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Outcomes of a Program to Enhance Exercise Self-Efficacy and Improve Fitness in Black and Hispanic College-Age Women

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Abstract

A quasi-experimental design was used to test the outcomes of an exercise program directed towards Black and Hispanic college-age women. Forty-four women (36 Black, 7 Hispanic, and 1 Black/Hispanic) attended exercise classes three times per week for 16 weeks. At program completion, women were classified as either high attendees (n = 26) or low attendees (n = 18). Compared to low attendees, the high attendees had significantly higher exercise self-efficacy (p < .001), perceived benefits and barriers (p =.004), aerobic fitness, flexibility, muscle strength, and percentage of body fat (all p <.001). Daily activity levels improved significantly in the high attendance group following the program (p <.001) and at 8 weeks post-program completion (p =.01).

Keywords

exercise; resistance training; intervention; Black and Hispanic women; health promotion; exercise self-efficacy

Considerable evidence exists that exercise has numerous physiological, metabolic, and psychological benefits. The U.S. Department of Health and Human Services report, *Physical Activity and Health* (1996), contains a summary of these benefits, including: (a) improvement in cardiovascular and respiratory function; (b) reduction in coronary artery disease risk factors; (c) decreased morbidity and mortality; and (d) the postulated benefits of decreased anxiety and depression, enhanced feelings of well-being, and enhanced performance of work, recreational, and sport activities.

Rather than embrace these benefits, a significant percentage of Americans maintain a largely sedentary lifestyle. Although physical activity has been shown to decline with age (Centers for Disease Control, 1998; National Center for Health Statistics, 1994, 1997), evidence suggests that these declines begin early in life. The findings of the Youth Risk Behavior Survey (Center for Disease Control and Prevention, 2001) indicated that teenage girls were less active than boys throughout the 4 years of high school, and both Black and Hispanic

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teenage girls were significantly less active than White teenage girls. During the college years, females tend to become even less active. This is particularly true for African-American and Hispanic women (Ainsworth, Berry, Schnyder, & Vickers, 1992; Ford & Goode, 1994; Kelley & Kelley, 1994). Suminski and Petosa (2002) studied 3,000 ethnically diverse college students and found that both Black and Hispanic female women were significantly more likely to report a sedentary lifestyle than were their White counterparts. Based upon age trends, many young minority women are at high risk for living out their lives as sedentary adults. Chronic inactivity in young and middle adulthood substantially increases the risk for cardiovascular disease, particularly hypertension and stroke (Howard et al., 1994; Whelton et al., 1996). One important sub-population of young adult minority women to target is both Black and Hispanic undergraduate college students. They are accessible as a group, and a successful program may have a lasting impact on their own and others' health behavior. After graduation, they could form an educated cadre of leaders who could influence others to adopt health-promoting lifestyles.

Few investigators have tested exercise programs to decrease sedentarism among college students (Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999). In particular, very few researchers have focused on African-Americans, other Blacks, or Hispanic women (Nieves-Squires, 1993), and almost nothing is reported about the long-term outcomes of such a program. The specific aims of the study reported here were to: (a) develop and test a self-efficacy enhancing exercise program to achieve physical fitness among both Black and Hispanic sedentary female college students; (b) optimize the benefits and minimize the perceived barriers to initiation of a program of exercise among both Black and Hispanic sedentary female college students; and (c) optimize the benefits and minimize the perceived barriers to maintenance of exercise as a health promotion behavior among both Black and Hispanic sedentary female college students.

THEORETICAL FRAMEWORK

Several theories have been proposed to explain physical activity among adolescents and young adults. Among these, the social cognitive theory (SCT) core construct of self-efficacy has been found to be the best predictor of maintaining exercise behavior over time (Sallis & Owen, 1999). According to SCT, human behavior is explained by triadic reciprocal determinism; the bi-directional interaction of cognition, prior behavior, and the environment operating interactively to influence current behavior (Bandura, 1986). Major constructs of SCT include behavioral capability, expectations, and self-efficacy. Self-efficacy is defined as judgments of one's ability to perform at a particular level in executing a specific behavior (Bandura, 1986). Exercise self-efficacy is defined as a person's confidence about their ability to do specific physical activities under specific circumstances. Self-efficacy is influenced by four principal sources of information: *performance accomplishments*, vicarious experiences *(modeling)*, *verbal persuasion*, and *emotional arousal* (physiological states). The relationships between the major sources of efficacy information, exercise self-efficacy expectations, and exercise performance are diagrammed in Figure 1.

Performance accomplishments are the most valid sources of self-efficacy information because they are based upon personal mastery experiences. Prior positive mastery experiences are most likely to raise the level of exercise self-efficacy and, thus the level of exercise performance. Non-athlete Black and Hispanic women are both likely to have had few positive exercise experiences while growing up and may, therefore, lack the skills and opportunities to participate in exercise and sport (Deem, 1982).

Modeling is a method of gaining vicarious experience by observing the desired behavior. Neophyte exercisers have benefited from having peers model high endurance exercise for

them (Gould & Weiss, 1981; King, Taylor, Haskell, & DeBusk, 1988). Given the prevalence of sedentarism across the lifespan among both Black and Hispanic women, it is likely that these college-age women have not had many female friends or family members who modeled healthy exercise behaviors as they were growing up. Hence, they may have no role models of women like themselves to emulate. The third source of exercise self-efficacy is verbal persuasion, in the form of positive reinforcement. Persuasive techniques and "self-talk" strategies can influence exercise self-efficacy and subsequent exercise performance (Del Ray, 1971).

The fourth source of self-efficacy information is emotional arousal. Bandura (1977) suggested that self-perceptions of arousal (also referred to as physiological states) may affect behavior by altering self-efficacy expectations. Individuals may interpret symptoms (e.g., a rapid heart rate) as a sign that they cannot perform the activity safely. Feltz (1984) suggested that if the individual can change this perception from negative to positive, self-efficacy will be enhanced.

According to SCT, the individual utilizes one or more of these sources of self-efficacy information to make judgments when presented with different situations or tasks. The consequences of these judgments (confidence expectations) are hypothesized to determine individual motivation to engage in exercise behavior. This is reflected in the challenges individuals undertake, the effort they expend in a given activity, and their level of perseverance in the face of difficulties. It is further thought that self-efficacy judgments also influence thought patterns and emotional reactions that may influence motivation. Self-efficacy judgments are modifiable through programs that use one or more strategies to increase the perception of exercise self-efficacy (Bandura, 1997).

Two additional constructs from SCT that have particular relevance for exercise include positive and negative outcome expectations (i.e., benefits and barriers). Although self-efficacy is described as a judgment about one's abilities to perform a given task, outcome expectations can be seen as a judgment of the consequences of performing the given task (Bandura, 1997). Outcome expectations can be physical or social effects or self-evaluative reactions of one's behavior, and can be classified as either positive or negative. According to SCT, personal facilitating factors, situational barriers, or perceived benefits may explain differences in health behaviors, including exercise seeking/avoiding behavior. Individuals are likely to report lower exercise self-efficacy when perceived barriers to exercise overwhelm the effect of perceived benefits of exercise. Because self-efficacy and perceived benefits and barriers are both SCT constructs that are amenable to modification, theory-based exercise programs designed to alter these factors as determinants of regular exercise would appear to hold much promise.

In an effort to learn more about the factors that contribute to the likelihood of initiation and maintenance of an exercise program among minority college females, focus groups were held at a large culturally diverse public university on the East Coast. Using focus groups is consistent with the SCT principle that the more influence individuals have on events in their lives (e.g., the selection and creation of supportive environments), the more they can shape these events to their liking. These adaptations can further contribute to increased feelings of self-efficacy. Three 60–90 minute focus groups were conducted according to the guidelines suggested by Morgan, Krueger, & King, (1998). Each group had 5–11 female college students who self-identified as either Black or Hispanic. The total of 23 women ranged in age from 18 to 27 years of age, and all described themselves as non-exercisers. Results of the focus group interviews concerning the women's preferences are presented in Table 1. The focus group findings were incorporated into the design of the program, as was attention to the concerns of the neophyte exerciser. The investigators worked with university athletic/

recreation facility staff and the exercise leaders to incorporate focus group recommendations into the design of the program.

This program was designed to increase the women's exercise self-efficacy through planned physical exercise sessions. These sessions were designed to provide mastery experiences, modeling of appropriate exercise behaviors, verbal feedback, and positive self-monitoring of physiological states. Behavioral methods were used to increase the women's exercise self-efficacy through instruction in techniques to optimize the benefits and minimize the perceived barriers to exercise. We theorized that women who participated in the program and experienced the benefits of exercise would increase their exercise self-efficacy and be more likely to continue exercising through the rest of their college career and into their adult life. We hypothesized that at the end of a 16-week exercise program, compared to those with lower attendance, both Black and Hispanic college-age women with higher attendance in the program would have:

1. greater exercise self-efficacy;
2. more perceived benefits of and fewer barriers to exercise;
3. greater aerobic fitness, muscle strength, flexibility, and lower percentage of body fat;
4. higher daily activity levels both then and at 8 weeks post-intervention compared to those with lower attendance.

METHOD

Sample

A sample size of 60 women (30 per group) was ascertained to be necessary to fulfill the power requirement to test for differences in exercise self-efficacy. The desired sample sizeof60women was based upon mean differences in exercise self-efficacy in a study among college students (Wallace & Buckworth, 2003) and was derived using statistical power .80, alpha .05, and effect size .73 for a two-tailed test. Cohen (1988) would consider this a large effect size.

The sample was recruited from minority women attending a large culturally diverse northeastern public university. Female undergraduate college students aged 18–35 who self-identified as Black or Hispanic were recruited through majority and minority student organizations, sororities, advertisements placed in the university student newspaper, and flyers in residence halls and eating areas. Consent forms were signed by 64 individuals prior to participation in the study. These contained the purpose of the study, selection criteria, procedures, benefits and risks, alternatives, confidentiality, withdrawal, and an injury disclaimer. Each participant underwent a health screening, including a history and physical examination. Five individuals who were considered to have some risk factor that precluded participation were not invited to enroll in the study, leaving 59 qualified women. There were 15 women lost to attrition after the initial screening; all reported that they dropped out of the study due to the difficulty of the step-test. Apparently they believed that because the pre-test exercise component was so difficult for them, the exercise sessions themselves would be beyond their abilities and/or desires to stress their bodies.

Of the remaining 44 women (74% of those accepted into the study) who successfully passed the health screening, gave informed consent, and began the exercise program, all (100%) returned at the end of the 16-week program for post-program testing and were included in data analyses. Thirty-six women identified themselves as Black, seven were Hispanic, and

one woman self-identified as Black and Hispanic. These 44 women stated they were not engaged in any regular exercise regimen or sport outside this project.

Design

The initial plan for the study was to use a crossover lag true experimental design (Shadis, Cook, & Campbell, 2002). This design was selected so that all participants would have the benefit of the exercise program, rather than to deny the control group the opportunity to participate. Originally, the true experimental design plan was to fit both randomly assigned lag and exercise group members into each of two academic semester schedules. However, scheduling difficulties arising during the preceding summer session and a prolonged winter break made that design infeasible. The design was changed to a quasi-experimental non-equivalent control-group design with pretesting and post-testing (Campbell & Stanley, 1963) and use of ANCOVA for the pretest scores.

The program took place on two campuses of the university during the spring and fall semesters. Two programs of 16 weeks each were held; 11women were in the fall semester program, and 33 women were in the spring semester program. At the end of each semester, all women who had been pre-tested were invited back for post-testing. Once the exercise program ended, women from both semesters were classified to high and low attendance groups based upon their attendance at the exercise sessions. Data from the two semesters were pooled, because there were no significant differences in baseline sample characteristics or pre-test variables between women in the two semesters.

Two measures of attendance were calculated: (a) the number of sessions attended and (b) an index score representing the percentage of total sessions attended. The latter was calculated as follows:

$$\frac{\text{number of sessions attended} + \text{number of weeks attended}}{64(48 \text{ sessions} + 16 \text{ wks/semester})}$$

Women who completed six or more sessions and had an index score of .16 or greater were classified as high attenders. Women who attended fewer than six sessions and had an index score of .15 or less were classified as low attenders. To obtain an index score of .16, a woman must have attended six sessions over a 4-week period. Six sessions was considered the minimum number of sessions a woman could attend and expect to see some improvement in fitness (Dishman, Ickles, & Morgan, 1980).

Dependent Variable Data Collection

Pre-program assessments of exercise self-efficacy and perceived benefits and barriers, as well as evaluation of cardiorespiratory fitness, muscle strength, flexibility, percentage of body fat, and activity level were obtained from all women before beginning the program and again at the end of the 16-week program. Details regarding the properties and scoring of the data collection tools are summarized in Table 2. Activity level was measured using the Digiwalker™ pedometer (Bassett et al., 1996) at pre-test and at 16 and 24 weeks.

Exercise Protocol

The recommendations of the focus groups were incorporated into the program. Exercise sessions were held on each campus in centrally located exercise facilities that were safe, secure, and private. Women could attend either a step or dance aerobics or kick boxing class three times per week, for 50–60 minutes per session. Women could move from one format to another, provided they were able to exercise for the entire aerobic segment at 60–80% of

their age predicted maximum heart rate. The classes were held at various time periods on a daily basis to accommodate a variety of schedules and to provide a supportive atmosphere. Classes were taught by Athletic Center or Recreation Department exercise instructors. Instructors worked in cooperation with the first author to pay particular attention to the needs and concerns of women who were not used to stressing their bodies through exercise. The first author explained all study procedures to the staff/ exercise leaders before the exercise sessions began and audited their performance to ensure consistency among the sessions and to see that the instructors maintained a non-judgmental supportive approach toward these neophyte exercisers. The protocol used for the exercise sessions is summarized in Table 3

The first author observed the exercise sessions and met with the women after each session to confirm attendance and provide immediate self-efficacy enhancing feedback regarding performance (e.g., report of total exercise time, achievement of target heart rates, praise for the achievement, and an invitation to return to the next session). At the end of each exercise session, each woman completed and submitted a data sheet that included the her code number, day, date, exercise instructor, type of class attended, resting and exercise heart rates, relative perceived exertion (RPE) score, step count for the session, and total aerobic exercise time as noted on a Digiwalker™. After each session, the investigator calculated the age-predicted maximum heart rates (APMHR) and percentage of target heart rates attained during the session from the coded data sheets to ensure that the women had exercised at the pre-determined intensity.

The exercise prescription was planned in accordance with the readiness of the women, following Bandura (1977) stages of behavior change: initiation, perseverance, and adherence. Key elements of the self-efficacy enhancing program, based upon principles of Social Cognitive Theory, are summarized in Table 4.

Participants were given weekly worksheets, handouts, motivational messages, and homework assignments corresponding to the relevant activities and stages of behavior. The investigator also sent weekly e-mail messages to the women; these included feedback regarding target heart rates, personalized motivational messages, tips for maintaining exercise during stressful periods, addresses of informative web sites, and reminders to individuals who missed an exercise session. Incentives were provided to the women every 2–3 weeks, based upon their level of participation. Incentives included water bottles, shower gel, and other items noted in Table 1 as suggestions from the focus groups.

Once the exercise sessions ended, the investigator continued to maintain contact with all of the women through weekly e-mails, telephone calls, mailings or other methods preferred by the women. At the end of the 8 weeks of follow-up, the participants reported the Digiwalker™ step count data to the investigator.

At the end of post-testing, all women received a T-shirt with the program's exercise logo on the front. Women who turned in their 8-week post-program Digiwalker™ step counts also received $50.

Data Analysis

Due to the quasi-experimental design of the study, baseline sample characteristics of the women in the two groups were compared and are presented in Table 5. The mean age for the higher attendance group was 21.46 years and it was 20.39 years for the lower attendance group. Few statistically significant differences were noted between the two groups. Hispanic women (n =7) and commuters (n =12) made up only 16 and 27% of the sample, respectively, but both were almost exclusively in the higher attendance group. An analysis

of the pre-program scores of the higher attendance and lower attendance groups revealed no statistically significant differences on any of the preprogram measures, except for the Modified Sit and Reach test, where the lower attendance women scored higher (were slightly more flexible) than higher attendance women [t (42)=−2.49, p =.03]. Mean scores for the pre-program assessments of exercise self-efficacy and exercise benefits and barriers were consistent with those published elsewhere (Sechrist, Walker, & Pender, 1987; Wallace & Buckworth, 2003).

Higher attendance women participated in 16–60% of the exercise sessions, with a mean attendance of 35% of the sessions. Lower attendance women came to 15% or less of the exercise sessions, with a mean attendance of 5% of the sessions.

All hypotheses were tested using a two-group covariate analysis of covariance (ANCOVA). Because experimental control through randomization was not feasible in this study, pretest values were used as covariates to minimize the possible bias effects from baseline group differences (Polit, Beck, & Hungler, 2003). Evaluation of the assumptions of normality, linearity, homogeneity of variance, homogeneity of regression, and reliability of covariates was satisfactory. No outliers were detected. The significance level for all tests was set at $p < .05$. Data analyses were performed using the Statistical Package for the Social Sciences (SPSS) Version 10.0.

RESULTS

All hypotheses were supported. Significant differences were found in the exercise self-efficacy scores and perceived benefits and barriers in the higher attendance group at the completion of the exercise program (16 weeks) as compared with women in the lower attendance group. The results for both Hypotheses 1 and 2 are shown in Table 6. Significant differences were found in aerobic fitness, muscle strength, flexibility, and percentage of body fat among the higher attendance women as compared with women in the lower attendance group. Results are shown in Table 7. Significant differences were noted in daily activity levels among the higher attendance women as compared with the women in the lower attendance group immediately following the 16-week program and at 8 weeks post-program. Results are shown in Table 8.

DISCUSSION

Women in the high attendance group showed significant differences in exercise self-efficacy and perceived benefits and barriers to exercise. They also demonstrated significant differences in aerobic fitness, muscle strength, flexibility, percentage of body fat, and overall daily activity level. Because women in the higher attendance group attended a mean of only 35% of the exercise sessions, or an average of just 1.3 sessions per week, the significance of these differences likely was blunted by the limited dosing effects of the program. Participation in the exercise program was still well below the recommendations for vigorous activity, which is 3–5 times per week (American College of Sports Medicine, 2000). The mean post-program step count and 8-week post-program step count for women in the higher attendance group were 7,787 and 8,127 steps/day respectively, still below the recommended 10,000 steps/day (Bassett et al., 1996). In light of the positive findings among those who exercised just 1.3 times per week on average, the benefits might have been even greater if they had come closer to the ACSM recommendations for frequency and consistency.

The major reasons given for missing exercise sessions were time conflicts due to academic, family, and work responsibilities. Similar barriers to exercise among college students have

been reported elsewhere (Sallis et al., 1988) and may play a greater role among low-income minority women facing financial burdens. The challenge for future research is to uncover the beliefs, motivations, and attitudes that lead one person to maintain an exercise regimen while another consistently forgoes exercise under similar schedules and responsibilities.

As noted earlier, the reason given by the 15 women who dropped out after the pre-testing was the perceived difficulty of the step test. At this critical time, their exercise self-efficacy and exercise skill level were so low that the step test was seen as a frightening and aversive experience. Mean exercise pre-program self-efficacy scores in this group averaged 3.5 points lower than high attenders and 1.75 points lower than low attenders. Even among those women with higher attendance, post-program scores of aerobic fitness (VO_2max) and muscle strength were lower than reported elsewhere in young women (Astrand, 1960; MacFarlane, 1993). In future studies, strategies that are even more sensitive to the vulnerabilities of beginning exercisers need to be tested to improve retention of highly sedentary women.

Given the academic demands of college-life, programs that combine structured exercise sessions with opportunities for self-monitoring of lifestyle physical activity may be useful in helping college-age women achieve healthier levels of activity. Dunn, Andersen, and Jakicic (1998) reviewed physical activity interventions conducted among previously sedentary children, as well as middle-age and elderly adults, and found the interventions to be effective at increasing and maintaining levels of physical activity that meet or exceed public health guidelines. Examples of lifestyle physical activity would include parking farther from classrooms, routinely taking the stairs, and maximizing all opportunities to walk rather than ride short or intermediate distances.

Limitations to the study include the lack of a true control group and a smaller than targeted sample size. Further testing using a randomized control design with larger samples is advised. In addition, the percentages of Hispanic females (16%) and commuters (27%) in the study were small. Both of these groups, however, were found primarily in the higher attendance group, indicating that their attendance was comparatively better than that of Black women and residential students. Although the program was designed to target both Black and Hispanic college-age females, cultural issues between these two groups may hinder them from feeling comfortable with simultaneous exposure to the program. Pasick, D'Onofrio, and Otero-Sabogal (1996) discussed the need to differentiate between targeting and tailoring when planning programs for culturally diverse groups. Targeting implies the need to identify the subgroup(s) that will be exposed to the program, whereas tailoring takes this one step farther. The investigator needs to tailor, or adapt the intervention to fit the needs and characteristics of each subset of the target audience. Further research is needed to learn how to best tailor an exercise intervention to fit the needs and characteristics of individuals from different cultures. Perhaps during socialization into fitness as a new skill set, separate groups would make the participants feel more comfortable. Qualitative research, including focus groups, may help to clarify this issue.

Our findings affirmed results from other studies indicating that a proportion of both Black and Hispanic females do benefit from a self-efficacy enhancing exercise program and will maintain their progress after the program ends. However, the challenge for future researchers is to develop and test successful strategies to help lifelong non-exercisers incorporate the ACSM recommendations of 3–5 regular aerobic/strength-training sessions per week into their regular lifestyle regardless of the competing demands on their time. Success in achieving this goal may require specific strategies to significantly change their perceptions of exercise benefits and barriers. Finally, research is needed to design fitness

enhancing protocols that are perceived as optimally user-friendly by culturally diverse groups composed of neophyte exercisers.

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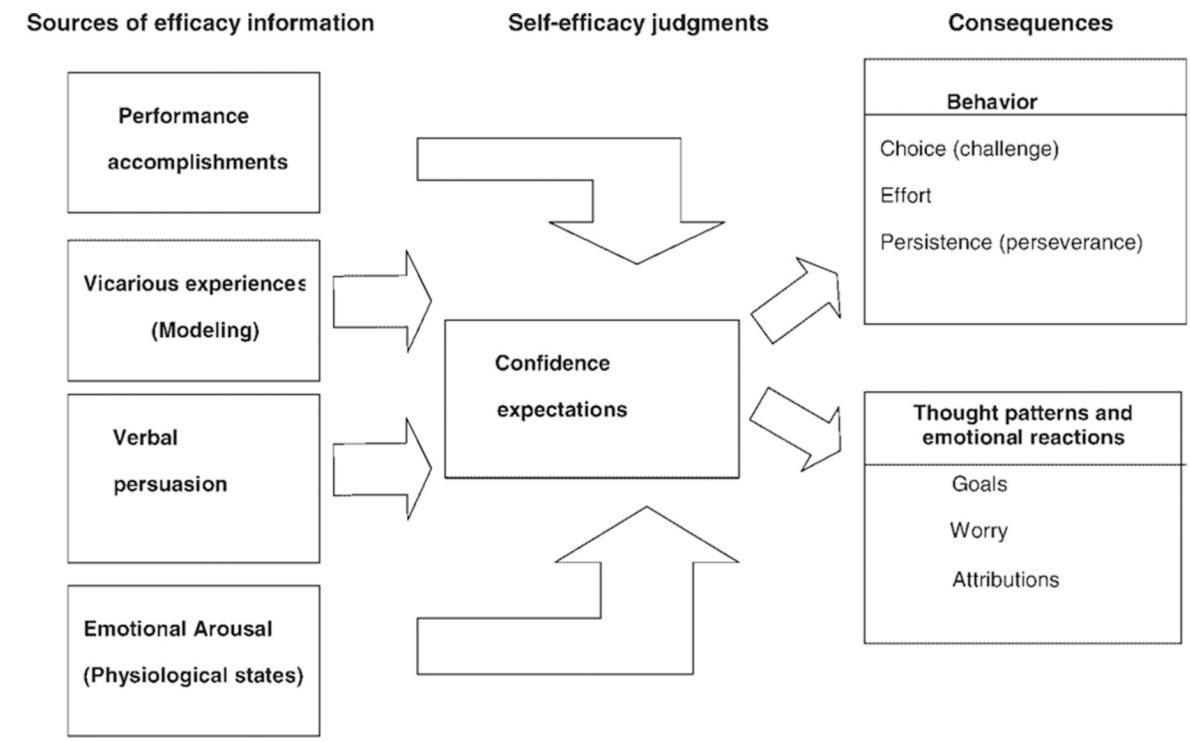

Note. From "The Measurement of Self-Efficacy and Confidence in Sport" in *Advances in Sport and Exercise Psychology Measurement* (p. 66) by D.Feltz and M.Chase. J.L. Duda, Ed. 1998, Morgantown, WV. Fitness Information Technology, Inc. Copyright 1998 by Fitness Information Technology, Inc. Reprinted with permission.

FIGURE 1.
Relationships among sources of efficacy information, efficacy judgments, and consequences.

Table 1

Summary of Focus Group Preferences and Modifiable Factors

Factors	Preferences/Responses
Format	Step aerobics
	Kick boxing
Music	"Club" or dance music
Benefits	Improved appearance
	Meeting/making new friends
Barriers	Time constraints with school (particularly during exams)
	Need for accessibility during bad weather
	Getting over aches/pains/soreness during the initial sessions
	Fear of being unable to keep up with the exercise regimen
Time of day	Late afternoon or evening exercise sessions (5 or 6 pm) for campus residents
	May need to change to an earlier time period during summer session
	Earlier afternoon session (around 3 pm) for commuters
Location	Commuter students favored the campus gym
	Campus residents split between gym and residence hall
	Concerns about availability of showers and presence of men in the exercise area
Exercise leader	Fit,motivating,andparticularlyattentivetotheneedsofnewexercisers/neophytes
	Preference for female exercise leader
	No preferences regarding age or ethnicity of leader
Incentives/motivators	Majority recommended a party and/or small cash payment at the end of the study
	Small incentives (e.g., water bottles, nutrition bars, shower gel, socks, coupons for exercise clothing, or shoes) throughout the study
	Increased stamina/energy, feeling fit, attaining target heart rates
	Positive feedback from the exercise leader(s)

Table 2

Summary of Study Measures

Variable	Measures	Description	Properties	Testing Schedule
Exercise self-efficacy	Self-efficacy and exercise habits survey (Sallis, Pinski, Grossman, Patterson, & Nader, 1988)	12 items Likert type-responses, range 12–60	α=.85 (Sallis et al., 1988), test-retest reliability *r*=.78 (Sallis et al., 1999)	Pre-test,16 wks
Exercise benefits and barriers	Exercise benefits barriers scale (Sechrist et al., 1987)	43 items Likert type-responses, range 43–172; barrier items are reverse scored	α=.95, test-retest reliability *r*=.88. (Sechrist et al., 1987)	Pre-test, 16 wks
Aerobic fitness	Queen's College step test (McArdle, Katch, Peschar, Jacobson, Ruck, 1972)	3 min step test used to predict VO_2max based on recovery heart rate	Validity correlation *r*=−.75; test-retest reliability *r*=.92 (McArdle et al., 1972)	Pre-test, 16 wks
Muscle strength	Robertson curl-up (Robertson & Magnusdottir, 1987)	No. of modified curlups performed in 1 min	Test-retest reliability *r*=.94 (Robertson & Magnusdottir, 1987)	Pre-test, 16 wks
Flexibility	Modified sit and reach (Hoeger & Hopkins, 1992)	Measurement of low back & LE flexibility	Test-retest reliability *r*=.89 (Hoeger & Hopkins, 1992)	Pre-test, 16 wks
Percentage of body fat	Skin fold thickness (Pollock, Schmidt, & Jackson, 1980)	Seven site formula used to calculate % body fat	Validity correlation = .85 (Jackson, Pollock, & Ward, 1980)	Pre-test, 16 wks
Activity level	Digiwalker™ pedometer	Step counts (3 day)	Pedometer recorded 100%steps, *SD* between subject 0.36 km (Bassett et al., 1996)	Pre-test, 16 wks & 24 wks

Table 3

Exercise Protocol

Activity	Time	Components
Resting pulse check	30 sec	Carotid pulse check
Warm up session	5–10 min	Stretching of large muscles & aerobic activity to increase heart rate
Aerobic component	20–30 min	Low impact dance or step aerobics or kick boxing at 60–80% of APMHR
Pulse check	30 sec	Carotid pulse check
Strength training/flexibility	10–15 min	Handweights, exercise bands, floor exercises
Cooldown	5–10 min	Stretching exercises on floor
Resting pulse check	30 sec	Carotid pulse check

Table 4

Theory Based Components of the Exercise Program

SCT Concept	Goal	Activity	Process Measures
Performance accomplishments	Ensure mastery of exercise skills	Pre-program fitness testing	Recovery HR from step test & estimated VO_2max
			Strength & flexibility assessment
Performance accomplishments	Increase subjects' skill & tolerance for exercise	Exercise sessions	Digiwalker™
Modeling			RPE scale
Verbal persuasion			Exercise HR vs. target HR
Emotional arousal			
Performance accomplishments	Promote continued participation in exercise program	Weekly e-mails & pertinent handouts	Attendance
Verbal persuasion		Support for exercise time & target HR	Exercise HR vs. target HR
		Reminders to women who missed sessions	
		Subgoal incentives	
Negative & positive outcome expectations (barriers & benefits)	Assist women to control barriers & maximize benefits	Group discussions	Attendance
		Decisional balance sheets	RPE scale
		Anticipatory guidance	Step counts
Verbal persuasion	Promote continued participation in exercise program & long-term maintenance	Group discussion of long-term strategies	Digiwalker™ step counts
	8-week post-test exercise maintenance	Weekly e-mails & motivational messages	Digiwalker™ step counts

HR, heart rate; RPE, relative perceived exertion.

Table 5

Sample Characteristics (n = 44)

	Lower Attendance		Higher Attendance	
Characteristics	***n*=18**	**Percent**	***n*=26**	**Percent**
Year in school				
Freshman	0	0.0	3	11.5
Sophomore	6	33.3	6	23.1
Junior	5	27.8	3	11.5
Senior	7	38.9	10	38.5
Other	0	0.0	4	15.4[a]
Total	18	100.0	26	100.0
Race/ethnicity				
Black[b]	17	94.4	19	73.1
Hispanic	1	5.6	6	23.1
Black and Hispanic	0	0.0	1	3.8
Total	18	100.0	26	100.0
Housing status				
Resident	17	94.4	15	57.7
Commuter	1	5.6	11	42.3
Total	18	100.0	26	100.0

[a] Represents non-matriculated students.

[b] "Black" was preferred over "African-American" by those women of African ancestry born outside the US (e.g., the Caribbean).

Table 6

ANCOVA Results: Group Means for Behavioral Variables Following a 16-Week Exercise Program (n=44)

Variable	Group	Pre-Program Mean Score	*SD*	Adjusted Post-Program Mean Score[a]	*SD*	*F* Value	*P* Value
Exercise self-efficacy	Higher attendance	45.58	6.71	47.27	5.85	10.98	<.001
	Lower attendance	43.89	7.99	40.66	5.85		
Exercise benefits/barriers	Higher attendance	134.85	12.60	136.99	2.27	5.12	.004
	Lower attendance	134.73	11.25	130.88	2.84		

[a]The post-program means in this table have been statistically adjusted for the subjects' pre-program behavioral scores.

Table 7

ANCOVA Results: Group Means for Fitness Variables Following a 16-Week Exercise Program (n=44)

Variable	Group	Pre-Program Mean Score	*SD*	Adjusted Post-Program Mean Score[a]	*SD*	*F* Value	*P* Value
VO_2max (ml/kg/min)	Higher attendance	34.36	2.46	35.35	1.74	18.65	<.001
	Lower attendance	34.39	3.58	32.04	1.74		
Robertson curlups	Higher attendance	38.04	11.75	42.36	8.80	11.09	<.001
	Lower attendance	40.72	12.05	38.53	8.86		
Mod. Sit and Reac	Higher attendance	32.49	10.33	40.16	4.82	30.32	<.001
	Lower attendance	38.84	8.13	38.27	4.79		
Percentage of body fat	Higher attendance	27.39	6.77	26.49	2.35	60.66	<.001
	Lower attendance	28.96	7.20	28.66	2.38		

[a]The post-program means in this table have been statistically adjusted for the subjects' pre-program fitness scores.

Table 8

ANCOVA Results: Group Means for Daily Activity Levels Following a 16-Week Exercise Program and 8 Weeks Post-Program (n=35)

Variable	Group	Pre-Program Mean Score	*SD*	Adjusted Post-Program Mean Score[a]	*SD*	*F* Value	*P* Value
Post-program	Higher attendance	7,084	2,884	7,727	392.2	9.29	<.001
	Lower attendance	7,161	3,025	7,004	480.5		
8 week post-program step count	Higher attendance	7,084	2,884	8,187	495.7	4.12	.01
	Lower attendance	7,161	3,025	6,993	607.3		

[a]The post-program means in this table have been statistically adjusted for the subjects' pre-program activity levels.