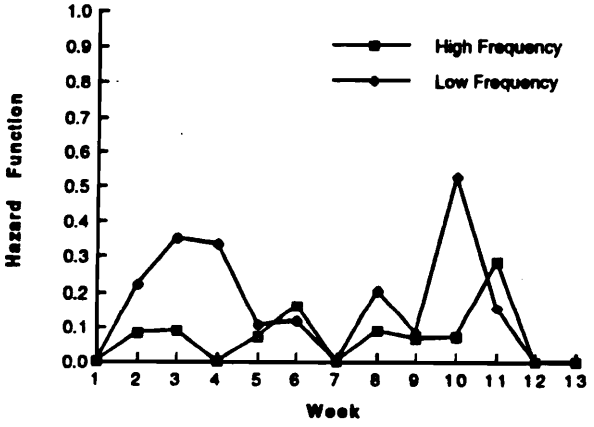
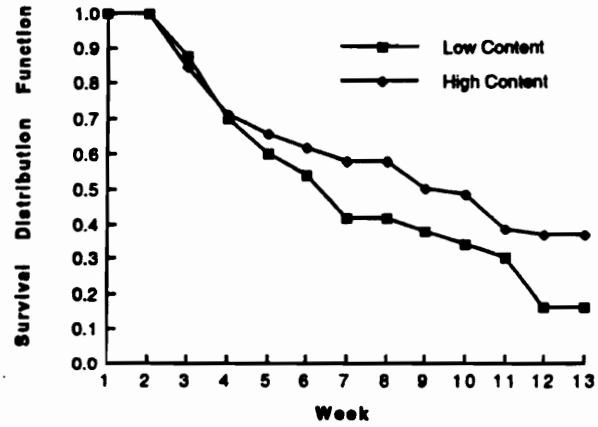


Figure 4. Survival and hazard functions for Dead 1 by frequency.



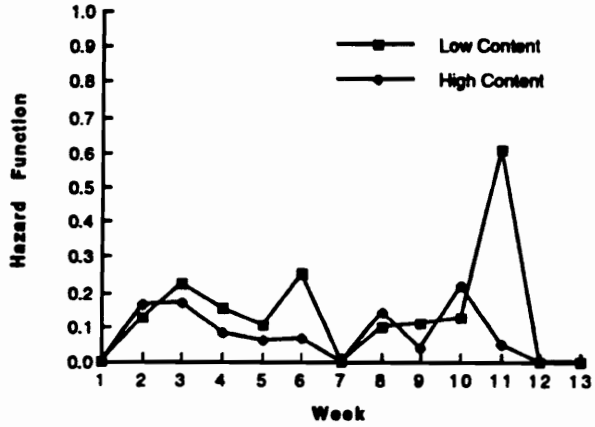


Figure 5. Survival and hazard functions for Dead 1 by content.

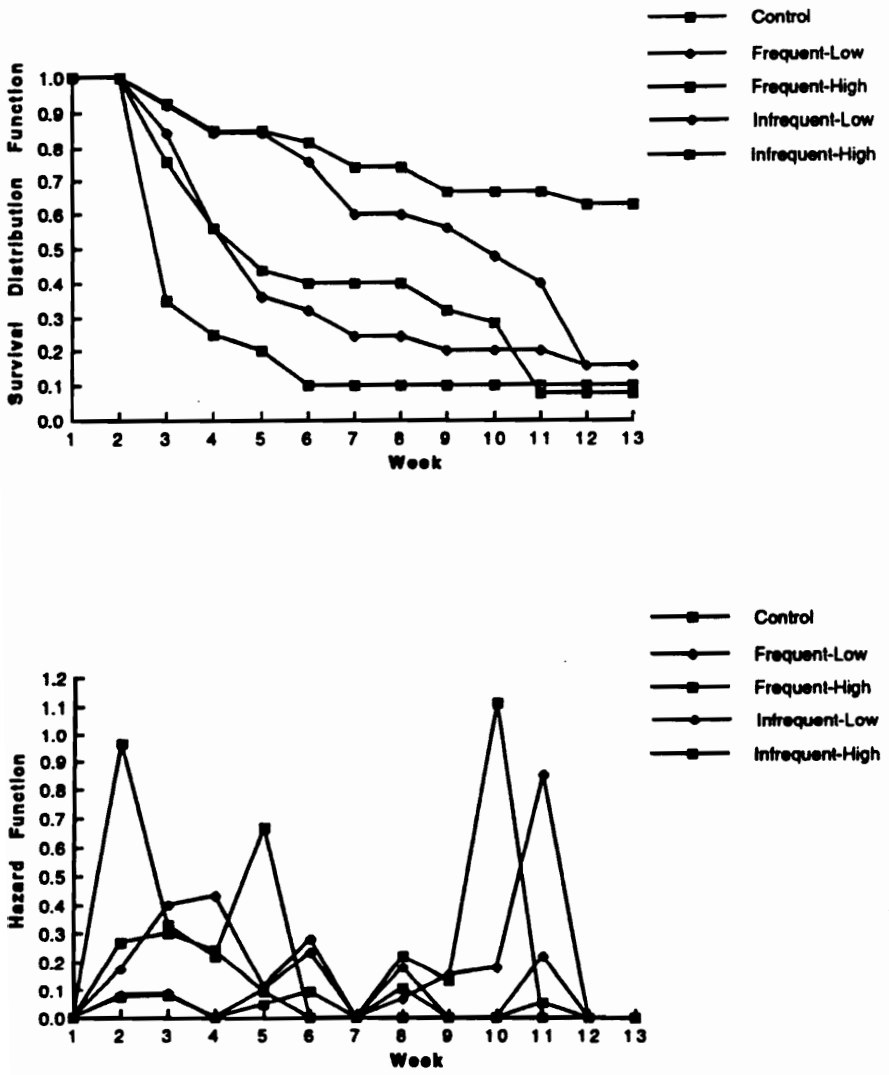
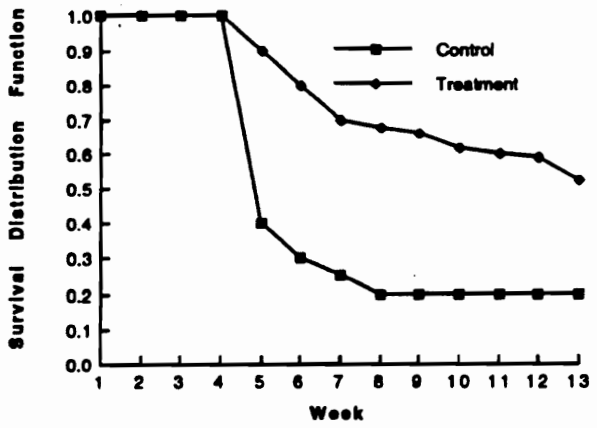


Figure 6. Survival and hazard functions for Dead 1 by condition.



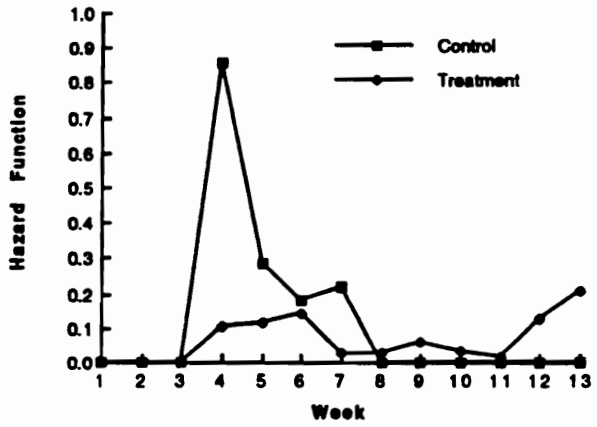


Figure 7. Survival and hazard functions for Dead 2 by treated.

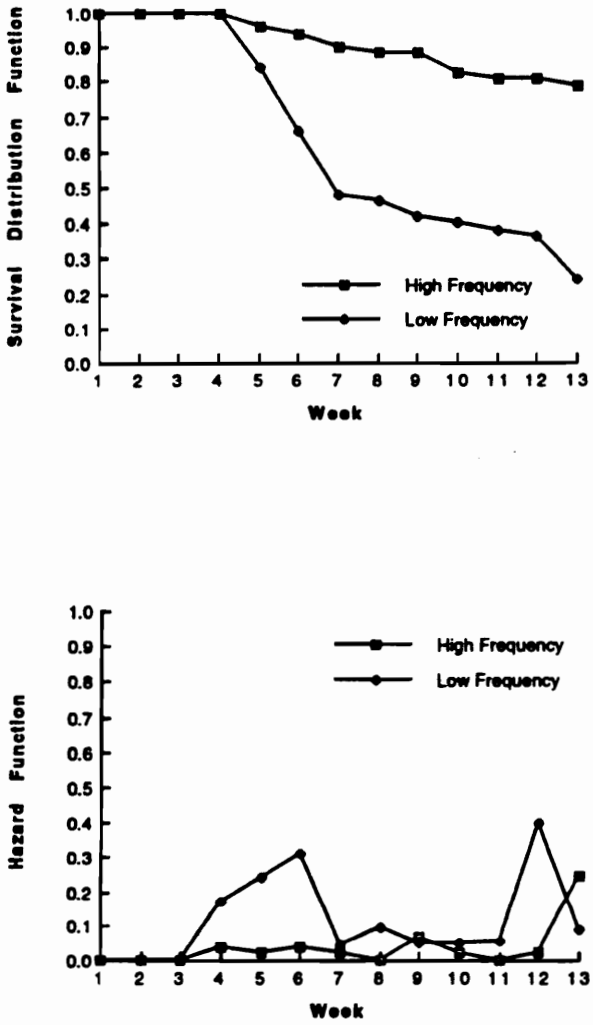
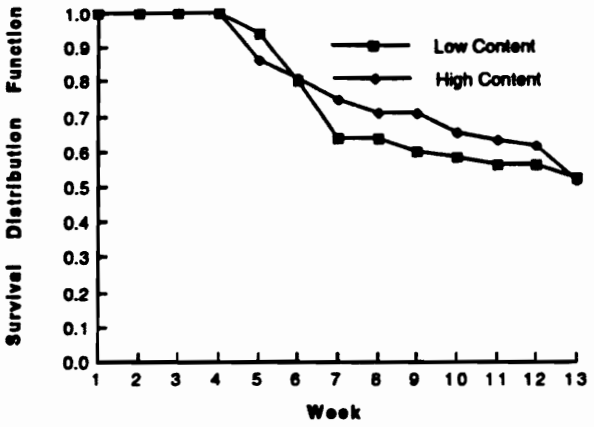


Figure 8. Survival and hazard functions for Dead 2 by frequency.



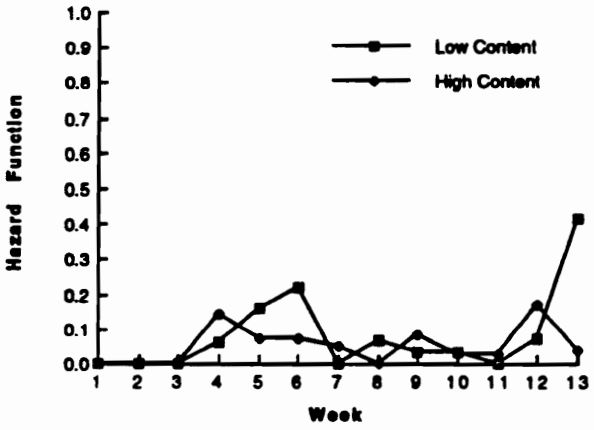


Figure 9. Survival and hazard functions for Dead 2 by content.

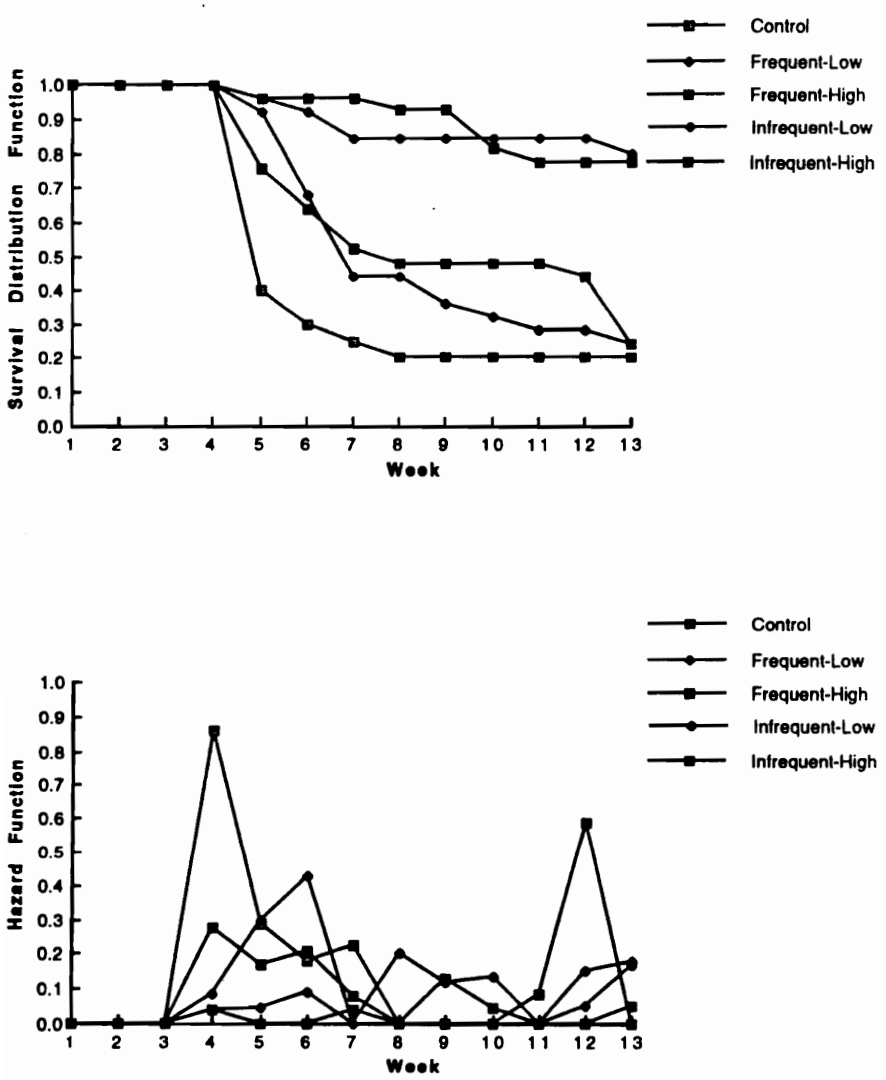
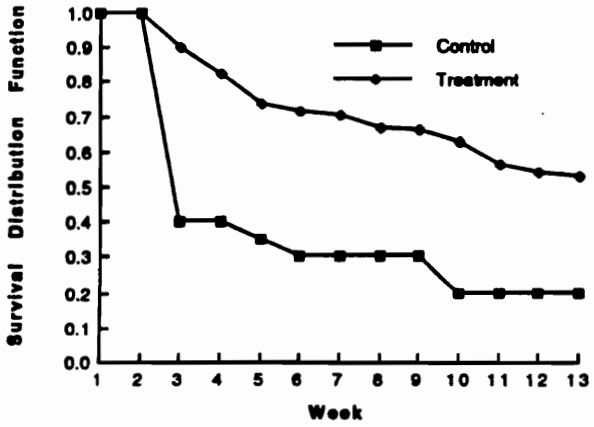


Figure 10. Survival and hazard functions for Dead 2 by condition.



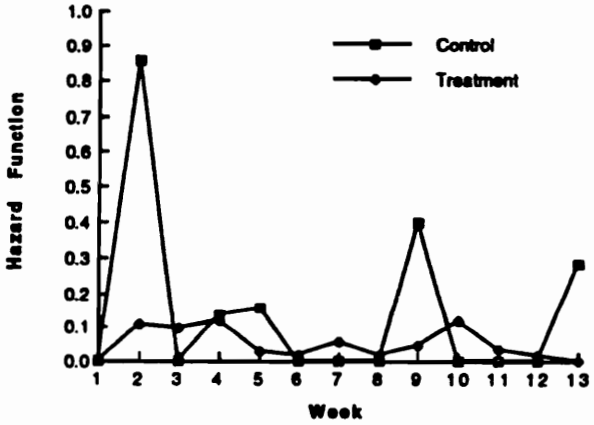


Figure 11. Survival and hazard functions for Dead 3 by treated.

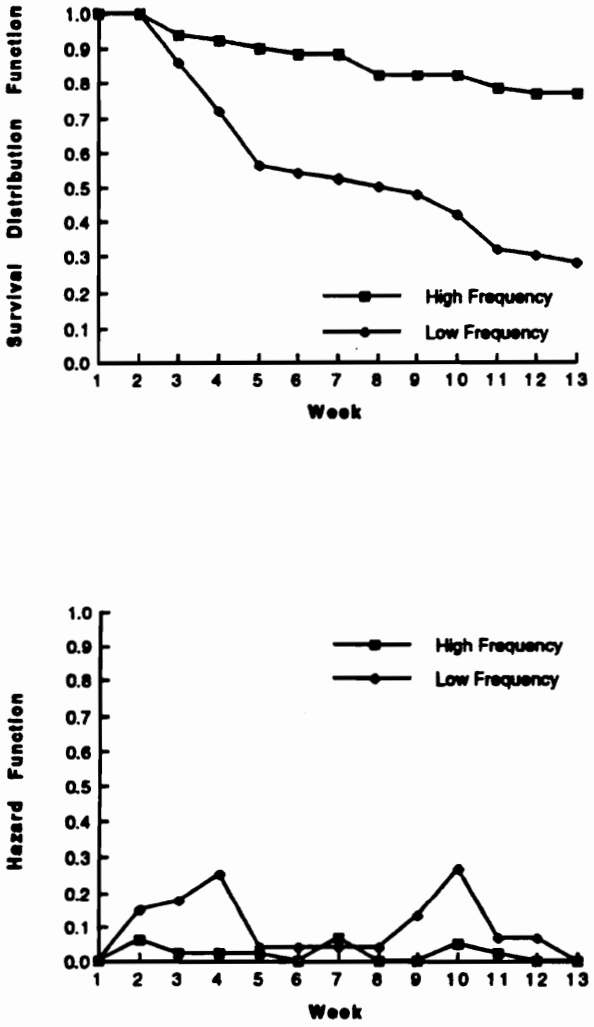


Figure 12. Survival and hazard functions for Dead 3 by frequency.

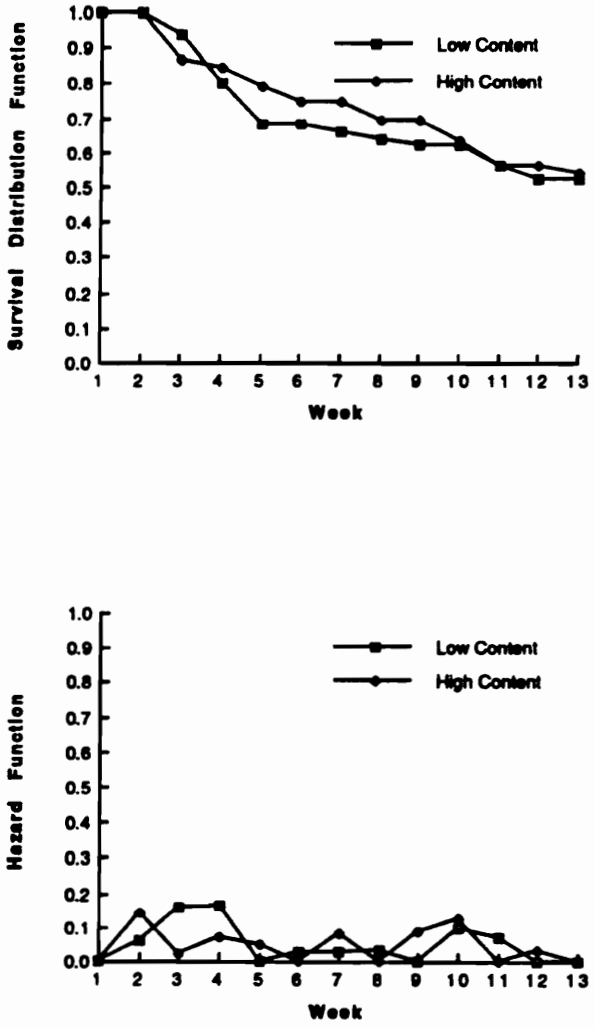


Figure 13. Survival and hazard functions for Dead 3 by content.

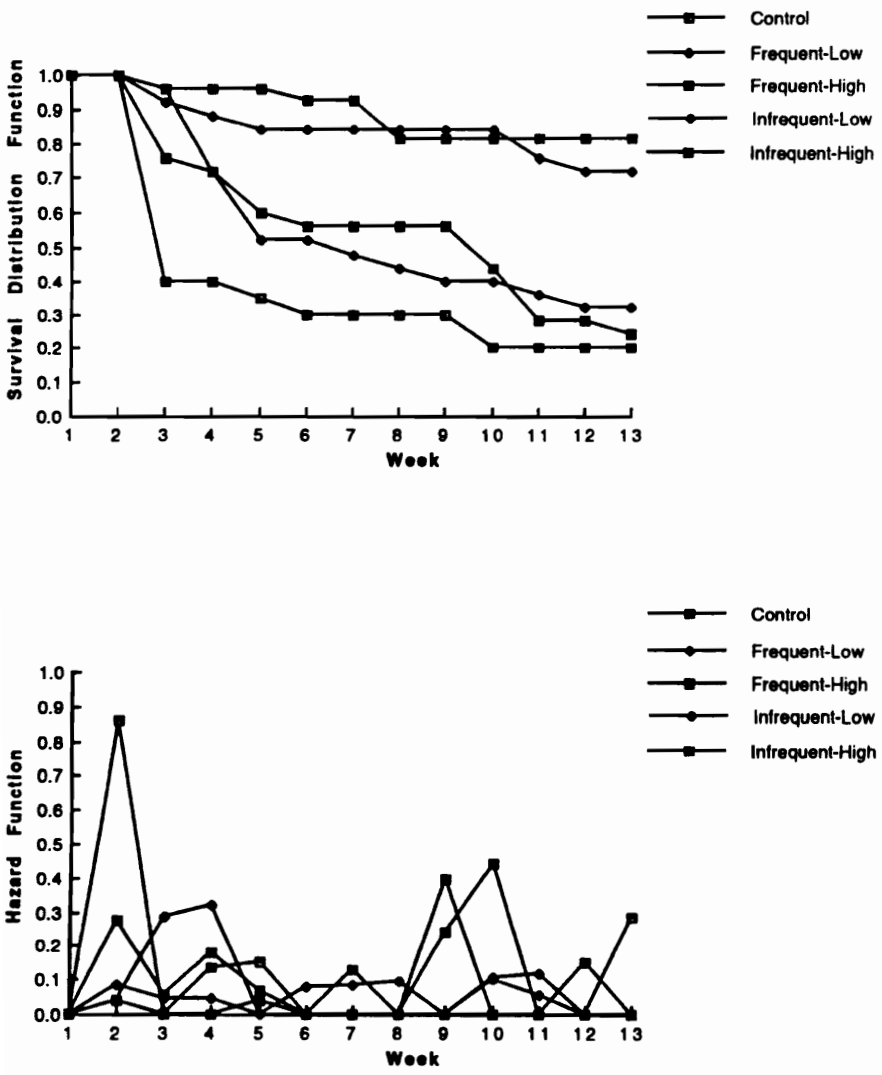


Figure 14. Survival and hazard functions for Dead 3 by condition.

Appendix A

Getting Started **Walkers tour the Drillfield.**

(Photo by Rick Griffiths)

Noon walking program begun

By Jennifer Blackwell, University Relations intern

How would you like to feel great, increase your chances of remaining healthy, and possibly win a prize at the same time? David Lombard from the Center for Research in Health Behaviors would like to help you accomplish a Noon-Time Walking Program on the Virginia Tech Campus.

The goal of the program is to involve more people on the Tech campus in a walking program which will be organized during part of their lunch hour. These individuals will walk on a regular basis on one of the walking paths on campus. Six miles of the campus is covered in walking paths with a new one under construction that will circle the entire campus. These paths are within easy walking distance of all buildings on the campus.

Information is available on how to form these groups by contacting Lombard, director of the program, through the Center for Research in Health Behaviors at 231-8747. When contacting the director, individuals will be given free maps, information on proper ways to begin a walking program, and how to organize a walking group with their friends. Not only does this program give people a chance to exercise, but also to have a good time.

Drop boxes will be available along the paths. Participants can drop a slip of paper into the box with their name and phone number on them. Each week a winner will be chosen from the box and will be awarded a prize for walking.

Appendix B

LET'S WALK!!!

A FREE walking exercise program is being offered for all :

Faculty
Staff
Graduate Students
and
Family

by the Center for Research in Health Behavior and the Department of Psychology at Virginia Tech

The program offers you:

Information on Starting a Walking Group,
Walking Maps of Campus and Other Areas,
Individualized, Personalized Feedback on your progress
Several Possible Health Benefits:
Reduced Risk for Heart Disease, Diabetes, Colon Cancer, Osteoporosis and Lower Cholesterol Levels

All staff are trained in the best techniques to get you walking and keep you walking

For more Information or to Sign-up please call the Project Director, David Lombard at 231-8747

Appendix C

Consent Form
Walking Group Leaders

Description

The purpose of this study is to help you begin and maintain a walking for exercise program for six months. The purpose of this study is also to test the effectiveness of various intervention strategies on the initiation and maintenance of a walking program. As a participant in this project, you will be provided with an informational packet on how to get started, a set of walking maps, and a set of weekly walking exercise logs.

As this is a study to evaluate the effectiveness of various intervention strategies, different participants will receive different intervention packages. The different packages are: 1) feedback and goal setting each week, 2) feedback and goal setting once every three weeks, 3) simply touching base once each week, 4) simply touching base once every three weeks, and 5) no contact after you sign-up. We will randomly assign you to one of these intervention packages. For everyone, this program primarily focuses on walking.

Your participation in this study will last 12 months and include the following responsibilities:

1) attending a short 20 minute initial meeting with the program staff,
2) keeping and sending in weekly exercise logs which may be verified by the researcher,
3) organizing a walking group to walk.

Risks and Benefits

Participation in this walking program may produce certain discomforts (e.g., stiff muscles, minor join pain, and shortness of breath) and may not be advisable for some individuals. If on your survey entitled "PARQ" you answered YES to any item, you should consult a physician, at your own cost, before beginning this program. The program director has

names of several local physicians for referral if needed. If you need to see a physician, please bring a letter from the physician noting his/her recommendation and any possible limitation you may have so we can give you the best program possible.

The discomforts most likely to occur after beginning a walking program are "stiff" leg muscles, minor joint pain, and shortness of breath. If participants follow the program goals, risk of these problems and any others will be minimized. If any problems do occur, the program director has the names of physicians who specialize in sports injuries who you can see at your own monetary cost. Please notify the director of any and all health problems you feel! The "NO Pain, No Gain" motto is <u>not</u> part of this program!

The possible benefits from this program include increased stamina and muscle tone, decreased body fat and weight, and decreased risk for coronary heart disease, hypertension, non-insulin dependant diabetes, and colon cancer. Many people who exercise regularly also state the benefit of reduced stress and overall happier moods.

<u>Informed Consent</u>

I understand that my data will be held confidentially and will be used for research purposes only, without revealing my name. I understand that I may abstain from participation in any part of this study or withdraw from the experiment at any time.

I understand that at random times throughout the program, the reseacher may call one of my walking partners to review the accuracy of the "Weekly Walking Logs."

I understand that it is my personal responsibility to advise the program director of any preexisting or presently occurring medical conditions that may affect my participation in this program. I understand medical referral will be given to

me if I request. I understand that all visits to physicians or any other medical settings will not be paid for by this project. I understand I will have to cover all my personal medical expenses during this project.

I understand this project requires me to perform mild to moderately intensity exercise; walking. Although the risk for injury is minimal, I agree not to hold Virginia Polytechnic Institute and State University or the Project Director responsible for any injuries or financial costs resulting from my participation in this project.

I am not on any medications. If I am, I have informed the project director.

To the best of my knowledge, I do not now, and have not in the past, had any medical or psychological problems or disorders that would negatively affect my participation in the research as described.

I have read the above statements and have had the opportunity to ask questions. I understand that the researcher will, at any time, answer my inquiries concerning the procedures used in this project in a truthful and straightforward manner.

I understand that this research program has been approved by the Psychology Department's Human Subjects Research Committee, and that any questions I may have about the project should be directed to the program director and primary researcher, David Lombard (231-8746), faculuty advisor Dr. Richard Winett (231-8746), Dr. Joseph Franchina, Chair, Human Subjects Committee (231-5664) or Institutional Review Board Chair, Dr. Janet Johnson (231-6077).

I, _____, have read and understood the above information about the research project described. I hereby agree to voluntarily participate under these conditions.

Date _____
Participant Signature_____
Witness_____

Appendix D

The Physical Activity Readiness Questionnaire

PAR-Q is designed to help you help yourself. Many health benefits are associated with regular exercise, and the completion of PAR-Q is a sensible first step to take if you are planning to increase the amount of physical activity in your life.

For most people physical activity should not pose any problem or hazard. PAR-Q has been designed to identify the small number of adults for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable for them.

Common sense is your best guide in answering these few questions. Please read them carefully and circle the YES or NO for each question as it applies to you.

1.	Has your doctor ever said you have heart trouble?	YES	NO
2.	Do you frequently have pains in your heart and chest?	YES	NO
3.	Do you often feel faint or have spells of severe dizziness?	YES	NO
4.	Has a doctor ever said your blood pressure was too high?	YES	NO
5.	Has your doctor ever told you that you have a bone or joint problem, such as arthritis, that has been aggravated by exercise, or might be made worse with exercise?	YES	NO
6.	Is there a good physical reason, not mentioned here, why you should not follow an activity program even if you wanted to?	YES	NO
7.	Are you over age 65 and not accustomed to vigorous exercise?	YES	NO

If you answered YES to one or more questions:

If you have not recently done so, consult with your personal physician by telephone or in person **BEFORE** increasing your physical activity and/or taking a fitness test. Tell him or her what questions you answered YES.

After a medical evaluation, seek advice from your physician as to your suitability for:

- unrestricted physical activity, probably on a gradually increasing basis or
- restricted and supervised activity to meet your specific needs, at least on an initial basis. Check in your community for special programs or services.

If you answered NO to all questions:

If you answered the questions on the PAR-Q accurately, you have reasonable assurance of your present suitability for:

- A GRADUATED EXERCISE PROGRAM--A gradual increase in proper exercise promotes good fitness development while minimizing or eliminating discomfort.
- AN EXERCISE TEST--Simple tests of fitness may be undertaken if you so desire.

Postpone exercise or exercise testing:

- If you have a temporary minor illness, such as a common cold.

Appendix E

Exercise History and Demographic Questionnaire

Please answer the following questions.

Name: _____ Age: _____ Gender : _____

Weight : _____ Height : _____

Office Phone : _____ Home Phone : _____

Department : _____

Marital Status : (Please circle one) Married Divorced Single Widowed

Number of Children : _____

Are you presently on any medications? YES NO

If you are on any medications, please list them:

1) _____ 2) _____ 3) _____

Do you smoke? YES NO

If you do smoke, how many packs a day? _____

If the following statements are true about you, please circle TRUE. If the statement is not true, please circle FALSE.

1)	I am not thinking about beginning any kind of exercise program.	TRUE FALSE
2)	I am thinking about beginning an exercise program.	TRUE FALSE
3)	I've decided to begin an exercise program, but haven't started yet.	TRUE FALSE
4)	I've recently begun an exercise program.	TRUE FALSE
5)	I have been exercising for at least 6 months.	TRUE FALSE
6)	I have started exercise progams in the past, but have never been able to stick with them.	TRUE FALSE
7)	I find it easy to maintain an exercise program for periods of months.	TRUE FALSE
8)	I exercise only once or less a week.	TRUE FALSE
9)	I exercise only on weekends.	TRUE FALSE
10)	I exercise only between two to three times a week.	TRUE FALSE
11)	I exercise four or more times each week.	TRUE FALSE
12)	I generally find exercising boring.	TRUE FALSE

Appendix F

How to Organize a Walking Group or Buddy System

Walking is a simple exercise that you can do in groups or with a friend that can help you to achieve a variety of health benefits. Many people have mentioned that walking in groups of two, three, or four people helps to pass the time and make walking seem like not exercising at all. They also report the fact that having other people counting on them to meet them to walk helps them be consistent and continue walking even on days when they might have skipped without the support of their walking partner(s). For these reasons, walking in a group or with a friend can help your exercise program.

Several questions may arise when you start to organize a group or seek a buddy to walk with.

1) Who should I approach about walking with me?

We suggest you ask people you know; friends or co-workers. These are the people you already know and have things in common with, so you will have plenty to talk about while you walk.

2) What time of day and which days of the week should we walk?

The answer to this question depends on you and the people you are walking with. Ideally, if you share a common lunch hour, you could walk during part of this hour. But, walking before or after work may work best for you and your group. It may help if you figure out what time and days are good for you so you can seek out people who have the same schedule.

3) How often and how long should we walk?

We suggest you start off walking twice a week and for a short period of time (20 minutes) to be sure not to hurt yourself or others in your group. Once you and your partner(s) feel comfortable with this, you could increase the number of days and length of time you walk. Ideally, walking for 20 to 40 minutes on 3 to 4 days each week would offer you maximal health benefits from walking. Also, you should walk at an enjoyable pace where you can still talk to each other. Just remember, increase gradually and do the amount of walking that is pleasurable for you and your partner(s). If you push it to a level that is painful, you may not like it anymore and may discontinue.

4) Should I keep records of our walks?

We find that keeping walking records helps people see their progress and gives them a nice way to see if they have met their goals. For this reason, we are asking you to keep a simple group log each week. On these logs (David Lombard will give them to you) simply enter the date, the place, duration you walked, and first names and phone numbers of your walking partner(s). We would like you partner(s) names and phone numbers so we can offer them information and check with them to validate the information on the "Weekly Walking Logs." Please, send these weekly logs via campus mail to David Lombard, Psychology Department. He will call you each week to see if you need anything or have any concerns. If you have questions, please call David at 231-8747 at the Center For Research in Health Behaviors.

What If...?

Every so often during your walking program, you may have some "What if.." questions. Below, we try to answer some of these possible "What if..." questions.

1) What if it Rains?

An umbrella and a rain coat is all you need to walk in a light rain. You may wish to keep these at your office for the days that it rains. You may already do this. Your walking partner(s) may also already do this. But, if it is raining hard or thundering, you may not want to go out. Instead, you could walk the halls of your building or, for more of a challenge, you could walk the stairs.

2) What if it Snows?

If you dress warmly and are careful of icy sidewalks, there is no reason why your should not walk. Just be careful of ice. Of course, if it is snowing very hard, you may want to walk inside your building or check out the hours of the field house.

3) What if your partner(s) miss a walk?

From time to time, you or one of your walking partners may have to miss a day. If you have to miss a day, we recommend you call or tell someone in your group so they do not wait for you to show up. On the other hand, if someone in your group misses and no one knows why, call her/him to see if everything is alright and see if they will be able to walk next time.

4) What if I get hurt?

Walking is a low intensity, low impact exercise, with a low risk for injury. But, if you do get hurt, we strongly recommend you immediately see your physician. If you do not have one, the Program Director will gladly give you the name of several physicians who specialize in sports injuries who you should see (at your own financial cost). There is no reason to exercise with an injury until a physician tells you you are okay.

5) What if we get bored of our walks?

There are several things you could do to add variety to your walks.

1) You could try some other walking routes.
2) Add more people to your group.
3) Try using hand weights while you walk.
4) Increase the pace you walk at.
5) Make some walks short for a faster pace and some longer at a slower pace.
6) Listen to music while you walk.
7) Plan interesting topics to discus while you walk (e.g., politics, TV, a current event, cooking, or a recent book). In the past some walking groups have had their members read an article or book each week and discus it during their walks.

The bottom line is feel free to do whatever would make your walks more interesting to you and your group.

The Benefits of Walking

For many years Americans have know the many benefits obtained from regular physical activity. Researchers have found regular exercise can help you reduce your risk for coronary heart disease, hypertension, osteoporosis, colon cancer, lower your cholesterol level, and help to manage diabetes, arthritis, and pregnancy. Furthermore, exercise has been shown to relieve depression and stress and affect other psychological states.

There are other, more immediate effects of regular exercise. Weight loss, improved muscle tone and strength and increased flexibility and respiratory capacity may result from regular physical activity.

Choosing walking as your exercise may have some benefits over other exercise choices. First, walking requires no health club membership and no special equipment or training. All you need is a comfortable pair of shoes to walk in. And, there are places all over campus right out your office door to walk. There is the drill field, the duck pond area, the path around campus, and the golf course area. Second, walking is a low impact, low to moderate intensity activity. This makes walking easy for anyone to join in and means it is a low risk for injuries. Third, walking in an exercise that can be enjoyed in a group. Walking in a group or with a partner helps to pass the time and may make your walks more interesting and challenging.

Because walking has these many benefits, we suggest you choose walking for your exercise. Also, we recommend that you walk with a partner or a group to increase your enjoyment of walking. Remember to start out slowly, only a few days each week, and build up to whatever level you feel most comfortable with. Now, it is up to <u>you</u> to start walking your way to a healthier more physically fit life. If you would like more information on walking or creating a walking group, please call the Noon-Time Walkers program director, David Lombard at 231-8747 at the Center for Research In Health Behaviors.

Weekly Walking Log

Your Name: _____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Date							
Time of Day							
Distance (rough estimate)							
Duration							
Place							
Partner: Name Phone							
Partner: Name Phone							
Partner: Name Phone							

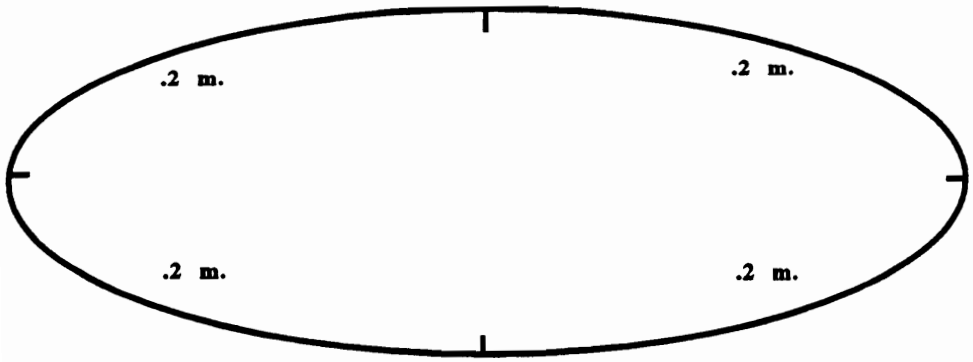
Comments: _____

_____

Please send this log each week to David Lombard, Department of Psychology (0436) through campus mail. If you have any questions, please feel free to call the program director, David Lombard at 231-8747 at the Center for Research In Health Behaviors.

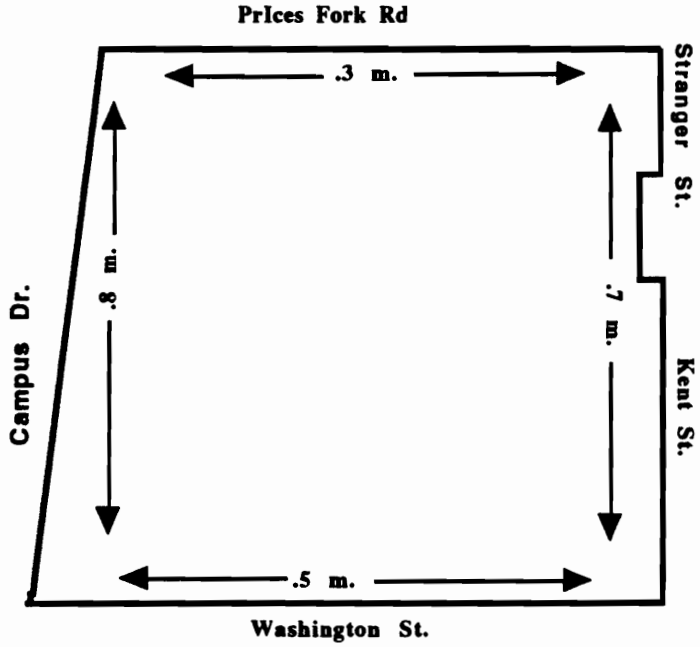
THE DRILL FIELD

1 Lap is .8 Miles



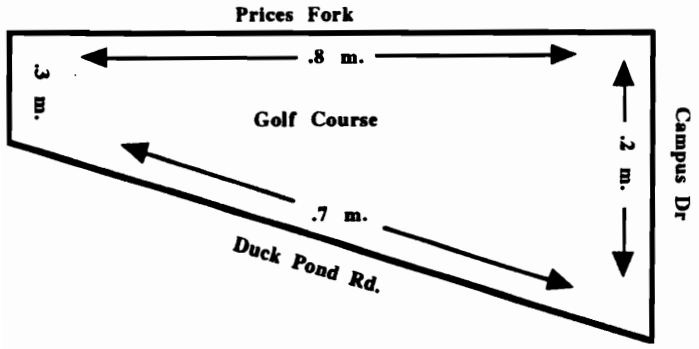
Campus Loop

1 Loop is 2.3 Miles



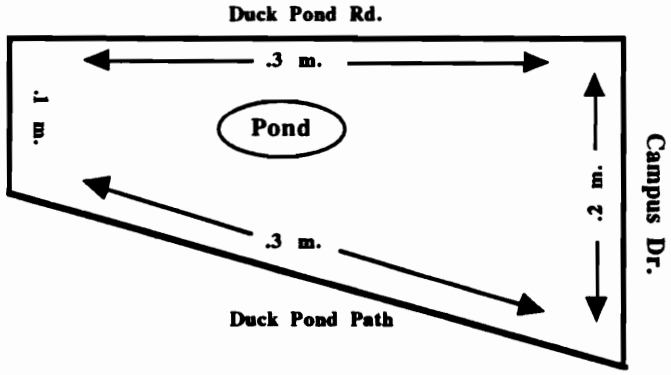
Golf Course Loop

1 Loop is 2.0 Miles



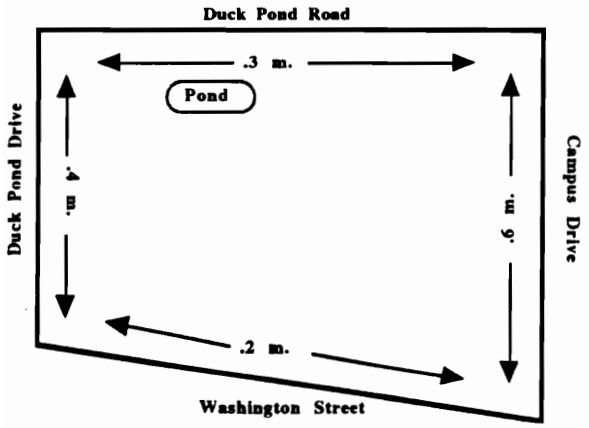
Duck Pond Loop

1 Loop is .9 Miles



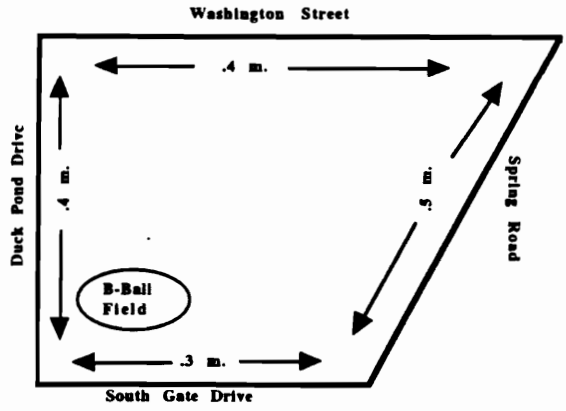
The Long Duck Pond Loop

1 Loop is 1.5 Miles



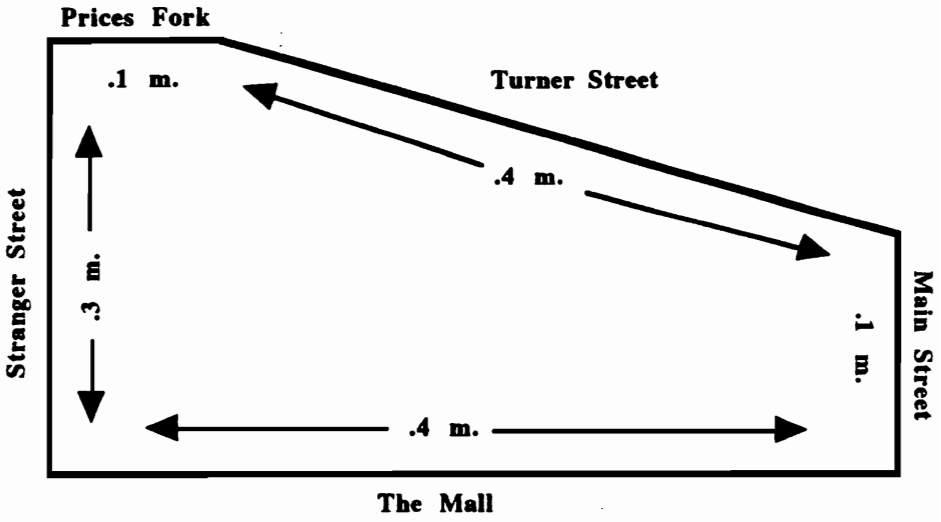
Baseball Field Loop

1 Loop is 1.7 Miles



The Tech Mall Loop

1 Loop is 1.3 Miles



Appendix G

Phone Contact Sheet
Touching Base Condition

Subject: _____ Caller: _____

Date : _____ Duration of Call: _____

Content

1) How is your walking program going?

2) Are you having any problems?

3) "Do you need any more walking log forms?"
YES NO

Appendix H

Phone Contact Sheet
High Content Condition

Subject: _____ Caller: _____

Date : _____ Duration of Call: _____

Content

1) How is your walking program going?

2) Are you having any problems?

3) Give feedback on last weeks logs and their monthly goals.

Fill out before you call:
Did they turn in log: YES NO

What was their Goal last week?
_____
Did they meet their last goal : YES NO

If they met their goals for last week say :

Great, your walking log shows that you were able to meet your goal of ____ for last week.

If they did not meet their goal say:

It looks like you were not able to reach you goal of ____ for last week. Do you think the goal was too high or was it just a bad week for you?

_____4) How about setting a new goal for the next month?

Have them make their goal based on what they did last week and based on what they tell you they want to get out of the program. You can talk in terms of frequency, duration, and intensity of their walks.

Goal :_____

_____

5) "Do you need any more walking log forms?"
YES NO

Appendix I

Walking to Meet Health Guidelines: The Effect of Prompting Frequency and Feedback and Goal Setting

David N. Lombard, Tamara N. Lombard, and Richard A Winett

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Abstract

Assessed the effects of frequency of prompting (phone calls once a week versus once every three weeks) and content of prompting (feedback and goal setting versus "touching base") in a walking program designed to meet ACSM's cardiovascular exercise goals. Survival analysis using six months of data points and using the criteria of walking at least 20 minutes a day for a at least three times per week indicated an effect for more frequent versus less frequent prompting (50% and 15%), but not for feedback and goal setting versus "touching base" prompting (31% and 30%). The results suggested the efficacy of frequent prompting delivered in inexpensive ways as a means to increase exercise adherence and the further parametric study of other basic behavior change strategies.

KEY WORDS: Physical activity promotion, prompting, feedback and goal setting, survival analysis.

Walking to Meet Health Guidelines: The Effect of

Prompting Frequency and Feedback and Goal Setting

The evidence of the importance of regular physical activity for disease prevention continues to mount. Researchers have found physical activity is important for the prevention and management of coronary heart disease (Powell, Thompson, Casperson & Kendrick, 1987), hypertension (Siscovick, LaPorte & Newman, 1985), noninsulin-dependent diabetes mellitus (Siscovick et al., 1985), osteoporosis (Siscovick et al., 1985), obesity, weight loss and weight control (Blair, Jacobs & Powell, 1985), lower rates of stroke (Paffenbarger & Hyde, 1984) and some forms of cancer (e.g., lung, colon, pancreas, and prostate) (Kohl, LaPorte, & Blair, 1988). Not surprisingly, Paffenbarger, Hyde, Wing, and Hsieh (1986) found individuals who are physically active live longer than those who are inactive. The Department of Health and Human Services (DHHS), however, estimates only 22 percent of the U. S. adult population exercises at the level recommended by the American College of Sports Medicine (ACSM) to produce health benefits (DHHS, 1991). Furthermore, Dishman (1988) estimates a six month survival rate 20% for the average exercise program, meaning only 20% of the participants are still exercising after six months. The purpose of the present study (The Noon-Time Walking Program) was to increase the six month survival rate and adherence to the ACSM goals for frequency and duration (20 minutes a day 3 days per week) in a physical activity program by using frequent prompting, feedback and goal setting, self-monitoring, and social support.

Prompting, feedback, goal-setting and social support are effective in increasing and maintaining physical activity as well as other (Kazdin, 1989). King, Taylor, Haskell and DeBusk (1988) found, for example, the addition of prompting (weekly phone calls) to a home based intervention enhanced the adoption of physical activity and increased fitness levels. Wankel and Thompson (1977) found similar results using telephone prompts and Acquista et al. (1988) found

telephone prompts increased adherence to a home-based physical activity program. These studies did not vary the frequency of prompting, thus, it is not clear what is the most parsimonious prompting schedule to attain and maintain desired levels of physical activity.

Martin et al., (1984) systematically assessed group versus individual feedback in a series of physical activity studies. They found individual feedback showed a great initial effect on adherence (77.2%) and during a three month follow-up (54%) to an organized jogging class with adherence defined as attending class twice each week plus exercising on their own once per week. Weber and Wertheim (1989) also found feedback effective in increasing physical activity when combined with self-monitoring. Interestingly, they also found a self-monitoring alone condition performed better than the combined feedback plus self-monitoring condition, raising the question does feedback add anything to the information a person receives from self-monitoring alone?

Several researchers have used goal setting successfully in the physical activity area. Reid and Morgan (1979) and Rhodes and Dunwoody (1980) found goal setting increased adherence to physical activity programs. Martin et al., (1984) conducted as series of studies comparing various methods of goal setting and found flexible, distal goal setting resulted in high initial adherence rates (83%) and follow-up adherence rates (67%). Goal setting appears to be an effective strategy for physical activity promotion research, but the question remains if goal setting will be incrementally effective over self-monitoring.

Social support has repetitively been noted to increase adherence to physical activity. Wankel, Yardly, and Graham (1985) found social support facilitated higher aerobics class attendance than a non-social support condition. Massie and Shephard (1971) also found social support facilitated initiation of physical activity through consistent attendance. Although social support appears effective, simply placing individuals together in a group to exercise does not equal social support, there needs to be some interpersonal liking or cohesion between individuals (King

and Frederikson, 1984). Moreover, most physical activity studies using social support used a group format (e.g., walking groups and aerobics classes). However, use of a "group" does not meet the definition of social support. But, a group format allows ease of program implementation and offers the possibility of social support. Some data do show attendance in group programs is superior to individual programs (Massie & Shephard, 1971; Wankel, Yardley & Graham, 1985). Yet, other researchers show similar adherence for social support (group) and individual conditions (King & Frederikson, 1984). Thus, to more correctly use social support, researchers should tap social support that already exists, such as family or friends. But, will participants be willing to approach their friends or family about exercising with them? Furthermore, will their friends or family consent? If participants were willing to ask friends and family members and if these persons consented, then this method could represent a quick and effective way to create social support within a physical activity program. Further research is needed to answer questions about practical social support approaches.

Reid and Morgan (1979), Oldridge and Jones (1983), and Weber and Wertheim (1989) all found self-monitoring increased physical activity levels. But, the present study used self-monitoring, not as an intervention strategy, but as a manner for collecting data. This raises the question of the validity and reliability of self-monitoring. In the physical activity area, Ainsworth, Jacobs, and Leon (1992) assessed the validity and reliability of self-reported physical activity status and found their subjects' self-reports validated by physiological testing. Sallis, Buono, Roby, Micale, and Nelson (1992) assessed the reliability and validity of seven-day exercise recall. They found test-retest reliabilities ranging from .77 to .93. Thus, past physical activity research has supported the use of self-reports as an outcome variable.

Even though activity self-monitoring may be reliable and valid, we took some conservative steps to increase this data's accuracy. First, instead of a seven-day recall, study

participants filled out the self-report measure daily to further reduce the probability of recall errors. Second, participants exercised with another person and we obtained permission to periodically contact a participant's "exercise partner" to corroborate his/her self-report. In this study, these steps helped increase the validity and reliability of self-monitoring as an outcome measure.

Overall, the "NoonTime Walkers" program was designed to answer several questions. 1. Does frequency of prompting effect program adherence? 2. Does feedback and goal-setting during prompting increase adherence? 3. Does researcher-delivered feedback enhance the effect of participant self-monitoring? 4. Can participants be trained as exercise leaders to create social support? 5. Are support groups sufficient to maintain exercise adherence in absence of prompting, feedback, and goal-setting. 6. Does a program using social support, prompting, self-monitoring, and feedback and goal setting surpass the average 6 month survival rate of 20% noted by Dishman (1988)? 7. Are the rudimentary program elements (e.g., information, minimal support), used in many programs, sufficient to increase and maintain exercise adherence?

Method

Participants

Newspaper advertisement and fliers posted on campus were used to recruit 135 participants from a population of approximately 5,000 staff and faculty members at a large southeastern university. All participants received a 15 minute initial training session where the first or second author reviewed the purpose of the study, conducted initial screening including a stages of exercise behavior change questionnaire, explained how to fill-out weekly walking logs, and how to begin a walking group. The Physical Activity Readiness Questionnaire (PAR-Q) (Blair, 1991) was used to screen participants for possible medical reasons for exclusion. Only one

participant met the exclusionary criteria on the PAR-Q and she received a waiver from her personal physician to participate in the study.

After the initial training session, participants were assigned equally to five prompt conditions using stratified random assignment by stage of exercise behavior change. The prompt conditions were: A) a control condition with no prompting; B) a high frequency/low content prompt; C) a high frequency/high content prompt; D) a low frequency/low content prompt; and E) a low frequency/high content prompt. Over the course of the study, 13 participants dropped-out, by indicating they were no longer willing to send in their weekly walking logs, regardless of whether they walked or not. Thus, the final sample consisted of 122 participants with complete data.

Table 1 summarizes the physical information for the final sample by treatment condition. Although there were no differences between conditions in the initial set of participants, as participants dropped-out of the study, there were some minor differences between the treatment conditions in the final sample (see Table 1). The average participant age was 40, ranging from 20 to 57 and the average weight was 153lb ranging from 120lb to 225lb. The gender frequencies are not shown in Table 1 because almost all the participants were women despite efforts to recruit men. At recruitment, about 97% indicated they were in the "action stage" because they were signing up for this program, not because of any exercise they were currently performing.

Insert Table 1 about here

Design and Duration

The study's design was a 2X2 plus a control group with the two dependent variables frequency of telephone prompt (once a week versus once every three weeks) and content of the

prompt (feedback and goal-setting versus "touching base"). The control condition received no intervention strategies after being recruited beyond a minimal informational program offered to all participants.

The study consisted of three data collection phases. The first phase was the intervention and lasted 12 weeks with data collected each week from each participant. The second phase, follow-up 1, was one week of data collected 1 month after the completion of the intervention period (i.e., week 16). The third phase, follow-up 2, was two weeks of data collected three months after the intervention period (i.e., weeks 23 and 24). At the end of week 12, all phone contacts and prompting ceased. Thus, weeks 16 and 23 and 24 were used to assess short-term maintenance. Overall, 15 sets of weekly data were collected over a 6 month period.

Intervention Goals and Strategies

Intervention goal. There were five basic goals of this program. 1. Increase the percentage of participants who walked each week. 2. Increase the average number of minutes each week the participants walked. 3. Increase the average number of days participants walk. 4. increase the number of participants walked with at least one partner each week. 5. Increase the percentage of participants who met the ACSM goals for frequency and duration of activity each week.

Initial training session. Each participant attended a 15 minute initial training session from which they received walking maps detailing various walking routes with distances noted, handouts on how to enlist walking partners, how to enlist support for walking, and "basic" strategies for starting (i.e., start slowly, work it into your daily routine). Each participant was also given the ACSM related goal to walk at least three times each week for at least 20 minutes each day with a partner.

Social support. Each participant was asked to organize a walking group or at least walk with a partner on a regular basis to create social support for walking. During the initial training session, each participant was given handouts on how to begin a walking group[1] .

Prompting schedule. Research assistants prompted all participants in the four experimental conditions by telephone. The assistants telephoned half the participants once each week (frequent) and the other half once every three weeks (infrequent) during the initial eight weeks of the intervention. During the last four weeks of the intervention, the assistants called the participants in the frequent condition once every second week and the participants in the infrequent condition only once to fade the telephone prompting.

Content of the prompts. The study used 2 different types of prompting content: feedback and goal-setting (high content) versus "touching base" (low content). In the high content condition, research assistants gave the participants specific feedback on frequency, time, and distance walked based on the weekly walking data the participants had sent in to the project. Also, the assistants set walking goals with the participants for the subsequent week or weeks using a highly structured protocol[2]. The mean time for these telephone prompts was three minutes

For the low content condition, during the telephone contact, the research assistants simply asked the participant "How's your walking program going?" They did not give feedback or conduct goal setting during these calls. The average duration of these contacts was one minute.

Implementation and Reliability. The study involved 14 undergraduate research assistants who were randomly assigned to make telephone contact with the participants. All assistants attended three-one hour training sessions where they were given specific scripts for each type of telephone contact. During a fourth session, and three times during the intervention, reliability assessments were conducted (manipulation checks) of the assistants' telephone call behavior through staged calls where other research assistants noted whether the caller was covering the nine

items from the feedback telephone calls or the three items from the "touching base" call. Reliability was calculated as the number of items correctly reviewed divided by the number that were supposed to be reviewed. The reliability estimate before the intervention began was .98, ranging from .96 to 1.0. The three reliability estimates conducted during the intervention were all 1.0.

Although reliability was high, there are still potential research assistant confounds if the same assistant called the same participants each week. To avoid this problem, the assistants were randomly rotated each week for the participants they called. Thus, each participant was contacted by several different assistants over the course of the study, reducing possible research assistant by participant confounds.

Measures

Each week all participants filled-out and sent in by mail to the project a "Weekly Walking Log". During the initial training session, participants reviewed instructions on how to fill-out the logs. On the logs, the participants indicated for each day of the week how many minutes they walked, how many miles they walked, what time of day they walked, where they walked, and the name and day time telephone number of the person they walked with on each occasion. Participants had consented to follow-up calls to their walking partner.

There were five main outcome measures calculated each week for each condition: 1) percentage of participants walking at least one day in a given week in each condition, 2) average minutes walked in each condition, 3) average days walked each week in each condition, 4) average number of partners walked with each week in each condition and, 5) the percentage in each condition walking on at least three days and for at least 20 minutes on each day (or meeting ACSM goal). In each of these outcome measures, non-walkers in each condition were included as well as walkers.

Reliability. Two types of reliability procedures on the walking logs were conducted. First, each week, 15% of that week's weekly logs were randomly selected and the individuals listed as walking partners were called to conduct reliability checks. The first two authors called and asked the participants' walking partners the place (must match exactly), time (match within two hours), and duration (match within 20 minutes) they had walked. Reliability of the individual log was the number of matches divided by three. For example, if a partner correctly noted the place and time they had walked, but not the duration, the reliability estimate for that log would be .67. The overall mean reliability estimate obtained by this method was .90, ranging from .33 to 1.0.

For the second reliability method, weekly walking logs sent in by the participants' partners were checked. We had initially intended on having all the participants' partners send in walking logs, but, because the partners were not recruited, signed-up, or prompted, only 23% sent in logs across the study. However, these logs were used to conduct a comparison of a participant's logs to their partners. The logs were compared to assess if they matched for the time of day (within two hours), the duration (within 20 minutes), and the place (exactly) where they had walked. Reliability was the number correct divided by three. The mean reliability estimate for this measure was .97, ranging from .67 to 1.0. Thus, both reliability estimates (.90 and .97) were acceptable for applied research (Kazdin, 1989).

Results

Raw data Table 2 depicts the week by week values for the four main outcome variables by treatment conditions (see Table 2). Weeks one through 12 are the data corresponding to the 12 week intervention period, week 16 is the one month follow up, and week 23 and 24 are the three month follow up data points. An examination of the overall pattern of results across weeks clearly suggests the efficacy of prompt frequency. For example, during week 24, 70% and 65% of the

participants in the high frequency prompting conditions were still walking, while only 28% and 24% of those in the low frequency prompting conditions and only 5% in the control condition were still walking. Furthermore, even though there was a decline in values for the high frequency of prompt conditions over time, there was a much greater decline in the controls and the low frequency of prompt conditions. The raw data also suggested there was no interaction between the frequency of the prompt and the content of the prompt.

Insert Table 2 about here

RMANOVA's. RMANOVA's conducted on the five main outcome measures indicated a consistent pattern with significant findings for being prompted (control versus experimental conditions) and for increased frequency of prompting, but not for the content of the prompt or the interaction of frequency and content. For example, for the percentage walking in each condition, more participants in the treatment conditions walked each week than those in the control condition ($F(1,120)=17.65$, $p=.0001$) and more participants in the high prompt frequency condition walked each week than the participants in the low prompt frequency condition ($F(1,100)=28.0$, $p=.0001$). Conversely, there was no difference in the percentage of participants who walked each week between the two content conditions ($F(1,100)=.78$, $p=.38$) and no significant finding for the interaction prompt frequency and content ($F=(1,98)=.765$, $p=.384$). The RMANOVA's conducted on the other four outcome measures indicated a similar pattern of significance (see Lombard, 1993 for a complete review of all analyses on the main outcome measures.)

Survival analyses. Statisticians originally designed survival analysis to compare the rates at which patients died across different medical treatment conditions (Cox, 1972). Recently, others have used survival analysis to assess how long it takes for a variety of different events to occur (e.g.,

dropping-out of school; Singer and Willett, 1991). What the researcher must do is specifically define what is to be considered "death" or the target termination criteria. As long as this criterion is specific, observable, and codable in terms of duration (day, weeks, months, etc.), survival analysis can be used to compare the termination rate across groups.

In the present study, the primary target termination criterion was defined as the week after the last week a participant's walking log indicated he/she met the ACSM goals for frequency (3 times or more/week) and duration (20 minutes or more/exercise bout). For example, if a participant met the ACSM goal in week 1-6 and in weeks 9-11 but not in any subsequent weeks, the participant "died" during week 12 . This participant would be assigned the value of 12 weeks for survival analyses. Thus, the survival analysis for this study fit the critical event of discontinuation of exercise meeting ACSM guidelines.

Once the survival values are calculated for each participant, survival analyses next calculated survival distribution functions for each treatment condition. Lastly, the analysis conducts Chi^2's on the slopes of the different survival distribution functions to highlight any differences between conditions (Cox, 1972).

For this study, survival analyses (LIFETEST, SAS, 1990) were conducted using three stratifiers. A stratifier is any method used to delineate treatment groups for analysis. The three stratifiers were: treated (the combined four treatment conditions versus the control condition); prompt frequency (once a week contact conditions versus once every three week contact conditions); and prompt content (feedback and goal setting conditions versus "touching base" conditions). Figure 1 depicts the survival distribution functions (SDF) for each method of stratification (see Figure 1). There are large differences between the SDF's for treated conditions versus the control condition with more participants in the treated conditions surviving beginning at week two and this difference continuing to week 24. The SDF's for high frequency versus the low

frequency prompt conditions shows a similar pattern with the more frequently prompted participants surviving at higher rates. The content SDF's, feedback and goal setting prompts versus "touching base" prompts, did not show any differences in rate of survival between the conditions over the weeks.

Insert Figure 1 about here

Chi^2 values for each set of survival curves indicate there was a significant effect for treated ($Chi^2_{(1)} = 12.74$, $p = .0001$) with higher values for the participants in the treated conditions versus those in the control condition. There was also a significant effect for the frequency of prompting ($Chi^2_{(1)} = 28.99$, $p = .0001$) with the more frequently prompted participants performing better than those prompted every third week. Conversely, there was no significant difference between the content of prompt conditions ($Chi^2_{(1)} = 1.24$, $p = .2731$).

Further survival analyses were conducted using three different definitions of "death" to see if a similar pattern of results would occur. The three definitions of death were: 1) "Dead1W" = the first week a participant failed to walk at all, 2) "Dead3W" = the week concluding a period a participant failed to walk for three consecutive weeks, and 3) "DeadStop" = the week after the last week a participant walked during at least one day. Subsequent survival analyses using these three definitions of "death" reflected the same pattern of results indicated earlier with significant effects for treatment versus control and frequency of prompting, but not for the content of the prompt (see Table 3).

Insert Table 3 about here

Discussion

Overall, this study yielded some potentially useful findings for future projects promoting physical activity. First, increasing the frequency of prompting from once every three weeks to once every week was a successful strategy for increasing the occurrence of the target behavior, walking. Second, the more frequent prompting without feedback and goal-setting was equally effective as the frequent prompting with feedback and goal-setting. Thus, feedback and goal-setting were not successful in increasing the target behavior incrementally when added to frequent prompting. However, the use of self-monitoring logs, as found by Weber and Wertheim (1989), may have obviated the use of feedback and goal-setting.

The following sections will review specific aspects of this study's procedures, both noting how these procedures may be used in other studies as well as some limitations of the present study.

Why prompting worked. Prompting may have worked as hypothesized, as a reminder to walk. Thus, the more frequent the reminder was given, the more frequent the behavior was performed. The prompt might have reminded the participants in this university community about their commitment to a research program and, thus they may have performed the target behavior (walking) to help the authors with their research. Frequent prompting also may have created negative reinforcement, i.e., if a participant had not walked during a given week, during the telephone prompt they might have felt (as one participant stated) they "let the program down." Therefore, to avoid the occurrence of negative affect during the telephone prompts, the participants may have performed the prompted behavior, walking. However, regardless of which explanation is correct, the findings for frequency prompting suggest a simple technique for increasing and maintaining physical activity.

Why did feedback not work? Feedback and goal-setting were not significantly more effective in increasing the target behavior compared to simply asking the participants "How's your walking program going?" This result does not indicate feedback and goal-setting are ineffective strategies for promoting exercise, but may reflect a shortcoming in the program's research design. Possible explanations include: 1) the self-monitoring was a form of feedback all participants had, thus there was no difference across conditions or 2) the question asked in the "touching-base" condition prompted participants to reflect on their past week of exercise, thus providing the opportunity for feedback.

Social support and the delivery system. The ease of creating social support (walking with a partner) and the telephone delivery of this program were encouraging aspects of this program. Participants were simply provided instructions on how to enlist coworkers, friends, and family members as walking partners. However, the overall patterns of results suggest using social support alone did not generate high rates of adherence. Only when social support was coupled with frequent prompting were there higher rates of adherence.

The most effective part of this program, frequency of prompting, was easily deliverable through scheduled phone contacts. These contacts took a mean of 1.5 minutes and cost a mean of $1.00. However, unlike other studies (e.g., King et al., 1988) persons delivering the prompts were not experienced health workers. Rather, they were undergraduate students who received brief, but specific training on a script. The apparent efficacy of such brief training and contact suggests applications of this procedure in settings such as HMO's and other primary care centers. For example, a minimum program fee could be used to pay the costs of brief, but frequent prompts.

Minimal treatment. The control group represented a minimal treatment group. The only intervention these participants received was the recruitment information (consisting of handouts on how to get a walking group started, who to ask, and basic strategies on starting walking and

walking maps with mileage estimates included) and the self-monitoring logs. The data for this treatment group indicated this intervention package had little to no effect. For example, only two participants in this group were walking during the follow-up periods. The minimal treatment group's results are important because this program is similar to some commercial and "do-it-yourself" programs. Given the findings for the minimal treatment group, these types of programs may be suspect because they appear insufficient to maintain physical activity or achieve any health benefits.

Meeting ACSM goals and related health benefits. Survival analyses indicated the more frequently prompted conditions were superior than the other conditions in meeting the ACSM goals for frequency and duration of activity. The ACSM set these goals because they are related to increased health and disease prevention benefits (ACSM, 1990). In this study, 50% of participants in the high frequency prompting conditions were still adhering to the ACSM goals at the 6 month follow-up. This rate was much greater than for participants in the low frequency of prompting condition and also, represents a large increase over the average adherence rate for exercise intervention studies noted by Dishman (20%), and potentially equates to a clinically significant health benefit impact.

Maintenance effect. Telephone prompting continued only through the initial 12 weeks of the program. thus, making weeks 16 and 23 and 24 maintenance data points. The participants received no intervention at all during the week 16 to week 24 period. Evidently, the initial prompts helped to make walking a "habit." Then, without the prompts, the participants continued to walk, thus, showing maintenance of the behavior. This finding suggests the importance of using effective procedures in the early acquisition stage for exercise, so that behaviors can develop and presumably be reinforced.

Gender. By far, women were more inclined to respond to the recruitment information than men. Out of a potential population of over 5,000 individual (with about 50% men and women), only 3 men inquired about and joined the walking program, while over 150 women inquired about the program. In order to better understand why the program did not appeal to men an informal interview was conducted with 22 men from the targeted community. The majority of the men (N=21) indicated they did not believe walking was "exercise." Furthermore, most (N=15) believed walking offered no health benefits. Given these findings and the name of this program ("NoonTime Walkers"), it was concluded men did not join because they did not believe they would benefit from a walking exercise program. Therefore, to target men for recruitment, future research needs to offer physical activities men believe are "exercise" and offers them health benefits or start with information and education for men about the benefits of walking.

Future Research Directions

The results from this study suggest several different future research inquires. Questions generated by the present study include: (1) At what level of frequency of prompting do you maximize its effectiveness based on both short-term and long-term adherence to ACSM guidelines? (2) Was the interaction between the participant and the research assistant during the telephone prompt important, or would a voice mail or computer mail delivered prompt be equally as effective as the personally delivered prompts (this would offer an effective low monetary and time cost delivery system)? (3) Would the package approach used in this study be successful for other target populations (e.g., men) and other target physical activities (e.g., running, biking, aerobics)?

Lastly, given the findings for the behavioral techniques used in this study, future physical activity promotion researchers may want to conduct more parametric studies applying specific behavior techniques (Kazdin, 1989). A number of past physical activity researchers have used

behavior change strategies in a less then optimal "apply it and see if it works" manner. If a strategy did not work, it was concluded the strategy was ineffective strategy and another strategy was tried. If a strategy did work, it was then recommended all programs use it. The present study suggests a more fine grain approach to studying intervention strategies for promoting adherence, an approach which has proven effective in other areas of behavior change (Kazdin, 1989).

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Footnotes

[1]Reprints of these handouts can be obtain from the first author upon request

[2]The reader can obtain the feedback protocol from the first author upon request.

Table 1. Physical characteristics of the participants completing the intervention.

		Treatment Condition				
		Control	Frequent Feedback Goal-setting	Frequent Touching Base	Infrequent Feedback Goal-setting	Infrequent Touching Base
N		20	27	25	25	25
Age (years)	M	41.8[a]	36.7[a]	40[a]	40.8[a]	43.1[a]
	SD	13	10.6	7.3	8.2	9.7
Weight (lb)	M	140[b]	150[a,b]	147[a,b]	152[a]	167[a]
	SD	33	21	21	34	38
Body Mass Index	M	22.56[a]	23.59[a]	23.12[a]	24.50[a]	25.92[a]
Stage Of Readiness	M	2.7[a]	3.9[b]	3.7[a,b]	4.0[b]	3.7[a,b]
	SD	1.4	1.1	1.6	.87	1.1
Smokers	N	3	3	6	0	0

Note: Means with different subscripts differ significantly at $p < .05$. Chi-square for smokers was significant at .02. For stage of readiness 1=precontemplation, 2=contemplation, 3=preparation, 4=action, and 5=maintenance.

Table 2. A review of the major outcome variables over the 24 weeks by treatment condition.

Variables By Condition	Weeks														
	1	2	3	4	5	6	7	8	9	10	11	12	16	23	24
Percentage Walking															
Control	35	25	25	10	30	20	30	10	10	20	20	10	10	10	5
Freq/No FB	92	88	84	76	64	84	72	72	68	44	32	28	72	72	70
Freq/Hi FB	93	85	96	93	85	82	70	70	78	74	74	74	67	66	65
InFreq/No FB	84	68	40	40	32	40	32	36	28	32	24	32	32	28	28
InFreq/Hi FB	76	56	44	48	48	48	49	36	24	24	16	8	28	24	24
Average Minutes/Week															
Control	54	66	46	28	79	42	40	40	30	42	65	27	28	28	19
Freq/No FB	125	116	122	82	84	99	86	84	88	35	25	33	55	64	63
Freq/Hi FB	84	156	144	99	98	87	89	91	93	96	83	85	78	79	80
InFreq/No FB	98	108	79	54	47	51	44	57	40	35	24	24	34	24	23
InFreq/Hi FB	55	64	42	58	35	35	43	36	30	35	11	11	35	29	30
Average Days/Week															
Control	1.6	1.4	1.1	.6	1.4	1.0	1.7	.6	.6	1.3	1.3	.6	.5	.5	.25
Freq/No FB	2.5	3.2	2.5	1.7	1.7	2.9	2.3	2.4	2.2	1.1	.6	1.0	2.4	2.5	2.5
Freq/Hi FB	2.5	3.4	2.9	2.9	2.7	2.7	2.5	2.3	2.6	2.5	2.4	2.2	2.1	2.2	2.2
InFreq/No FB	2.7	2.2	1.3	1.0	.9	1.4	1.0	1.2	1.0	.8	.7	.7	.7	.6	.6
InFreq/Hi FB	2.1	2.2	1.6	1.7	1.2	1.2	1.2	1.0	.9	1.0	.5	.3	1.0	.9	.9
Average Number of Partners/Week															
Control	1.0	.9	.8	.1	.8	.6	1.0	.1	.1	.8	.8	.2	.2	.2	.1
Freq/No FB	1.9	1.6	1.4	1.1	.7	1.1	1.1	1.0	.8	.8	.6	.6	1.4	1.2	1.2
Freq/Hi FB	1.7	1.6	1.9	1.8	1.2	1.7	1.3	1.2	.8	1.2	1.1	1.1	1.0	1.1	1.2
InFreq/No FB	1.4	1.2	.6	.7	.6	.7	.6	.5	.4	.6	.4	.5	.5	.4	.6
InFreq/Hi FB	2.0	.9	.4	.8	.8	.7	.8	.4	.6	.4	.2	0.0	.4	.4	.8
Percentage Met ASCM															
Control	35	25	25	10	30	20	30	10	10	20	20	10	10	10	5
Freq/No FB	32	64	40	16	24	60	40	48	48	12	30	28	52	52	56
Freq/Hi FB	41	74	60	70	63	63	63	41	59	56	48	44	41	41	40
InFreq/No FB	52	40	32	24	24	36	20	32	24	20	20	20	16	12	12
InFreq/Hi FB	28	40	32	36	8	24	20	24	16	24	8	8	24	16	16

Table 3. Chi^2 values from LIFETEST analyses performed using four different definitions of death with the independent variables treated, frequency, and content

"Death" Stratifier	df:	Chi^2	p value
ACSM			
Treated	1	12.74	.0001
Frequency	1	28.99	.0001
Content	1	1.24	.2731
Dead1W			
Treated	1	24.08	.0001
Frequency	1	38.32	.0001
Content	1	1.35	.2456
Dead3W			
Treated	1	23.46	.0001
Frequency	1	40.93	.0001
Content	1	.007	.9387
DeadStop			
Treated	1	23.66	.0001
Frequency	1	45.11	.0001
Content	1	1.25	.2630

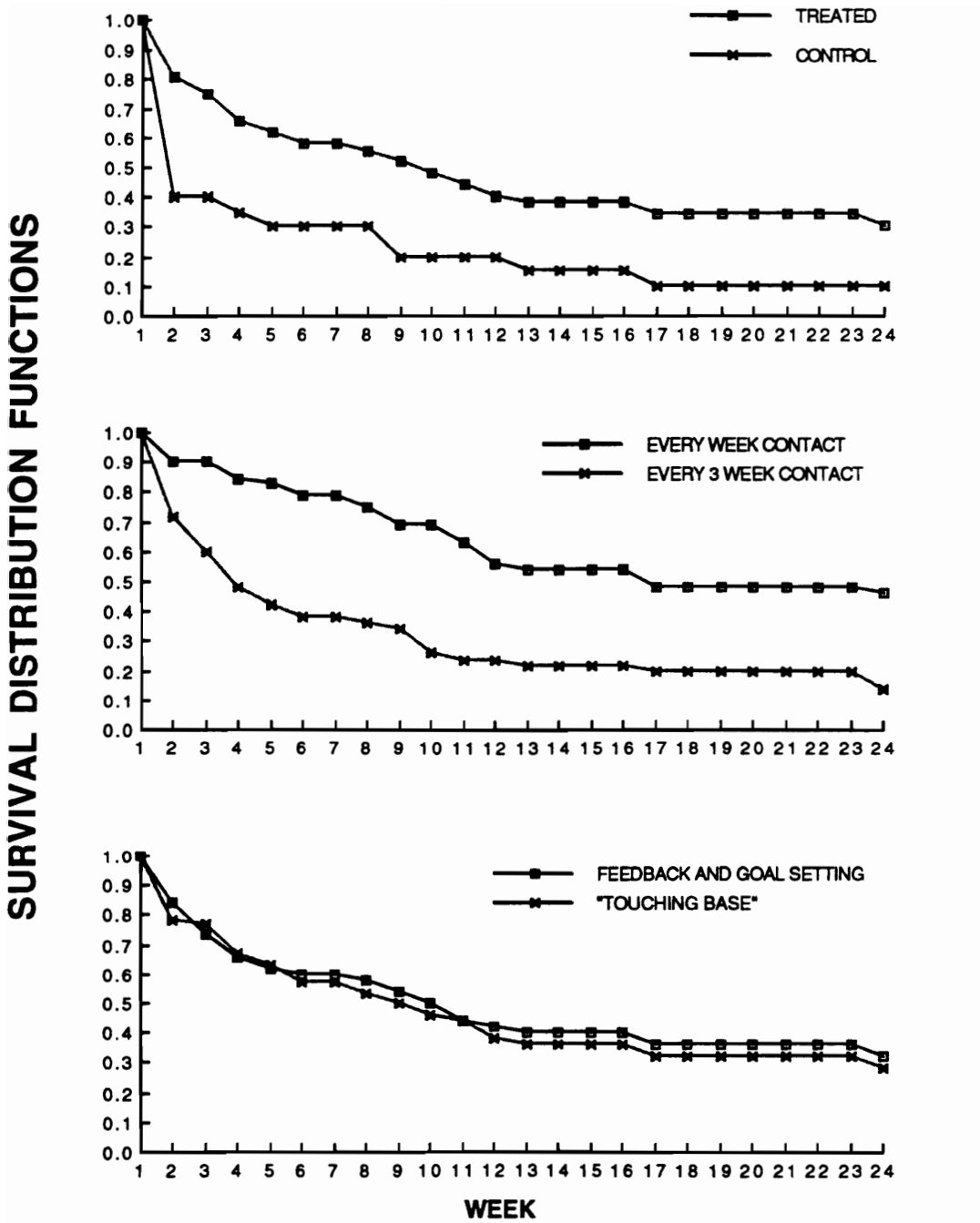

Figure 1. Survival functions for various definitions of death.

CURRICULUM VITA
1993

DAVID NEUBAUER LOMBARD

PERSONAL INFORMATION

Birth Date:	June 30, 1966
Birth Place:	Islip, Long Island
Marital Status:	Married
School Address:	Department of Psychology Derring Hall Virginia Polytechnic Institute and State University Blacksburg, VA 24061
School Phone:	(703) 231-8746
Home Phone:	(703) 552-8187

EDUCATION

September 1991-Present

Virginia Polytechnic Institute and State University
Blacksburg, Virginia
Doctoral program
Area of Specialization: Clinical Health Psychology
Major advisor: Dr. Richard Winett
Dissertation: Increasing Exercise Adoption: Effects of Feedback, Goal Setting, and Prompting in a Community Walking Program
Chair: Dr. Richard A. Winett

September 1989-May 1991

Virginia Polytechnic Institute and State University
Blacksburg, Virginia
Masters program
Area of Specialization: Clinical Health Psychology
Major advisor: Dr. Richard Winett
Thesis: Skin Cancer and Preventive Behaviors: Effects of Posted Prompting, Feedback and Peer Leader Modeling
Chair: Dr. Richard A. Winett

July 1991

University of Virginia
Charlottesville, Virginia
State Forensic Training

September 1984-April 1989

University of Florida
Gainesville, Florida
B.S. awarded April 1989
Major: Psychology
Thesis: The Differential Effects of Systematic Desensitization on Social Phobia Versus Agoraphobia
Chair: Dr. Peter Lang

POSITIONS HELD

August 1991 - Present
Graduate Project Assistant
Community Intervention to Reduce AIDS Risk Behavior
NIMH grant
Center for Research in Health Behavior,
Department of Psychology, Blacksburg, Virginia
Supervisor: Dr. Richard A. Winett
Duties: Conduct AIDS Prevention Intervention Groups, Data Collection

August 1992 - Present
Graduate Teaching Assistant
Abnormal Psychology
Supervisor: Dr. Joseph Sgro
Duties: Teach Undergraduate Abnormal Psychology Class (125 Students)

January 1992 - Present
Research Assistant & Statistician
College Intervention to Reduce AIDS Risk Behavior
NIMH grant
Deborah Webster Dissertation,
Department of Psychology, Blacksburg, VA
Supervisor: Dr. Deborah Webster
Duties: Grant Preparation Consultant, Conduct AIDS Prevention Intervention Groups, Bio-statistical Analyses

November 1990 - August 1991
Graduate Research Assistant
Community Intervention to Reduce AIDS Risk Behavior
NIMH grant
Center for Research in Health Behavior,
Department of Psychology, Blacksburg, Virginia
Supervisor: Dr. Richard Winett
Duties: Data Collection

January 1990 - August 1990
Research Assistant & Statistician
College Intervention to Reduce AIDS Risk Behavior
Kathy Sikkema Dissertation,
Department of Psychology, Blacksburg, VA
Supervisor: Dr. Kathy Sikkema
Duties: Conduct Intervention, Bio-statistical Analyses

October 1989- October 1990
Graduate Research Assistant
Nutrition Grant for the National Cancer Institute
Center for Research in Health Behavior,
Department of Psychology, Blacksburg, Virginia
Supervisor: Dr. Richard Winett
Duties: Subject Recruitment, Data Analysis

October 1989-
December 1989

Graduate Teaching Assistant
Introductory Psychology Department of Psychology
Virginia Polytechnic Institute and State University
Blacksburg, Virginia
Supervisor: Dr. Joseph Sgro
Duties: Teach Introduction to Psychology Discussion Course (4 Sections)

January 1989-
April 1990

Research Assistant
Anxiety Disorders Clinic
Psychology Department, University of Florida
Supervisor: Dr. Peter Lang
Duties: Data Collection, Conduct Systematic Desensitization, Conduct Psychophysiological Assessments

POSITIONS PENDING

March 1993-
July 1994

Co-Principal Investigator
2 year Community Skin Cancer Prevention Program
American Cancer Society Grant
Center for Research in Health Behaviors
Blacksburg, Virginia
Duties: Wrote originally submitted grant, Coordinate implementation of the grant

Professional Affiliations Positions and Honors

Association for Behavioral Analysis	(1991-present)
Society of Behavioral Medicine	(1991-present)
Society for Psychophysiological Research	(1989-1990)
Graduate Student Representative to Clinical Faculty	(1991-1992)
Psychology Graduate Student Excellence Tuition Scholarship	(1991-1992)
Psychology Graduate Teaching Excellence Tuition Scholarship	(1992-1993)

CLINICAL EXPERIENCE

August 1992-
Present

Student Clinician and Supervisor
Psychological Services Center
Virginia Polytechnic Institute and State University
Supervisor: Dr. Thomas Ollendick
Duties: Individual Psychotherapy and Assessments, Supervisor Second Year Clinical Students

August 1992-
Present

Cardiac Rehabilitation
Cardiac Rehabilitation Center
Virginia Polytechnic Institute and State University
Supervisor: Dr. Doug Southard
Duties: Psycho-Social Assessments, Smoking Cessation Treatment, Relaxation Training, Individual and Couples Psychotherapy, Organize Inter-Disciplinary Clinical Team Meetings

December 1991-
Present

Health Education Workshop
Topic: Men's Health and Gender Issues
Student Health Services
Virginia Polytechnic Institute and State University
Supervisor: Joanne Underwood, M.S., R.N.
Duties: Create, Coordinate, and Implement Undergraduate Men's Groups

August 1991-
Present

Health Education Workshops
Topics: Sex, Alcohol, STD's, AIDS, & Relationship Issues
Student Health Services
Virginia Polytechnic Institute and State University
Supervisor: Joanne Underwood, M.S., R.N.
Duties: Conduct Workshops within the Undergraduate Community

August 1991-
June 1992

Forensic Evaluator
Radford Community Service Board
Radford, Virginia
Supervisor: Dr. Dennis Cropper
Duties: Conduct Competency to Stand Trial and Mental Status at the Time of the Offense Assessments

August 1991-
June 1992

Group Facilitator
AIDS Prevention Project
Hollins College, Roanoke, Virginia
Supervisor: Dr. Deborah Webster
Duties: Conduct Intervention Groups Within the all Female Campus

December 1991-
February 1992

Group Facilitator
AIDS Prevention Project
Wilmington, North Carolina
Supervisor: Dr. Laurie Desiderato
Duties: Conduct Intervention Groups

December 1990-
February 1991

Group Facilitator
AIDS Prevention Project
Parkersburg, West Virginia
Supervisor: Dr. Laurie Desiderato
Duties: Conduct Intervention Groups

June 1991-
August 1991

Psychology Intern
Southwest Virginia Mental Health Institute
Marion, Virginia
Supervisor: Dr. Cynthia McClure
Duties: Acute Admissions Psychological Assessment, Individual Psychotherapy, Psychological Evaluations, Competency to Stand Trial Evaluations, Competency Restoration

September 1990-
April 1991

Student Clinician
Psychological Services Center
Virginia Polytechnic Institute and State University
Supervisors: Dr. George Clum & Dr. Jack Finney
Duties: Psychological Assessments, Individual, Couples, and Group Therapy

September 1989-
April 1990

Student Clinician
Psychological Services Center
Virginia Polytechnic Institute and State University
Supervisors: Dr. George Clum & Dr. Robert Stephens
Duties: Psychological Assessments, Individual, Couples, and Group Therapy

January 1987-
April 1989

Student Clinician
Anxiety Disorders Clinic
SHANDS Hospital
Psychology Department, University of Florida
Supervisors: Dr. Chris Patrick, Dr. Peter Lang, & Dr. Barbara Melamed
Duties: Conduct Systematic Desensitization and Psychophysiological Assessments, Data Collection

April 1986-
August 1986

Mental Health Associate
Fair Oaks Hospital
Boca Raton, Florida
Duties: Daily Patient Care, Monitoring of Patients on Evaluation Unit

April 1986 -
August 1986

Crisis Hotline Associate
305-Suicide
State of Florida
Duties: Answer Hotline Calls

April 1986-
August 1986

Addiction Hotline Associate
1-800-Cocaine
Boca Raton, Florida
Duties: Answer Hotline Calls

VOLUNTEER CLINICAL PARTICIPATION

August 1990- Present	**AIDS Education Committee** New River Valley AIDS Coalition **Duties:** Coordinate Community Education Programs
August 1991- Present	**AIDS Client Service Committee** New River Valley AIDS Coalition **Duties:** Coordinate Community Services for Individuals Living with AIDS
August 1991- Present	**AIDS Support Group** New River Valley AIDS Coalition **Duties:** Co-facilitate Bi-weekly HIV+ Support Group
August 1990- Present	**AIDS Education Committee** Virginia Polytechnic Institute and State University **Duties:** Help Set University HIV/AIDS Policies, Coordinate Education Programs
August 1990- September 1991	**Date Rape Workshop Coordinator** Virginia Polytechnic Institute and State University **Supervisor:** Dr. Richard Eisler **Duties:** Create and conduct Date Rape Awareness and education workshops within the campus community
December 1991	**"How to Talk to Your Kids About AIDS"** Community Workshop **Duties:** Create, Coordinate, and Conduct Workshop on talking with children and adolescents about AIDS

PUBLICATIONS

Lombard, D., Neubauer, T.E., Canfield, D., & Winett, R.A. (1992). Skin Cancer and Preventive Behavior: Effects of Posted Prompting Feedback and Peer Leader Modeling. Journal of Applied Behavior Analysis.

Kelly, A.K., Solomon, L.J., Roffman, R. A., Winett, R. A., Sikkema, K.J., Stevenson, L.Y., Kalichman, S.C., Koob, J.J., Yaffe, D. M., Steiner, S., Perry, M., Norman, A.D., Morgan, M.G., Lombard, D., Lemke, A. L., Hauth, A.C., Desiderato, L.L., Flynn, B.S., & Ayotte, D.R. (1992) AIDS/HIV risk behavior among gay men in small cities: Findings of a 16-city national sample. Archives of Internal Medicine, 152, 2293-2297.

Moore, J. F., Winett, R. A., Wagner, J. L., Neubauer, T.E., Walker, W. B., Hite, L. A., Leahy, M., Walberg, J. L., Lombard, D. & Mundy, L. (1990). Nutrition for a Lifetime, Promoting NCI dietary guidelines through interactive systems in supermarkets. Proceedings of the Society for Applied Learning Technology 8th Conference on Interactive Instructional Delivery, Orlando, February.

Southard, D.R., Winett, R.A., Walberg-Rankin, J.L., Neubauer, T.E., Donckers-Roseveare, Burkett, P.A., Gould, R., Lombard, D., & Moore, J.F. (1992). Increasing the effectiveness of the National Cholesterol Education Program: Dietary and behavioral strategies. Annals of Behavioral Medicine.

Winett, R. A., Moore, J. F., Wagner, J. L., Hite, L. A., Neubauer, Leahy, M., Walberg, J. L., T. E., Walker, W.B., Lombard, D., Geller, E.S., & Mundy, L. (1991) Altering shoppers food purchases to meet nutritional guidelines: An interactive information system. Journal of Applied Behavior Analysis, 24, 95-105.

Winett, R. A., Wagner, J. L., Moore, J. F., Hite, L. A., Neubauer, T.E., Leahy, M., Walberg, J., Walker, W. B., Arbour, D., Lombard, D., Geller, E. S., & Mundy, L. (1991) Experimental evaluation of an interactive system for promoting nutrition in the supermarket. Health Psychology, 10(1), 75-78.

Winett, R. A., Moore, J. F., Walberg-Rankin, J., Hite, L. A., Neubauer, T. E., Lombard, D., Mundy, L. L. (1991) Conceptual and strategic considerations for effective supermarket interventions. Conference Proceedings: Promoting Dietary Change in Communities: Applying Existing Models of Dietary Change to Population-Based Intervention. National Cancer Institute.

Publications Under Review

Lombard, D. N. & Winett, R.A. An integrated model for large scale behavior change: An integration of social marketing, segmentation and stages of behavior change strategies.

GRANT PROPOSALS WRITTEN

Winett, R.A., Lombard, D.N., Lombard, T.N. A community skin cancer prevention program at public swimming pools. Funding Approved 11/08/92 for $130,000 over two years from the American Cancer Society..

PRESENTATIONS and SYMPOSIA

Lombard, D.N., Lombard, T. N., Winett, R.A., (January, 1992) Increasing exercise adherence through feedback, goal-setting, and prompting: A pilot study. Poster presented to the Southeast Sport and Exercise Psychology Symposium. Greensboro, NC.

Lombard, D., Neubauer, T.E., Canfield, D., & Winett, R.A., (1991). Skin cancer and prevention behavior: Effects of posted prompts, feedback, and peer leader modeling. Behavior Community Psychology: For the Health of a Planet and its Residents. Chairperson: E. Scott Geller. Symposium proposal for the 17th Annual Convention of the Association for Behavior Analysis: International Atlanta, GA.

Lombard, D., Neubauer, T.E., Canfield, D., & Winett, R.A. (March, 1991). Skin Cancer and Preventive Behavior: Effects of Posted Prompting Feedback and Peer Leader Modeling. Paper presented at the Twelfth Annual Meeting for the Society of Behavioral Medicine, Washington, D.C.

Kelly, A.K., Solomon, L.J., Roffman, R. A., Winett, R. A., Sikkema, K.J., Stevenson, L.Y., Kalichman, S.C., Koob, J.J., Yaffe, D. M., Steiner, S., Perry, M., Norman, A.D., Morgan, M.G., Lombard, D., Lemke, A. L., Hauth, A.C., Desiderato, L.L., Flynn, B.S., & Ayotte, D.R. (November, 1992).Producing HIV risk behavior change among gay

men in small cities by community diffusion of innovation: Results of a 16-city randomized field trial. Poster presented at American Public Health Associations 120th annual meeting.

Kelly, A.K., Solomon, L.J., Roffman, R. A., Winett, R. A., Sikkema, K.J., Stevenson, L.Y., Kalichman, S.C., Koob, J.J., Yaffe, D. M., Steiner, S., Perry, M., Norman, A.D., Morgan, M.G., Lombard, D., Lemke, A. L., Hauth, A.C., Desiderato, L.L., Flynn, B.S., & Ayotte, D.R. (1991). Randomized multiple-city trial of community-level intervention to alter population HIV/AIDS risk taking behavior. Abstract submitted to American Psychological Association 1992 meeting.

Moore, J. F., Winett, R. A., Wagner, J. L., Neubauer, T.E., Walker, W. B., Hite, L. A., Leahy, M., Walberg, J. L., Lombard, & Mundy, L. (1990). Nutrition for a Lifetime. Promoting NCI dietary guidelines through interactive systems in supermarkets. Paper presented as the Society for Applied Learning Technology's 8th Conference on Interactive Instructional Delivery, Orlando, February.

Neubauer, T.E., Lombard, D., Gould, R.A., Winett, R.A. & Donckers-Roseveare, K. (1991). Investigation in Cholesterol Reduction Utilizing Standard Treatment versus Intensive Treatment Protocols. Paper presented at the Twelfth Annual Meeting for the Society of Behavioral Medicine, Washington, D.C., March.

Neubauer, T.E., Gould, R.A., Lombard, D., Donckers-Roseveare, K., Burkett, P.A., Winett, R.A., Southard, D.R., & Walberg, J. (March, 1991). Investigation in Cholesterol Reduction Utilizing Standard Treatment versus Intensive Treatment Protocols. Paper presented at the Twelfth Annual Meeting for the Society of Behavioral Medicine, Washington, D.C.

Neubauer, T.E., Gould, R.A., Lombard, D., Donckers-Roseveare, K., Burkett, P.A., Winett, R.A., Southard, D.R., & Walberg, J. (1991) Impact of frequent contact and feedback on cholesterol reduction. Behavior Community Psychology: For the Health of a Planet and its Residents. Chairperson: E. Scott Geller. Symposium for the 17th Annual Convention of the Association for Behavior Analysis: International Atlanta, GA.

Sikkema, K. J., Lombard, D., Winett, R.A., Blalock, J.A., & Vaught, D.R. (March, 1991). College Women's HIV Prevention Skills Training Intervention. Paper presented at the Twelfth Annual Meeting for the Social of Behavioral Medicine, Washington, D. C.

Winett, R. A., Moore, J. F., Wagner, J. L., Hite, L A., Leahy, M., Walker, W. B., Neubauer, T. E., Lombard, D., & Mundy, L. (1989). Nutrition for a Lifetime System: Experimental Evaluation. Presentation to the National Cancer Institute's Principal Investigators Conference on Nutrition Promotion. Rockville, December.

SYMPOSIA (Pending)

Lombard, D.N., Lombard, T.N. & Winett, R.A., (1993). Increasing exercise adherence through the use of intervention agents, prompting, feedback, and goal setting. Chairperson: E. Scott Geller. Symposium for the 1993 Annual Convention of the American Psychchological Society, Chicago,Illinois.

Lombard, T.N., Lombard, D.N., & Winett, R.A., (1993). Increasing and maintaining physical activity using telephone prompting, goal-setting and feedback within a medical setting. Chairperson: E. Scott Geller. Symposium for the 1993 Annual Convention of the American Psychology Society, Chicago, Illinois.

Lombard, D.N., Lombard, T.N. & Winett, R.A., (1993). Using Activly caring intervention agents to organize and maintain communiyt walking groups Chairperson: E. Scott Geller. Symposium for the 1993 Annual Convention of the Association for Applied Behavior Analysis, Chicago, IL.

EDITORSHIP

January 1, 1992 - Present	**Journal of Community Psychology** Student Reviewer
February 1992 - Present	**Journal of Applied Behavior Analysis** Guest Reviewer