AN ABSTRACT OF THE THESIS OF

Marc D. Spaziani for the degree of Master of Science in Exercise and Sport Science presented on December 3, 2003.

Title: Effectiveness of Classroom vs. Web-Based Lifetime Fitness for Health Lab Instruction on College Students' Behavioral and Psychological Physical Activity Orientation.

Redacted for privacy

Abstract approved: ____ _____

Bradley J. Cardinal

Offering courses that promote, encourage, and support physical activity among college students has been an aim of physical education departments for the past century (Sargeant, 1900). Even so, this population has been identified in Healthy People 2010 as a target population segment in need of physical activity intervention. Historically, such coursework has almost exclusively been activity- and skill-based, which made it particularly appealing to students who were already active while those who were not physically activity generally avoided such courses (Scantling, Strand, Lackey, & McAleese, 1995).

Over time, alternative courses and course formats began to evolve, including conceptually-based Lifetime Fitness for Health (LFH) courses (Corbin, 1969). Such courses were designed to promote wellness-related behaviors among college students, including physical activity participation. These courses have

increased in popularity over the past 30 years (Hensley, 2001) and are now included by some colleges and universities as part of the students' graduation requirements (Cardinal, Jacques, & Levi, 2002).

Some colleges and universities have also begun offering on-line versions of their LFH courses (Conlee, 2000), but little research has been done on the effectiveness of these courses and the influences delivery format (i.e. face-to-face vs. web based) may have.

The purpose of this study was to determine the relative effectiveness of a theoretically-based, LFH course on college students' behavioral and psychological physical activity orientation. The independent variables were course format (i.e., face-to-face vs. web-based vs. control) and time (i.e., baseline and post-intervention). The study was conducted over 10 weeks, using intact groups.

The dependent variables were exercise behavior, and self-efficacy, decisional balance, and the behavioral and cognitive processes of change (all from the Transtheoretical Model). Of the initial 151 people enrolled in the study, 109 (72.2%) returned post-intervention questionnaires and were therefore retained in the study. Retention rates did not differ across groups ($p > .30$). The majority of participants were female (60.3%), Caucasian (81.5%), and held either freshman or sophomore class standing (80.1%). Participants were, on average, 21.3 ($SD = 5.7$) years old, with a Body Mass Index (BMI) of 24.3 ($SD = 5.4$). The majority of participants were in the preparation stage of change (45.7%), followed by

maintenance (35.1%), action (12.6%), contemplation (5.3%), and precontemplation (1.3%).

Exercise behavior improved significantly over time ($p < .01$); however, the main effect for groups ($p = .06$), and the group by time interaction were not significant ($p = .31$). Significant main effects were observed between groups ($p < .01$), and over time ($p < .01$) for the vector of means comprised of self-efficacy, decisional balance, and the cognitive and behavioral processes of change. The group by time interaction for the vector of means was not significant ($p = .17$).

Follow-up F-tests revealed the group differences were due to differences in the cognitive ($p < .05$) and behavioral ($p < .05$) processes of change, with no differences observed for either self-efficacy ($p = .35$) or decisional balance ($p = .96$). Time effects were observed for self-efficacy ($p < .05$), and the cognitive ($p < .001$) and behavioral ($p < .01$) processes of change, with no difference observed on decisional balance ($p = .39$). While not entirely supportive, the results due suggest some promising strategies for enhancing the efficacy of LFH courses, regardless of delivery format.

Effectiveness of Classroom vs. Web-Based Lifetime Fitness for Health Lab Instruction on College Students' Behavioral and Psychological Physical Activity Orientation

by
Marc D. Spaziani

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

Presented December 3, 2003
Commencement June 2004

Master of Science thesis of Marc D. Spaziani presented on December 3, 2003.

APPROVED:

Redacted for privacy

Major Professor, representing Exercise and Sport Science

Redacted for privacy

Chair of the Department of Exercise and Sport Science

Redacted for privacy

Dean of the Graduate School

I understand that my thesis will become part o the permanent collection of Oregon State University libraries. My signature below authorized release of my thesis to any reader upon request.

Redacted for privacy

Marc D. Spaziani, Author

ACKNOWLEDGEMENTS

I would like to thank Dr. Bradley Cardinal for his assistance, support, expertise, and guidance throughout my schooling at Oregon State University. His sincere assistance, encouragement, and belief in me has helped greatly throughout my program and thesis project.

On a more personal level, I could not have done this without the support of my wife, children and parents. For without their ongoing support, prayers, and sacrifices, I would not have been able to start and complete my Master's program. Their patience and continued words of encouragement helped me to forge through.

TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION 1

CHAPTER 2 - LITERATURE REVIEW 5

CHAPTER 3 - METHODS 11

PARTICIPANTS 11

INSTRUMENTS 12

Procedures 13
Intervention 15

ANALYSIS 19

CHAPTER 4 - RESULTS 21

CHAPTER 5 - DISCUSSION 34

CHAPTER 6 - CONCLUSION 38

REFERENCES 39

APPENDICES 44

LIST OF TABLES

Table		Page
1	TTM Intervention Overview for HHS-241 General Lab	16
2	Baseline Demographic Characteristics Across Groups	22
3	Internal Consistency Values for the Scales at Baseline and Post-Intervention	24
4	Correlation Matrix of all Dependent Variables at Baseline and Post-Intervention (N = 109)	25
5	Means and Standard Deviations for Exercise METs at Baseline and Post-Intervention	26
6	Means and Standard Deviations for Self-Efficacy at Baseline and Post-Intervention	28
7	Means and Standard Deviations for Decisional Balance at Baseline and Post-Intervention	29
8	Means and Standard Deviations for the Cognitive Processes of Change at Baseline and Post-Intervention	30
9	Means and Standard Deviations for the Behavioral Processes of Change at Baseline and Post-Intervention	31
10	Post-Intervention Stage of Change for Exercise Behavior Across Groups	32
11	Transitional Shift Patterns Across Groups	33

LIST OF APPENDICES

Page

Appendix A Informed Consent Document.....45

Appendix B Demographic Information.....49

Appendix C Activity Stage.....51

Appendix D Exercise Level.....53

Appendix E Self-efficacy.....55

Appendix F Decisional Balance.....57

Appendix G Processes of Changes.....60

Effectiveness of Classroom vs. Web-Based Lifetime Fitness for Health Lab Instruction on College Students' Behavioral and Psychological Physical Activity Orientation

CHAPTER 1 - INTRODUCTION

The National Health and Nutrition Examination Survey (NHANES) reported 64.5% of U.S. adults are considered overweight with approximately half of those obese (Fiegal, Carroll, Ogden, & Johnson, 2002). This represents an increase of over 50% in the prevalence of overweight and obesity since 1980. The association of excess body weight and potential health problems (e.g., heart disease, diabetes, high blood pressure, and certain cancers) has been well documented by the Centers for Disease Control and Prevention (CDC). The CDC estimates that approximately 300,000 people die prematurely each year in the U.S. due to inadequate physical activity and poor nutritional choices (Jefferies, 2000). A 1996 report by the CDC noted that cardiovascular related deaths could be reduced by 50% if Americans were more active (Jefferies, 2000).

Among youths excess body weight has doubled since 1980, and tripled since 1974 (NCHS, 2000). This rate is two times that of adults. Although excess weight gain can occur at any age, it commonly occurs between 18 and 34 years of age and accompanies the transition from high school into the workforce or college. An example of this weight gain, for college students, has even been named "the

freshman 15," which refers to weight gained by college students during their freshman year (Matvienko, 2001).

Paralleling the trend of increased body weight is a decrease in physical activity. One of the most dramatic decreases in physical activity occurs in late adolescence and early adulthood (Sallis et al. 1999; CDC, 1992). Along with other factors, the CDC has included physical inactivity as a major contributor to excess weight gain among youth (i.e., those between 12-21 years old). Current estimates suggest that only half of youth in this age range regularly participate in vigorous physical activity, and one-fourth report no vigorous physical activity (CDC, 1999).

Various reasons have been cited for the increase in weight and decrease in physical activity among the youth population. While most youth in the U.S. are taught the importance of being physically active, physical education (PE) programs, at all levels of education, continue to struggle for their existence (Hensley, 2000). With specific reference to physical education, the U.S. Surgeon General stated that school districts needed to realize that PE was one of the best investments they could make to the health of the community (Jefferies, 2000). The Surgeon General also stated that many states in the U.S. are "penny wise, pound foolish" when it comes to cutting back on PE since the benefits of physical activity encompasses the entire lifespan – from "womb to tomb."

Health behaviors during childhood, adolescents, and young adulthood can determine quality of life in later years (Buckworth, 2001), and one of the last opportunities society has to influence the health behavior of young adults is during the

college years. With approximately 24% of adults in the 18-24 year old age range enrolled in colleges and universities (Buckworth, 2001), this is an important setting for reaching a large segment of society. For this reason, college students have been identified in Healthy People 2010 as a target population segment in need of physical activity intervention. Specifically, assuring that college students obtain sufficient amounts of physical activity is one of the six priority health behaviors cited in Healthy People 2010.

Offering courses that promote, encourage, and support physical activity among college students has been an aim of physical education departments for the past century (Sargeant, 1900). However, just offering coursework in this area has not addressed the problem of decreased physical activity across the lifespan. Historically, such coursework was almost exclusively activity- and skill-based, which made it particularly appealing to students who were already active while those who were not physically activity generally avoid such courses (Scantling, Strand, Lackey, & McAleese, 1995).

Over time, alternative courses and course formats began to evolve. Beginning in the 1960s, Corbin (1969) proposed conceptually-based lab courses as one potential alternative. Such courses focus on higher-order thinking (e.g., analysis, application, and synthesis) and fostering a sense of independence among students.

These courses have increased in popularity over the years (Hensley, 2001) and are now included by some colleges and universities as part of the students' core curricular graduation requirements (Cardinal, Jacques, & Levy, 2002). By having such a requirement for graduation, it insures that all students attending higher education will have the opportunity to have positive influences in their health behaviors for the betterment of their quality of life through physical activity.

CHAPTER 2 - LITERATURE REVIEW

Research has shown that participation in physical activity courses can help college students' increase their physical activity behavior (Adams & Brynteson,1995; Goldfine, et al., 2003; Hensley,2000; Pearman, Silas, and Valois, 1997; Sparling & Snow, 2002) though differences have been found in the level of physical activity based on the type of course being offered. The two main types of physical activity courses offered on most college campuses are activity-based physical education classes (APE), and/or conceptually based physical education classes (CPE).

A study by Adams and Brynteson (1995) found a significant difference between alumni who participated in APE vs. CPE courses. Specifically, those in CPE placed a greater value in their colleges' PE programs and were significantly more active. Pearman et al. (1997) surveyed a random sample of 2,000 college alumni and found that those who took a health and physical education course as part of their college graduation requirement were more likely to engage in aerobic exercise, have better dietary habits, and be less likely to smoke in comparison to college alumni who were not required to take such courses in college. When looking at recent college alumni, Sparling and Snow (2002) found a strong positive association between college alumnae's physical activity behavior and their physical activity behavior as college seniors. Moreover, those who engaged in adequate levels of moderate or vigorous physical activity had gained significantly less

weight in the years following graduation than those who reported being insufficiently active (i.e., 3.0 kg vs. 6.1 kg, respectively). A recent study by Goldfine et al. (2003) found that a 15-week health-related fitness course utilizing behavioral change strategies designed to promote increased physical activity improved the proportion of female and white students who reported that they were either in the action or maintenance stage of change.

To further support the positive impact LFH courses can have on college students, one university reported that within 3 years of dropping their "wellness/activity requirement," negative trends in students' nutrition and exercise patterns occurred (Ansuini, 2001). Although these studies support the general premise of such coursework, there have been few attempts to assess the impact such courses have on college students' physical activity behavior (Buckworth, 2001; Cardinal, et al. 2002; Sallis, et al., 1999; Sparling & Snow, 2002).

An important aspect related to the efficacy of such courses is whether or not they are theoretically based (O'Connor, 1994). Using theory, as it relates to attempting to modify human behavior, not only has the potential to strengthen a course's intervention potential, but also allows for the testing of theory among a particular population or within a particular setting. For example, Buckworth (2001) reported that both the Active Recreation Tertiary Education Campuses (ARTEC) and Project GRAD (i.e., Graduates Ready for Activity Daily) curriculums are based on Social Cognitive Theory (SCT) and the Transtheoretical Model (TTM), and this theoretical basis is a key element of each respective curriculum's effectiveness.

Cardinal et al. (2002) found the stages of change (i.e., one core construct from TTM) was an important moderating variable associated with college students' exercise behavior.

Unfortunately many colleges do not develop their conceptually-based LFH courses using any particular theoretical framework, thus limiting physical activity research in the area of testing theoretical frameworks, and the possible effectiveness of LFH courses (Wallace, Buckworth, Kirby, & Sherman, 2000). This may be the case in a recent study that showed a LFH course had little effect on participants' exercise levels outside of class, and did little to positively influence the participants' stage of change for exercise behavior between the pre and post testing time periods (Cardinal et al., 2002). On the positive side, this evaluation study did propose modifying the LFH course curriculum with a stronger theoretical basis, specifically using the TTM of behavior change as a guiding framework, and these suggestions have been implemented as a result.

The TTM is a multi-dimensional model that integrates stages of changes, processes of change, decisional balance, and self-efficacy (Marcus, Eaton, Rossi, & Harlow (1994); Prochaska & Velicen, 1997). Initially the TTM was used in studies of behaviors such as smoking (Prochaska & DiClemente, 1983; Marcus, DiClemente, Velicer, Ginpil, & Norcross, 1985), obesity, (O'Connell, & Velicer, 1988), and alcoholism (DiClemente & Hughes, 1990). But the model has also been successfully applied to intervention programs promoting physical activity in various settings and among various groups including work site wellness programs

(Marcus & Owen, 1992; Marcus, Pinto, Simkin, Audrian, & Taylor 1994; Marcus, Rossi, et al., 1992), physicians' offices, (Long et al., 1996), high schools (Nigg & Courneya, 1998), and in community settings (Marcus, Bock, Pinto, Forsyth, Roberts, & Traficante, 1998).

Research has proposed exercise and health behavior change follows a multi-stage model such as the TTM (Dishman, 1991; Prochaska & Velicer, 1997). The use of a multi-stage model reflects a temporal dimension in which change occurs, as well as incorporating behavior and behavioral intention (Marcus & Simkin, 1994). Research has supported that those who received individualized information relating to their stage of physical activity made more progress in their physical activity levels compared to those who did not (Marcus et al., 1994, Marcus et al., 1996, Marcus et al. 1998). Since LFH classroom settings will have students at various 'stages' as it relates to physical activity behavior and behavioral intention, using the TTM framework as a base for LFH courses development allows for stage specific interventions to be used in the classroom setting.

Besides physical activity being promoted in a face-to-face setting, like in a classroom, online web sites promoting physical activity are also becoming increasingly available (Hohman, 2003). As with many conceptually-based LFH courses, some of these web sites may not be incorporating theoretical framework when developing their online physical activity promoting web sites. For example, a recent study by Doshi, Patrick, Sallis, and Calfas (2003) evaluated 23 physical activity web sites for their use of behavior change theories. Though the sites varied

widely in application of theory-based constructs, overall they found the web sites inclusion of theory-based constructs to be low.

Online, or distance education, versions of LFH courses are beginning to be introduced on college and university campuses nationwide (Conlee, 2000). Though studies are limited, a study by Suminski, Petosa, and Waggle (2003) examined Social Cognitive Constructs correlating with physical activity behavior at the college level, found the web-based instructional programs had a positive impact on knowledge and skills as related to physical activity.

The trend for colleges and universities to offer online LFH courses has reached the campus of Oregon State University too. Beginning Winter Quarter 2003, an on-line version of the LFH course was offered for the first time at the university. The on-line version of the course was based on the TTM, with weekly assignments and course materials paralleling those of the on-campus, face-to-face, version of the course.

The purpose of this study was to determine the relative effectiveness of the revised LFH lab course on college students' behavioral and psychological physical activity orientation as offered through one of two mediums (i.e. traditional, face-to-face classroom instruction [Classroom], and the newly developed web-based version of the course [Web-Based]). The independent variables in this study were course format (i.e., Classroom vs. Web-Based vs. Control - no intervention provided) and time (i.e., baseline and post-intervention). The dependent variables were exercise behavior (a ratio level variable); self-efficacy, decisional balance,

and the behavioral and cognitive processes of change (all quasi-interval level variables); and stage-of-change (an ordinal level variable).

Based on research suggesting that the use of the TTM may be useful in developing such courses, it was hypothesized that those students enrolled in the LFH course (regardless of format) would see more positive changes on each of the dependent variables relative to the control group. However, without a clear rationale for doing so, no specific hypotheses were advanced relative to the comparison of the course delivery format (i.e., this is an exploratory research project).

CHAPTER 3 - METHODS

PARTICIPANTS

To meet the requirements for repeated measures analysis of variance (RM ANOVA), the guidelines established by Schutz and Gessaroli (1987) were followed. Specifically, they suggested that the number of dependent variables be multiplied by the number of data collection periods, and then this figure be multiplied by the number of groups involved. This result became the recommended number of participants per group.

The main outcome variable in this study was exercise behavior, thus at least six participants were needed per group. However, while this figure met the minimum assumptions of RM ANOVA, it is insufficiently powered to detect moderate effect sizes of .40 with $p < .05$ (one tailed test). To achieve 80% power, a minimum of 36 participants per group was required (Kraemer & Thiemann, 1987).

Volunteers were recruited during the first week of classes from among those students enrolled in the Classroom ($n = 67$) and Web-Based ($n = 15$) versions of the LHF lab. The Control group was comprised of students enrolled in non-LHF courses at a two-year community college (n = 69). All potential study participants were informed about the purpose of the study, and asked to voluntarily provide their informed consent in accordance with Oregon State University's Institutional Review Board for the Protection of Human Subjects.

INSTRUMENTS

The primary outcome variable in this study was exercise behavior, as assessed using the Weekly Leisure Time Exercise Questionnaire (Godin & Shephard, 1985). On this instrument, participants reported their frequency of 15 minute (or more) bouts of strenuous, moderate, and mild exercise during the previous week. Scores were then converted to metabolic equivalents (METs) using the following equation: Exercise METs = [(Strenuous x 9) + (Moderate x 5) + (Mild x 3)].

The secondary outcome variables were all constructs from TTM, as measured by self-report questionnaires. On the basis of TTM, a five-item stage of change for physical activity questionnaire was administered to determine participants' stage as it relates to exercise. In previous studies, similar stage measures were able to validly and reliably differentiate among people classified by stage on a number of behavioral measures in a manner consistent with theory (Cardinal et al., 2002).

Self-efficacy was measured using a five-item questionnaire, with participants responding to each item on Likert scale. Internal consistency for this measure has been demonstrated (Cronbach α coefficient = .82; Marcus, Selby, Niaura, & Rossi, 1992). Burbank and Riebe (2000) reported that self-efficacy for exercise within the TTM has shown consistent results, and significantly and independently contributes to the discrimination among stages. This increase does

not seem to depend on the scale used or the population studied, exemplifying the universality of exercise self-efficacy.

Decisional balance was measured using a ten-item questionnaire (i.e., five con items and five pro items) with study participants responding to each item on a five-point Likert scale (Plotnikoff, Blanchard, Hotz, & Rhodes, 2001). In their developmental study, Plotnikoff et al. (2001) demonstrated the validity and reliability of the instrument within the general adult population (Plotnikoff, et. al., 2001). For the purposes of this study, a single decisional balance score was created by subtracting the total score on the con sub-scale from the total score on the pro sub-scale.

The processes of change (five behavioral and five cognitive) were measured using a 30-item questionnaire with participants responding on a five-point Likert scale. Among college students, the processes of change instrument has been found to be internally consistent (Cronbach α coefficient range from .64 to .86) in previous research (Nigg, Norman, Rossi & Benisovich, 1999).

Procedures

During the first day of their respective LFH laboratory course, students in the student researcher's class were asked if they would like to participate in the study. Those wishing to do so were given an informed consent (either in class or

via the web). Those agreeing to participate in the on campus setting were given the questionnaires in class and allotted time to complete them. Those agreeing to participate through the web-based course were given 72 hours to complete and return the questionnaire. The web-based questionnaires were administered and returned electronically.

Data was collected at baseline (the first week of the course) and week 10 (the last week of the course). For the on campus participants baseline data collection occurred during the first day of their class Winter Quarter 2003. For the web-based participants this took place during the first week of class Winter Quarter 2003. For the post test data collection, the on campus participant data was collected during their last regular class time during week 10, and for the web-based participants, post test data was collected during the last week of the course. At each time period, it took approximately 20 minutes to complete all questionnaires.

Control group participants were recruited from an area college, not affiliated with Oregon State University. Participants were enrolled in non-health and non-physical education courses. Similar to those in the experimental groups, they completed the same questionnaires at baseline and post-intervention time periods.

Intervention

The general lab (HHS 241) was designed using the TTM as a guiding framework. Since students in the course are at various stages in their behaviors and attitudes towards physical activity, the lab was designed to encompass intervention materials through the first four stages (precontemplation, contemplation, preparation, action), while supporting those already in the maintenance stage.

Over the 10-week course, there were nine units presented. Units one through four focused on the precontemplation and contemplation stages of the TTM by providing materials, activities, and assignments to build awareness of the students' current health status and behavioral patterns. Starting in unit four, the preparation stage was targeted by developing S.M.A.R.T. (specific, measurable, action-oriented, realistic, and timed) goals and objective statements. These goals and objective statements were designed by the student to help move them from the preparation stage to the action stage in the component of health/fitness they would like to improve the most as it related to their individual health/fitness goals. For those already in the maintenance stage, goals and objective statements aimed at reinforcing current health/fitness behaviors was the focus.

Units five through nine focused on potential obstacles that could prevent students from reaching their desired goals by addressing factors such as body image, potential barriers, stressors, lack of knowledge in exercise/activity program development, time management skills, personal support structure, and rewards.

During these units students were held accountable for their progress on 'actions' taken to reach their health/fitness goals. This was accomplished using weekly assignment and record sheets that were part of the graded course materials for all course students. There was not intervention provided for the control group.

The following table provides a general overview of the intervention of the course as it relates to the TTM in the Classroom setting, web-based setting, and control group.

TABLE 1

TTM Intervention Overview for HHS-241 General Lab

LAB INTERVENTION OVERVIEW				
GENERAL FOCUS	UNIT	CLASSROOM	WEB BASED LAB	CONTROL
INFORMATION, RAISE AWARENESS, PERSONAL ASSESSMENT	1	- Course intro/overview - TTM discussion - Wellness Inventory assignment	- Course intro/overview; reading - TTM; reading - Wellness Inventory assignment	N/A
	2	- Aerobic fitness evaluation (group) - Journaling; Energy expenditure & nutritional intake	- Aerobic fitness evaluation (on own) - Journaling; Energy expenditure & nutritional intake	N/A

	3	- Assessment & analysis: Energy expenditure & nutritional intake (group) - Body composition issues video & discussion (group)	- Assessment & analysis: Energy expenditure & nutritional intake (on own) - Body composition issues: discussion board, article reviews	N/A
PREPARATION	4	- Muscular fitness assessment (group) - Developing S.M.A.R.T. goals & goal objectives (group activity)	- Muscular fitness assessment (web-based, on own) - Developing S.M.A.R.T. goals & goal objectives (readings)	N/A
	5	- Flexibility Assessment (group activity) - Start 1st goal objective - Barriers & obstacles (group activity & worksheets)	- Flexibility Assessment (on own, web based) - Start 1st goal objective - Barriers & obstacles worksheets (on own)	N/A
MOVE INTO ACTION ON PERSONAL FOCUS	6	- Scorecard: quick journaling of eating and activity patterns - Body image; video & discussion (group) - 2nd objective statement	- Scorecard: quick journaling of eating and activity patterns - Body image; discussion board, article reviews (on own) - 2nd objective statement	N/A

	7	- Back health exercises (group activity) - Stress & time management discussion & worksheets (group) - 3rd objective statement	- Back health exercises (on own - report) - Stress & time management worksheets (on own, on-line articles) - 3rd objective statement	N/A
	8	- Developing a resistance program (group discussion) - Perform resistance circuit training exercise routine (group activity) - Relaxation techniques (group activity) - 4th objective statement	- Developing a resistance program (on-line articles, materials) - Perform resistance exercise routine. On-line articles and program (on own - report) - Relaxation techniques (on own – report) - 4th objective statement	N/A
	9	- Sedentary activity discussion & worksheet - Support & rewards discussion & worksheets (group activity) - Self evaluation & plan-of-action paper	- Sedentary activity worksheet (on own) - Support & rewards worksheets (on own) - Self evaluation & plan-of-action paper	N/A

ANALYSIS

Means, standard deviations, and percentages were used to describe the participants at baseline. Since intact groups were employed in this study, analysis of variance (ANOVA) and chi-square (χ^2) tests were used to examine potential between-group differences at baseline. Variables in which participants were found to differ at baseline were then used as covariates in the main analyses. Also, as an adjunct to all χ^2-tests (throughout the study), contingency coefficients (*cc*) were computed. Fleiss (1981) suggested *cc* values < .30 are small.

At post-intervention, retention rates were compared between groups using a χ^2-test. Next, those who completed the study vs. those who dropped from the study were compared on their baseline characteristics using either χ^2- or *F*-tests.

Prior to the main analyses, the internal consistency (reliability) of the psychological inventories employed in this study were assessed at both baseline and post-intervention time periods using Cronbach's α coefficient (Cronbach, 1951). Multiple item inventories with Cronbach α values $\geq .70$ are thought to be reliable (Nunnally, 1978). A correlation matrix (Pearson's *r*) was also generated to examine the data for multicollinearity

There were three main analyses in this study. First, a 3 (group: Control, Classroom, Web-Based) X 2 (time: baseline, post-intervention) repeated measures analysis of covariance (ANCOVA) with repeated measures on the second factor was performed on the participants' exercise METS. Post-hoc testing (i.e., Tukey a)

was carried out on all significant main and/or interaction effects observed. Additionally, Delta (Δ) scores were computed to examine increments of change from baseline to post-intervention for each variate. As an adjunct to significance tests, the proportion of variance being accounted for (i.e., η^2) and/or effect sizes (i.e., *d*) were calculated. Cohen (1988) defined η^2 values of 0.01, 0.06, and 0.14 as small, medium, and large, respectively. Thomas, Salazar, and Landers (1991) defined *d* values of $\leq$ 0.40, 0.41-0.70, and $\geq$ .71 as small, moderate, and large, respectively.

Second, a 3 (group) X 2 (time) repeated measures multivariate analysis of covariance (MANCOVA) with repeated measures on the second factor was performed on the participants' self-efficacy, decisional balance, cognitive processes of change, and behavioral processes of change scores. Follow-up univariate *F*-tests were performed on the significant main and interaction effects observed in the MANCOVA. Similar to the preceding analysis, Tukey a, Δ, η^2, and *d* values were computed as appropriate.

The relationship between the participants' stage of change for exercise behavior at post-intervention and their group membership constituted the final analysis. This relationship was examined with a χ^2 test.

CHAPTER 4 - RESULTS

PARTICIPANT CHARACTERISTICS AT BASELINE

There were 151 people initially recruited into the study. The majority of participants were female (60.3%), Caucasian (81.5%), and held either freshman or sophomore (i.e., underclass = 80.1%) class standing. The average age of the participants was 21.3 (SD = 5.7) years, and the average Body Mass Index (BMI) of the participants was 24.3 (SD = 5.4). The majority of participants were in the preparation stage of change (45.7%), followed by maintenance (35.1%), action (12.6%), contemplation (5.3%), and precontemplation (1.3%). The baseline demographic characteristics are summarized by group in Table 2. As can be seen, a slight majority of participants were in the Control group (n = 69), followed by the Classroom group (n = 67), and the Web-Based group (n = 15). Participants in the Web-Based group were older (F [2, 148] = 36.95, p <.001, η^2 = .33) and had higher BMIs (F [2, 148] = 7.52, p <.001, η^2 = .09) compared to those in the other two groups. They were also more likely to be in the upper-class grade levels (i.e., Juniors and Seniors) compared to those in the other two groups (χ^2 [2, N = 151] = 47.03, p <.001, cc = .49). In terms of gender, race/ethnicity, and stage of change, no differences were observed between the groups at baseline (all p >.05).

Table 2

Baseline Demographic Characteristics Across Groups

Variable	Group Control (n = 69)	Classroom (n = 67)	Web-Based (n = 15)	Total (N = 151)
Gender				
% Female	58.0	61.2	66.7	60.3
% Male	42.0	38.8	33.3	39.7
Class Standing*				
% Underclass	85.5	89.6	13.3	80.1
% Upperclass	14.5	10.4	86.7	19.9
Race/Ethnicity				
% Caucasian	78.3	85.1	80.0	81.5
%Other/Decline	21.7	14.9	20.0	19.5
Stage of Change				
% Maintenance	42.0	31.3	20.0	35.1
% Action	10.1	16.4	6.6	12.6
% Preparation	39.1	46.3	73.3	45.7
% Contemplation	7.2	4.5	0.0	5.3
% Precontemplation	1.4	1.5	0.0	1.3
Age (year)*				
M	21.6	19.0	30.4	21.3
SD	5.5	1.6	8.5	5.7
BMI (kg/m^2)*				
M	24.7	23.0	28.7	24.3
SD	5.7	3.8	7.9	5.4

*$p < .05$.

Note – Those in the Web-Based group were more likely to be upperclass (i.e., Juniors and Seniors) compared to those in the Control and Classroom groups who were more likely to be underclass (i.e., Freshman and Sophomores). Those in the Web-Based group were also older and had higher BMIs compared to those in the other two groups.

RETENTION RATES AND PARTICIPANT CHARACTERISTICS POST-INTERVENTION

Of the initial 151 enrolled in the study, 109 (72.2%) returned post-intervention questionnaires and were therefore retained in the study. Retention rates were 69.6%, 77.6%, and 60.0% for the Control, Classroom, and Web-Based groups, respectively (χ^2 [2, N = 151] = 2.33, p = .31). The only demographic variable related to study retention was gender. The retention rate for females was 78%, whereas for males it was 63.3% (χ^2 [1, N = 151] = 3.89, p <.05, cc = .16). Relative to baseline exercise METS, stage of change, self-efficacy, decisional balance, and the behavioral and cognitive processes of change, no significant differences were observed between those who were retained vs. dropped out of the study (all p >.05).

PSYCHOMETRIC PROPERTIES OF THE SCALES AND BIVARIATE CORRELATIONS: BASELINE AND POST-INTERVENTION

Internal consistency values for the scales used in this study are shown in Table 3. As can be seen, except for the decisional balance con scale, the remaining scales were found to be highly reliable at both baseline and post-intervention.

Although the con scale had slightly lower than desirable reliability, it was retained because it has both theoretical importance (within the Transtheoretical Model), and operational importance (i.e., it is used in calculating the participants' decisional balance score).

Table 3

Internal Consistency Values for the Scales at Baseline and Post-Intervention.

Scale	Baseline α (N = 151)	Post-Intervention α (N = 109)
Behavioral Processes	.84	.87
Cognitive Processes	.88	.90
Decisional Balance Pros	.80	.86
Decisional Balance Cons	.68	.65
Self-Efficacy	.80	.80

A correlation matrix of all the bivariate relationships is shown in Table 4. As can be seen, the correlation coefficients ranged in size from .08 to .80, with only 3 of the 46 bivariate correlations exceeding .70. Hence, multicollinearity was not deemed to be a major problem in this study.

Table 4

Correlation Matrix of all Bivariate Relationships at Post-Intervention

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.
Baseline									
1. Exercise METs									
2. Self-Efficacy	.44								
3. Decisional Balance	.34	.44							
4. Cognitive Processes	.23	.34	.49						
5. Behavioral Processes	.38	.44	.47	.66					
Post-Intervention									
6. Exercise METs	.57	.39	.22	.11	.13				
7. Self-Efficacy	.36	.80	.42	.28	.34	.44			
8. Decisional Balance	.20	.42	.69	.49	.43	.26	.51		
9. Cognitive Processes	.10	.21	.38	.80	.48	.08	.27	.61	
10. Behavioral Processes	.20	.33	.34	.49	.56	.22	.46	.63	.71

.19 to .24, $p < .05$ .25 to .30, $p < .01$ $\geq .31$, $p < .001$

Exercise METs improved significantly over time (F [1, 103] = 7.82, p <.01, η^2 = .07); however, the main effect for groups (F [2, 103] = 2.97, p = .06, η^2 = .05), and the group by time interaction were not significant (F [2, 103] = , p = .31, η^2 = .02). These results are summarized in Table 5.

Table 5

Means and Standard Deviations for Exercise METs at Baseline and Post-Intervention

Time	Group			
	Control (n = 48)	Classroom (n = 52)	Web-Based (n = 9)	Total[a] (N = 109)
Baseline				
M	35.4	41.6	40.2	38.8
SD	21.6	23.7	35.4	23.9
Post-Intervention				
M	40.3	53.4	47.8	47.2
SD	28.8	26.3	35.3	28.6
Absolute Δ	+4.9	+11.8	+7.6	+8.4
Within Column *d*	0.19	0.47	0.21	0.32

[a] Post-intervention exercise MET scores significantly (p <.01) higher than baseline scores.

INTERVENTION EFFECTS ON THE TRANSTHEORETICAL MODEL OF BEHAVIOR CHANGE CONSTRUCTS

Significant main effects were observed between groups (Wilks' Λ [8, 200] = .81, p <.01), and over time (Wilks' Λ [4, 103] = .87, p <.01) for the vector of means comprised of self-efficacy, decisional balance, and the cognitive and behavioral processes of change. The group by time interaction for the vector of means was not significant (Wilks' Λ [8, 206] = .89, p = .17).

Follow-up F-tests revealed the group differences were due to differences in the cognitive (F [2, 103] = 3.66, p <.05, η^2 = .07) and behavioral (F [2, 103] = 4.28, p <.05, η^2 = .08) processes of change, with no differences observed for either self-efficacy (F [2, 103] = 1.05, p = .35) or decisional balance (F [2, 103] = 0.04, p = .96). Time effects were observed for self-efficacy (F [1, 106] = 5.25, p <.05, η^2 = .05), and the cognitive (F [1, 106] = 13.51, p <.001, η^2 = .11) and behavioral (F [1, 106] = 7.75, p <.01, η^2 = .07) processes of change, with no difference observed on decisional balance (F [1, 106] = 0.75, p = .39). These results are summarized in Tables 6-9.

Table 6

Means and Standard Deviations for Self-Efficacy at Baseline and Post-Intervention

Time	Group			
	Control (n = 48)	Classroom (n = 52)	Web-Based (n = 9)	Total[a] (N = 109)
Baseline				
M	17.9	18.3	18.7	18.3
SD	3.7	3.4	4.9	3.6
Post-Intervention				
M	18.4	18.5	19.9	18.9
SD	3.7	2.9	3.9	3.4
Absolute Δ	+0.5	+0.2	+1.2	+0.6
Within Column *d*	0.14	0.06	0.27	0.17

[a] Post-intervention self-efficacy scores significantly (p <.01) higher than baseline scores.

Table 7

Means and Standard Deviations for Decisional Balance at Baseline and Post-Intervention

Time	Group			
	Control ($n = 48$)	Classroom ($n = 52$)	Web-Based ($n = 9$)	Total ($N = 109$)
Baseline				
M	11.1	10.8	10.4	10.8
SD	5.0	5.2	2.9	4.9
Post-Intervention				
M	10.8	10.2	12.7	11.2
SD	5.5	5.3	4.3	5.3
Absolute Δ	-0.3	-0.6	+2.2	+0.4
Within Column *d*	0.06	0.11	0.61	0.08

Table 8

Means and Standard Deviations for the Cognitive Processes of Change at Baseline and Post-Intervention

Time	Group[a] Control ($n = 48$)	Classroom ($n = 52$)	Web-Based ($n = 9$)	Total[b] ($N = 109$)
Baseline				
M	45.3	47.9	52.3	48.5
SD	8.4	9.3	9.7	9.1
Post-Intervention				
M	47.4	51.4	55.3	51.4
SD	9.2	9.8	11.1	9.8
Absolute Δ	+2.1	+3.5	+3.0	+2.9
Within Column *d*	0.24	0.37	0.29	0.31

[a] Web-Based group's average cognitive score ($M = 53.8$) significantly ($p < .05$) higher than the Control group's average cognitive score ($M = 46.3$) ($d = .83$).
[b] Post-intervention cognitive scores significantly ($p < .001$) higher than baseline scores.

Table 9

Means and Standard Deviations for the Behavioral Processes of Change at Baseline and Post-Intervention

Time	Group[a] Control ($n = 48$)	Classroom ($n = 52$)	Web-Based ($n = 9$)	Total[b] ($N = 109$)
Baseline				
M	44.4	48.9	44.2	45.9
SD	7.7	9.2	9.2	8.8
Post-Intervention				
M	45.6	50.4	50.8	48.9
SD	9.4	9.4	9.2	9.6
Absolute Δ	+1.3	+1.5	+6.6	+3.0
Within Column *d*	0.15	0.16	0.72	0.33

[a] Classroom group's average behavioral score ($M = 49.7$) significantly ($p < .01$) higher than the Control group's average behavioral score ($M = 45.0$) ($d = .52$).
[b] Post-intervention behavioral scores significantly ($p < .001$) higher than baseline scores.

Participants' post-intervention stage of change was unrelated to group (χ^2 [8, N = 109] = 5.85, p = .66, cc = .23). These results are summarized in Table 10.

Table 10

Post-Intervention Stage of Change for Exercise Behavior Across Groups

Stage of Change	Group			
	Control (n = 48)	Classroom (n = 52)	Web-Based (n = 9)	Total (N = 109)
% Maintenance	37.5	46.2	33.3	41.3
% Action	18.8	19.2	44.4	21.1
% Preparation	31.3	28.8	22.2	29.4
% Contemplation	10.4	3.8	0.0	6.4
% Precontemplation	2.1	1.9	0.0	1.8

Transitional shift patterns were created and examined across groups. The transitional shift patterns explored were stable sedentary (n = 3; e.g., remaining in contemplation from baseline to post-intervention), stable active (n = 47; e.g., remaining in action at both time periods), activity adoption (n = 21; e.g., moving from preparation to action), activity relapse (n = 4; e.g., moving from action to contemplation), and perpetual preparation (n = 34; e.g., remaining in preparation at both time periods). This coding scheme was originally developed by Cardinal,

Engels, and Smouter (2001) in an attempt to account for the dynamic nature of change. It can be used whenever the stage of change construct is assessed on two or more occasions. Transitional shift patterns, too, were unrelated to group (χ^2 [8, N = 109] = 9.56, p = .30, cc = .28). These results are summarized in Table 11.

Table 11

Transitional Shift Patterns Across Groups

Transitional Shift	Group			
	Control (n = 48)	Classroom (n = 52)	Web-Based (n = 9)	Total (N = 109)
% Stable Sedentary	6.3	0.0	0.0	2.8
% Stable Active	41.7	46.2	33.3	43.1
% Activity Adoption	14.6	19.2	44.4	19.3
% Activity Relapse	6.3	1.9	0.0	3.7
% Perpetual Preparation	31.5	32.7	22.2	31.2

CHAPTER 5 - DISCUSSION

The purpose of this study was to determine the relative effectiveness of the revised LFH course on college students' behavioral and psychological physical activity orientation as offered through two formats (i.e. Classroom setting and web-based setting). The course revisions were based on the TTM framework constructs and examined stage specific changes, self-efficacy, decisional balance, and the behavioral and cognitive processes of change. The primary behavior of interest was physical activity, as measured in terms of exercise METS.

However, the course format gave students the freedom to choose the health behavior(s) they desired to change. Though physical activity was a focal point throughout the course, students were able to tailor and apply course lead behavior change activities and strategies on health behaviors other than physical activity (e.g., smoking cessation, stress management, dietary changes). This is a very important point to raise as positive changes seen, as it relates to physical activity, were the voluntary choice of participants. Not all study participants may have chosen physical activity as their focal behavior change for the course; though, for the purposes of this study, this was not quantified.

The TTM provides a framework that has been successfully applied in behavior change studies as it relates to various health behaviors including that of physical activity. It was hypothesized that those students enrolled in the LFH

course (regardless of format) would see more positive changes in the dependent variables, relative to the control group, thus an increase in physical activity.

Exercise behavior improved significantly over time ($p < .01$); however, the main effect for groups ($p = .06$), and the group by time interaction were not significant ($p = .31$). Part of the overall increase observed may have been due to seasonal changes in physical activity. Though not statically significant, both LFH courses (i.e., classroom +11.8 and web-based +7.6, exercise METS, respectively) saw a higher overall increase in physical activity than did the control group (i.e., +4.9 exercise METS). When exercise METS are converted into minutes per week, the participants increased their moderate physical activity level as follow: control increased by 15 minutes, the classroom group by 35 minutes, and the web-based group by 23 minutes. Though not a significant increase in physical activity from pre- to post-intervention (10 weeks), as it relates to lifetime fitness and health, if higher activity levels were to continued among the LFH course participants, the results may be more pronounced (as some alumnae studies have shown).

Significant main effects were observed between groups ($p < .01$), and over time ($p < .01$) for the vector of means comprised of self-efficacy, decisional balance, and the cognitive and behavioral processes of change. However, the group by time interaction for the vector of means was not significant ($p = .17$). Follow-up F-tests revealed the group differences were due to differences in the cognitive ($p < .05$) and behavioral ($p < .05$) processes of change, with no differences observed for either self-efficacy ($p = .35$) or decisional balance ($p = .96$).

Time effects were observed for self-efficacy ($p < .05$), and the cognitive ($p < .001$) and behavioral ($p < .01$) processes of change, with no difference observed on decisional balance ($p = .39$). While not entirely supportive, the results do suggest some potentially promising strategies for enhancing the efficacy of LFH courses, regardless of delivery format. Since positive significant differences were observed in the LFH groups vs. the control in the cognitive and behavioral processes of change, behavior change strategies focusing in this area may be helpful in developing more effective LFH courses in the future.

For example, some strategies employed in the course include; self- and social- liberation – providing students the option to choose the health behavior change they wished to focus on (students noted breaking down their main goals into small attainable goal objectives [mini goals] not only brought awareness to, but also made changing their health behavior(s) easier, and they felt more commitment in reaching their main goal); helping relationships – students were encouraged to find accountability partners in helping them reach their goals, and many noted they did; consciousness raising – from the first day of the class students were introduced to the TTM model to help build awareness of the stages they may be in as it relates to various health behaviors. Also in this area, various health assessment we completed by the students throughout the course to build personal health awareness - several students noted these assessment brought about self-reevaluation. Though speculative, one of the most important strategies employed seemed to be providing an opportunity for students to experience most all the stages in the TTM model,

from precontemplation to action. Several students, who overall had healthy lifestyles and did not want to change any particular health behavior but rather to maintain the ones they had, noted the course was helpful in reinforcing their current health behaviors and beliefs.

As this was a quasi-experimental study there are several study limitations that must be considered when interpreting the results. First, as is often the case with educational studies, intact study groups were used. Future studies may attempt to randomly identify and randomly assign study participants to the various experimental and control conditions. Second, the unit of analysis was at the individual level, rather than at the classroom level, thus, there may be some elements of a within class nesting effect observed; particularly among those in the classroom (experimental) group. Third, the sample size was less than ideal for the web-based experimental group. Also, this was the first time the web-based class was offered. These two factors, both independently and combined, limit the generalizability of the study's results. Fourth, while the self-report measures used in this study were from well-established measures with reasonable psychometric support, future researchers might consider using an objective measure of physical activity behavior (e.g., accelerometer, pedometer) as the primary outcome variable. This would help avoid potential issues associated with self-report bias (e.g., item interpretation, social desirability). Fifth, though the strategies in the course were based on the TTM framework, intervention materials provided to participants were not necessarily "stage-matched" to their physical activity behaviors.

CHAPTER 6 - CONCLUSION

The potential impact LFH courses may have, not only on the students who participate in them, but on society as a whole, remains only minimally understood. Thus, this marks an important area for continued investigation. Research in this area has suggested that participation in physical activity courses, both of the APE and CPE variety, may help college students' increase their physical activity behavior (Adams & Brynteson,1995; Goldfine, et al., 2003; Hensley,2000; Pearman, et al., 1997; Sparling & Snow, 2002). However, due to limited studies and theoretically based LFH courses, there is more work that needs to be done in this area. Also, with emerging technologies and course delivery formats, the efficacy of alternative delivery approaches should continue to be the topic of future inquiry. The present study suggests that such alternative formats may be of similar value as the more traditional, classroom approach.

REFERENCES

Adams, T.M., & Brynteson, P. (1995). The effects of two types of required physical education programs on attitudes and exercise habits of college alumni. *Physical Educator, 52*, 203–210.

Ansuini, C. G. (2001). The impact of terminating a wellness/activity requirement on campus trends in health and wellness (Abstract). *American Journal of Health Promotion, 15*, 455.

Buckworth, J. (2001). Exercise adherence in college students: Issues and preliminary results. *Quest, 53*, 335–344.

Burbank, P.M., & Riebe, D. (2000). *Promoting exercise and behavior change in older adults: Interventions with the Transtheoretical model.* New York, NY: Springer.

Cardinal, B. J., Engels, H-J., & Smouter, J. (2001). Changes in preadolescents' stage of change for exercise behavior following "Health Kids 2000 – Get With It." *American Journal of Medicine and Sports, 3*, 272-278.

Cardinal, B.J., Jacques, K.M., & Levy, S.S. (2002). Evaluation of a university course aimed at promoting exercise behavior. *Journal of Sports Medicine and Physical Fitness, 42*, 113–119.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd Ed.). Hillsdale, NJ: Erlbaum.

Conlee, R. K. (2000). Sharing on-line courses. *AAALF The Active Voice, 6* (1), 5.

Corbin, C. (1969). Lecture-laboratory physical education program organization and evaluation. *Proceedings of the Annual Meeting of the National College Physical Edudcation Association for Men, Chicago, IL, 73*, 139-142.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.

DeVoe, D., Kennedy, C., Ransdell, L., Pirson, B., DeYoung, W., & Casey, K. (1998). Impact of health, fitness, and physical activity courses on the attitudes and behaviors of college students. *Journal of Gender, Culture, and Health, 3*(4), 243–255.

DiClemente, C.C., & Hughes, S. (1990). Stages of change profiles in outpatient alcoholism treatment. *Journal of Substance Abuse, 2,* 217 – 235.

Dishman, R.K. (1991). Increasing and maintaining exercise and physical activity. *Behavior Therapy, 22,* 345 – 378.

Doshi, A., Patrick, K., Sallis, J.F., & Calfas, K. (2003). Evaluation of physical activity web sites for use of behavior change theories. *Annals of Behavioral Medicine. 25,* 105 – 111.

Fiegal, K.M., Carroll, M.D., Ogden, C.L., & Johnson, C.L. (2002). Prevalence and trends in obesity among US adults, 1999-2000. *Journal of the American Medical Association,* 288, 1723-1727

Fleiss, J. L. (1981). *Statistical methods for rates and proportions* (2nd Ed.). New York: John Wiley & Sons.

Godin, G., & Shephard, R.J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport and Science, 10,* 141-146.

Goldfine, B., Collins, M.A., Barros, M., Nahas, M., Lanier, A.B., & Ash, C.W. (2003). Impact of a health-related fitness course on the stage of change for physically active behavior. *Research Quarterly for Exercise and Sport, 74, (suppl.),* A-16

Hensley, L. D. (2000). Current status of basic instruction programs in physical education at American colleges and universities. *Journal of Physical Education, Recreation and Dance, 71,* 30-36.

Hohman, S. (2003). Personal Health: An online model for health education. *The Health Educator, 35,* 9 – 14.

Jefferies, S. (2000). *Summary of AAHPERD National convention keynote presentation by David Satcher, MD, PH.D., US Surgeon General.* Orlando, Florida.

Kraemer, H.C., & Thiemann, S. (1987). *How many subjects: Statistical power analysis in research.* Newbury Park, CA: Sage.

Long, B.J., Calfas, K.J., Wooten, W., Sallis, J.F., Patrick, K.,Goldstein, M., Marcus, B.H., Schwenk, T.L., Chenoweth, J., Carter, R., Torres, T., Palinkas, L.A., & Heath, G. (1996). A multisite field test of the acceptability of physical activity counseling in primary care: Project PACE. *American Journal of Preventive Medicine, 12,* 73 – 81.

Marcus, D.B., Bock, B.C., Pinto, B.M., Forsyth, L.H., Roberts, M.B., & Traficante, R.M. (1998). Efficacy of an individualized, motivationally tailored physical activity intervention. *Annals of Behavioral Medicine, 20,* 174 – 183.

Marcus, B.H., Eaton, C.A., Rossi, J.S., & Harlow, L.L. (1994). Self-efficacy, decision-making, and stages of change: An integrative model of physical exercise. *Journal of Applied Social Psychology, 24,* 489 – 508.

Marcus, B. H., & Owen, N. (1992). Motivational readiness, self-efficacy and decision-making for exercise. *Journal of Applied Social Psychology, 22,* 3 – 16.

Marcus, B.H., Pinto, B.M., Simkin, L.R., Audrian, J.E., & Taylor, E.R. (1994). Application of theoretical models to exercise behavior among employed women. *American Journal of Health Promotion, 9(1),* 49 – 55.

Marcus, B.H., Rossi, J.S., Selby, V.C., Niaura, R.S., & Abrams, D.B. (1992). The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychology, 11,* 386 - 395

Marcus, B.H., Selby, V.C., Niaura, R.S., & Rossi, J.S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport, 63,* 60-66.

Marcus, B.H., & Simkin, L.R. (1994). The transtheoretical model; Applications to exercise behavior. *Medicine and Science in Sports and Exercise, 26,* 1400 – 1404.

Matvienko, O., Lewis, D.S., & Schafer, E., (2001). A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *Journal of Nutrition Education and Behavior, 33,* 95–101.

National Center for Health Statistics (NCHS). (2000) *Table 68: Healthy weight, overweight, and obesity among persons 20 years of age and over, according to sex, age, race, and Hispanic origin:* United States, 1960-62, 1971-74, 1976-80, and 1988-94. National Center for Health Statistics.

Nigg, C.R., & Courneya, K.S. (1998). Thranstheoretical model: Examining adolescent exercise behavior. *Journal of Teaching Physical Education, 14,* 2 – 12.

Nunnally, J. (1978). *Psychometric theory.* New York: McGraw-Hill.

O'Connell, D., & Velicer, W.F. (1988). A decisional balance measure and the stages of change model for weight loss. *International Journal of the Addictions 23,* 729 - 750

O'Connor, M.J. (1994). Exercise promotion in physical education: Application of the Transtheoretical Model. *Journal of Teaching in Physical Education , 14,* 2–12.

Pearman III, S.N., & Valois, R.F. (1997). The impact of a required college health and physical education course on the health status of alumni. *Journal of American College Health, 46,* 77–85.

Plotnikoff, R.C., Blanchard, C., Hotz, S.B., & Rhodes, R. (2001). Validation of the decisional balance scales in the exercise domain from the Transtheoretical model: A longitudinal test. *Measurement in physical education and exercise science, 5,* 191-206.

Prochaska, J.O., & DiClemente, C.C. (1983). Stage and processes of self-change of smoking: Toward an integrate model of change. *Journal of Consulting and Clinical Psychology, 51,* 390 – 395.

Prochaska, J.O., & DiClemente, C.C., Velicer, W.F., Ginpil, S., & Norcross, J.C. (1985). Predicting changes in smoking status for self-changers. *Addictive Behaviors,* 10, 395 – 406.

Prochaska, J.O., & Velicer, W.F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12,* 38 – 48.

Sallis, J.F., Calfas, K.J., Nichols, J.F., Sarkin, J., Johnson, M.F., Caparosa, S., Thompson, S., & Alcaraz, J.E. (1999). Evaluation of a university course to promote physical activity: Project GRAD. *Research Quarterly for Exercise and Sport, 70,* 1–10.

Sargeant, D. A. (1900). The place for physical training in the school and college curriculum. *American Physical Education Review, 5*(1), 1-17.

Scantling, E., Strand, B., Lackey, D., & McAleese, W. (1995). An analysis of physical education avoidance. *Physical Educator, 52,* 197-202

Schutz, R.W., & Gessaroli, M.E. (1987). The analysis of repeated measures designs involving multiple dependent variables. *Research Quarterly for Exercise and Sport, 58,* 132–149.

Sparling, R.B., & Snow, T.K. (2002). Physical activity patterns in recent college alumni. *Research Quarterly for Exercise and Sport, 73,* 200 -205.

Suminski, R., Petosa, R.L., & Waggle, L. (2003). Web-based instruction for changing Social Cognitive Theory constructs that are related to physical activity behavior. *Research Quarterly for Exercise and Sport, 74, (suppl.)*, A-67

Thomas, J. R., Salazar, W., & Landers, D. M. (1991). What is missing in $p < .05$? Effect size. *Research Quarterly for Exercise and Sport, 62*, 344-348.

Wallace, L.S., Buckworth, J., Kirby, T.E., & Sherman, M.W. (2000). Characteristics of exercise behavior among college students: Application of Social Cognitive Theory to predicting stage of changes. *Preventive Medicine, 31*, 494–505.

APPENDICES

APPENDIX A

OFFICE USE ONLY
_____
(Please do not remove)

INFORMED CONSENT DOCUMENT

Project Title: Effectiveness of Classroom vs. Web-Based Lifetime Fitness for Health Lab Instruction on College Students' Behavioral and Psychological Physical Activity Orientation

Principal Investigator: Brad Cardinal, Department of Exercise and Sport Science
Research Staff: Marc Spaziani

PURPOSE

This is a research study. The purpose of this research study is to look at how the design of the HHS 241 lab may affect college students' participation, views, and attitudes towards physical activity. The study will also be looking at any possible differences between the on campus lab and the distance education lab as it is taught electronically. The information gained in this will help the course developers and teachers improve the quality of the course in the future.

The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask any questions about the research, what you will be asked to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When all of your questions have been answered, you can decide if you want to be in this study or not. This process is called "informed consent". You will be given a copy of this form for your records.

We are inviting you to participate in this research study because you are enrolled in a HHS 241 lab for winter term 2003 either on campus or through distance education.

Procedures

If you agree to participate, your involvement will last the length of winter term 2003.

The following procedures are involved in this study. During the first and last week of lab (weeks 1 & 10) you will be given questionnaires that relate to your participation, views, and attitudes towards physical activity. For those who take part in the study on campus, the questionnaires will be given to you to fill out during regular lab time. It should take about 15 – 20 minutes to complete.

For those who take part in the study through distance education, the questionnaire will be sent you via e-mail. You will need to fill them out and send them back within 72 hours via e-mail.

Participation or non-participation in the research study will NOT affect your grade in the lab in anyway.

RISKS

There are no major foreseeable risks associated with participating in this study.

BENEFITS

There may be no personal benefit for participating in this study. However, the researchers anticipate that as a result of your participation in this study you are helping the course developers and teachers improve the quality of the course in the future.

Cost and Compensation

You will not have any costs for participating in this research project, and you will not be compensated for participating in this research project

CONFIDENTIALITY

Records of participation in this research project will be kept confidential to the extent permitted by law. However, federal government regulatory agencies and the Oregon State University Institutional Review Board (a committee that reviews and approves research studies involving human subjects) may inspect and copy records pertaining to this research. It is possible that these records could contain information that personally identifies you. Participant's names will be replaced with a code number and the code numbers will be used for all data entry, analysis, and reporting. There will be no way to identify individual respondents by name once data entry is completed, verified, and the link file name deleted. In the event of any report or publication from this study, your identity will not be disclosed. Results will be reported in a summarized manner in such a way that you cannot be identified.

VOLUNTARY PARTICIPATION

Taking part in this research study is voluntary. You may choose not to take part at all. If you agree to participate in this study, you may stop participating at any time. If there any questions in the survey that you do not wish to answer, you can decline to answer them. If you decide not to take part, or if you stop participating at any time, your decision will not result in any penalty or loss of benefits to which you may otherwise be entitled. If you choose to stop participation in the study, any information already gathered from you will be destroyed.

QUESTIONS

Questions are encouraged. If you have any questions about this research project, please contact: Dr. Brad Cardinal at (541) 737-2506 or at brad.cardinal@oregonstate.edu or Marc Spaziani at (541) 737-6793 or at spazianm@onid.orst.edu. If you have questions about your rights

as a research participant, please contact the OSU Institutional Review Board (IRB) Coordinator at (541) 737-3437 or at IRB@oregonstate.edu.

Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Participant's Name (printed): _____

(Signature of Participant):_____ Date: ___/___/___

If viewing this document electronically

By checking the "I agree to participate in the study" box below indicates that you have read and understand the procedures described above and give you informed and voluntary consent to participate in this study. Please print a copy for your records. To check the box you should be able to double click on the box and click on the "checked" default value. If unable to, please place an "X" before or after the box below.

Participant's Name (typed electronically) _____ Date: ___/___/___

☐ ***I agree to participate in the study***

I have discussed the above points with the participant or, where appropriate, with the participant's legally authorized representative, using a translator when necessary. It is my opinion that the participant understands the risks, benefits, and procedures involved with participation in this research study.

(Signature of Researcher) (Date)

_____ _____

APPENDIX B

OFFICE USE ONLY

_____
(Please do not remove)

Understanding Health and Physical Activity Behavior

Section 2: Demographic Information

1. What year/grade level are you in school?

[ ] Freshman
[ ] Sophomore
[ ] Junior
[ ] Senior
[ ] Other _____
(Please indicate)

2. What is your gender/sex?

[ ] Female
[ ] Male

3. Which best describes your racial/ethnic identity?
(Please check all that apply)

[ ] American Indian or Alaskan Native
[ ] Asian or Asian American
[ ] Black, African American
[ ] Hispanic or Latino American
[ ] Middle Eastern or Middle-Eastern American
[ ] North African or North African American
[ ] Pacific Islander
[ ] White, European American
[ ] If none of the above choices apply to you, please use your own description:
_____
[ ] Decline to respond

5. How much do you weigh? _____(Weight in pounds)

6. How tall are you? _____(Height in feet/inches)

7. How old are you? _____(Age to nearest year)

8. Are you right- or left-handed?

[ ] Right
[ ] Left
[ ] Both equal (ambidextrous)

9. Have you taken a Lifetime Fitness for Health, or similar course, at the college level before?
Yes _____ No _____

If "Yes", when: _____

APPENDIX C

Section 3: Activity Stage

Stages-of-change algorithm

Instruction: Have you been regularly participating in physical activities of moderate intensity (such as walking, recreational swimming, cycling, dancing and other similar activities)? Activities that are primarily sedentary, such as bowling, playing golf with a cart, and passive stretching, would not be considered physical activity. REGULAR PHYSICAL ACTIVITY = 5 DAYS OR MORE PER WEEK FOR 30 MINUTES OR MORE DAILY.

Note: the accumulation of 30 minutes of daily activity can be obtained consecutively or in an additive manner of two separate 15-minute activity sessions.

Please indicate the statement that most closely applies to your activity level

- ____ Yes, I have been for more than 6 months.
- ____ Yes, I have been, but for less than 6 months.
- ____ Not regularly, but I engage in such activities occasionally and plan to start on a regular basis within the next month.
- ____ No, but I'm thinking of starting in the next 6 months.
- ____ No, and I am not thinking of starting in the next 6 months.

APPENDIX D

Section 4: Exercise Level

1. Considering a **7-Day period** (week), how many times, on the average, do you do the following kinds of exercise for **more than 15 minutes** during your **free time** (write in each circle the appropriate number).

   For example: If you ran three times this past week for 20 minutes and played golf for 3 hours on Sunday, you would respond as follows: Strenuous = 3, Moderate = 0, and Mild = 1).

	Times Per Week
A. **STRENUOUS EXERCISE (HEART BEATS RAPIDLY)** (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, etc.)	◯
B. **MODERATE EXERCISE (NOT EXHAUSTING)** (e.g., fast walking, baseball, tennis, easy bicycling volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing, etc.)	◯
C. **MILD EXERCISE (MINIMAL EFFORT)** (e.g., yoga, archery, fishing from river bank, bowling horseshoes, golf, snowmobiling, easy walking, etc.)	◯

2. Considering a 7-Day period (week), during your leisure-time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN	SOMETIMES	NEVER/RARELY
☐	☐	☐

APPENDIX E

Section 5: Self-efficacy

Directions: Listed below are 5 statements designed to assess your *beliefs* in your ability to engage in physical activity under various circumstances or conditions. Please rate each statement as it applies to you and your situation by circling the appropriate number.

1. I am confident I can participate in regular physical activity when I am tired.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

2. I am confident I can participate in regular physical activity when I am in a bad mood.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

3. I am confident I can participate in regular physical activity when I don't have time.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

4. I am confident I can participate in regular physical activity when I am on vacation.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

5. I am confident I can participate in regular physical activity when it is raining or snowing.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

APPENDIX F

Section 6: Decisional Balance

Directions: This section looks at positive and negative aspects of physical activity. Please read the following items and indicate how *important* each statement is with respect to your decision to be physically active or not to be physically active in your leisure time. Please rate each item by circling the appropriate number.

1. Physical activity would help me reduce tension or manage stress.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

2. I would feel more confident about my health by getting physical activity.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

3. I would sleep better.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

4. Physical activity would help me have a more positive outlook.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

5. Physical activity would help me control my weight.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

Continued on next page

6. I am too tired to get physical activity because of my other daily responsibilities.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

7. Physical activity would take too much of my time.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

8. I would have less time for my family and friends if I participated in physical activity.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

9. I'd worry about looking awkward if others saw me being physically active.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

10. Getting physical activity would cost too much money.

Not at All	Somewhat	Moderately	Very	Extremely
1	2	3	4	5

APPENDIX G

Section 7: Processes of Change

Directions: The following experiences can affect the physical activity habits of some people. Think of similar experiences you may be currently having or have had during the past month. Please rate how frequently the event occurs by circling the appropriate number.

1. I read articles to learn more about physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

2. I get upset when I see people who would benefit from physical activity but choose not to be active.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

3. I realize that if I don't do physical activity regularly, I may get ill and be a burden to others.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

4. I feel more confident when I do physical activity regularly.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

5. I have noticed that many people know physical activity is good for them.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

6. When I feel tired, I make myself do physical activity anyway because I know I will feel better afterwards.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

7. I have a friend who encourages me to do physical activity when I don't feel up to it.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

Continued on next page

8. One of the rewards of regular physical activity is that it improves my mood.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

9. I tell myself that I can keep doing physical activity if I try hard enough.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

10. I keep a set of physical activity clothes with me so I can do physical activity whenever I get the time.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

11. I look for information related to physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

12. I am afraid of the results to my health if I do not do physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

13. I think that by doing physical activity regularly I will not be a burden to the health care system.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

14. I believe that regular physical activity will make me a healthier, happier person.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

15. I am aware of more and more people who are making physical activity a part of their lives.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

16. Instead of taking a nap after work, I do physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

Continued on next page

17. I have someone who encourages me to do physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

18. I try to think of physical activity as a time to clear my mind as well as a workout for my body.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

19. I make commitments to do physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

20. I use my calendar to schedule my physical activity time.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

21. I find out about new methods of being physically active.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

22. I get upset when I realize that people I love would have better health if they did physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

23. I think that regular physical activity plays a role in reducing health care costs.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

24. I feel better about myself when I do physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

25. I notice that famous people often say they do physical activity regularly.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

26. Instead of relaxing by watching TV or eating, I take a walk or do physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

27. My friends encourage me to do physical activity.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

28. If I engage in regular physical activity, I find that I get the benefit of having more energy.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

29. I believe that I can do physical activity regularly.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5

30. I make sure I always have a clean set of physical activity clothes.

Never	Seldom	Occasionally	Often	Repeatedly
1	2	3	4	5