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# Predictors of Improvement in Women's Physical Activity

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# Predictors of Improvement in Women's Physical Activity

Janet Purath, PhD, RN
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**ABSTRACT.** This study identified factors that predicted improved levels of physical activity in working women. Data were from a prospective, controlled trial. Sedentary women ($N = 287$) were recruited during an employer-sponsored health screening. The experimental group received a brief, tailored physical activity intervention as well as a booster phone call 2 weeks later. Participants were evaluated by comparing pre-test/post-test measures at 6-week follow-up. It was hypothesized that variables in the Transtheoretical Model (baseline stage of change, perceived pros, cons, and self-efficacy), as well as demographic variables and physical characteristics would predict improved physical activity. In addition, the study tested whether increased physical activity changed the variables of the Transtheoretical Model. Factors that correlated to improved physical activity were entered into regression models to determine predictors of improved physical activity.

Being assigned to the intervention group was a significant predictor in all of the regression models. Women who increased their stage of change of physical activity had greater improvement in self-efficacy ($p = .013$). Minority women showed greater improvement in stage of

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change of physical activity ($p$ = .001) as well as week-end physical activity ($p$ = .042). Women with less education were more likely to increase total minutes walked per week ($p$ = .038).

The research suggests that these cognitive and demographic variables are important for improving levels of physical activity. The Transtheoretical Model was partially supported by the analyses. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> © 2005 by The HaworthPress, Inc. All rights reserved.]*

**KEYWORDS.** Physical activity, women's health, transtheoretical model

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## *INTRODUCTION AND BACKGROUND*

### *Physical Activity and Women*

Regular physical activity protects against coronary heart disease, the leading cause of death for white, black, and Hispanic women (USDHHS, 2004) and hypertension, a disease affecting 32.3% of U.S. women (AHA, 2005). Physical activity enhances weight loss, a problem for 61.6% of U.S. women who are overweight or obese (Hedley et al., 2004). Physically active women generally outlive inactive women (Oguma et al., 2002; Rockhill et al., 2001) and have reductions in some diseases that are more prevalent in women, such as breast cancer (Thune et al., 1997). Despite the important benefits of physical activity, only 43.9% of U.S. women are sufficiently physically active (CDC, 2002). The high prevalence of sedentary lifestyles makes it essential to evaluate factors that are associated with improvement in women's levels of physical activity.

### *Demographic and Physical Characteristics*

Demographic characteristics such as education, socio-economic status, age, gender, and ethnicity are frequently associated with exercise and physical activity (Brownson et al., 2000; Sternfeld, Ainsworth, & Quesenberry, 1999; Wilcox et al., 2000). National data from the Behavioral Risk Factor Surveillance System (CDC, n.d.) show relatively high levels of sedentary living among the lowest education and income groups. Further, the prevalence of exercise decreases with age. Sternfeld et al. (1999) found that older women were less active than younger women in a large sample of ethnically diverse participants.

With regard to gender, the Centers for Disease Control (2002) reports that a smaller percentage of women than men report leisure-time physical activity. Leisure-time physical activity is lowest among Blacks and Hispanics. Body mass index (BMI) also plays a role in physical activity. Women who engage in physical activity have significantly lower BMIs than inactive women (Ashton, Nanchahal, & Wood, 2000; Lahti-Koski et al., 2002).

### *Transtheoretical Model*

Recent advances in behavioral theories have identified specific cognitive and behavioral processes and stages that are important in health behavior change. Prochaska, Redding, and Evers (1997) described one such behavioral model, the Transtheoretical Model (TTM) of Behavior Change. This study used three of the constructs from the TTM: stage of change, self-efficacy, and decisional balance.

*Stage of Change.* Prochaska et al. (1997) posit that people progress through stages when trying to accomplish a behavior change. Persons may be in: precontemplation–not thinking about changing; contemplation–thinking about changing; or preparation-preparing for change, but not actually or consistently performing the new behavior. Persons engaging in a behavior for the first six months are defined as being in action. The stage of long-term continuation of a behavior for more than six months is considered maintenance. When adopting a behavior change, a move from precontemplation and contemplation to higher stages suggests the intention to begin a behavior. This movement may be an important precursor to actual behavior change. Use of stages of change for physical activity was supported with persons in primary care settings (Calfas et al., 1996; Steptoe, Rink, & Kerry, 2000) as well as other groups (De Bourdeaudhuij et al., 2005; Jacobs et al., 2004; Schumann et al., 2002).

*Self-Efficacy.* Self-efficacy is defined as a person's confidence in his/her capabilities to carry out a behavior (Bandura, 1977). The Surgeon General's Report notes that self-efficacy has been positively related to physical activity among men, women, and younger and older adults (USDHHS, 1996). Research findings have revealed that self-efficacy is rated progressively higher as an individual increases physical activity and/or moves through the stages from precontemplation to action and maintenance (Gorely & Gordon, 1995; Leenders et al., 2002; Wakui et al., 2002).

*Decisional Balance.* Decisional balance is the individual's relative weighing of the pros and cons of changing a behavior (Prochaska et al., 1997). Pros, the advantages or positive aspects of changing behavior,

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may be facilitators of change. Cons, the disadvantages or negative aspects of changing behavior, may be barriers to change. Decisional balance, the balance of pros and cons, may be most important in the beginning of all behavior change. Decisional balance for physical activity was significantly associated with stage of physical activity adoption from precontemplation to maintenance of action in cross-sectional studies (Gorely & Gordon, 1995; Jaffee et al., 1999). In the TTM, exercise cons are thought to be relatively stable while pros tend to increase more than cons as stage increases (Prochaska et al., 1997).

Although leisure-time physical activity has positive health benefits, a significant proportion of U.S. women remain sedentary. Even though self-efficacy and favorable decisional balance have been associated with physical activity, it is still undetermined whether the variables predict the likelihood of improvement in physical activity levels (Sherwood & Jeffery, 2000). Studies are needed to determine the role of self-efficacy and decisional balance in the adoption of physical activity. Specifically, researchers need to determine whether high baseline self-efficacy, high baseline pros and low cons will predict adoption of physical activity, and if improved self-efficacy and decisional balance are results of increased engagement in regular physical activity.

This study analyzed factors related to improvement in physical activity. The research questions were: (1) to what extent do baseline self-efficacy decisional balance, physical health (BMI), and demographic variables predict subsequent improvement in physical activity and (2) how does increased physical activity change the variables in the Transtheoretical Model (stage of change, self-efficacy, and decisional balance)?

## *METHOD*

### *Participants*

Participants were recruited from a population of female employees aged 18-69 years, who voluntarily attended a university-provided health screening as a part of a wellness program. Prior to recruitment, all 141 buildings at the university were randomly assigned to treatment and control groups. This strategy sacrificed the purity of simple random assignment while protecting against contamination of the two groups through the sharing of information among participants who worked together.

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Participant inclusion criteria were female university employees who engaged in moderate physical activity for less than 30 minutes per day 5 days a week or vigorous activity less than 20 minutes per day 3 days a week. All 603 women who attended the screening during the study time were invited to participate. Two hundred twenty (36.5%) of these declined and 383 (63.5%) women consented to be in the study. Of the 383, ninety-six (25%) were excluded from the study. Eighty-seven women (22.7%) were excluded because they reported being in the action or maintenance stages of change; hence they were considered physically active. The remaining nine women (2.3%) were excluded due to their responses on the Physical Activity Readiness Questionnaire, a tool used to identify risk of harm from physical activity (Thomas, Reading, & Shephard, 1992). Two hundred eighty-seven women enrolled in the study. Sixty-one buildings, with a range of 1 to 15 women from each building were represented in the sample.

### *Procedure*

The study was a prospective, controlled trial. Consenting participants completed self-administered questionnaires at the health screening. Participants then proceeded through the screening where they were assessed for health risks and habits, BMI, and other measures. Nursing and health education students performed the screening and usual care follow-up counseling for both the control and intervention groups. The students were trained in assessment and counseling as part of their educational curriculum. Usual care consisted of referrals and/or advice for personal health improvement. Participants in the usual care group were frequently offered advice to increase their level of physical activity if that was identified as a problem during the screening. Any advice offered to them was non-stage-based.

After usual care counseling, intervention participants received additional counseling tailored to their stage of change. The intervention, based on the PACE© intervention protocol, was brief, usually lasting between 3 and 5 minutes. Two weeks later, participants were telephoned to inquire about their progress toward their goal and to provide additional information and support if appropriate. The PACE© intervention is detailed more specifically elsewhere (Calfas et al., 1996; PACE, 1999). The original study used predominately physicians in primary care practices to deliver the intervention. A nurse practitioner conducted the intervention for this study. Participants in both the experimental and control groups were evaluated by comparing pre-test/

post-test measures of self-reported physical activity, stage of change, and beliefs about exercise at baseline and 6 weeks later. Results of the intervention outcomes are described elsewhere (Purath, Miller, McCabe, & Wilbur, 2004).

## *Measures*

### *Health Screening Measures*

Self-reported age, race, ethnicity, marital status, level of education, job task, and tobacco use were lifestyle and demographic variables collected at baseline. Weight and height were measured on a calibrated balance scale with an attached height rod. Students were trained to collect these and other data by the researcher. BMI was hand calculated from baseline height and weight using the formula:

$$\frac{\text{pounds} \div 2.2}{(\text{inches} \times .025)^2}$$

### *Cognitive Measures*

*Self-efficacy.* Marcus, Selby, Niaura, and Rossi's (1992) 5-item scale is designed to measure confidence in one's ability to persist with exercising in various situations. Items measured negative affect, resisting relapse, and making time for exercise. The construct was measured using a 10-point scale with one indicating "not at all confident" and ten indicating "very confident." High scores indicate a high level of self-efficacy. The original study (Marcus, Selby et al., 1992) asked participants to rate their self-efficacy related to regular exercise, which was defined as three or more times per week for 20 or more minutes each time. The researchers reported an internal consistency of .76 and a test-retest reliability of .90 for the scale. Criterion validity was assessed by correlating self-efficacy with exercise habits (Marcus, Rakowski et al., 1992).The present study asked participants to rate their self-efficacy related to moderate, leisure-time physical activity for 30 minutes on most days of the week. Cronbach's alpha for this study was .80.

*Decisional Balance Inventory.* A 16-item decisional balance measure (Marcus, Rakowski et al., 1992) measured pros and cons of physical activity. A 5-point Likert scale rates the 10 pro and 6 con items. An example of a "pro" item is: "I would have more energy for my family

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and friends if I engaged in regular physical activity." A decisional balance index is calculated by subtracting the sum of the con scale from the sum of the pro scale. A higher decisional balance index is associated with a greater motivational readiness for physical activity (Marcus, Eaton et al., 1994; Marcus, Selby et al., 1992). For this study, the instructions were modified to address physical activity rather than exercise. This modification more closely measured the intervention. Cronbach's alpha for this study was .80 for the decisional balance index, .95 for the pros of physical activity, and .80 for the cons.

*Stage of Change.* The PACE© Stages of physical activity instrument is an 8-item measure designed to place persons in the precontemplation, contemplation, preparation, action, or maintenance stage of exercise. Responses to the stage measures were used to eliminate participants who were physically active (those in action and maintenance) as well as to select the appropriate stage-based intervention. The PACE© Stages has a test-retest reliability of 0.80. Construct validity was evidenced by correlations with self-efficacy and previously validated measures of physical activity (Isrow-Cohen et al., unpublished manuscript, as cited in Armstrong, 1990).

### *Physical Activity Outcome Measures*

Six physical activity outcome variables were used in these analyses. They were Stage of Change, four variables from the Paffenbarger Physical Activity Questionnaire, and total minutes walked per week.

*Paffenbarger Physical Activity Variables.* The Paffenbarger Physical Activity Questionnaire was originally designed to identify leisure-time physical activities with college alumni (Paffenbarger et al., 1993). The Paffenbarger measure has correlated significantly with body mass index (Washburn, Adams, & Haile, 1987), as well as $VO_{2\ max}$, percent body fat, and a Caltrac activity monitor (Ainsworth et al., 1993). This study used the following Paffenbarger variables: flights of stairs climbed per day, blocks walked per day, vigorous and moderate weekday physical activity, and vigorous and moderate week-end physical activity. Cronbach's alpha for the Paffenbarger variables in this study was .67.

*Total Minutes Walked per Week.* Four questions were adapted from the National Health Interview Survey (NHIS). The questions are reported as minutes walked per week: for exercise, on errands, on breaks or lunch, and to work or school. The results of the four walking questions were summed and reported as total minutes walked per week. The NHIS measure is considered reliable and valid for the assessment of

self-reported walking (Rauh et al., 1992). In this study, the alpha for the walking variables was .75.

### *Statistical Analyses*

Histograms and bivariate plots were obtained, and the assumptions of approximate normality and linearity for dependent variables were verified. Outcome variables with non normal distributions were standardized to meet assumptions of normality. Pearson correlations were used to determine the relationship between change in physical activity and traits of participants. Two of the six physical activity outcomes, flights of stairs climbed per day, and vigorous and moderate physical activity did not change significantly from baseline to six weeks and were not further analyzed. Correlations were performed with the four physical activity outcomes that significantly improved from baseline to six weeks: stage of change, blocks walked per day, vigorous and moderate week-end activity, and total minutes walked per week. The physical activity outcomes were correlated with: (1) baseline cognitive variables and change in cognitive variables: self-efficacy, decisional balance pros, cons, and index; (2) demographic variables: age, education, race/ethnicity, and marital status; and (3) BMI.

Multiple linear regressions with independent variables entered simultaneously were then undertaken to explore associations with the physical activity outcomes. Because identifying the predictors of improvement in physical activity was considered exploratory, variables that correlated ($p < 0.10$) were entered into the regression analyses. All analyses were performed using SPSS 12.0 for Windows. Unless otherwise stated, statistical significance was set at the .05 level.

## *RESULTS*

The mean age of the participants was 43.9 years ($SD = 10.4$) (Table 1). Mean years of education was 14.3 years. The majority of the participants (66.9%) described themselves as married and their job task as administrative/professional workers (62.4%), which included clerical, administrative, and teaching personnel. Sixty-six (23%) were food-service workers; and 33 (11.5%) were cleaning-service workers. The majority of the participants (81.2%), described themselves as White. Thirty (10.5%) identified themselves as Asian or Pacific Islander. Mean BMI was 30.5. National obesity guidelines categorize persons with a

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TABLE 1. Description of Sample Characteristics at Baseline

| Variable | *N* | % | Mean*(S.D.)* | *Range* |
|---|---|---|---|---|
| Age | 287 | | 43.9 (10.4) | 21-65 |
| 20-29 | 30 | 10.5 | | |
| 30-39 | 71 | 24.7 | | |
| 40-49 | 94 | 32.8 | | |
| 50-59 | 73 | 25.4 | | |
| 60-69 | 19 | 6.6 | | |
| Education | 287 | | 14.3 (2.9) | 3-22 |
| 12 years or less | 118 | 41.1 | | |
| 2 or less years of college | 34 | 11.8 | | |
| 16 years (Bachelors) | 78 | 28.0 | | |
| 18 years (Masters) | 32 | 11.5 | | |
| Greater than 18 years | 17 | 6.1 | | |
| Missing data | 8 | 2.8 | | |
| Marital status | 287 | | | |
| Single | 47 | 16.4 | | |
| Married | 192 | 66.9 | | |
| Widowed | 4 | 1.4 | | |
| Divorced | 38 | 13.2 | | |
| Missing data | 6 | 2.1 | | |
| Job task | 287 | | | |
| Administrative/professional | 179 | 62.4 | | |
| Food service | 66 | 23.0 | | |
| Cleaning service | 33 | 11.5 | | |
| Laboratory assistant | 9 | 3.1 | | |
| Race/Ethnicity | 287 | | | |
| White (non-Hispanic) | 233 | 81.2 | | |
| Black (non-Hispanic) | 11 | 3.8 | | |
| Hispanic | 12 | 4.2 | | |
| Asian or Pacific Islander | 30 | 10.5 | | |
| Native American | 1 | 0.3 | | |

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TABLE 1. (Continued)

| Variable | *N* | % | Mean*(S.D.)* | *Range* |
|---|---|---|---|---|
| Body Mass Index | 285 | | 30.52 (7.36) | 18-58 |
| 25 or less | 74 | 25.8 | | |
| > 25-30 (overweight) | 75 | 26.1 | | |
| > 30 (obese) | 136 | 47.4 | | |
| Stage of change | 287 | | 2.8(0.9) | 1-8 |
| Precontemplation | 18 | 6.3 | | |
| Contemplation | 88 | 30.7 | | |
| Preparation | 181 | 63.0 | | |

BMI greater than 30.0 as obese (NHLBI, 1998). In this sample, 136 (47.4%) of the participants were obese.

The mean Stage of Change score of 2.8 indicated that the average participant was between the point of "thinking of starting" physical and "trying to start" activity in the next six months. At baseline, participants reported climbing a mean of less than five flights of stairs and walking 7.2 blocks per day–approximately 2/3 of a mile (Table 2). They walked a mean of 86.8 minutes per week. More than 200 (72%) participants reported no baseline walking, hence the distribution was skewed to the right and had a wider standard deviation than expected.

### *Correlation Results*

With regard to the cognitive variables, significant bivariate correlations with the dependent variables were revealed. Change in self-efficacy correlated with increases in stage of change after 6 weeks ($r = .164$; $p = .009$) and in number of blocks walked per day ($r = .108$ $p = .099$). Participants who had a greater decrease in the cons of physical activity also had more improvement in their stage of change ($r = -.169$; $p = .007$). Women who showed more improvement in the decisional balance index had significantly greater change in stage of change ($r = .167$; $p = .008$) and total minutes walked per week ($r = .167$; $p = .019$).

Minority participants had significantly improved stage of change ($r = .130$; $p = .035$) and vigorous and moderate week-end physical activity ($r = .127$; $p = 0.05$). Women with less education had significantly more change in total minutes walked per week ($r = -.140$; $p = .048$) (Table 3).

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TABLE 2. Description of Participants' Baseline Physical Activity

| Physical Activity and Physical Measures (*N*) | Mean(*SD*) | (*Range*) |
|---|---|---|
| Stage of change score (287) | 2.8 (.9) | (1-4) |
| Paffenbarger physical activity questions | | |
| Flights of stairs/day (284) | 4.8 (5.1) | (0-40) |
| Blocks walked/day (270) | 7.2 (7.4) | (0-36) |
| Hours of vigorous and moderate weekday physical activity (276) | 3.9 (3.5) | (0-14) |
| Hours of vigorous and moderate weekend physical activity (275) | 5.1 (3.4) | (0-15) |
| Walking questions | | |
| Minutes walked to work/week (280) | 21.8 (29.3) | (0-180) |
| Minutes walked on errands/week (278) | 30.3 (46.4) | (0-300) |
| Minutes walked during lunch or breaks (280) | 17.6 (30.3) | (0-180) |
| Minutes walked for exercise/week (274) | 17.9 (37.2) | (0-180) |
| Total minutes walked/week (271) | 86.8 (90.8) | (0-530) |

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### *Regression Results*

A series of multiple regression analyses was performed to identify factors associated with increase in the physical activity outcomes. To determine factors associated with increase in stage of change, the following variables were entered into the regression model: intervention vs. control group assignment, decisional balance con change, decisional balance index change, self-efficacy change, race/ethnicity (white and non-white), and age. With the stage of change model, assignment to the experimental group, change in self-efficacy, and being a minority were significant contributors. The entire model, including experimental condition accounted for 27% of the variance in stage of change.

Change in blocks walked per day was examined by regressing group assignment, self-efficacy change, baseline decisional balance pro, baseline decisional balance index, race/ethnicity, and age. Assignment to the experimental group and change in self-efficacy were significantly associated with improvement in blocks walked ($R^2 = .044$).

To determine factors associated with change in vigorous and moderate week-end physical activity, the significant correlates of group assignment, body mass index, level of education, race/ethnicity, and age

TABLE 3. Bivariate Correlations Between Demographic and Cognitive Variables with Change in Physical Activity

| Variable | Stage of Change | Blocks walked/day | Vigorous and moderate week-end activity | Total minutes walked/week |
|---|---|---|---|---|
| Cognitive variables | | | | |
| Con change | −.169*** | −.089 | −.012 | −.119 |
| Pro change | .095 | −.112 | −.011 | −.004 |
| Index change | .167*** | −.065 | −.001 | .167** |
| Self-efficacy change | .164*** | .108* | −.044 | .043 |
| Baseline con | −.060 | −.036 | −.037 | .011 |
| Baseline pro | −.061 | .142** | −.022 | −.004 |
| Baseline index | −.014 | .129** | .002 | −.003 |
| Baseline self-efficacy | .038 | −.010 | .066 | .083 |
| Demographic and health variables | | | | |
| Education | .062 | −.064 | .009 | −.140** |
| Age | −.051 | −.077 | .020 | .024 |
| Race/ethnicity (minority = 1) | .130** | −.048 | .127** | −.048 |
| Marital status (married = 1) | .006 | .024 | .015 | .024 |
| Body mass index | −.088 | −.116 | −.145** | .067 |

*$p < 0.10$ **$p < 0.05$ ***$p < 0.01$

were entered into the regression model. Assignment to the experimental group and being a minority were significantly associated with improvement in week-end physical activity ($R^2 = .057$).

The final regression model examined factors associated with total minutes walked per week. Variables in the model were experimental condition, change in decisional balance index, education, race/ethnicity, and age. Assignment to the experimental group and education were significant predictors in the model ($R^2 = .047$).

Regression models showing the variables contributing to the change in physical activity are displayed in Table 4. To summarize:

- Assignment to the intervention group contributed significantly to all of the physical activity outcomes.

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- Change in self-efficacy was a significant contributor in two of the regression models: stage of change and change in blocks walked.
- None of the decisional balance indices: pro change, con change, or baseline measures contributed significantly to the regression models.
- Persons in minority groups showed significantly improved stage of change and change in week-end vigorous and moderate physical activity.
- Having less education contributed significantly to improvement in walking.
- While BMI significantly correlated with the amount of vigorous and moderate week-end physical activity and amount of change in blocks walked per day, it did not contribute significantly to the regression models for these outcomes.
- The stage of change model explained 27% of variance. Four other models explained a significant percent of variance. However, their $R^2$ results, all less than 6% were not highly predictive.

## *CONCLUSIONS AND DISCUSSION*

In this study, baseline self-efficacy did not predict increase in physical activity at 6 weeks for any of the outcome variables. This is contrary to previous work where self-efficacy was found to be a strong correlate and/or significant predictor to physical activity (Barrett, 1998; Marcus, Pinto et al., 1994; Oman & King, 1998; Steptoe, Rink, & Kerry, 2000). These findings may relate to the study sample. The sample of women from the wellness program who agreed to participate in the physical activity study may have had higher self-efficacy related to physical activity; hence the total group was more homogeneous, as well as more stable, making baseline self-efficacy less likely to be a predictor of physical activity. Reaching more women in the precontemplation stage and more women who do not attend health-related screenings would provide a clearer view of the role of self-efficacy as a predictor in physical activity adoption.

It was expected that participants in this study who increased their physical activity would have an increase in self-efficacy. Increase in self-efficacy did predict improved stage of change and change in blocks walked per day. These inconsistencies are also found in previous work (Marcus, 1998; Miller et al., 2001; Pinto et al., 2001) that reports an increase in self-efficacy in older adults 6 weeks after a brief intervention.

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TABLE 4. Results of Multiple Regression Analyses Explaining Change in Physical Activity with Experimental Condition, Demographic and Cognitive Variables

| Variable in Model | B | t | *p* |
|---|---|---|---|
| Change in stage of change | | | |
| Experimental condition (intervention = 1) | .948 | 8.49 | <.001 |
| Decisional balance con change | −.020 | −1.00 | NS |
| Decisional balance index change | .015 | 1.69 | NS |
| Self-efficacy change | .016 | 2.50 | .013 |
| Race/ethnicity (minority = 1) | .489 | 3.38 | .001 |
| *F (5, 242) = 18.71. p < .001. Adj. $R^2$ = .27* | | | |
| Change in blocks walked/day | | | |
| Experimental condition (intervention N = 1) | 3.032 | 2.32 | .021 |
| Decisional balance-baseline pro | .283 | 1.17 | NS |
| Decisional balance-baseline index | −.056 | −.28 | NS |
| Self-efficacy change | .152 | 2.00 | .046 |
| *F (4,230) = 3.62. p = .007. Adj. $R^2$ = .044* | | | |
| Change in vigorous and moderate week-end physical activity | | | |
| Experimental condition (intervention = 1) | 1.39 | 3.19 | .002 |
| Body mass index | −.054 | −1.78 | NS |
| Race/ethnicity (minority = 1) | −1.17 | 2.05 | .042 |
| *F (3,246) = 5.92; p = .001. Adj. $R^2$ =.057* | | | |
| Change in total minutes walked/week | | | |
| Experimental condition (intervention = 1) | 42.22 | 2.24 | .026 |
| Education | −7.156 | −2.09 | .038 |
| Decisional balance index change | 2.428 | 1.86 | NS |
| *F (3, 230) = 4.76; p = .003. Adj. $R^2$ =.047* | | | |

However, lack of increase in self-efficacy is a finding that is consistent with the original PACE© study (Calfas et al., 1997). Another study (Wilbur, Miller, & Chandler, 2003) reported a decrease in self-efficacy in women who were exposed to a walking intervention. It is possible that 4-6 weeks of physical activity is not enough to result in substantial

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self-efficacy improvement and/or those programs offering more support and supervision may more effectively enhance self-efficacy (Calfas et al., 1997).

The fact that baseline self-efficacy was not significant, but improved self-efficacy did contribute to two of the physical activity outcomes, lends support to the notion that a temporal ordering of increased physical activity followed by increased self-efficacy may exist. In other words, self-efficacy may be a consequence rather than a predictor of behavior change. The preferable approach to increasing self-efficacy might be to focus on methods to help women begin physical activity. The actual practice of the behavior will then help the woman bolster her own sense of self-efficacy. McAuley, Lox, and Duncan (1993) recommend that we target self-efficacy as an outcome in itself. Determining the optimal way(s) to promote self-efficacy, such as comparing the effectiveness of some of the alternative strategies with brief interventions is an area for future research.

Important information was derived from the regression models relating to the demographic variables of race/ethnicity and education. Minority women were more likely to improve their stage of change and to increase their levels of vigorous and moderate week-end physical activity than Whites. Fifteen percent of the participants in this study were classified in a minority group, with Asian/Pacific Islander being predominate. This group seemed to prefer activities such as swimming or going to a gym over walking. They also tended to concentrate their physical activity change more on the weekends. Women with less education had greater change in total minutes walked per week. Walking may have been selected because it was the preferred method to increase physical activity. Alternatively, walking may have been selected because choices for other types of physical activity were limited. Further exploratory research is needed to determine preferred types of physical activity for women of varying educational and race/ethnic groups.

This study has several limitations. The physical activity measures were all self-report which is less reliable than objective measures. Generalizability is limited due to the self-selection and to the nature of sample recruitment. Women who are more concerned and conscious of the health are more likely to enroll in a health screening, hence they are not typical of the university population at large. Further, more than a third of the women refused to participate in the study. It can be assumed that many in the group who refused to participate were less interested in physical activity and may be less motivated to increase their activity.

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Generalizability is further limited to women who are initiating physical activity rather than those seeking to adhere to an activity program.

Despite these limitations, the study, which offers information on strategies to increase moderate leisure-time physical activity in women, is both timely and practical. The analysis helps us understand the predictors of physical activity adoption in working women. The variables of the TTM were partially supported by the multivariate analyses. This provides researchers and healthcare providers with empirical evidence that cognitive variables play a role in improving levels of physical activity. Future research is needed to delineate the roles of self-efficacy and decisional balance in helping women to be more active. Further examination of these cognitive variables in a variety of populations is also needed.

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