Stages of change of exercise behavior : relationships with other health behaviors
by Catherine Elaine Costakis

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Health and Human Development
Montana State University

Abstract:
The Stages of Change Model has been useful in explaining how people change health behaviors. Although this model has been used in numerous investigations to examine how people change single health behaviors, few researchers have used this model to investigate the change process when multiple behaviors are involved. The purpose of this study was to determine if the stages of exercise adoption were associated with other health behaviors. The health behaviors included in this study were cigarette and smokeless tobacco use, seat belt nonuse, alcohol use, and nonregular use of stress management practices. The researcher hypothesized that respondents in the later stages of exercise adoption would practice more healthful behaviors than respondents in the earlier stages. Survey research was conducted, using a sample of 1,896 university employees, to obtain the demographic, socioeconomic and behavioral information used in this study. The survey response rate was 68%. Logistic regression analysis was used to determine if stage of exercise predicted the presence of each of the health behaviors while controlling for demographic, socioeconomic, and other health behavior variables. Respondents in the later stages of exercise adoption were less likely to be cigarette smokers, more likely to use their seat belt regularly, and more likely to use regular stress management practices than respondents in the earliest stage of exercise. Hence, encouraging individuals to become more involved in exercise could indirectly influence other lifestyle behaviors. Exercise has been found to have therapeutic effects in relation to a variety of chronic diseases and could be a possible "gateway" behavior towards healthier lifestyle choices.

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Catherine Elaine Costakis

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

Timothy A. Dunnagan, EdD
Chairperson, Graduate committee — (Signature) — 1/16/98 (Date)

Approved for the Department of Health and Human Development

Ellen Kreighbaum, PhD
Department Head — (Signature) — 1/16/98 (Date)

Approved for the College of Graduate Studies

Joseph J. Fedock, PhD
Interim Graduate Dean — (Signature) — 1/21/98 (Date)

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Date 1-16-98

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ABSTRACT

The Stages of Change Model has been useful in explaining how people change health behaviors. Although this model has been used in numerous investigations to examine how people change single health behaviors, few researchers have used this model to investigate the change process when multiple behaviors are involved. The purpose of this study was to determine if the stages of exercise adoption were associated with other health behaviors. The health behaviors included in this study were cigarette and smokeless tobacco use, seat belt nonuse, alcohol use, and nonregular use of stress management practices.. The researcher hypothesized that respondents in the later stages of exercise adoption would practice more healthful behaviors than respondents in the earlier stages. Survey research was conducted, using a sample of 1,896 university employees, to obtain the demographic, socioeconomic and behavioral information used in this study. The survey response rate was 68%. Logistic regression analysis was used to determine if stage of exercise predicted the presence of each of the health behaviors while controlling for demographic, socioeconomic, and other health behavior variables. Respondents in the later stages of exercise adoption were less likely to be cigarette smokers, more likely to use their seat belt regularly, and more likely to use regular stress management practices than respondents in the earliest stage of exercise. Hence, encouraging individuals to become more involved in exercise could indirectly influence other lifestyle behaviors. Exercise has been found to have therapeutic effects in relation to a variety of chronic diseases and could be a possible "gateway" behavior towards healthier lifestyle choices.

CHAPTER 1

INTRODUCTION

A radical shift in the causes of death in the United States has occurred within the past century. In 1900 the three leading causes of death were infectious diseases: 1) pneumonia and influenza, 2) tuberculosis, and 3) diarrhea and enteritis (e.g., distemper) (Rosenberg, Ventura, Maurer, et al., (1996). Infectious diseases were brought under control primarily through the advent of immunizations, improvements in sanitary conditions, and the use of antibiotics (Friis & Sellers, 1996).

In the first half of the century due largely to declining infant mortality rates, life expectancy at birth rose from 47 years to 68 years (U.S. Department of Health and Human Services [USDHHS], 1980). As people lived longer, the incidence of chronic or degenerative diseases increased. Chronic diseases have now replaced infectious diseases as the top three causes of death (i.e., heart disease, cancer, and stroke) and now account for 6 out of the top 10 causes of death (Rosenberg, Ventura, & Maurer, 1995).

Consequently, determining factors that contribute to the development of chronic diseases is of great importance. A 1974 report published by the Canadian Government identified four determinants of Canadian health: 1) Human Biology (e.g., genetic factors); 2) Environment (e.g., pollution); 3) Lifestyle (e.g., smoking, alcohol abuse, poor diet, sedentary lifestyle, and stress-related conditions); and 4) Health Care Organization

(e.g., accessibility and adequacy of hospitals, outpatient clinics, and physician services) (Lalonde, 1974). It was Lalonde's contention that far too much effort and money was being spent in the area of Health Care Organization when the actual causes of sickness and death were based in the other three areas. In 1977 the Centers for Disease Control (CDC) reported that, approximately 50% of the causes of death due to preventable disease in the United States were attributable to lifestyle factors (USDHHS, 1977). Hence, it follows that improving lifestyle practices has great potential for reducing the number of deaths due to preventable disease.

The construct of "lifestyle" is complex and has been described "not as isolated acts under the autonomous control of the individual, but rather as socially conditioned, culturally embedded, economically constrained patterns of living" (Green & Kreuter, 1991, p. 12). Wankel and Sefton (1994) argued that "personal choice and responsibility are important aspects of leading a healthy lifestyle but they occur within a physical and social environment with powerful facilitating and inhibiting influences" (p. 530). Therefore, health promotion efforts aimed at improving lifestyles need to be sensitive to the social, cultural, economic, and environmental circumstances in which individuals live (Green & Kreuter, 1991). However, this study will not address the modification of lifestyle factors such as poverty or educational status. Rather, the purpose of this study is to address lifestyle practices, or health behaviors, which are narrowly defined as practices or behavioral patterns under volitional control, that are consistent over time, and have health consequences (Green & Kreuter, 1991).

One lifestyle practice, regular exercise, has been found to have therapeutic effects in relation to a variety of chronic diseases. These diseases include: coronary artery disease, hypertension, diabetes mellitus, obesity, selected cancers (e.g., colon cancer), and psychological disorders such as anxiety and depression (Dishman, 1991; Marcus, Banspach, Lefebvre, Rossi, Carleton, & Abrams, 1992; Marcus, Rakowski, & Rossi, 1992; Marcus & Simkin, 1994; Sallis & Hovell, 1990).

Several research studies have been conducted to determine the relationship between physical activity or exercise and other health-related lifestyle behaviors (Blair, Jacobs, & Powell, 1985; Shephard, 1989; Wankel & Sefton, 1994). Results have been mixed, however, there is some evidence to support the hypothesis that individuals who engage in regular physical activity are more likely to display other healthy behaviors. For example, a regular exerciser is more likely to not smoke and have a healthier diet than a sedentary individual. Hence, encouraging individuals to adopt a more active lifestyle could indirectly influence other lifestyle behaviors and potentially compound the health protective effect of exercise.

A number of theoretical models have been used in behavior change research. The Transtheoretical or *Stages of Change* Model has been found to be particularly useful in explaining how people change health behaviors (Prochaska, 1979; Prochaska & DiClemente, 1982). The Stages of Change Model was initially developed in order to better understand addictive behaviors such as smoking, drinking, and drug use. Recently

it has been used to study smoking cessation and its relationship with other health behaviors (Unger, 1996). This model has not been used to study the relationship between the stages of exercise adoption and other health behaviors.

Problem Statement

Using a sample of Montana State University employees, this investigation will determine if the stages of exercise adoption are associated with other health behaviors.

Research Hypothesis

Employees in the later stages of exercise adoption will display more health-protective behaviors than individuals in the earlier stages of exercise adoption.

Significance of the Study

According to the Centers for Disease Control and Prevention (CDC), over half of the two million deaths that occur each year in the U.S. "are due to personal health behaviors--the choices people make every day that affect their health" (CDC, 1995, p. 2).

In the landmark Alameda County study, Belloc and Breslow (1972), found that positive health practices were associated with positive health status and that the relationship of these practices was cumulative; individuals engaging in the highest number of positive health practices were the healthiest.

The high cost of health care, coupled with a rapidly aging population, pose a serious challenge for the health care system. There is a need to find cost-effective health promotion strategies that can affect multiple health behaviors to prevent or delay the onset of chronic diseases. Fries and colleagues (Fries, Green, & Levine, 1989) argue that health promotion's primary purpose is not necessarily the *extension* of life, but rather the *compression* of morbidity. Decreasing the period of infirmity (compressing morbidity), and extending the period of active, independent living can have profound effects on health care expenditures (Brink, 1986). Consequently, improving multiple health behaviors has tremendous potential not only for improving overall health status and quality of life but for containing rapidly escalating health care costs as well (McLeroy & Crump, 1994).

Definition of Terms

Health Behaviors are practices or behavioral patterns under volitional control that are consistent over time and have health consequences. The behaviors included in this study are: tobacco use (cigarette and smokeless tobacco), seat belt use, consumption of alcoholic beverages, exercise, and performance of activities to reduce stress.

Exercise is a subcategory of physical activity; physical activity that is planned, structured, repetitive, and results in the improvement or maintenance of one or more facets of physical fitness (Caspersen, 1989).

Regular Exercise is any physical activity or exercise, such as running, calisthenics, golf, gardening, or walking, that is performed at least three times per week for at least 20 minutes per session (American College of Sports Medicine, 1990).

Physical Activity	is any bodily movement produced by skeletal muscles that results in caloric expenditure (Caspersen, 1989).
Physical Fitness	is a set of outcomes or traits that relate to the ability to perform physical activity (Caspersen, 1989).
Stress Reduction Activities	are any activity or exercise done specifically to reduce stress such as relaxation exercises, listening to music, hiking, and meditation.
Transtheoretical or Stages of Change Model	provides a theoretical framework for understanding how people change health behaviors such as sedentary lifestyles, smoking, and use of drugs and alcohol (Marcus & Simkin, 1994). Individuals move through a series of stages in order to change a behavior. These stages have been labeled: precontemplation, contemplation, preparation, action, maintenance, and termination (see Chapter 2 -- Research of Literature for a definition of these stages).

Delimitations

1. This study was limited to employees of Montana State University-Bozeman with an on-campus address.
2. Measures used in this study were limited to questions included in the survey (Appendix A).
3. Information on background characteristics of subjects was limited to those included in the survey (Appendix A).
4. The cross-sectional design of this study limits causal inference.

Limitations

1. A survey designed by the researchers was used to determine health behaviors. Therefore, the study is limited by the self-reported nature of the data.

2. Results are generalizable only to the population of Montana State University-Bozeman employees.

CHAPTER 2

REVIEW OF LITERATURE

All parts of the body which have a function, if used in moderation and exercised in labours in which each is accustomed, become thereby healthy, well-developed and age more slowly, but if unused and left idle they become liable to disease, defective in growth, and age quickly.

Hippocrates
(Wallace, 1986)

The benefits of a healthy lifestyle have been evident since the days of Hippocrates. However, during the past two decades, societal and scientific interest in health behaviors and their relationship to morbidity and mortality have increased dramatically (Glik, Kronenfeld, & Jackson, 1996; McLeroy & Crump, 1994). This chapter will review studies related to: 1) health behaviors and their relationship to morbidity and mortality, 2) physical activity and select chronic diseases, 3) interrelationships of health behaviors, and 4) Transtheoretical Model and its application to exercise.

Health Behaviors and Their Relationship to Mortality and Morbidity

Numerous studies have examined the relationship between health behaviors and mortality and morbidity. One of the earliest and most important of these studies was the

Alameda County Study (Belloc & Breslow, 1972). Breslow and colleagues studied the association of seven health behaviors (i.e., never smoking cigarettes, regular physical activity, moderate or no use of alcohol , 7-8 hours sleep/day regularly, maintaining proper weight, eating breakfast, and not eating between meals) with mortality and health status (Belloc, 1973; Belloc & Breslow, 1972; Berkman & Breslow, 1983; Breslow & Enstrom, 1980). These seven health behaviors were significantly associated with mortality; the strongest associations being with cigarette smoking, physical activity, and alcohol consumption (Berkman & Breslow, 1983). Age-adjusted mortality rates were found to be more strongly associated with poor health behaviors than with physical health status or with level of income (Belloc, 1973).

Belloc and Breslow (1972) found the relationship between positive health behaviors and physical health status to be cumulative. That is to say, as the number of positive health behaviors increased, there was a concomitant increase in physical health status. Consequently, individuals following all seven positive health practices were found to be in better health than those following fewer than three. In fact, those over the age of 75 who followed all seven health practices were found to be in similar health as individuals 30 years younger who practiced fewer than three. These results were consistent after controlling for age, sex, and income (Belloc & Breslow, 1972).

The relationships found in the Alameda Study were found to be consistent over time. In a follow-up survey conducted 9 1/2 years later, both health behaviors and their relationship to mortality were found to be stable. Men and women following all seven

health behaviors were found to have age-adjusted mortality rates 28% and 43%, respectively, of those following fewer than three health behaviors (Breslow & Enstrom, 1980).

It is beyond the scope of this paper to review all lifestyle factors that are associated with all chronic diseases. Therefore, the remainder of this discussion will be limited to studies which examined the relationship between physical activity and the three leading causes of death: coronary heart disease, cancer, and stroke.

Physical Activity and Select Chronic Diseases

Physical Activity and Coronary Heart Disease (CHD)

Sedentary lifestyles have been associated with 34.6% of deaths from coronary heart disease (Hahn, Teutsch, Rothenberg, & Marks, 1990). Researchers have consistently reported an inverse relationship between physical activity or exercise and coronary heart disease (USDHHS, 1995). In one of the earliest of these studies, the Framingham Study, researchers found that the most sedentary individuals had five times the risk of dying from CHD than individuals who were the most active (Kannel, 1967).

Male British Civil Service workers who engaged in vigorous leisure-time physical activity were found to be at less than half the risk of developing CHD over an 8 1/2 year period than their colleagues who participated in no vigorous exercise (Morris, Everitt, Pollard, & Chave, 1980). Researchers involved in the Multiple Risk Factor Intervention Trial (MRFIT) found that during the 7 1/2 year study period, men who engaged in

moderate leisure-time physical activity had 63% as many fatal CHD events and sudden deaths and 70% as many total deaths as those engaging in low leisure-time physical activity (Leon, Connett, Jacobs, & Rauramaa, 1987).

In a review article researchers found that "the relative risk of CHD associated with inactivity varies among studies but generally ranges from 1.5 to 2.4, with a median of about 1.9" (Powell, Thompson, Caspersen, & Kendrick, 1987, p. 279). Berlin & Colditz (1990) in a more recent meta-analysis of physical activity and CHD found similar results. In both these reviews the researchers found a relationship between quality of research methodology and the strength of the association between physical activity and CHD. The higher quality studies were more likely to show a larger benefit of physical activity than less well-designed studies (Berlin & Colditz, 1990; Powell et al., 1987). Blair (1994) reviewed 14 studies which were conducted between 1987 and 1992. All 14 studies were prospective in design and, in general, used more objective assessment measures of physical activity than the studies included in Powell's review. Blair found similar results to the other reviews.

Blair, Kohl, Paffenbarger, Clark, Cooper, and Gibbons (1989) studied the association of physical fitness and all-cause mortality in a prospective study of healthy men and women. They placed subjects into five categories ranging from least-fit to most-fit and found that relative risk (RR) for all-cause mortality in the least-fit group when compared to the most-fit group was 3.4 in men and 4.7 in women (Blair et al., 1989). This means that the risk of death from all causes for men and women in the least-fit group

was over three and four times, respectively, that of men and women in the most-fit group. The RR was much higher when the disease outcome measured was limited to cardiovascular disease (RR was approximately 8.0 in both men and women). The RR in this study (and other physical fitness and mortality studies, Blair, 1994) was higher than in most other studies measuring physical activity or exercise and CHD (e.g., RR of 1.9 as calculated by Berlin & Colditz, 1990). Blair and colleagues suggested that physical fitness, as measured by maximal treadmill tests, was a more objective measure of physical activity than other assessment methods (i.e., survey and subject recall). Therefore, the possibility exists that physical activity, measured by more objective techniques, has a stronger relationship to mortality than previously detected (Blair et al., 1989).

In summary, researchers have consistently found a significant negative association between physical activity and coronary heart disease. The RR of CHD associated with inactivity is approximately 1.9 with higher RR found when physical fitness is used as the measure of physical activity. In general, studies with higher quality research designs have found a stronger association between sedentary living and the risk of developing CHD.

Physical Activity and Cancer

Evidence of the health protective effect of physical activity on CHD is strong, however, the association between physical activity and cancer is much less understood. Cancer manifests itself in a variety of site-specific diseases that are influenced by a wide variety of factors (Calabrese, 1990). Colon cancer has been the only cancer exhibiting a

clear association with physical activity (USDHHS, 1995). It is estimated that 15% of colon cancer deaths could be prevented by increased physical activity (Hahn et al., 1990).

In a 1995 report devoted exclusively to physical activity and health, the Surgeon General reviewed 29 studies of colon cancer and physical activity (USDHHS, 1995). In 18 of these 29 studies, the researchers examined occupational physical activity, measured solely by job title, and its association with colon cancer. Many of these studies did not control for possible confounding variables such as socioeconomic status and diet. In 14 of the 18 studies, a statistically significant inverse relationship was found between occupational physical activity and colon cancer (USDHHS, 1995). In four of the studies, the researchers found no significant relationship between occupational physical activity and colon cancer (USDHHS, 1995).

The Surgeon General's report also included studies measuring the association between leisure-time physical activity and the risk of colon cancer. Eight out of 11 studies reported an inverse relationship between leisure-time physical activity and the risk of colon cancer (USDHHS, 1995).

There is a consistent health protective relationship between physical activity and colon cancer, however, no association has been found between physical activity and rectal cancer (Lee, Paffenbarger, & Hsieh, 1991; USDHHS, 1995). The relationship between physical activity and other cancers (i.e., breast, endometrial, ovarian, prostate, and testicular) is not as clear. Further research is needed to elucidate these relationships.

Physical Activity and Stroke

Approximately 29% of deaths due to stroke have been attributable to sedentary lifestyles (Hahn et al., 1990). Inactivity has not been studied as extensively in relation to stroke as it has been with coronary heart disease. Although much of the data were equivocal concerning the health protective effect of physical activity in relation to stroke (Kohl & McKenzie, 1994), a significant inverse relationship between physical activity and the risk of stroke in men and women was reported in a recent review article (Bronner, Kanter, & Manson, 1995).

In a prospective study of a cohort of British men aged 40-59, the relative risk (RR) of stroke associated with moderate and vigorous activity was 0.6 and 0.3, respectively, when compared with inactivity (Wannamethee & Shaper, 1992). This means that men who engaged in moderate and vigorous activity were 40% and 70%, respectively, less likely to have a stroke than men who were inactive. In the Honolulu Heart Program, a group of men were followed for 22 years for the purpose of studying cardiovascular disease (Abbott, Rodriguez, Burchfiel, & Curb, 1994). Older middle-aged men (55-68 years) who were classified as inactive or partially active "experienced a three-to four-fold excess incidence of hemorrhagic stroke as compared with active men" (Abbott et al., 1994, p. 881). Non smoking, inactive men in this cohort had a relative risk of thromboembolic stroke of 2.8 (95% confidence interval, 1.2-6.7) when compared to non smoking, active men (Abbott et al., 1994). This relationship did not hold for men who

smoked. The researchers controlled for confounding variables such as systolic blood pressure and other risk factors for stroke.

In the majority of studies involving physical activity and stroke, researchers have examined this relationship in men only (Kiely, Wolf, Cupples, Beiser, & Kannel, 1994). In a 32-year follow-up of the Framingham Study cohort, researchers found that medium and high levels of physical activity were protective against stroke for men, however, no significant protective effect was found for women (Kiely et. al., 1994). A more recent study examined this relationship in women and found a significant health protective effect of physical activity in relation to risk of stroke (Manson, Stampfer, Willett, Colditz, Speizer, & Hennekens, 1995).

In summary, nearly one-third of the deaths due to stroke have been attributable to sedentary lifestyles. Much of the early data were equivocal concerning the health protective effect of physical activity in relation to stroke. However, in more recent studies, researchers have found a significant inverse relationship between physical activity and the risk of stroke in men and women.

Interrelationships of Health Behaviors

Researchers have been examining the interrelationships of health behaviors for many years. Three categories of health behaviors have been the most studied: prevention, promotion, and detection behaviors (Maddux, 1993). Prevention behaviors, sometimes referred to as protection behaviors, are "those behaviors people engage in or cease

engaging in because they believe these behaviors or their cessation will prevent or reduce their risk for future health problems" (Maddux, 1993, p. 118). Seat belt use and use of vaccinations are examples of prevention behaviors. Promotion behaviors, sometimes referred to as health enhancement behaviors, are behaviors that people engage in to maintain or improve good health. Exercise can be thought of as a prevention (e.g., cardiac rehabilitation) or a promotion (e.g., running to stay fit) behavior. Detection behaviors are behaviors engaged in to provide information about the presence or absence of disease (Maddux, 1993). Participation in screenings and the use of medical tests are examples of detection behaviors.

In early studies researchers hypothesized that health behavior was an unidimensional construct (Haefner, Kegeles, Kirscht, & Rosenstock, 1967; Rosenstock, 1969). That is to say, health behaviors were interrelated; performance of one health behavior was thought to predict performance of other health behaviors. Researchers who subscribed to this theory suggested that individuals who performed health behaviors were motivated by an overall orientation toward health. However, early researchers studied only a few behaviors, mostly detection behaviors, and then generalized these findings to other areas of health behavior (Kannas, 1981). Support for the unidimensional hypothesis of health behavior is limited (Kannas, 1981).

In more recent studies researchers have examined a broader range of health behaviors and have described health behavior as: 1) multidimensional, 2) a series of independent behaviors, or 3) a combination of both. Researchers subscribing to the

multidimensional theory have used statistical methods, primarily factor or cluster analysis, to discover that health behaviors form groupings or clusters of related behaviors (i.e., several health behaviors loaded on one particular factor, however, several factors were needed to include all health behaviors) (Castro, Newcomb, McCreary, & Baezconde-Garbanati, 1989; Kannas, 1981; Krick & Sobal, 1990; Kronenfeld, Goodyear, Pate, Blair, Howe, Parker, & Blair, 1988; Langlie, 1979; Steele & McBroom, 1972; Stephens, 1986; Tapp & Goldenthal, 1982). Other researchers have found no significant correlation between behaviors; engaging in one behavior did not predict whether an individual would be more likely to engage in others (Norman, 1985; Sobal, Revicki, & DeForge, 1992; Vingerhoets, Croon, Jeninga, & Menges, 1990). A few researchers have found a combination of these two theories; health behaviors formed some clusters but also included some highly unrelated behaviors (Harris & Gluten, 1979; Williams & Wechsler, 1972).

Due to inconsistencies in health behavior research methodology, it is difficult to make comparisons between studies regarding the interrelationships of health behaviors (Krick & Sobal, 1990; Ungemack, 1994). Although research studies have focused on a variety of health behaviors (e.g., prevention, promotion, and detection), it is rare when two studies have examined the same set of behaviors. Sample populations have varied across studies (e.g., age and gender limited, culturally diverse samples, differing sample

size), making generalizability of results difficult. In addition, there is a lack of standardization of health behavior assessment instruments, making between-study comparisons problematic.

Despite these difficulties researchers have found several patterns in health behavior relationships. It is beyond the scope of this study to delineate all of the relationships found amongst health behaviors. However, it is important to review those studies which examine the relationships between exercise, or physical activity, and other health behaviors. Specifically, the relationships between physical activity and smoking, smokeless tobacco use, drinking (alcohol), seat belt use, and stress management practices will be discussed.

Physical Activity's Relationship to Select Health Behaviors

Blair and colleagues (1985) reviewed research pertaining to the relationships between exercise and physical activity patterns and smoking, alcohol intake, substance abuse, diet, weight control, stress management, risk-taking behavior, and preventive health examinations (Blair, Jacobs, & Powell, 1985). Despite methodological complications associated with this analysis, the researchers found several significant relationships: 1) Smoking and leisure-time physical activity were negatively associated, however, the relationship was weak; 2) occupational physical activity was positively associated with smoking, however, these results are probably confounded by socioeconomic status; 3) in two cohort studies, increased physical activity did not lead to reduced smoking; 4) results pertaining to alcohol intake and physical activity were inconsistent, some showing no

association, while others showing a positive association; 5) no data was found on the association between exercise or physical fitness and the behaviors of stress management; and 6) several studies found a positive association between physical activity and seat belt use.

A Behavioral Risk Factor Surveillance Survey (BRFSS), which included a measure of vigorous leisure-time exercise, was conducted in 28 states and the District of Columbia between 1981 and 1983. The results of this survey supported the findings of Blair et al.(1985): "As the level of such activity [vigorous leisure-time activity] increased, the prevalence of cigarette smoking, obesity, and seat belt non-use declined. The prevalence of chronic heavy drinking, acute heavy drinking, and drinking and driving did not vary with the level of exercise" (White, Powell, Hogelin, Gentry, & Forman, 1987, p. 307). A subsequent BRFSS was conducted in 22 states between January 1984 and December 1985 comparing risk behaviors of runners and nonrunners. The researchers found results consistent with those of the previous survey with the exception of drinking behavior in females. It was found that "female runners were more likely to drink and drive and to use alcohol on a chronic basis compared to their nonrunning counterparts" (Heath & Kendrick, 1989, p. 347).

Shephard (1989) conducted a review of studies that examined the impact of regular exercise on lifestyle change. In both cross-sectional and prospective studies, generally weak associations were found between exercise habits and other health behaviors (Shephard, 1989). Although results were not consistent, a majority of the

studies reviewed showed an inverse relationship between exercise habits and smoking behavior. There was no clear association found between exercise habits and alcohol consumption (Shephard, 1989). In several studies researchers found active individuals to be more regular users of seat belts than their less active counterparts (Blair et al., 1985; Langlie, 1979; Williams & Wechsler, 1972). Shephard argued that inadequate measurement techniques of both physical activity and other health behaviors may obscure and possibly weaken the associations between regular exercise and other health behaviors (Shephard, 1989).

Although many researchers have found regular exercise to be helpful in reducing stress (Rostad & Long, 1996), very few studies have measured the relationship between exercise or physical activity and the use of stress management practices. Kronenfeld and colleagues (1988) in a work-site based prospective study found a positive association between stress management practices and leisure-time physical activity. This relationship was significant for men but not for women.

In a more recent review, Wankel and Sefton (1994) examined the relationship of leisure-time physical activity and other lifestyle behaviors. Several conclusions were reported (Wankel & Sefton, 1994, p. 543):

1. Correlational studies generally indicate that for both smoking status (smoking vs. non-smoking) and smoking consumption (number of cigarettes/day), there is a negative association with level of leisure-time physical activity involvement.

2. Retrospective and prospective observational studies of selected activity groups indicate that although active groups at baseline generally smoke less than do inactive groups, these differences do not increase appreciably over time.

3. In more highly selected populations (e.g., serious runners, competitive athletes) smoking rates are observed to decline as intensity of training increases. These changes may reflect a desire to remove the performance constraints of smoking.

4. Although the negative relationship of physical activity and smoking has been consistently reported across both male and female populations, the reported relationship is somewhat stronger in males.

5. No consistent relationship is evident between physical activity involvement and alcohol consumption.

6. The very limited research investigating the association of physical activity involvement with other preventive health behaviors (e.g., wearing a seat belt, regular health check-ups) suggests a small positive relationship.

Relationship of Physical Activity to Sociodemographic Variables

A discussion of the relationships among physical activity and other health behaviors would not be complete without addressing the influence of demographic and socioeconomic variables. Age, gender, education, occupation, income, and marital status have all been associated with participation in physical activity (King, Blair, Bild, Dishman, Dubbert, Marcus, Oldridge, Paffenbarger, Powell, & Yeager, 1992; Schmitz, French, & Jeffery, 1997; Stephens & Caspersen, 1994). These relationships are summarized below:

Age -- Numerous studies have reported an inverse relationship between age and physical activity (King et al., 1992; Schmitz et al., 1997; Stephens & Caspersen, 1994).

Gender -- Women have been found to participate in less vigorous activity than men, however, gender differences for moderate levels of activity are smaller or nonexistent (King et al., 1992; Stephens & Caspersen, 1994).

Education -- Research studies have been consistent in reporting a positive association between level of education and leisure-time physical activity (King et al., 1992; Schmitz et al., 1997; Stephens & Caspersen, 1994).

Occupation -- The relationship between occupation and leisure-time physical activity is not clear (King et al., 1992). In some studies researchers have found no relationship between occupation and leisure-time physical activity, while in other studies high levels of occupational physical activity were associated with low levels of leisure-time physical activity (King et al., 1992). If leisure-time physical activity is the sole measure of physical activity, then those workers who are highly active on the job may be assessed as sedentary when in reality they may have equivalent or greater total physical activity levels when compared to workers who are less active on the job (King et al., 1992).

Income -- Researchers have found a modest association between leisure-time physical activity and income (King et al., 1992).

Marital Status -- Researchers have found that remaining single was consistently associated with high physical activity levels in both men and women (Schmitz, French, & Jeffery, 1997). Being married and female was consistently associated with low levels of physical activity. This finding did not hold for married men (Schmitz, French, & Jeffery, 1997).

In summary, there is evidence to support the hypothesis that physical activity is at least weakly associated with other health behaviors. Specifically, an inverse relationship has been found between leisure-time physical activity and smoking, and a modest

association has been found between physical activity and seat belt use. There is limited support of a positive association between leisure-time physical activity and stress management practices. The above findings also provide evidence that physical activity is influenced by demographic and socioeconomic factors. Therefore, it is important to consider these factors when conducting and reporting physical activity research.

The Transtheoretical Model and Its Application to Exercise

Theories and models of human behavior have been used to guide research in the area of exercise behavior. The Transtheoretical Model (Prochaska, 1979; Prochaska & DiClemente, 1982), has been found to be particularly useful in explaining how people change health behaviors. Prochaska, working under the assumption that effective therapies share common processes, developed this model from a comparative analysis of 18 leading therapy systems (Prochaska & DiClemente, 1982). Hence, the model was appropriately named *Trans*theoretical. The Transtheoretical or *Stages of Change* Model was initially developed in order to better understand addictive behaviors such as smoking, drinking, and drug use. Studying the ways in which smokers quit on their own, Prochaska discovered that individuals use a set of common cognitive and behavioral processes to move through a series of stages while changing smoking behavior (Marcus, Banspach et al., 1992). Prochaska initially identified four stages of change: 1) precontemplation, 2) contemplation, 3) action, and 4) maintenance. Recent research has supported the

importance of including "preparation" and "termination" stages into the model (Prochaska, DiClemente, & Norcross, 1992; Prochaska & Marcus, 1994). The six stages can be defined as:

Precontemplation is the stage at which there is no intention to change behavior in the foreseeable future (Prochaska et al., 1992). Prochaska stated that in this stage individuals are unaware of their problems. A quote from G. K. Chesterton describes this stage quite well "It isn't that they can't see the solution. It is that they can't see the problem" (Prochaska et al., 1992, p. 1103). Precontemplators are classified in this way if they have no serious intentions to change their problem behavior within the next six months.

Contemplation is the stage in which people are "aware that a problem exists and are seriously thinking about overcoming it but have not yet made a commitment to take action" (Prochaska et al., 1992, p. 1103). Contemplators can stay in this stage for long periods of time. In one study smokers were observed in this stage for a period of two years (Prochaska et al., 1992). Contemplators are classified in this way if they have serious intentions to change their problem behaviors within the next six months.

Preparation is the stage in which individuals have intentions to change their behavior and have made small behavioral changes towards altering their behavior (Prochaska et al., 1992). For example, a sedentary individual in this stage might purchase running shoes but only use them once a month. Although they have made steps toward

changing their behavior, they have not met the criterion for action (see next stage). Individuals are placed in this stage if they are intending to take action in the next month.

Action is the stage in which individuals modify their behavior, experiences, or environment in order to overcome their problems (Prochaska et al., 1992). This is the stage in which the criterion measure is accomplished (e.g., quit smoking, abstain from drinking). The action stage is the least stable stage and the one most associated with relapse (Prochaska & Marcus, 1994). Individuals are in the action stage if they have met the criterion for a period of zero-to-six months (Prochaska & Marcus, 1994).

Maintenance is the stage in which people have met the criterion for at least six months but are still at risk for relapse. This period lasts longer for some people than others. As in the case of alcoholics, the temptation to drink could last a lifetime, therefore, maintenance could be a lifelong stage. A person leaves the maintenance stage when one of two things occur: 1) they relapse and return to an earlier stage or 2) they reach the termination stage.

Termination is the stage in which temptation to relapse is no longer a problem (Prochaska & Marcus, 1994). All previously tempting situations are met and negotiated with no risk of returning to the old behavior. The termination stage is a relatively new stage and has not been included in this study or any other investigation reviewed. It has been observed that moving through these stages of change is a dynamic process and does not necessarily occur in a linear fashion. People who move forward through the stages are likely to make several attempts to change their behavior before they are successful.

The Stages of Change Model is significant in that it focuses on both actual behavior and behavioral intention (Marcus, Eaton, Rossi, & Harlow, 1994). The strength of the model lies in its ability to specifically examine different transitions in adoption and maintenance of exercise behavior (Marcus, Selby, Niaura, & Rossi, 1992). Individuals previously categorized as sedentary can now be differentiated by three stages (i.e., precontemplation, contemplation, and preparation). Marcus, Selby, and colleagues (1992) suggest that "the exercise field needs to shift from predictive to process models to better understand behavior change" (p. 60). Clearly, the Stages of Change Model embraces a process orientation.

Although the stage concept has been very useful in the study of single-risk behaviors, few studies have used this model to investigate the change process when multiple-risk behaviors are involved (King, Marcus, Pinto, Emmons, & Abrams, 1996). Unger (1996) used this model to examine the association between the stages of smoking cessation and other health behaviors. She found that individuals in the later stages of smoking cessation had more healthful behaviors in regards to alcohol and exercise than individuals in the earlier stages. Emmons, Marcus, Linnan, Rossi, and Abrams (1994) found that the smoking stage was related to physical activity; those in the later stages for smoking cessation engaged in more physical activity than those in the earlier stages. A similar relationship was found for smoking status; smokers were more likely to be in the earlier stages for physical activity than non smokers (Emmons et. al., 1994).

King and colleagues (1996) studied the cognitive-behavioral and motivational mechanisms which affect changes in both smoking and exercise behavior. They found that "cognitive mechanisms associated with changes in smoking behavior are related to the cognitive variables which have been shown to predict changes in exercise behavior" (p. 684).

As might be expected, a relationship has been found between stage of readiness to perform physical activity and select demographic and socioeconomic variables. Men were more likely to be in the later stages for physical activity than women (Emmons et. al., 1994). In addition, age was inversely related to stage of readiness for exercise; in general, intention to do more exercise decreased with age (Booth, Macaskill, Owen, Oldenburg, Marcus, & Bauman, 1993; Read, Auld, Bock, Bruhn, Gabel, Sauritzen, See, Medeiros, McNulty, Newman, Nitzke, Ortiz, Schutz, & Sheehan, 1996). The opposite was true for level of education; intention to do more exercise increased with level of education (Booth, et. al., 1993).

In summary, the stage of change model has been useful in explaining how people change a variety of health behaviors, however, most studies have examined only one behavior at a time. Few studies have examined how the stage of readiness to perform one health behavior is related to performance of other health behaviors. No studies have examined the relationship between stage of readiness to change exercise behavior and the health behaviors included in this study (i.e., cigarette smoking, smokeless tobacco use, alcohol use, seat belt nonuse, and use of stress management practices).

Conclusion

It has been estimated that 50% of deaths each year in the U.S. can be attributed to lifestyle factors. The top three factors contributing to mortality in the U.S. in 1990 were: 1) tobacco, 2) diet and activity patterns, and 3) alcohol (McGinnis & Foege, 1993). In the landmark Alameda County study, Belloc and Breslow (1972) found that individuals engaging in the highest number of positive health practices were the healthiest. Therefore, health promotion strategies that can positively affect multiple behaviors could have a profound effect on morbidity and mortality in the United States.

Active lifestyles have been associated with lower rates of morbidity and mortality as well as with other healthy behaviors (i.e., not smoking and using seat belts). It may be that individuals who begin to exercise may also change other behaviors. The Stages of Change Model has been found to be useful in understanding how people change health-related behaviors. Select health behaviors have been found to vary with stage of smoking cessation. The purpose of this study is to determine if the stages of exercise adoption are associated with participation in other health behaviors.

CHAPTER 3

METHODOLOGY

Data

Subjects

The sampling frame of this study included all full-time employees of Montana State University-Bozeman who 1) worked on-campus and 2) were eligible for full health insurance benefits as of October 1996. Spouses, dependents, and retirees were excluded from the study.

Instrumentation

A 48-item questionnaire was developed to answer a variety of research questions (Appendix A). The health behavior data for this research project was obtained from this questionnaire.

The questionnaire was divided into seven sections. The three sections pertinent to this investigation were: 1) demographic and socioeconomic information, 2) health behavior information, and 3) Prochaska's stages of change for exercise.

The demographic and socioeconomic variables used in this questionnaire were age, gender, marital status, number of dependents, level of education, job class, and income. Many of the questions from this section were taken directly from the Behavioral Risk Factor Surveillance Survey (BRFSS). The BRFSS is conducted yearly by the Centers for

Disease Control and Prevention and is used to measure prevalence rates of selected risk factors and preventive health measures in the U.S. (U.S. Public Health Service, 1996).

The health behavior variables used in this questionnaire were tobacco use (cigarette and smokeless tobacco), alcohol consumption, exercise behavior, stress management behavior, and seat belt use. These questions were developed through an extensive review of related literature (Bertera, 1991; Brink, 1986; Lalonde, 1974; Leigh & Fries, 1992; McGinnis & Foege, 1993; Yen, Edington, & Witting, 1991) and through a review of the Montana BRFSS (1995) data to determine health behavior characteristics related to increased health risk.

The survey consisted of two 11 in. x 17 in. pieces of paper stapled together in booklet style to create four 8 1/2 in. x 11 in. pages (Appendix A). The first page contained a cover letter which was signed by the president of the university. This letter was used to demonstrate the level of commitment to this research and to help increase the response rate of the questionnaire. In addition, the cover letter was used to: 1) explain the purpose of the study and identify the researchers involved, 2) explain to the respondents that their participation was voluntary, and 3) briefly explain the process by which respondent anonymity and confidentiality would be protected.

A series of interviews were conducted involving Employee Wellness Program (EWP) participants and nonparticipants. A focus group of EWP participants was also held. The purpose of these data collection efforts was two-fold: 1) to uncover any additional questions which should have been included in the questionnaire and 2) to

modify or delete problematic questions. Extensive revisions were made to the instrument before a preliminary questionnaire was developed. Consultation on form, content, and many aspects of survey administration was provided by Susan Walwork, a University of Montana survey expert. Walwork is employed by the Bureau of Business and Economic Research and has extensive knowledge in the area of survey development and administration.

A pilot study was conducted with a sample of 18 university employees. The purpose of the pilot was: 1) to determine whether respondents understood the questions (i.e. terminology, directions, meaning, overall clarity) and 2) to evaluate the questionnaire as a whole (i.e., length, transitions between sections, readability, font size). Several changes were made to the questionnaire as a result of the pilot study.

Human Subjects Committee Approval

A human subjects clearance form was submitted to the Montana State University Human Subjects Committee (HSC) on September 10, 1996. This form explained the purpose of the research and gave a detailed description of the investigation procedures. Participation in the study was voluntary, and the HSC approved the survey procedures on October 17, 1996.

Survey Distribution

The questionnaire was distributed through campus mail on November 8, 1996. A preaddressed return envelope was provided, and respondents were requested to return the

survey via campus mail within five days. Dillman's Total Design Method was used to increase response rate (Dillman, 1978). Exactly five days after the surveys were sent, respondents received a postcard reminding them to return the survey if they had not already done so. Three weeks after the initial surveys were sent, a new cover letter and an additional copy of the survey was sent to nonrespondents. Six weeks later a final mailing, containing a new cover letter and copy of the survey, was sent to nonrespondents.

Statistical Analysis

Descriptive statistics were used to obtain a general characterization of the data. Frequencies and percent distributions were calculated by gender for age, marital status, education, income, job classification, dependent status, health behaviors (e.g., smoking status, smokeless tobacco status, seat belt use, alcohol use, use of stress management practices), and stage of exercise change.

To determine the extent of multicollinearity among the independent variables, five Spearman correlation matrices were run (Appendix B). The first matrix was used to illustrate the correlation between the sociodemographic variables. The second was used to illustrate the correlation between the various health behaviors. The third matrix was used to show the degree of relationship between the sociodemographic variables and the health behaviors. The fourth correlation matrix was used to show the degree of

relationship between the sociodemographic variables and stage of exercise. The final correlation matrix was used to show the degree of correlation between the health behaviors and stage of exercise.

The independent variables used in the regression model included: age, gender, marital status, level of education, job classification, dependent status, level of income, all health behaviors, and stages of exercise change. Dependent variables used in this model included: tobacco use (cigarette and smokeless), seat belt nonuse, level of alcohol use, and nonregular participation in stress reduction activities. The independent and dependent variables are described below. Independent and dependent variables were categorized by use of dummy variables. Due to the use of binary dependent variables, logistic regression analysis was performed.

Using the LOGISTIC procedure in the SAS system for personal computers (SAS Institute, 1996), logistic regression analysis was used to determine if stage of exercise predicted the presence of each of the health behaviors. The sociodemographic covariates were then added to the model to determine if stage of exercise predicted the presence of the various health behaviors while controlling for these important variables. Significance was determined at the .05 level of confidence.

The empirical models used in this investigation are specified as follows:

$$\mathbf{CU} = B_0 + B_1AGE + B_2GEN + B_3MS + B_4DEP + B_5JOB + B_6ED + B_7INC + B_8EXST + B_9ST + B_{10}SB + B_{11}AU + B_{12}SR + e$$

$$\mathbf{ST} = B_0 + B_1AGE + B_2GEN + B_3MS + B_4DEP + B_5JOB + B_6ED + B_7INC + B_8EXST + B_9CU + B_{10}SB + B_{11}AU + B_{12}SR + e$$

$$\mathbf{SB} = B_0 + B_1AGE + B_2GEN + B_3MS + B_4DEP + B_5JOB + B_6ED + B_7INC + B_8EXST + B_9CU + B_{10}ST + B_{11}AU + B_{12}SR + e$$

$$\mathbf{AU} = B_0 + B_1AGE + B_2GEN + B_3MS + B_4DEP + B_5JOB + B_6ED + B_7INC + B_8EXST + B_9CU + B_{10}ST + B_{11}SB + B_{12}SR + e$$

$$\mathbf{SR} = B_0 + B_1AGE + B_2GEN + B_3MS + B_4DEP + B_5JOB + B_6ED + B_7INC + B_8EXST + B_9CU + B_{10}ST + B_{11}SB + B_{12}AU + e$$

where the **Dependent Variables** are:

CU = Cigarette Use (current nonsmoker of cigarettes = 0*; current smoker = 1)

ST = Smokeless Tobacco Use (current nonuser of smokeless tobacco =0; current user of smokeless tobacco = 1)

SB = Seat Belt Use ($\geq$ 75% of time = 0; < 75% of time = 1)

AU = Average Alcohol Use ($\leq$ 2 drinks per day = 0; > 2 drinks per day = 1)

SR = Participation in Stress Reduction Activities (< 3 times per week = 0; $\geq$ 3 times per week = 1)

Independent Variables:

β_0 = the intercept term

AGE = Age group (20-29 = 1; 30-39 = 2; 40-49 = 3; 50-59 = 4; 60+ = 5)

GEN = Gender (male = 1; female = 0)

MS = Marital Status (married = 1; not married = 0)

DEP = Number of Dependents (one or more dependents = 0; no dependents = 1)

JOB = Job Classification Status (Classified = 1; Contract = 0)

ED = Level of Education (≤ high school diploma = 1; 1-3 years college = 2; bachelor's degree = 3; master's degree = 4; terminal degree = 5)

INC = Level of Income (< $25,000 = 1; $25,000-$34,999 = 2; $35,000-$49,999 = 3; $50,000-$74,999 = 4; $75,000+ = 5)

EXST = Stage of Exercise Adoption (precontemplation = 1; contemplation = 2; preparation = 3; action = 4; maintenance = 5. Note: termination stage was not included in study; no other studies reviewed included this stage)

e = Error Term

*note: numbers indicate dummy variable coding

Logistic Regression Analysis

The goal of this analysis was to determine whether a respondent's stage of exercise was predictive of their participation in select health behaviors. Several demographic and socioeconomic variables were found to be related to exercise behavior and, therefore, were included as control variables. All dependent variables (i.e., behaviors) in this analysis are binary, indicating the presence or absence of the behavior (e.g., smoker vs. nonsmoker). When discrete dependent (y) variables are used, assumptions necessary for ordinary least squares (OLS) analysis are violated, and linear regression is no longer the preferred method of analysis (Schroeder, Sjoquist, & Stephan, 1986). In OLS analysis the error terms (the amounts by which the observed y deviates from the predicted y) are normally distributed and equally variable (assumption of normal distribution and homoscedasticity of error terms) across levels of the independent variable (Hosmer &

Lemeshow, 1989). This is not the case when the dependent variable is binary. Binary dependent variables can have two possible values--zero and one. The mean of a binary variable is equal to the probability that the variable is equal to one, (p), and the variance is equal to p(1- p). For example, if y is the binary dependent variable for smoker (1) vs. nonsmoker (0) and there are six smokers and four nonsmokers in the sample, the probability of y being a smoker is six out of ten or .6, the mean of y is .6, and the variance is (.6)(1-.6) or .24. The value of the dependent variable y given x can be expressed as: $y = \pi(x) + \varepsilon$, where $\pi(x)$ is considered the conditional mean given x, and ε is the error term. If y can assume only two possible values (0,1), it follows that ε can have only two possible values. If $y = 1$, then $\varepsilon = 1 - \pi(x)$ with the probability $\pi(x)$, and if $y = 0$, then $\varepsilon = -\pi(x)$ with the probability $1- \pi(x)$ (Hosmer & Lemeshow, 1989). Therefore, the error term follows a binomial, not normal, distribution with mean zero and variance equal to $\pi(x)[1 - \pi(x)]$ (Hosmer & Lemeshow, 1989).

In addition to the assumptions of normally distributed and equally variable error terms, OLS analysis assumes that there is a linear relationship between the independent and dependent variable such that $y = \beta_0 + \beta_1 x$. This expression implies that it is possible for y to vary between $-\infty$ and $+\infty$ as x varies between $-\infty$ and $+\infty$. This is not possible when the dependent variable is binary (i.e., y can only assume the values of zero and one). It is therefore necessary to transform the dependent variable into a term called a logit, which is linear in its parameters, may be continuous, and may range from $-\infty$ to $+\infty$, depending on the range of x (Hosmer & Lemeshow, 1989). It is this logit transformation

which makes it possible to use independent variables (continuous or categorical) to predict values of binary dependent variables. Maximum likelihood rather than the OLS statistical criterion is used to obtain coefficients (Glass & Hopkins, 1996). Glass and Hopkins state that logistic regression is conceptually similar to multiple regression in that it "combines information from a set of independent variables to predict with maximal accuracy the probability of falling into category 1 or 0 of the dichotomous dependent variable."

Stage of exercise was the independent variable of interest in this investigation. The variables of age group, gender, marital status, education, income, job class, and dependent status were used as control variables. Spearman rank correlation matrices were run to determine whether multicollinearity (i.e., when two independent variables are highly correlated) existed between the independent variables (Appendix B). It is generally accepted that two independent variables are considered redundant if they are correlated at .9 or higher. If this occurs, those variables should be dropped from the model. No correlation was found to be .9 or higher, therefore, all control variables were retained.

Logistic regression analysis is a nonparametric statistical technique which is not constrained by the normal assumptions of linear regression. However, one limitation of this analysis is that expected cell sizes must be of adequate size. Tabachnick and Fidell (1989) cite two conditions which produce expected frequencies that are too small; "a small sample in conjunction with too many variables with too many levels, and rare events" (p. 240). Due to the number of control variables included in the model, it was necessary to consider whether the sample size was large enough to produce adequate

expected frequencies. Tabachnick and Fidell suggest that an adequate sample size is five times the number of cells which is produced in the two-way association between the two variables with the most categories. For example, the variables with the highest number of categories in this investigation are education (5 levels) and income (5 levels). These two variables in a two-way association produce the largest number of cells--25. Twenty-five times five or 125 cases are needed for adequate expected frequencies. The sample size in this investigation was more than adequate to address this limitation.

Rarity of events is the other limitation of logistic regression which needs to be addressed. When events are rare as in the case of smokeless tobacco, cell frequencies can become so small that power is drastically reduced, and results can be rendered meaningless (Tabachnick & Fidell, 1989). Tabachnick and Fidell suggest that the researcher "examine expected cell frequencies for all two-way associations to assure that all are greater than one and that no more than 20% are less than five" (p.240). When examining the cell sizes produced in Table 5 (stage by behaviors), less than 20% of the cell sizes are less than five. One cell (Stage 4 and smokeless tobacco use) has only one case causing interpretation of the regression of smokeless tobacco and stage of exercise to be suspect.

When respondents were grouped by gender and stage, cell sizes became too small when cross-tabulated with the select behaviors (Table 6). For males, 28% of the cells had frequencies of less than five, and three of the cells had frequencies of one or less (Table 6). For women, 40% of the cells had frequencies of less than five, and six of the cells had

frequencies of one or less (Table 6). Therefore, separate logistic regression analyses were not run for males and females, however, gender was used as a control variable in all models.

CHAPTER 4

RESULTS

A total of 1,940 surveys were distributed via campus mail to all Montana State University (MSU) employees who worked on the Bozeman campus. Forty-four subjects were excluded from the study for one of three reasons: 1) the intended respondent was no longer employed by the University (n = 36), 2) the respondent was a new employee and could not adequately answer the survey questions (n = 6), and 3) the respondent was a retiree (n = 2). Of the remaining 1,896 surveys, 1,283 were returned, producing a response rate of 68%.

Demographic and Socioeconomic Characteristics

Frequencies and percent distributions of select demographic and socioeconomic characteristics of respondents are presented in Table 1. For comparison purposes data from the MSU and state of Montana populations are included. It is apparent that the sample of respondents is characteristic of the entire MSU population. MSU respondents and the entire MSU population are very similar when compared by age group, gender, and job classification. However, large differences in demographic and socioeconomic variables exist between the MSU respondents and the general population of the state of Montana. The most notable differences occur when level of education and income are

compared; over 72% of MSU respondents have obtained a college degree or higher as compared to less than 25% of the state population. Over 82% of MSU respondents make $25,000 or more per year as compared to 41% of the state population. The comparisons demonstrated that the MSU population is a more highly educated and wealthier group than the state of Montana population. Therefore results of this analysis can be generalized to the MSU population but not to the state population.

Table 1. Demographic and socioeconomic characteristics of survey respondents compared to the MSU and state of MT populations (MT BRFSS, 1995)

VARIABLE	% of MSU sample N = 1,269	% of MSU POP N = 1,940	% of MT POP N = 1,189
[a]AGE-mean, 44 (sd = 9.51)			
18-34 years	17.1	18.0	29.9
35-44 years	33.5	32.7	23.4
45-54 years	34.6	34.4	16.7
55+ years	14.9	14.9	30.1
GENDER			
Male	46.2	49.4	41.4
Female	53.8	50.6	58.1
MARITAL STATUS			
Married	77.2	*	67.3
Not Married	22.8		32.6
JOB CLASS			
Contract/Professional	47.8	52.1	*
Classified	52.2	47.9	
EDUCATION			
< College Degree	10.8	*	75.4[b]
College Degree or more	72.3		24.6[b]
INCOME			
< $25,000	17.2	*	58.2[b]
25K +	82.7		41.8[b]

[a] for comparison purposes, the age groups have been modified to match the MT BRFSS data
[b] data taken from Dunnagan & Haynes, in press
* data not available

Table 2 presents demographic and socioeconomic characteristics of MSU respondents in greater detail and also reports these characteristics by gender. The notable differences between genders are: 1) a greater percentage of men are married than are women (82.5% vs. 72.9%), 2) 37% of the women have less than a college degree as compared to only 17% of the men, 3) over four times as many men as women have obtained a terminal degree, and 4) nearly 70% of women are classified employees as compared to only 32% of the men. These differences make it necessary to describe the data in this analysis by gender.

Table 2. Percent of demographic and socioeconomic variables by gender

VARIABLE	MALE % (N = 586)	FEMALE % (N = 683)	TOTAL % (N =1,269)
AGE (mean 44 yrs) (std dev 9.51)			
20-29 years	6.7	8.6	7.7
30-39 years	22.5	26.4	24.6
40-49 years	38.1	40.3	39.3
50-59 years	25.6	20.6	22.9
60+ years	7.3	4.1	5.5
MARITAL STATUS			
Married	82.5	72.9	77.2
Not Married	17.5	27.2	22.8
EDUCATION			
≤ High School	7.5	13.7	10.8
1-3 Years College	9.5	23.3	16.9
Bachelor's Degree	17.8	34.1	26.6
Master's Degree	17.0	17.5	17.2
Terminal Degree	48.3	11.5	28.5

Table 2. continued

VARIABLE	MALE % (N = 586)	FEMALE % (N = 683)	TOTAL % (N =1,269)
INCOME			
< $ 25,000	10.5	22.9	17.2
25K--$ 34,999	14.9	18.1	16.6
35K-- $ 49,999	22.1	24.8	23.6
50K- $ 74,999	33.1	23.2	27.7
75K +	19.4	11.1	14.9
JOB CLASS			
Contract	68.1	30.4	47.8
Classified	31.9	69.6	52.2
DEPENDENTS			
None	41.4	47.3	44.6
At least one	58.6	52.7	55.4

Health Behaviors

Table 3 presents the percentage and number of MSU respondents by gender that participate in the various health behaviors. The MSU sample is then compared with the state of Montana data obtained from the Montana Behavioral Risk Factor Surveillance System (MT BRFSS, 1995). The differences in behaviors between the two populations are at least partially explained by the differences in socioeconomic factors (MT BRFSS, 1995). A higher percentage of MSU female respondents smoke cigarettes than do males, however, the use of smokeless tobacco is almost exclusively a male behavior. Men do not wear their seat belts as regularly as women; this relationship holds for the Montana population as well (MT BRFSS, 1995). A higher percentage of MSU male respondents as compared to MSU women respondents consume greater than two drinks per day.

Table 3. Percent and frequency of behaviors by gender compared to Montana population

BEHAVIOR	MALE % (N)	FEMALE % (N)	TOTAL % (N)	% OF MT POPULATION[a]
CIGARETTE USE	6.8 (40)	9.2 (63)	8.1 (103)	21.1
SMOKELESS TOBACCO USE	5.8 (34)	0.4 (3)	2.9 (37)	5.6
SEAT BELT NONUSE < 75% OF TIME	13.2 (78)	10.2 (70)	11.6 (148)	22.6
ALCOHOL USE > 2 drinks/day	5.1 (30)	3.6 (25)	4.3 (55)	*
EXERCISE PARTICIPATION ≥ 3x per week	62.8 (360)	60.1 (398)	61.3 (759)	45.0[b]
STRESS MGMT USE - REGULAR 3X/WK	29.7 (168)	33.0 (216)	31.6 (384)	not available

[a] figures obtained from the Montana Behavioral Risk Factor Surveillance System, 1995 report
[b] latest physical activity figures available were obtained from the 1994 BRFSS (MT BRFSS, 1995)
* figures cannot be compared due to differences in measurement method

Stage Classification

Based on a series of four questions included in the questionnaire, MSU respondents were placed into one of the five stages of exercise. The exercise questions used to classify respondents were as follows:

[instructions] Please note for questions B9-13, "exercise" refers to any physical activity or exercise such as running, calisthenics, golf, gardening, or walking. To "exercise regularly" means that you exercise at least 3 times per week for at least 20 minutes per session.

B9.	I do exercise now.	Yes	No
B10.	In the next 6 months, I plan to exercise.	Yes	No
B11.	I exercise regularly now.	Yes	No
B12.	For the past 6 months, I have exercised regularly.	Yes	No

An algorithm was used to classify respondents based on their answers to the exercise questions. The algorithm is as follows (Rehor, McNeill, Moon, & Brock, 1996):

STAGE	Question B9	Question B10	Question B11	Question B12
Precontemplation	No	No	No	No
Contemplation	No	Yes	No	No
Preparation	Yes	Yes	No	No
Action	Yes	Yes	Yes	No
Maintenance	Yes	Yes	Yes	Yes

The proportion of total respondents in each of the five stages of exercise change is presented in Table 4. Respondents in each stage of exercise are also reported by gender. Approximately 7% of respondents participated in no exercise and did not intend to begin exercising within the next six months (Precontemplation, Stage 1). Fifteen percent of respondents did not exercise but were planning to exercise within the next six months (Contemplation, Stage 2). Over 16% of respondents participated in some exercise but did not exercise regularly (Preparation, Stage 3). Eight percent of respondents reported participation in regular exercise for a period of six months or less (Action, Stage 4). Finally, over half of respondents, 53%, reported that they exercised regularly and had done so for longer than six months (Maintenance, Stage 5).

Table 4. Percent of respondents in stage of exercise by gender

STAGE CLASSIFICATION	MALE % (573)	FEMALE % (662)	TOTAL[a] % (1,235)
STAGE 1 Precontemplation	7.9 (45)	6.0 (40)	6.9 (85)
STAGE 2 Contemplation	14.5 (83)	15.7 (104)	15.1 (187)
STAGE 3 Preparation	14.8 (85)	18.1 (120)	16.6 (205)
STAGE 4 Action	5.9 (34)	9.7 (64)	7.9 (98)
STAGE 5 Maintenance	56.9 (326)	50.5 (334)	53.4 (660)

[a] 48 respondents could not be classified due to missing data

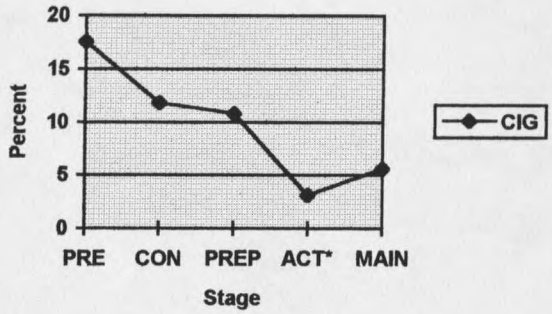
Table 5 illustrates the change in proportion of respondents with select behaviors by stage of exercise. A trend was seen with three of the behaviors, specifically, as stage of exercise increased, the proportion of respondents participating in cigarette use, seat belt non-use, and non-regular use of stress management practices decreased. That is to say, in general, respondents who are in the later stages of exercise (Action and Maintenance) displayed more healthful behaviors than those in the earlier stages. Figures 1-5 present a linear representation of the data included in Table 5.

Table 5. Percent of respondents with selected behaviors by stage of exercise

BEHAVIOR	STAGE 1 Precont. (N = 85)	STAGE 2 Contemp. (N = 187)	STAGE 3 Preparation (N = 205)	STAGE 4 Action (N = 98)	STAGE 5 Maintenance (N = 660)
Cigarette Use	17.6[a] (15)[b]	11.8 (22)	10.8 (22)	3.1[c] (3)	5.6 (37)
Smokeless Tobacco Use	5.8 (5)	1.6 (3)	3.4 (7)	1.0 (1)	2.9 (19)
Seat Belt Nonuse < 75% of time	27.1 (23)	14.4[c] (27)	10.8[c] (22)	11.2[c] (11)	9.1[c] (60)
Alcohol Use > 2 drinks/day	2.4 (2)	7.0 (13)	2.9 (6)	5.1 (5)	4.1 (27)
Nonregular Use of Stress Management Practices	85.5 (65)[d]	78.3 (144)[d]	76.7 (155)[d]	71.1 (64)[d]	60.9[c] (393)[d]

[a] indicates that 17.6 % of the respondents who are in Stage 1 for exercise smoke cigarettes
[b] numbers in parentheses indicate the number of respondents with the behavior in that stage
[c] indicates this stage is a significant predictor of the behavior as compared to Stage 1 (Precontemplation)
[d] a large number of people did not answer the stress question adequately (missing data, n = 65) therefore these numbers do not correspond exactly when the percentage is multiplied by the number of respondents in that stage (i.e., 85.5% of 85 does not equal 65 respondents)

Figure 1: Percent of cigarette smokers by stage of exercise



* indicates stages that are significantly different from Stage 1 - Precontemplation

Figure 2: Percent of smokeless tobacco users by stage of exercise

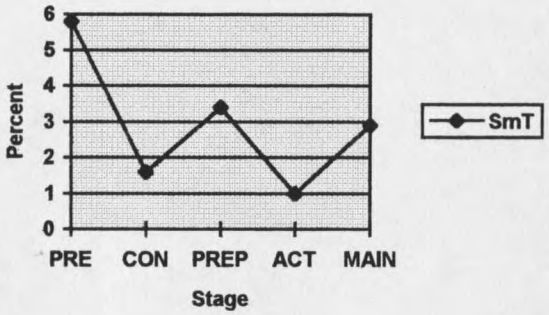


Figure 3: Percent of seat belt nonusers by stage of exercise

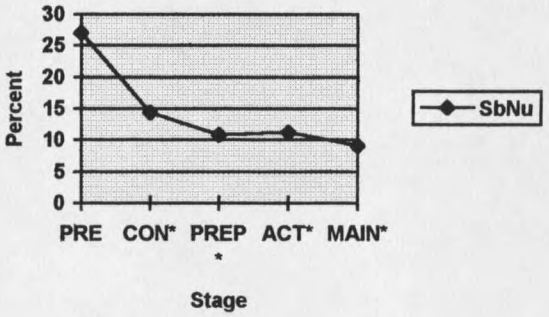


Figure 4: Percent of alcohol users (> 2 drinks/day) by stage of exercise

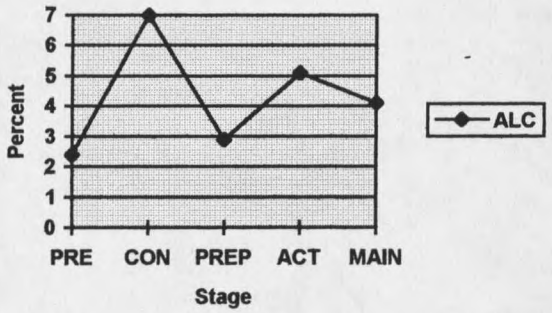
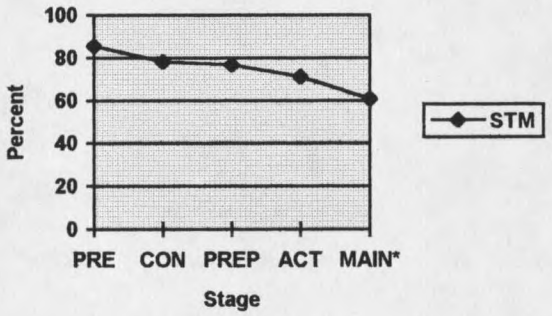


Figure 5: Percent of nonregular users of stress management practices by stage of exercise



* indicates stages that are significantly different from Precontemplation

The prevalence of the behaviors by stage of exercise for males and females are reported in Table 6. Some gender differences in the behaviors by stage of exercise are evident. For example, 14.5% of the males in Stage 2 smoke cigarettes as compared to 9.6% of the females. However, in Stage 3 the percentage of female smokers is over twice that of males.

Table 6. Percent of male and female respondents with selected behaviors by stage of exercise

BEHAVIOR	STAGE 1 Precont. (N = 85)	STAGE 2 Contemp. (N = 187)	STAGE 3 Preparation (N = 205)	STAGE 4 Action (N = 98)	STAGE 5 Maintenance (N = 660)
MALES					
Cigarette Use	17.8 (8)	14.5 (12)	5.9 (5)	2.9 (1)	3.4 (11)
Smokeless Tobacco Use	11.1 (5)	3.7 (3)	8.3 (7)	2.9 (1)	4.9 (16)
Seat Belt Nonuse < 75% of time	28.9 (13)	20.5 (17)	9.4 (8)	11.8 (4)	11.0 (36)
Alcohol Use > 2 drinks/day	2.2 (1)	6.0 (5)	2.4 (2)	5.9 (2)	5.5 (18)
Nonregular Use of Stress Mgmt Practices	73.8 (31)	84.0 (68)	78.6 (66)	69.7 (23)	64.4 (206)
FEMALES					
Cigarette Use	17.5 (7)	9.6 (10)	14.3 (17)	3.1 (2)	7.8 (26)
Smokeless Tobacco Use	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.9 (3)
Seat Belt Nonuse < 75% of time	25.0 (10)	9.6 (10)	11.8 (14)	10.9 (7)	7.2 (24)
Alcohol Use > 2 drinks/day	2.6 (1)	7.7 (8)	3.4 (4)	4.7 (3)	2.7 (9)
Nonregular Use of Stress Mgmt Practices	100.0 (34)	73.8 (76)	75.4 (89)	71.9 (41)	57.5 (187)

Logistic Regression Results

Separate simple logistic regression models were run using each of the behaviors as the dependent variable and stage of exercise as the independent variable. Results are presented in Tables 7, 8, 9, 10, and 11. Model fitting information as well a chi-squared test to determine significance of the model is presented in the first half of the table. The chi-squared test is used to test the global null hypothesis that all the regression coefficients in the model are zero and that none of the independent variables affect the probability of having the behavior (Everitt & Der, 1996). The second half of the tables headed, "Analysis of Maximum Likelihood Estimates," gives parameter estimates, standard errors, chi-squared tests, and P-values for assessing whether a coefficient of an independent variable differs from zero; in addition, the standardized estimate and odds ratio are printed (Everitt & Der, 1996). Odds ratios are useful for interpreting logistic regression models.

Stage 4 and 5 were found to be a significant predictors of cigarette smoking behavior, respondents in Stage 4 were 82% less likely than respondents in Stage 1 (the reference group) to be cigarette smokers, and respondents in Stage 5 were 65% less likely than respondents in Stage 1 to be cigarette smokers. No stage of exercise was found to be a significant predictor of smokeless tobacco use. Stages 3, 4, and 5 were found to be significant predictors of seat belt nonuse; those respondents in Stage 3, 4, and 5, were 56%, 54%, and 64%, respectively, less likely than respondents in Stage 1 to wear their seat belt < 75% of the time. No stage of exercise was found to be a significant predictor

of alcohol use. Stage 5 was the only stage that was predictive of nonregular use of stress management practices; respondents in Stage 5 of exercise were 61% less likely than respondents in Stage 1 to not use stress management practices regularly.

Table 7. Logistic regression analysis -- dependent variable (DV) = cigarette use, independent variable (IV) = stage of exercise

Model fitting information and testing global null hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 Log L	716.409	694.877	21.978 w/4 DF **(p = 0.0002)**

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-1.7560	0.2484	49.9600	0.0001		
Stage 2	1	-0.2589	0.3365	0.5918	0.4417	-0.050444	0.772
Stage 3	1	-0.3569	0.3357	1.1307	0.2876	-0.072078	0.700
Stage 4	1	-1.6992	0.6369	7.1191	**0.0076**	-0.249286	0.183
Stage 5	1	-1.0692	0.3006	12.6520	**0.0004**	-0.294687	0.343

Table 8. Logistic regression analysis -- DV = smokeless tobacco, IV = stage of exercise

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	334.919	329.455	5.463 w/4 DF (p = 0.2430)

Table 8. continued

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-2.8581	0.3887	54.0790	0.0001		
Stage 2	1	-1.2528	0.6999	3.2039	0.0735	-0.243820	0.286
Stage 3	1	-0.4792	0.5468	0.7680	0.3808	-0.096860	0.619
Stage 4	1	-1.7166	1.0777	2.5373	0.1112	-0.252107	0.180
Stage 5	1	-0.6589	0.4530	2.1154	0.1458	-0.181613	0.517

Table 9. Logistic regression analysis -- DV = seat belt nonuse, IV = stage of exercise

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	916.286	899.858	16.429 w/4 DF (**p = 0.0025**)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-1.2829	0.2136	36.0820	0.0001		
Stage 2	1	-0.4964	0.2982	2.7720	0.0959	-0.096768	0.609
Stage 3	1	-0.8300	0.3107	7.1349	**0.0076**	-0.167676	0.436
Stage 4	1	-0.7851	0.3847	4.1642	**0.0413**	-0.115220	0.456
Stage 5	1	-1.0197	0.2529	16.2590	**0.0001**	-0.281045	0.361

Table 10. Logistic regression analysis -- DV = alcohol use (> 2 drinks/day), IV = stage of exercise

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	453.627	449.197	4.430 w/4 DF (p = 0.3509)

Table 10. continued

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-3.4340	0.5080	45.6950	0.0001		
Stage 2	1	0.8399	0.5837	2.0702	0.1502	0.163720	2.316
Stage 3	1	-0.0625	0.6556	0.0091	0.9240	-0.012630	0.939
Stage 4	1	0.5108	0.6847	0.5566	0.4556	0.074968	1.667
Stage 5	1	0.2778	0.5447	0.2601	0.6101	0.076557	1.320

Table 11. Logistic regression analysis -- DV = nonregular use of stress management practices, IV = stage of exercise

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	1518.245	1479.648	38.597 w/4 DF (p = **0.0001**)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-1.3994	0.2562	29.8420	0.0001		
Stage 2	1	-0.1184	0.3124	0.1438	0.7046	-0.023393	0.888
Stage 3	1	-0.2061	0.3055	0.4550	0.5000	-0.042278	0.814
Stage 4	1	-0.4986	0.3460	2.0766	0.1496	-0.071937	0.607
Stage 5	1	-0.9524	0.2686	12.5780	**0.0004**	-0.262178	0.386

The next step was to add the remaining independent variables (i.e., control variables) to the model. This was done to determine whether stage of exercise was still a significant predictor of the behaviors when respondents were equated by the control

variables. When the full model including all independent variables was analyzed, several of the stages that were significant predictors of behaviors in the simple regressions became nonsignificant.

When cigarette use was regressed on stage of exercise and all control variables, only Stage 4 remained a significant predictor at the .05 level of significance (Stage 5 became nonsignificant): respondents in Stage 4 (Action) were 76% less likely to be cigarette smokers than respondents in Stage 1 (Precontemplation). Marital status and all levels of education were also significant contributors to the model, respondents who were married were 58% less likely to smoke than respondents who were not married, and respondents in the third and fourth levels of education (i.e., bachelor's degree and master's degree) were approximately 80% less likely to smoke than respondents in the first level of education (≤ high school degree).

When smokeless tobacco use was regressed on stage of exercise and all control variables, the full model was a significant predictor of smokeless tobacco behavior (the model without controls was not significant). However, no stage of exercise was significant in predicting the behavior. Several of the control variables were significant predictors of smokeless tobacco behavior: Respondents who wore their seat belts < 75% of the time were over four times as likely to be users of smokeless tobacco than respondents who wore their seat belts ≥ 75% of the time; age group 3 (40-49) were 79% less likely to use smokeless tobacco than the youngest age group (20-29); and men were over 27 times more likely to use smokeless tobacco than women.

When seat belt nonuse was regressed on stage of exercise and all control variables, the full model was a significant predictor of the behavior. Stages 3, 4, and 5 remained significant predictors of the behavior: Respondents were 62%, 58%, and 64%, respectively, less likely to use their seat belt < 75% of the time than respondents in Stage 1. In addition, Stage 2 became a significant predictor of seat belt nonuse: Respondents in Stage 2 of exercise were 50% less likely to use their seat belts < 75% of the time than respondents in Stage 1.

When alcohol use was regressed on stage of exercise and all control variables, the full model was not a significant predictor of the behavior.

When nonregular use of stress management practices was regressed on stage of exercise and all control variables, the full model was a significant predictor of the behavior. Stage 5 continued to be the only stage that significantly predicted the behavior: Respondents in Stage 5 of exercise were 54% less likely to not use regular stress management practices than respondents in Stage 1. Two levels of education were predictive of the behavior: Respondents in levels 3 and 4 for education (bachelor's and master's degrees) were 45%, and 56%, respectively, less likely to not use regular stress management practices than respondents in the first level of education (≤ high school).

Table 12. Logistic regression analysis -- DV = cigarette use, IV = stage of exercise + smokeless tobacco, seat belt nonuse, alcohol use, nonregular use of stress management practices, age, gender, marital status, job class, dependent status, education, income

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	637.914	559.239	78.675 w/24 DF (p = **0.0001**)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-0.8555	0.7489	1.3052	0.2533		
Stage 2	1	-0.1245	0.4057	0.0942	0.7589	-0.024811	0.883
Stage 3	1	-0.1479	0.4128	0.1284	0.7201	-0.030197	0.862
Stage 4	1	-1.4178	0.6787	4.3639	**0.0367**	-0.203786	0.242
Stage 5	1	-0.6545	0.3792	2.9796	0.0843	-0.180138	0.520
Smokless T.	1	0.2654	0.6225	0.1817	0.6699	0.023606	1.304
Seat belt	1	-0.0390	0.3292	0.0141	0.9056	-0.007012	0.962
Alcohol	1	1.0358	0.4215	6.0402	**0.0140**	0.113786	2.817
Stress	1	0.0865	0.2658	0.1060	0.7447	0.022246	1.090
Age group 2	1	0.7842	0.4667	2.8239	0.0929	0.186212	2.191
Age group 3	1	0.2259	0.4704	0.2306	0.6311	0.060930	1.253
Age group 4	1	0.3580	0.4874	0.5394	0.4627	0.082117	1.430
Age group 5	1	0.2630	0.6483	0.1645	0.6850	0.032374	1.301
Gender	1	-0.1502	0.2660	0.3190	0.5722	-0.041307	0.861
Marital St.	1	-0.8360	0.3028	7.6224	**0.0058**	-0.193849	0.433
Job Class	1	0.2829	0.4265	0.4399	0.5071	0.077966	1.327
Dependent	1	-0.3550	0.2555	1.9310	0.1646	-0.097245	0.701
Education 2	1	-0.8641	0.3421	6.3791	**0.0115**	-0.178595	0.421
Education 3	1	-1.5769	0.3740	17.7803	**0.0007**	-0.382481	0.207
Education 4	1	-1.6636	0.5446	9.3318	**0.0023**	-0.344529	0.189
Education 5	1	-1.2469	0.5474	5.1873	**0.0228**	-0.313535	0.287
Income 2	1	0.1080	0.3471	0.0969	0.7556	0.022002	1.114
Income 3	1	-0.2114	0.3868	0.2987	0.5847	-0.048886	0.809
Income 4	1	0.2414	0.4284	0.3175	0.5731	0.059325	1.273
Income 5	1	-0.1258	0.5760	0.0477	0.8271	-0.024542	0.882

Table 13. Logistic regression analysis -- DV = smokeless tobacco use, IV = stage of exercise + cigarette use, seat belt nonuse, alcohol use, non regular use of stress management practices, age, gender, marital status, job class, dependent status, education, income

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	285.740	197.301	88.439 w/24 DF (p = **0.0001**)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-1.4332	9.9463	0.0016			
Stage 2	1	-0.7863	0.8428	0.8705	0.3508	-0.156667	0.456
Stage 3	1	0.4499	0.7595	0.3508	0.5536	0.091836	1.568
Stage 4	1	-0.6285	1.2423	0.2560	0.6129	-0.090336	0.533
Stage 5	1	-0.2053	0.6888	0.0889	0.7656	-0.056512	0.814
Cigarette	1	0.2749	0.7137	0.1484	0.7001	0.040771	1.316
Seat belt	1	1.4540	0.4768	9.2994	**0.0023**	0.261251	4.280
Alcohol	1	0.2352	0.8986	0.0685	0.7935	0.025842	1.265
Stress	1	-0.1404	0.4433	0.1003	0.7515	-0.036089	0.869
Age group 2	1	0.2108	0.6264	0.1132	0.7365	0.050048	1.235
Age group 3	1	-1.5666	0.7408	4.4722	**0.0345**	-0.422524	0.209
Age group 4	1	-1.5999	0.8405	3.6230	0.0570	-0.366979	0.202
Age group 5	1	-11.9920	126.1	0.0091	0.9242	-1.476365	0.000
Gender	1	3.2827	0.7622	18.551	**0.0001**	0.902579	26.647
Marital St.	1	0.1195	0.5557	0.0463	0.8297	0.027710	1.127
Job Class	1	-0.4750	0.6222	0.5828	0.4452	-0.130918	0.622
Dependent	1	-0.0464	0.4866	0.0091	0.9241	-0.012700	0.955
Education 2	1	-0.2328	0.7873	0.0874	0.7675	-0.048119	0.792
Education 3	1	-0.6949	0.7235	0.9225	0.3368	-0.168550	0.499
Education 4	1	-1.0852	0.9279	1.3677	0.2422	-0.224745	0.338
Education 5	1	-1.6711	0.9386	3.1698	0.0750	-0.420267	0.188
Income 2	1	-0.0746	0.6643	0.0126	0.9106	-0.015196	0.928
Income 3	1	0.6732	0.6665	1.0202	0.3125	0.155672	1.960
Income 4	1	-0.0199	0.8247	0.0037	0.9517	-0.012268	0.951
Income 5	1	-1.1593	1.2354	0.8805	0.3481	-0.226136	0.314

Table 14. Logistic regression analysis -- DV = seat belt nonuse, IV = stage of exercise + cigarette use, smokeless tobacco use, alcohol use, nonregular use of stress management practices, age, gender, marital status, job class, dependent status, education, income

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	854.449	769.157	85.292 w/24 DF (p = **0.0001**)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-0.2682	0.5661	0.2244	0.6357		
Stage 2	1	-0.6880	0.3381	4.1400	**0.0419**	-0.137077	0.503
Stage 3	1	-0.9718	0.3537	7.5488	**0.0060**	-0.198374	0.378
Stage 4	1	-0.8767	0.4337	4.0872	**0.0432**	-0.126014	0.416
Stage 5	1	-1.0247	0.3005	11.629	**0.0006**	-0.282021	0.359
Cigarette	1	-0.0264	0.3299	0.0064	0.9363	-0.003910	0.974
Smokeless T.	1	1.2802	0.4484	8.1509	0.0043	0.113876	3.597
Alcohol	1	-0.1423	0.4842	0.0864	0.7688	-0.015637	0.867
Stress	1	0.0428	0.2146	0.0399	0.8418	0.011014	1.044
Age group 2	1	-0.5116	0.3644	1.9712	0.1603	-0.121488	0.600
Age group 3	1	-0.2351	0.3419	0.4729	0.4916	-0.063409	0.790
Age group 4	1	-0.0859	0.3614	0.0566	0.8120	-0.019715	0.918
Age group 5	1	-0.7389	0.5722	1.6676	0.1966	-0.090963	0.478
Gender	1	0.6097	0.2140	8.1172	**0.0044**	0.167651	1.840
Marital St.	1	-0.6454	0.2534	6.4852	**0.0109**	-0.149654	0.524
Job Class	1	0.3201	0.3136	1.0419	0.3074	0.088218	1.377
Dependent	1	0.00872	0.2119	0.0017	0.9672	0.002388	1.009
Education 2	1	-0.5837	0.3236	3.2532	0.0713	-0.120632	0.558
Education 3	1	-0.5581	0.3154	3.1316	**0.0768**	-0.135361	0.572
Education 4	1	-0.8057	0.4247	3.5997	**0.0578**	-0.166869	0.447
Education 5	1	-1.2582	0.4581	7.5441	**0.0060**	-0.316431	0.284
Income 2	1	0.0288	0.2957	0.0095	0.9225	0.005869	1.029
Income 3	1	-0.2614	0.3220	0.6592	0.4168	-0.060455	0.770
Income 4	1	-0.1702	0.3631	0.2198	0.6392	-0.041843	0.843
Income 5	1	0.3717	0.4157	0.7993	0.3713	0.072502	1.450

Table 15. Logistic regression analysis -- DV = alcohol use, IV = stage of exercise + cigarette use, smokeless tobacco use, seat belt nonuse, nonregular use of stress management practices, age, gender, marital status, job class, dependent status, education, income

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	399.743	378.197	21.546 w/24 DF (p = 0.6063

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	-3.3447	1.1288	8.7804	0.0030		
Stage 2	1	1.3806	0.7931	3.0308	0.0817	0.275096	3.977
Stage 3	1	0.5924	0.8528	0.4825	0.4873	0.120918	1.808
Stage 4	1	1.4150	0.8805	2.5822	0.1081	0.203379	4.116
Stage 5	1	0.8236	0.7778	1.1211	0.2897	0.226664	2.279
Cigarette	1	1.0490	0.4208	6.2150	**0.0127**	0.155563	2.855
Smokeless T.	1	0.4321	0.7949	0.2955	0.5867	0.038440	1.541
Seat belt	1	-0.1510	0.4765	0.1005	0.7513	-0.027137	0.860
Stress	1	-0.0263	0.3328	0.0063	0.9369	-0.006768	0.974
Age group 2	1	-0.5263	0.6205	0.7196	0.3963	-0.124971	0.591
Age group 3	1	-0.1704	0.5771	0.0872	0.7678	-0.045958	0.843
Age group 4	1	-0.2335	0.6073	0.1479	0.7006	-0.053565	0.792
Age group 5	1	0.2574	0.7430	0.1200	0.7290	0.031694	1.294
Gender	1	0.4465	0.3408	1.7168	0.1901	0.122778	1.563
Marital St.	1	-0.2730	0.4154	0.4318	0.5111	-0.063296	0.761
Job Class	1	-0.3544	0.4945	0.5137	0.4735	-0.097694	0.702
Dependent	1	-0.2890	0.3398	0.7236	0.3950	-0.079170	0.749
Education 2	1	-0.2370	0.5287	0.2009	0.6540	-0.048983	0.789
Education 3	1	-0.7169	0.5468	1.7191	0.1898	-0.173896	0.488
Education 4	1	-0.4611	0.6578	0.4915	0.4833	-0.095498	0.631
Education 5	1	-1.2498	0.7093	3.1043	0.0781	-0.314323	0.287
Income 2	1	0.1377	0.5571	0.0611	0.8048	0.028052	1.148
Income 3	1	0.5809	0.5197	1.2492	0.2637	0.134335	1.788
Income 4	1	0.4844	0.5922	0.6691	0.4134	0.119061	1.623
Income 5	1	0.4533	0.6995	0.4199	0.5170	0.088419	1.573

Table 16. Logistic regression analysis -- DV = nonregular use of stress management practices, IV = stage of exercise + cigarette use, smokeless tobacco use, seat belt nonuse, alcohol use, age, gender, marital status, job class, dependent status, education, income

Model Fitting Information and Testing of the Global Null Hypothesis BETA = 0

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
-2 LOG L	1452.522	1391.113	61.410 w/24 DF (p = **0.0001**)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-SQ	Pr > Chi-SQ	Standardized Estimate	Odds Ratio
Intercept	1	1.2038	0.4646	6.7146	0.0096		
Stage 2	1	0.0638	0.3239	0.0388	0.8439	0.012711	1.066
Stage 3	1	0.0598	0.3209	0.0347	0.8522	0.012202	1.062
Stage 4	1	-0.2448	0.3642	0.4518	0.5015	-0.035179	0.783
Stage 5	1	-0.7814	0.2838	7.5790	**0.0059**	-0.215050	0.458
Cigarette	1	0.1187	0.2632	0.2034	0.6520	0.017601	1.126
Smokeless T.	1	-0.2879	0.4136	0.4844	0.4864	-0.025607	0.750
Seat belt	1	0.0585	0.2124	0.0760	0.7828	0.010520	1.060
Alcohol	1	-0.0246	0.3302	0.0056	0.9405	-0.002705	0.976
Age group 2	1	-0.0157	0.2702	0.0034	0.9538	-0.003717	0.984
Age group 3	1	0.0794	0.2664	0.0888	0.7657	0.021412	1.083
Age group 4	1	0.00976	0.2804	0.0012	0.9722	0.002238	1.010
Age group 5	1	0.2191	0.3758	0.3399	0.5599	0.026975	1.245
Gender	1	0.1974	0.1501	1.7294	0.1885	0.054288	1.218
Marital St.	1	0.1560	0.1866	0.6986	0.4032	0.036163	1.169
Job Class	1	-0.00653	0.2079	0.0010	0.9750	-0.001799	0.993
Dependent	1	0.2207	0.1448	2.3233	0.1274	0.060470	1.247
Education 2	1	-0.5256	0.2858	3.3812	0.0659	-0.108634	0.591
Education 3	1	-0.5887	0.2792	4.4462	**0.0350**	-0.142789	0.555
Education 4	1	-0.8301	0.3293	6.3555	**0.0117**	-0.171926	0.436
Education 5	1	-0.4978	0.3423	2.1156	0.1458	-0.125204	0.608
Income 2	1	0.4617	0.2369	3.7977	0.0513	0.094044	1.587
Income 3	1	0.0708	0.2280	0.0965	0.7561	0.016381	1.073
Income 4	1	0.1678	0.2506	0.4486	0.5030	0.041256	1.183
Income 5	1	0.2101	0.2894	0.5269	0.4679	0.040974	1.234

CHAPTER 5

DISCUSSION

The purpose of this study was to determine if the stages of exercise adoption were associated with other health behaviors in a sample of university employees. Stage of exercise was found to be predictive of three of the five health behaviors selected in this investigation: Respondents in the Precontemplation Stage (Stage 1) for exercise were more likely to be cigarette smokers, less likely to wear their seat belt ≥ 75% of the time, and less likely to use regular stress management practices than respondents in higher stages of exercise.

Cigarette Use

After controlling for all independent variables (i.e., demographic, socioeconomic, and other health-behavior variables), it was found that Stage 4 was predictive of smoking behavior: Respondents in Stage 4 were significantly less likely to smoke than respondents in Stage 1. However, none of the other stages were significant predictors of this behavior.

Stage 4 exercisers represent exercisers who are relatively new to the behavior--by definition they have been participating in regular exercise for zero-to-six months. It may be that *beginning* to exercise is more difficult than maintaining exercise. Researchers have found that approximately 50% of those who do begin an exercise program drop out within

the first three-to-six months (Carmody, Senner, Manilow, & Mattarazzo, 1980; Dishman, 1988). It is possible that individuals who have not yet experienced the cardiovascular and pulmonary adaptations that accompany regular aerobic training (McArdle, Katch, & Katch, 1994) may find that cigarette smoking and beginning to exercise are incompatible behaviors. Therefore, they either discontinue exercising and drop to a lower stage or continue exercising but cease the smoking behavior.

In addition, it may be possible that respondents in Stage 4 were recent quitters of smoking behavior. In a recent prospective study, researchers examined diet, alcohol, and physical activity in relation to smoking status in middle-aged women (Perkins, Rohay, Meilahn, Wing, Matthews, & Kuller, 1993). The researchers found that "compared with continuing smokers, ex-smokers did not change their dietary and alcohol intake but significantly increased physical activity (Perkins et al., 1993, p. 410). Although no causal inference can be made due to the cross-sectional nature of the data, it is possible that recent quitters could begin to exercise (i.e., Action Stage of exercise) in order to control weight or to relieve stress related to quitting smoking.

Stage 5, which was not significant as a predictor ($p = 0.0843$), includes exercisers that have been exercising regularly for longer than six months and may have developed adequate heart and lung capacity such that smoking may not be as detrimental to exercise behavior as it is for exercisers who are just beginning the behavior. However, due to the cross-sectional nature of the data, it is not possible to make conclusions about the causal relationship between smoking and stage of exercise.

Three control variables--alcohol use, marital status, and level of education--were associated with cigarette smoking. A positive association between cigarette smoking and use of alcohol is consistent with the literature (Istvan & Matarazzo, 1984; Remington, Forman, Gentry, Marks, Hogelin, & Trowbridge, 1985; Revicki, Sobal, & DeForge, 1991). As expected, there was a relationship between smoking status and level of education: Those individuals in higher levels of education tended to smoke less than individuals in lower levels of education (MT BRFSS, 1995). An interesting finding was that those respondents who were married were less likely to be smokers than respondents who were not married. A similar relationship was found in the Montana BRFSS which reported that divorced individuals were more likely to be smokers than individuals who were married (33.9% vs. 18.7% respectively). However, this may also be due to the association between educational status and smoking; more men are married than women (82.5% vs. 72.9%), and male respondents had a much higher level of education than female respondents (four times as many men had terminal degrees as women). Although more females reported smoking than males (9.2% vs. 6.8%, respectively), gender was not a significant predictor of smoking behavior. This may also be explained by the differences in education levels between males and females.

The fact that Stage 4 (Action) was the only stage predictive of cigarette use suggests that only individuals who are just starting to exercise have lower probabilities of smoking. These results should be interpreted with caution due to the small frequency of smokers in Stage 4 for exercise (N = 3). With regard to the other stages, a trend became

evident in the association of stage of exercise and cigarette use; progression through the stages of exercise was associated with lower percentages of respondents reporting smoking behavior (Table 5, Figure 1). This finding is compatible with the literature regarding the association between smoking and exercise behavior (Blair et al., 1985; Shephard, 1989; Wankel & Sefton, 1994; White et al., 1987). The Spearman correlation matrix (Appendix B, Table 22) shows that the correlation between smoking and stage of exercise changes from positive to negative when Stage 4 is reached, indicating that as the respondent begins to exercise regularly the association with smoking becomes negative. However, these correlations should be interpreted with caution due to the lack of control for demographic and socioeconomic variables.

Smokeless Tobacco Use

No stage of exercise was found to be predictive of smokeless tobacco behavior. Inadequate cell sizes for smokeless tobacco vs. stage of exercise make interpretation of these findings inadvisable. A suggestion for future research is for researchers to sample populations with a higher rate of smokeless tobacco use than the university sample used in this investigation. Several control variables were predictive of smokeless tobacco use. Seat belt nonusers were over four times more likely to be users of smokeless tobacco. One possible explanation of this may be that users of smokeless tobacco are almost exclusively men, and men are less likely to wear their seat belts regularly than are women (MTBRFSS, 1995). Age group three (40-49) were less likely to use smokeless tobacco

than age group one (20-29). In the state of Montana the highest prevalence of smokeless tobacco use, 33%, is among males aged 25-34 (MT BRFSS, 1995).

Seat Belt Nonuse

After controlling for all independent variables, it was found that Stages 2-5 (Contemplation - Maintenance) were predictive of seat belt nonuse when compared to Stage 1 (Precontemplation): Respondents in Stage 2, 3, 4, and 5 were approximately 50%, 62%, 58%, and 64%, respectively, less likely to be seat belt nonusers than respondents in Stage 1. Results are consistent with the findings of other researchers who have shown a negative association between exercise and seat belt nonuse (Blair et al, 1985; Langlie; 1979; Williams & Wechsler, 1972).

A clear trend became evident when the association between stage of exercise and seat belt nonuse was reported (Table 5 and Chart 1); progression through the stages of exercise was associated with significantly lower percentages of respondents reporting seat belt nonuse.

Four control variables were significant predictors of seat belt nonuse; use of smokeless tobacco, gender, marital status, and level of education. One possible explanation of the association between smokeless tobacco and seat belt nonuse has been discussed above. Another possible explanation may be that smokeless tobacco users are more likely to be found in the youngest age group, and there is a negative association between age and seat belt nonuse (MT BRFSS, 1995). Hence, it follows that smokeless

tobacco users use their seat belts less often than nonusers. The finding that more females regularly wear their seat belts than males is supported by the results of the MT BRFSS. It is interesting that more married respondents wear their seat belt than respondents who were not married. This may be due to the fact that more male respondents vs. women respondents were married (82.5% vs. 72.9%), and men are less likely to wear their seat belts than women. The fact that lower levels of education were associated with seat belt nonuse is also supported by the literature (Eiser & Sutton, 1979; Helsing & Comstock, 1977).

Alcohol Use

When alcohol use was regressed on stages of exercise and all covariates, the full model was not found to be a significant predictor of the behavior. This finding was consistent with the literature; no clear association has been found between exercise behavior and alcohol consumption (Blair et al., 1985; Shephard, 1989; Wankel & Sefton, 1994; White et al., 1987). It should be noted that low cell frequencies could have been a limitation with this analysis (Table 5, Precontemplation, N = 2; Action, N = 5).

Nonregular Use of Stress Management Practices

After controlling for all covariates, Stage 5 was found to be predictive of nonregular use of stress management practices. Only one study was found that measured the relationship between exercise and use of stress management practices; a positive

relationship was reported (Kronenfeld et al., 1988). It is possible that this relationship is influenced by the fact that exercise is considered a stress management practice. Therefore, those respondents who regularly exercise to relieve stress would also be included in Stage 5 of exercise. It may be that respondents in Stage 4 had not been exercising long enough to discover the stress management benefits of regular exercise.

Although Stage 5 was the only stage that significantly predicted nonregular use of stress management practices, a trend became evident when the association between stage of exercise and stress management practices was reported (Table 5, Figure 5); progression through the stages of exercise was associated with a lower percentage of respondents reporting nonregular use of stress management practices (Table 5, Figure 5).

Only one control variable, level of education, was predictive of nonregular use of stress management practices. Respondents in levels three and four (bachelor's degree and master's degree) were less likely to be nonregular users of stress management practices when compared with respondents with less than a high school education. Nothing was found in the literature to support this finding, however, due to the positive association between education and other positive health practices such as physical activity (King et al., 1992), it is possible that this relationship also exists with stress management practices.

Summary

A significant association was found between three of the five health behaviors examined in this investigation and stage of exercise. Progression through the stages of

exercise was associated with less cigarette use, less seat belt nonuse, and less nonregular stress management behavior. However, only one behavior, seat belt nonuse, was significantly predicted with each progression through the stages of exercise.

In addition, the data lends support to the validity of the classification of respondents by stage. Behaviors changed as respondents progressed through the stages, suggesting that the stages of exercise behavior are conceptually distinct.

Conclusions

Multiple risk behaviors (e.g., smoking, not exercising, not wearing seat belts, drinking heavily) have been associated with high health care costs (Emmons et al., 1994; Yen et al., 1991). A large percentage of the U.S. population exhibit multiple risk behaviors (Emmons et al., 1994). Therefore, it is important to understand the mechanisms by which people change behaviors in order to design health promotion programs to affect multiple behaviors.

In the case of cigarette use and nonregular use of stress management practices, it was necessary for respondents to attain Stage 4 or 5 in order to significantly predict the behavior. Quitting smoking and engaging in regular stress management practices are more difficult behaviors to accomplish, requiring a much higher level of commitment on the part of the individual than simply wearing a seat belt. It may be necessary for individuals to attain a higher level of commitment to exercise before they are motivated to change the more difficult-to-change behaviors of smoking and stress management behavior.

Behaviors that are difficult to change, such as smoking, may potentially be affected indirectly through exercise interventions. However, it may be that a high degree of involvement in exercise is necessary before difficult to change behaviors can be affected. The Stages of Change Model has been useful for understanding how people change exercise behavior. Exercise has been found to have therapeutic effects in relation to a variety of chronic diseases and could be a possible "gateway" behavior towards healthier lifestyle choices.

Direction for Future Research

In the past health behavior research has focused on understanding mechanisms involved in changing single behaviors (i.e., smoking cessation research or physical activity research). Few studies have investigated ways in which multiple health behaviors can be changed simultaneously (Emmons et al., 1994). Stages of Change Theory provides a useful model for understanding behavior change. Future research should focus on the mechanisms and motivations people use to change multiple behaviors.

Limitations

A number of limitations were present in this study, and it is hoped that researchers will address these issues in subsequent investigations. First, this study relied on self-reports of health behaviors. In a review focusing on the validity of self-reports in research and practice, it was found that individuals tend to underreport certain behaviors thought to

be socially undesirable (Strecher, Becker, Clark, & Prasada-Rao, 1989). For example, it was found that the general population tends to underreport alcohol consumption. Smokers participating in smoking cessation or cardiac rehabilitation programs are also more likely to misclassify their smoking behavior. However, smokers not involved in a smoking cessation intervention appear to correctly represent their smoking status (i.e., smoker vs. non-smoker) (Strecher et al., 1989). Inaccurate recall can affect the validity of self-reports, although it has been found to be more of a problem with level of consumption rather than with behavior status. Dillman (1978) reports that socially undesirable answers occur most often in face-to-face interviews and least often in mail surveys. Although it may be more desirable to obtain objective measures of health behaviors, it is seldom feasible or cost-effective in large studies.

Second, due to the cross-sectional nature of the data used in this investigation, no statements regarding causality can be made. For example, it cannot be said that moving from Stage 3 (Preparation) to Stage 4 (Action) *causes* an individual to stop smoking. Longitudinal studies are needed to understand the causal relationship of stage of exercise and other health behaviors.

Third, more objective measures should be found to measure physical activity. The activity measure in this study addressed the issues of frequency and duration but not level of intensity. It is possible that individuals who classified themselves as regular exercisers were not exercising at a level sufficient to obtain health benefits.

In addition, different questions should be used to classify respondents as to stage of exercise. Forty-eight respondents were not able to be classified due to missing data. It is thought that some respondents did not understand the questions adequately enough to answer them completely. Questions used to classify individuals as to their stage of exercise that have been tested for reliability and validity should be used in future research (Marcus, Eaton, et. al., 1994).

Finally, studies conducted on more representative and diverse populations would be desirable. The MSU population is a more highly educated, wealthier, and more health-conscious population than the general Montana population.

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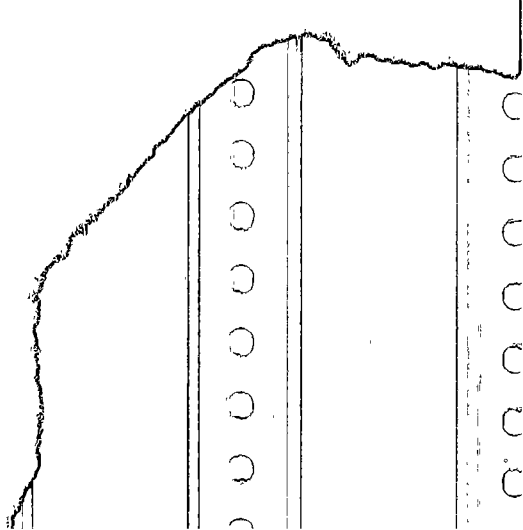
APPENDICES



APPENDIX A

COVER LETTERS & QUESTIONNAIRE USED IN THIS STUDY

MONTANA STATE UNIVERSITY

Office of the President
211 Montana Hall
MSU • Bozeman
Bozeman, MT 59717-0242
Telephone (406) 994-2341
Fax (406) 994-1893

October 24, 1996

Dear University Employee:

I am writing to request your participation in a campus-wide research effort, and with the hope that you will participate.

The research concerns our Employee Wellness Program (EWP). The study is intended to evaluate the impact of the EWP on the employee population as well as any relationship between EWP participation and health insurance costs. The study is being conducted by Dr. Tim Dunnagan and Dr. George Haynes of the Department of Health and Human Development, and Dr. Vince Smith of the Department of Agricultural Economics and Economics, and has the full support of the MSU-Bozeman Benefits Committee.

Your participation is, of course, voluntary, but I hope you will choose to take part. The investigators have gone through an extensive process, approved by the MSU-Bozeman Human Subjects Committee, to protect respondent anonymity. Only summarized information from all the respondents will be used or published. The original data will be processed by the Information Technology Center and *no identifying numbers, such as social security numbers, will be released to anyone.*

Please take some time right now to complete and return the enclosed questionnaire. By responding within the next five days, you can help us save resources and time that would otherwise go to follow-ups with those who have not responded. If you have any questions about the study, please feel free to call Dr. Tim Dunnagan at 994-4001.

Again, thank you for your support and assistance in this research project.

Sincerely,

Michael Malone
President

MM/bk

MONTANA STATE UNIVERSITY
BOZEMAN

Department of Health and Human Development
Marga Hosaeus Health and Physical Education Complex
MSU • Bozeman
Bozeman, MT 59717-0336
Telephone (406) 994-4001
Fax (406) 994-6314

December 4, 1996

Dear University Employee,

Within the last month, you should have received the enclosed Employee Wellness Survey. Our records indicate that you have not returned it. This is a busy time of year for all of us and I know your time is very valuable. I realize how easily things can be misplaced and have therefore enclosed another survey for your convenience. Your input in this investigation is very important and I urge you to respond during this second mailing.

If you have already responded, please excuse this second reminder (and thank you!). If you have not responded, I would greatly appreciate your doing so at this time. Please use the enclosed envelope and return the survey, via campus mail, at your earliest convenience.

Thank you for your support.

Sincerely,

Tim Dunnagan
Health and Human Development

MONTANA STATE UNIVERSITY
BOZEMAN

Department of Health and Human Development

Hosaeus PE Complex
P.O. Box 173360
Bozeman, MT 59717-3360

Telephone (406) 994-4001
Fax (406) 994-6314

January 13, 1997

Dear University Employee,

Last semester you should have received the enclosed Employee Wellness Survey. Our records indicate that you have not returned the survey. Our intent in sending you this *final* mailing is not to harass you. However, your participation is very important. Currently, 63% of the MSU-Bozeman employees have responded and our goal is 70%. Please take 10 minutes of your time to complete and return the enclosed survey.

Thank you for your support.

Sincerely,

Tim Dunnagan

November 1996

Questionnaire #

Each questionnaire is individually numbered. Once a completed questionnaire is returned, that number is removed from the separate mailing list so the respondent will not be sent the various reminders and follow-ups that are necessary to insure an appropriately high response rate.

We urge you to respond, to give us the benefit of your candid judgments and experiences, regardless of the extent of any involvement in EWP activities.

***Please complete and return this questionnaire within the next five days.** A pre-addressed reply envelope is provided for your convenience in doing so. And please feel free to call Dr. Tim Dunnagan at 994-4001 if you have any questions or concerns.*

MSU-Bozeman Employee Wellness Survey

Please check or fill in the most appropriate response for each question.

Section A.

A. During 1996, did you participate in any MSU Employee Wellness Program (EWP) activity? ❑ Yes ❑ No

A2. Have you *ever* participated in any EWP activity? ❑ Yes ❑ No

A3. What is your age as of your last birthday? _____

A4. What is your gender? ❑ Male ❑ Female

A5. Are you: ❑ Married? ❑ Not married?

A6. What is the highest grade or year of school you completed?

❑ Some high school or less
❑ High school graduate/GED
❑ College 1-3 years (including associate or 2-year degree)
❑ Bachelor's degree
❑ Master's degree
❑ Terminal degree

A7. What is your job classification at MSU?

❑ Classified hourly ❑ Classified salary ❑ Nonclassified hourly
❑ Contract faculty ❑ Contract professional ❑ Contract administrator

A8. How many dependents do you have, other than a spouse, in each age category? (Include children and any others.) Place a check (✔) next to "none" if you have no dependents.

_____ None _____ 6-12 years _____ 18-65 years
_____ Under 6 years _____ 13-17 years _____ Over 65 years

Section B.

B1. Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?

❑ Yes → B1a. → Was the first number (systolic blood pressure) 140 or higher? ❑ Yes ❑ No ❑ Not sure

B1b. → Was the second number (diastolic blood pressure) 90 or higher? ❑ Yes ❑ No ❑ Not sure

❑ No

B2. Have you ever been told by a doctor or other health professional that your blood cholesterol is high?

☐ Yes → B2a. → Was your total cholesterol 240 mg/dl or higher?
☐ No ☐ Yes ☐ No ☐ Not sure

B3. Do you smoke cigarettes now? ☐ Yes ☐ No

B4. Do you currently use any smokeless tobacco products such as chewing tobacco or snuff? ☐ Yes ☐ No

B5. About how much do you weigh without shoes? _____ lbs

B6. About how tall are you without shoes? _____ ft/in

B7. How often do you use seat belts when you drive or ride in a car?

☐ 100% of the time
☐ 75% of the time
☐ 50% of the time
☐ Less than 50% of the time
☐ Never drive or ride in a car

B8. During the past month, how many alcoholic drinks did you consume each day on the average? (A drink is 1 can or bottle of beer, 1 glass of wine, 1 cocktail, or 1 shot of liquor.)

☐ 0 drinks
☐ between 0 and 1 drink
☐ 2 drinks
☐ 2 drinks
☐ 3 drinks
☐ 4 or more drinks

Please note for questions B9-13, "exercise" refers to any physical activity or exercise such as running, calisthenics, golf, gardening, or walking. To "exercise regularly" means that you exercise at least 3 times per week for at least 20 minutes per session.

B9. I do exercise now. ☐ Yes ☐ No

B10. In the next 6 months, I plan to exercise. ☐ Yes ☐ No

B11. I exercise *regularly* now. ☐ Yes ☐ No

B12. For the past 6 months, I have exercised *regularly*. ☐ Yes ☐ No

B13. During the past 3 years, I have exercised *regularly* for a period of at least 3 months in a row. ☐ Yes ☐ No

For questions B14-18, "stress reduction activities" refers to any activity or exercise done specifically to reduce stress such as relaxation exercises, listening to music, hiking, meditation, etc. To participate "regularly" in stress reduction activities means that you do some type of stress reduction activity at least 3 times per week.

B14. I participate in stress reduction activities now. ☐ Yes ☐ No

B15. In the next 6 months, I plan to participate in stress reduction activities. ☐ Yes ☐ No

B16. I participate in stress reduction activities *regularly* now. ☐ Yes ☐ No

B17. For the past 6 months, I have participated in stress reduction activities *regularly*. ☐ Yes ☐ No

B18. In the past 3 years, I have participated in stress reduction activities *regularly* for a period of at least 3 months in a row. ☐ Yes ☐ No

Instructions for Sections C and D

Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item, we would like you to circle the number that represents the extent to which you disagree or agree with the statement. The more strongly you agree with a statement, then the higher the value of the number you circle. The more strongly you disagree with a statement, then the lower the value of the number you circle. Please make sure that you answer every item and that you circle ONLY ONE number per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

1 = strongly disagree (STD)
2 = moderately disagree (MD)
3 = slightly disagree (SLD)
4 = slightly agree (SLA)
5 = moderately agree (MA)
6 = strongly agree (STA)

For questions C1-5, "health enhancement activities" refers to any activities which contribute to a healthy lifestyle (i.e., healthy diet, physical activity or exercise, stress management activities, participation in health screenings, etc.). ***If you do not participate in health enhancement activities, please skip to question C6.***

Section C	*STD*	*MD*	*SLD*	*SLA*	*MA*	*STA*
C1. I *began* participation in health enhancement activities because I experienced a major illness or disease in my life (e.g., heart attack, stroke, cancer, etc.).	1	2	3	4	5	6
C2. I *began* participation in health enhancement activities because I had some health risk factor(s) of concern (e.g., high blood pressure, diabetes, obesity, poor physical fitness, etc.).	1	2	3	4	5	6
C3. I *began* participation in health enhancement activities because I was warned by a doctor or other health professional that I am at risk for a major illness or disease (e.g., heart attack, stroke, cancer, etc.).	1	2	3	4	5	6
C4. The results of a health screening done outside the Employee Wellness Program (EWP) (e.g., doctor's office) caused me to seek additional medical attention.	1	2	3	4	5	6
C5. I *began* participation in health enhancement activities to relieve depression.	1	2	3	4	5	6
C6. *If you have never participated in the Employee Wellness Program, please skip to Section D.* The results of an EWP health screening provided the stimulus for me to seek additional medical attention.	1	2	3	4	5	6
C7. Information I received while I was in the EWP alerted me to some elevated health risk which caused me to seek additional medical attention.	1	2	3	4	5	6
Section D	*STD*	*MD*	*SLD*	*SLA*	*MA*	*STA*
D1. The EWP is a valuable employee benefit.	1	2	3	4	5	6
D2. I think it is important that the EWP be offered on my campus.	1	2	3	4	5	6
D3. The money that is used to fund the EWP is an appropriate way to spend a portion of the university's benefit monies.	1	2	3	4	5	6
D4. The EWP has positively influenced my health.	1	2	3	4	5	6
D5. I think it is important that the EWP be offered to co-workers.	1	2	3	4	5	6
D6. It is my opinion that the EWP has had a positive influence on my co-workers' health.	1	2	3	4	5	6
D7. I have found the EWP to be an effective way for enhancing a sense of community within my campus.	1	2	3	4	5	6

Section E.

E1. Think of your job in general. All in all, what is it like most of the time? In the blank beside each word or phrase below, write:

"Y" for "yes" if it describes your job *"N" for "no" if it does NOT describe it* *"?" if you cannot decide*

Job in General

_____ Pleasant	_____ Bad	_____ Ideal
_____ Waste of time	_____ Good	_____ Undesirable
_____ Worthwhile	_____ Worse than most	_____ Acceptable
_____ Superior	_____ Better than most	_____ Disagreeable
_____ Makes me content	_____ Inadequate	_____ Excellent
_____ Rotten	_____ Enjoyable	_____ Poor

Section F.

F1. If you were given a total budget of $100 to spend on the following programs, how would you spend (distribute) the $100 among the following programs? Feel free to spend no money on some programs if that is your preference. Please specify:

a. _____ Activity/exercise classes

b. _____ Health screening

c. _____ Health education (i.e., seminars classes)

d. _____ Counseling (i.e., family, marriage, individual)

e. _____ Stress management program

f. _____ Nutrition counseling

g. _____ Other (please specify) _____

_____

F2. Health promoting activities can be performed in a variety of settings. Please indicate the activities in which you currently participate and the settings in which they are performed by placing a check mark (✓) in the appropriate box(es).

Activity	*Employee Wellness Program*	*Community/Private (i.e., health club, private physician or counselor)*	*On My Own*
Activity/exercise classes			
Health screenings			
Health education (i.e., seminars, classes, books)			
Counseling (i.e., family, marriage, individual)			
Stress management program			
Nutrition counseling			
Other (please specify)			

F3. Please rank the following employee benefits according to their importance to you (1 being the *most* important and 7 being the *least* important). Please use each number only once.

a. _____ Dental insurance plan

b. _____ Vision plan

c. _____ Retirement program

d. _____ Health insurance plan

e. _____ Wellness program

f. _____ Employee Assistance Plan (EAP) (counseling services)

g. _____ Life insurance plan

F4. The Montana University System is looking at options for containing health-related costs and ways of maximizing health benefits. For each benefit listed below, please check (✓) the option you feel is most appropriate.

Benefit Option	***Increase Funding***	***Maintain Funding***	***Decrease Funding***	***Eliminate Funding***
Dental plan				
Wellness program				
Vision plan				

Section G.

G1. Which of the following categories best describes your *total household* income from *all* sources in the last calendar year before taxes and other deductions?

❑ Less than $10,000
❑ $10,000-$14,999
❑ $15,000-$19,999
❑ $20,000-$24,999
❑ $25,000-$34,999
❑ $35,000-$49,999
❑ $50,000-$74,999
❑ $75,000-$99,999
❑ Over $100,000

G2. The information from each questionnaire will be used in aggregate analysis only—that is, only the summarized information from all the respondents will be used. No individual responses will be identified or released to anyone. In order to complete the evaluation, though, it is necessary also to match and combine the coded data from each questionnaire with the appropriate health insurance data, and your social security number is needed to do this. Thus, we would appreciate your providing your social security number below:

SS#: _____

The appropriate data will be combined and provided in summarized form to the research investigators; ***no identification will be included.*** This process of ensuring anonymity has been carefully reviewed and approved by the MSU-Bozeman Human Subjects Committee, which oversees research like this with human subjects. However, if you choose not to provide us with your social security number, ***we urge you to still return your completed questionnaire.*** Thank you!

G3. Additional comments: _____

_____

_____

_____

APPENDIX B

CORRELATION MATRICES

Table 17. Spearman correlation coefficients -- demographic and socioeconomic variables

	Gender	Marital Status	Level of Education	Job Class	Dep.	Income
Age	0.09085[c]	0.14654[c]	0.06359[a]	-0.07279[b]	0.01126	0.28810[c]
Gender	1.00 (0.0)	0.11419[c]	0.38287[c]	-0.37623[c]	-0.05934[a]	0.20691[c]
Marital Status		1.00 (0.0)	0.08572[b]	-0.08749[b]	-0.30379[c]	0.48593[c]
Level of Education			1.00 (0.0)	-0.75673[c]	-0.09779[c]	0.47443[c]
Job Class				1.00 (0.0)	0.13661[a]	-0.45125[c]
Dep.					1.00 (0.0)	-0.20577[c]
Income						1.00 (0.0)

[a] $p < 0.05$; [b] $p < 0.01$; [c] $p < 0.001$

Table 18. Spearman correlation coefficients -- behaviors

	Cigarette Smoker	Smokeless Tobacco Use	Seat Belt Non-use	Alcohol Use	Regular Stress Mgmt Use
Cigarette Smoker	1.00 (0.0)	0.01733	0.04548	0.07881[b]	-0.04466
Smokeless Tobacco		1.00 (0.0)	0.14152[c]	0.00926	0.00663
Seat Belt Use			1.00 (0.0)	-0.00451	-0.02854
Alcohol Use				1.00 (0.0)	-0.00380
Regular Stress Mgmt Use					1.00 (0.0)

[a] $p < 0.05$; [b] $p < 0.01$; [c] $p < 0.001$

Table 19. Spearman correlation coefficients -- behaviors vs. demographic and socioeconomic variables

	Cigarette Smoker	Smokeless Tobacco Use	Seat Belt Use	Alcohol Use	Regular Stress Mgmt Use
Age	0.01346	-0.11500[c]	-0.02178	0.01756	-0.01781
Gender	-0.04354	0.15875[c]	0.04721	0.03550	-0.03808
Marital Status	-0.10399[c]	-0.03502	-0.10500[c]	-0.01802	-0.03961
Level of Education	-0.13754[c]	-0.05392[a]	-0.14143[c]	-0.01471	0.02677
Job Class	0.11591[c]	0.00610	0.11491[c]	-0.00568	-0.01774
Dependents	0.08174[b]	0.01418	0.05980[a]	0.03480	0.05480
Income	-0.10777[c]	-0.07442[a]	-0.12129[c]	-0.00626	-0.00598

[a]$p < 0.05$; [b]$p < 0.01$; [c]$p < 0.001$

Table 20. Spearman correlation coefficients -- stages vs. demographic and socioeconomic variables

	Stage 1 Precontemp.	Stage 2 Contempl.	Stage 3 Preparation	Stage 4 Action	Stage 5 Maintenance
Age	0.02909	0.00382	-0.08173[b]	-0.03727	0.08166[b]
Gender	0.03621	-0.01483	-0.04124	-0.06629[a]	0.06668[a]
Marital Status	-0.04286	-0.00968	-0.06194[a]	-0.03842	0.10777[c]
Level of Education	-0.13066[c]	-0.07098[a]	-0.00376	-0.01019	0.14355[c]
Job Class	0.08967[b]	0.05770[a]	0.01058	0.01972	-0.11957[c]
Dependents	0.02289	-0.03743	0.01725	0.01627	-0.02495
Income	-0.09562[c]	-0.06927[a]	-0.03913	-0.01987	0.15120[c]

[a]$p < 0.05$; [b]$p < 0.01$; [c]$p < 0.001$

Table 21. Spearman correlation coefficients -- stages vs. behaviors

	Stage 1 Precontem.	Stage 2 Contempl.	Stage 3 Preparation	Stage 4 Action	Stage 5 Maintenance
Cigarette Smoker	0.09407[c]	0.05644[a]	0.04372	-0.05285	-0.09333[c]
Smokeless Tobacco	0.04749	-0.03168	0.6218	-0.03230	-0.00102
Seat Belt Use	0.12911[c]	0.03698	-0.01085	-0.00321	-0.08040[b]
Alcohol Use	-0.02513	0.05403	-0.02926	0.01134	-0.01116
Regular Stress Mgmt Use	-0.09640[c]	-0.0887[b]	-0.07927[b]	-0.01604	0.17114[c]

[a] $p < 0.05$; [b] $p < 0.01$; [c] $p < 0.001$