

Applying Exercise Stage of Change to a Low-income Underserved Population

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Objectives: To validate the transtheoretical model for exercise behavior and the constructs of decisional balance and self-efficacy for exercise in a low-income, poorly educated primary care sample. **Methods:** Patients attending public primary-care clinics from 4 separate sites in Louisiana were interviewed regarding their health behaviors. **Results:** The data provide equivocal support for applying the transtheoretical model for exer-

cise and integrating it with other models of behavior change within this population. **Conclusions:** Further studies modifying the decisional balance measures are necessary before definitive statements regarding the applicability of these models to exercise within this specialized population can be made.

Key words: exercise, stages of change, models of behavior change, underserved population

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A sedentary lifestyle adversely impacts health status and can be attributed to approximately 250,000 deaths per year in the United States alone.^{1,2} In contrast, regular physical activity has been shown to improve physical and psychological health,^{3,4} such as

decreased incidence of coronary heart disease,⁵ protection against stroke,⁶ decreased incidence of non-insulin dependent diabetes mellitus,⁷ and lower risk for colon cancer.⁸ Exercise also has been shown to result in positive psychological health benefits.⁹

Several theoretical models have been proposed in an effort to explain and predict exercise behavior. One frequently used theoretical model that has been proposed to help improve prediction of and interventions for improving exercise behavior is the transtheoretical model.¹⁰⁻¹² This model considers the process of adopting and maintaining exercise behavior a dynamic one and advocates empirically based stage-specific interventions. The 5 empirically derived stages of change are Precontemplation (not intending to exercise regularly in the next 6 months), Contemplation (considering beginning to exercise regularly in the next 6 months), Preparation (intending to begin exercise regularly in the next month and having displayed some behavior indicative of

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change), Action (having successfully begun to exercise regularly for a period of less than 6 months), and Maintenance (successfully exercising regularly for at least 6 months).

Several theories of behavior change have been integrated into the transtheoretical model, including decisional balance and self-efficacy. The decisional balance theory is a model of behavior change postulated by Janis and Mann¹³ that examines motivations associated with decision making. The model proposes that people engage in a behavior based on the pros and cons associated with that behavior. This model has been used to help explain the cognitive processes involved in moving from one stage of change to another.¹⁰ The available evidence consistently indicates that the pros and cons "cross over" before people actually take action. In fact, some evidence suggests that people first begin to increase their evaluation of the pros of the behavior change, then subsequently decrease their evaluation of the cons. An increase in pros corresponds to movement from Precontemplation to Contemplation, whereas a decrease in cons corresponds to movement from Contemplation to Action.^{10,14}

Self-efficacy refers to people's beliefs concerning their capabilities of performing a behavior and their importance in determining whether they actually engage in the behavior.¹⁵ Marcus and Owen¹¹ found that self-efficacy for exercise behavior reliably predicted stage of change. Precontemplators and Contemplators had the lowest efficacy, and those in the Maintenance stage had the highest efficacy.

Studies integrating these behavior-change models typically enrolled participants having high education and socioeconomic status.^{11,16} Validation of these models in specialized populations will provide information regarding their applicability and will assist in dictating appropriate behavior-change interventions to underserved individuals.

The purpose of this study was to validate the transtheoretical model for exercise behavior in a low-income, poorly educated primary care sample. At the time these data were collected, the American College of Sports Medicine recommended that adult Americans engage in at least 20 minutes of moderate physical activity on 3 or more days per week.¹⁷ For the

purpose of this study, we use this recommendation as the basis for the definition of regular exercise.

The goals of the study were to (1) obtain prevalence information regarding stage of change for exercise, (2) test the ability of the pros and cons measures to differentiate stage and compare results to previous research, (3) test the ability of exercise self-efficacy to differentiate across stage, and (4) compare the results to existing studies.

METHOD

Participants

Participants were recruited as part of a study examining high-risk behaviors and preventive medicine practices of low-income individuals attending primary care clinics. Five hundred fifty four patients attending public primary-care clinics from 4 separate sites in Louisiana were randomly selected to participate in this study. Patients older than 18 years of age were recruited. Although participants were not asked about their income level, previous studies have shown that these clinics serve primarily low-income patients. For example, Scarinci and colleagues¹⁸ found that only 2% of patients attending public care clinics reported monthly income above the low-income bracket. According to the US Bureau of the Census, adults at or below 200% of the poverty line are classified within the low-income bracket.¹⁹

Procedure

Participants were randomly selected while attending scheduled clinic appointments from October 1995 through June 1996. Participants read and signed an informed consent and were given information regarding the purpose of the study. Participants were then interviewed using questionnaires discussed below. Details concerning other aspects of the study are reported elsewhere.²⁰ Participants were compensated \$25 for their participation. Medical records were reviewed to record diagnosed chronic illnesses.

Measures

Exercise Stages of Change Questionnaire (SOCQ). Participants were asked questions regarding stage of change for regular exercise.²¹ Respondents indicated which description best described themselves from a list of items assessing in-

tion to exercise regularly, attempts to engage in regular exercise, and length of time they have engaged in regular exercise. Based on the individual's responses, she or he is classified as in the Precontemplation, Contemplation, Preparation, Action, or Maintenance stage of change. The definitions used in this study are based on previous work with the transtheoretical model.²²

Exercise Decisional Balance Questionnaire (DBQ). The DBQ is a 16-item measure designed to assess the degree to which individuals weigh pros and cons of engaging in exercise. Participants use a 5-point Likert-type scale ranging from 1 = *not important* to 5 = *extremely important* to rate given statements regarding their decision to exercise. The DBQ for exercise is composed of 2 scales including the pros and cons. Higher scores on the Exercise Pros subscale indicated the extent to which individuals consider the advantages of engaging in regular exercise. The Exercise Cons subscale indicated the degree to which individual consider the disadvantages of engaging in regular exercise. The DBQ has been shown to have adequate psychometric properties.¹⁶ Internal consistency reliabilities were .79 for cons and .95 for pros.²³

Exercise Self-Efficacy Questionnaire (SEQ). The Self-Efficacy for Exercise Questionnaire is a 5-item measure designed to assess confidence in an individual's ability to engage in exercise in a range of given situations. Participants rate their confidence levels to these given situations on a 5-point Likert-type scale from 1 = *not at all confident* to 5 = *extremely confident*. It has adequate internal consistency ($\alpha = .82$ and $.76$ from 2 separate studies) and a test-retest reliability over a 2-week period of .90.²¹

Behavioral Risk Factor Surveillance Survey (BRFSS).²⁴ The BRFSS questionnaire has been widely used to measure high-risk behaviors among adults over 18 years old. Test-retest reliability has been reported to be adequate in a tri-ethnic population (kappa ranging from 0.57 in whites to 0.77 in African Americans).²⁵ The BRFSS was developed from telephone surveys conducted by the CDC and others to assess the prevalence of high-risk behaviors on a population-wide scale.²⁴ The BRFSS focuses on behaviors that are related to one or more of the 10 leading

causes of death. For the purpose of this paper, only the data on exercise will be presented. A particular metabolic equivalent (MET) was attributed to each exercise reported as proposed by Ford and colleagues.²⁶ The energy expenditure was then calculated for each activity according to the formula: Kcal/week = METs X hours/week X weight in kilograms. Therefore, kcals/week were generated for each exercise and summed to obtain a total energy expenditure/week for each participant.

Data Analyses

Simple statistics, including descriptive and frequency analyses, were computed on the demographic variables. Frequency analyses also were conducted on stage-of-change data. Standard analysis of variance tests were conducted on continuous demographic variables (ie, age, years of education) and dependent variables (kilocalories expended through exercise, decisional balance, and self-efficacy) with stage of change as the independent variable. Chi-square analyses were conducted on discrete variables (ie, gender, race) with stage of change as the independent variable.

RESULTS

Sample Demographics

The overall sample was 59.9% African American, 80.7% female, 42.1% unemployed, and 43% married. Approximately 49% completed high school, and 7% received a GED. The mean years of education completed was 10.94 (SD=2.84). The mean age was 45.34 (SD=14.08). The majority had no health insurance (71.2%). Approximately 20% received Medicaid, Medicare, or both. Based on medical chart reviews, it was found that approximately 72% of the sample had at least one chronic illness.

Models of Behavior-Change Data

The following are results regarding stage of change for exercise. Data are presented on how stage of change is associated with various demographic variables, as well as its association with energy expenditure as measured by self-reported exercise through the BRFSS. Data also are presented on how decisional balance and self-efficacy relate to stage of change. In order to derive standardized values consistent with the lit-

Table 1
Prevalence of Stage of Change for Exercise

Stage of Change for Exercise	N	%	*Comparison Sample (%)
Precontemplation	91	17	7
Contemplation	187	35	23
Preparation	89	16	30
Action	68	13	17
Maintenance	102	19	23

a Comparison sample taken from Marcus and colleagues²¹

erature, data on decisional balance and self-efficacy variables were converted to t-scores.

Stages of Change for Exercise

Approximately half the sample (52%) reported engaging in no exercise (Precontemplation and Contemplation). Almost 17% reported engaging in some exercise, but not regularly (Preparation). Overall, a total of 68% did not engage in exercise 3 days/week for a minimum of 20 minutes each day. Stages-of-change distribution for exercise for the sample are presented with a comparison from the literature in Table 1.

Stages of Change and Demographic Variables

In order to determine whether stage distribution was differentially associated with selected demographic variables, one-way ANOVAs were conducted on continuous variables (ie, age, years of education) and chi-square analyses were conducted on discrete variables (ie, gender, race). ANOVA results indicated no significant differences between groups in terms of years of education. Results for age indicated those in the Action stage of change were significantly younger than those in the Precontemplation stage of change [$F(531,4)=2.75, P<.05$]. Those in the Maintenance stage of change were not significantly different in terms of age from any of the other groups. Results of chi-square analyses indicated there were more Whites in the Precontemplation stage than African Americans, and there were more African Americans in the Preparation stage

Table 2
Tukey Post Hoc Means Comparisons on Decisional Balance Pro Scores

Stage of Change	Mean (SD)	M	A	Prep	C	Prec
Maintenance	51.43 (8.48)					
Action	51.33 (8.43)					
Preparation	51.52 (8.96)					
Contemplation	51.73 (8.52)					
Precontemplation	42.44 (12.87)	*	*	*	*	*

Note. M=Maintenance, A=Action, Prep=Preparation, C=Contemplation, Prec=Precontemplation

* = significantly different at $P<.05$

than whites $\chi^2(4)=12.82, P<.05$. Results also indicated gender differences with more women in the Contemplation and Preparation stages and more men in the Maintenance stage, $\chi^2(4)=11.91, P<.05$.

Stages of Change and Kilocalories Expended Through Exercise

To validate self-report of exercise stage of change, a one-way ANOVA was conducted examining group differences in terms of reported kilocalories expended per week through exercise. Results indicated that participants in the Action and Maintenance stages of change, or those who reported engaging in exercise 3 days/week for at least 20 minutes per day, reported expending significantly more kilocalories per week than did those in the first 3 stages of change [$F(531,4)=38.38, P<.0001$]. The mean total kilocalories expended per week through exercise was 1150.05 (SD=1474.55) for those in the Action stage and 1389.89 (sd=1695.51) for those in the Maintenance stage. These means are above the Surgeon General's recommendation of 1000 per week,²⁷ indicating participants in these later stages likely classified themselves correctly. The means for Precontemplation, Contemplation, and Preparation were far below the recommendations (153.50 kcal/week, 51.90 kcal/week, and 386.13 kcal/week,

respectively). Results indicated participants responded in a consistent manner when answering questions about current exercise and stages of change.

Stages of Change and Decisional Balance

One-way ANOVAs were conducted to test for differences in decisional balance variables (exercise pros and cons) across the stages of change. Results were significant for the exercise Pros [$F(529,4)=17.60, P<.001$]; Tukey post hoc comparisons indicated that the Precontemplators appraised the pros of exercise as less important than did the participants in all other stages of change. Results are presented in Table 2.

For the exercise cons, results were also significant [$F(529,4)=3.42, P<.01$]; Tukey post hoc comparisons indicated participants classified in the Contemplation stage of change appraised the cons of exercise as more important than did those in Maintenance. Results are presented in Table 3.

Stage of Change and Self-Efficacy

A one-way ANOVA also was conducted to test for differences in exercise self-efficacy across the stages of change. Results indicated that exercise self-efficacy significantly differentiated participants across the various stages of change, $F(531,4)=38.32, P<.001$. Tukey post hoc comparison results indicated Pre-contemplators had significantly lower levels of exercise self-efficacy than did all those in other stages of change ($P<.05$). Contemplators had significantly lower levels of self-efficacy than did those in Action and Maintenance ($P<.05$). Those in the Maintenance stage of change had significantly higher levels of exercise self-efficacy than those in all 4 other stages of change including those in the Action stage ($P<.05$). See summary of these results in Table 4.

DISCUSSION

Exercise Stages of Change

Only about one third of the sample, or those in the Action and Maintenance stages of change, reported engaging in regular physical activity 3 times/week, 20 minutes each time. Approximately 68% of this sample, those in the Precontemplation, Contemplation, and Preparation stages of change, reported not exercising at the frequency and dura-

Table 3
Tukey Post Hoc Means
Comparisons on Decisional
Balance Con Scores

Stage of Change	Mean (SD)	M	A	Prep	C	Prec
Maintenance	47.39 (10.93)					
Action	48.62 (10.10)					
Preparation	49.71 (9.25)					
Contemplation	51.47 (9.73)	*				
Precontemplation	51.01 (9.04)					

Note. M=Maintenance, A=Action, Prep=Preparation, C=Contemplation, Prec=Precontemplation
* = significantly different at $P<.05$

tion of exercise that was recommended by the American College of Sports Medicine¹⁷ at the time the study was conducted. This percentage is on par with that reported for low-income individuals (65%).²⁸ Overall, these rates are much higher than is acceptable for the goal stated in Healthy People 2010, which is to reduce the prevalence of sedentary lifestyle to less than 20%.²

Results indicate more individuals in this sample are in earlier stages of change for exercise as compared to other samples from studies assessing exercise stages of change.¹⁶ The other studies were conducted on samples with quite different demographics from the present one as all participants were employed and the majority had greater than a high school education.^{11,21} Marcus and colleagues acknowledge their samples are not representative and should not be seen as absolute prevalence estimates. These results may support the demonstrated educational²⁹ and socioeconomic status differences in terms of exercise participation.²⁸ Those with lower education and income are more sedentary than individuals with higher education and income. Additionally, increased prevalence rates of sedentary lifestyle may reflect the fact that participants were medical patients with a potential medical history.

Table 4
Tukey Post Hoc Means
Comparisons on Self-Efficacy
Scores

Stage of Change	Mean (SD)	M	A	Prep	C	Prec
Maintenance	57.28 (9.08)					
Action	52.30 (7.90)	*				
Preparation	50.86 (9.45)	*				
Contemplation	48.71 (9.05)	*	*			
Precontemplation	42.02 (8.05)	*	*	*	*	

Note. M=Maintenance, A=Action, Prep=Preparation, C=Contemplation, Prec=Precontemplation
 * = significantly different at $P < .05$

This is supported by the observation that approximately 72% of the sample had at least one chronic illness. Unfortunately, our definition of regular activity was conservative compared to the current recommendation of 30 minutes of moderate activity on most days of the week. Had this recommendation been used for our definition of regular exercise, even fewer participants would have been classified as in the Action or Maintenance stage of change. Overall, results support the need for increased physical activity within this population, especially because many of the chronic illnesses plaguing this population could possibly be helped with regular exercise (obesity, coronary artery disease, diabetes, rheumatoid arthritis, etc).

The validity of the stages of change construct was examined through comparison with questions from the BRFSS assessing kilocalories expended per week through exercise. The questions from the BRFSS significantly differentiated participants across stage of change with those in the later stages of change expending more kilocalories per week through exercise than did participants in the earlier stages of change. Mean energy expenditure for those in the Action and Maintenance stages of change were greater than 1000 per week indicating participants were meeting the Surgeon

General's recommendations.²⁷ These results also demonstrated participants were responding in a consistent manner and were comparable to those obtained by Marcus and Simkin¹² in a sample of Rhode Island employees.

Exercise Decisional Balance

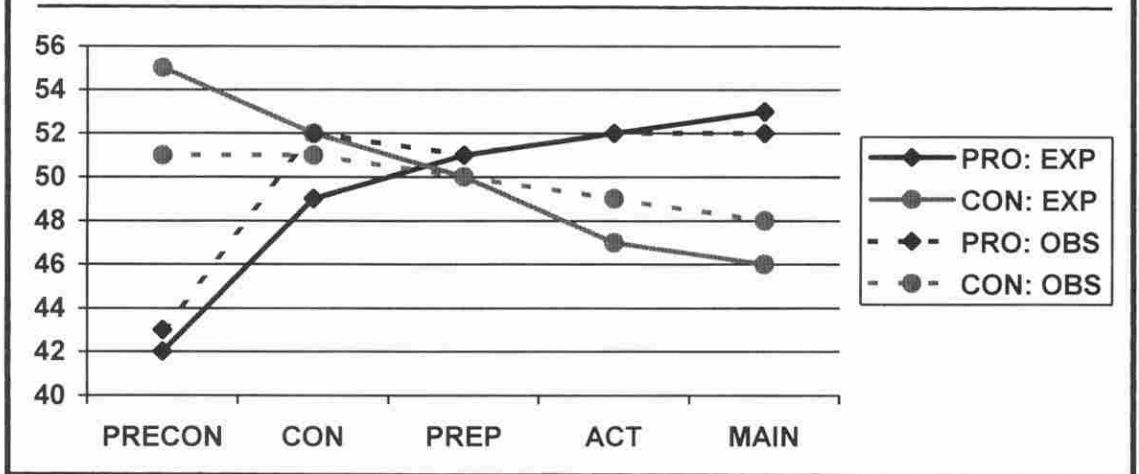
The exercise decisional balance variables did not strongly discriminate between all of the stages of change though they do follow a similar pattern to that obtained in previous research as seen in Figure 1. Previous research has not demonstrated a clear differentiation across all stages, but has demonstrated a stronger differentiation across stages than the present study.²³ The pros of exercise significantly differentiated the Precontemplators from the other stages of change (Contemplation, Preparation, Action, and Maintenance). These results differ from previous studies that found the pros of exercise to differentiate across most stages of change.²¹ Even less of a differentiation was obtained with the cons, or barriers to exercise, as it only significantly differentiated Contemplators from Maintainers, those who have exercised regularly for more than 6 months. Again, results are in contrast to previous studies where the cons of exercise differentiated across most stages of change.²¹ Figure 1 demonstrates the differences between the "expected" pattern for pros and cons as seen in previous research versus those obtained in the present study.^{11,21}

The crossover of pros and cons, or the point in the stage process where pros began to be appraised as more important than the cons, occurred in the Contemplation stage of change. Previous research in exercise has demonstrated this crossover to occur in the Preparation stage of change;²³ however, other problem behaviors have shown a crossover pattern in Contemplation. It has been argued that this crossover consistently occurs before the Action stage of change,¹⁰ demonstrating that people change the way they appraise problem behaviors before they change them. There appears to be no consensus as to whether it occurs during Contemplation or Preparation.

Exercise Self-Efficacy

Regarding exercise self-efficacy, results showed that individuals in the latter stages of change had higher exercise

Figure 1
Expected and Observed Pros/Cons by Stage of Change; Expected
Taken from: Marcus and Colleagues¹¹



self-efficacy than did those in the earlier stages of change. Unfortunately, clear differentiation across all stages was not present (ie, no differentiation between Contemplation and Preparation and no differentiation between Preparation and Action); however, this problem has been noted in previous research and may not necessarily be a problem specific to this population.^{11,21} The need to further modify the instrument to clearly differentiate between all stages has been documented.²¹ Figure 2 demonstrates the "expected" pattern for self-efficacy as seen in previous research versus those obtained in the present study.^{11,21} The observed pattern is comparable to that obtained in previous research.

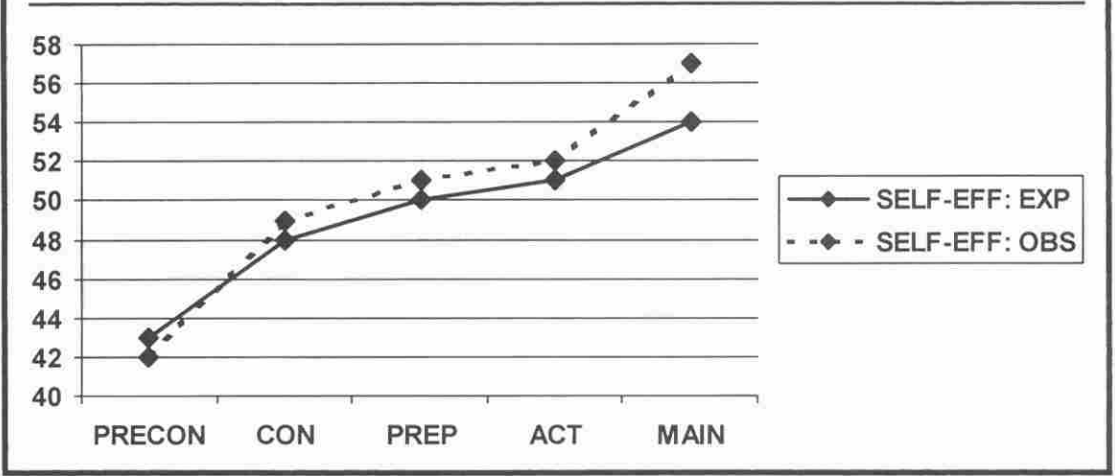
General Discussion of the Transtheoretical Model

In summary, results regarding exercise self-efficacy were similar to those obtained in other studies; however, responses on the exercise pros and cons from the decisional balance measure provided a less clear differentiation across stages than that seen in other studies. These results may be interpreted in one of 2 ways. The obtained results could reflect measurement problems regarding the assessment of pros and cons. Analyses of participant response to the pros indicated that 72% or greater of the re-

spondents rated the 10 pro questions as either "very important" or "extremely important." Such responding limited the variability and may have prevented group differences from being observed. An opposite pattern of response was observed for the cons questions. On 4 of the 6 current cons for exercise, almost half the sample reported the con was "not important." These results suggest that current questions regarding cons may not adequately assess the exercise barriers within this population or that the format does not provide adequate discrimination. A modified version including more environmental barriers to exercise, ie, safety, childcare, may result in improved differentiation across stages,²³ and ultimately may provide information for appropriate stage-matched interventions for community-based programs in this population.

Another explanation for the limited ability of the exercise decisional balance variables to discriminate across stage is that the stages of change may not apply to this population. It could be that the proposed differences in cognitions across the stages are not as distinctively defined in this lower-educated population. For example, individuals in the Precontemplation stage of change rated the pros of exercise significantly lower than all the other stages of change. It may be the case that once an individual

Figure 2
Expected and Observed Self-efficacy by Stage of Change;
Expected Taken From: Marcus and Colleagues¹¹



in this population is convinced of the benefits of exercise, the evaluation of those benefits does not change as the individual progresses through stages. Overall, these results demonstrate potential differences in demographically diverse samples and reinforce the need to validate behavior change models in underserved populations.

Implications and Futue Directions

Results of this study indicated that the current sample of low-income individuals attending primary care clinics has high rates of sedentary behaviors that may have a significant impact on their health status. Further studies need to be conducted regarding the applicability of the transtheoretical model of exercise behavior. Some of the obtained results for exercise are consistent with existing data regarding stage of change. There are areas that require further research to ascertain whether discrepancies between the present findings and other studies reflect measurement problems specific to this population or imply the stages of change for exercise behavior does not apply to this population. Future studies should include modification of pros and cons, or the perceived benefits and barriers of these behaviors, to further test the applicability of the transtheoretical model for this specialized population.

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REFERENCES

- 1.U.S. Department of Health and Human Services. Healthy People 2000: Midcourse review and 1995 revisions. Hyattsville: National Center for Health Statistics 2000:23-26.
- 2.U.S. Department of Health and Human Services. Physical Activity and Fitness. In Healthy People 2010 (chapter 22). Washington, DC 2000:3-39.
- 3.Haskell WL. Health consequences of physical activity: understanding and challenges regarding dose-response. *Med Sci Sports Exerc.* 1994;26(6):649-660.
- 4.Dubbert PM. Exercise in behavioral medicine. *J Consult Clin Psychol.* 1992;60:613-618.
- 5.Leon AS, Connett J, Jacobs DR, et al. Leisure-time physical activity levels and risk of coronary heart disease and death: the multiple risk factor intervention trial. *JAMA.* 1987;258(17):2388-2395.
- 6.Shinton R, Sagar G. Lifelong exercise and stroke. *BMJ.* 1993;307:231-234.
- 7.Helmrich SP, Ragland DR, Leung RW, et al. Physical activity and reduced occurrence of non-insulin-dependent diabetes mellitus. *N Engl J Med.* 1991;325:147-152.
- 8.Giovannucci E, Ascherio A, Rimm EB, et al. Physical activity, obesity, and risk for colon cancer and adenoma in men. *Ann Intern Med.* 1995;122:327-334.
- 9.Carmack CL, Boudreaux E, Amaral-Melendez

- M, et al. Aerobic fitness and leisure physical activity as moderators of the stress-illness relation. *Ann Behav Med.* 1999;21(3):251-257.
10. Prochaska JO, Velicer WF, Rossi JS, et al. Stage of change and decisional balance for 12 problem behaviors. *Health Psychol.* 1994;13:39-46.
 11. Marcus BH, Owen N. Motivational readiness, self-efficacy and decision making for exercise. *J Appl Soc Psychol.* 1992;22:3-16.
 12. Marcus BH, Simkin LR. The stages of exercise behavior. *J Sports Med Phys Fitness.* 1993;33:83-88.
 13. Janis IL, Mann L. *Decision Making: A Psychological Analysis of Conflict, Choice and Commitment.* New York: Free Press 1977.
 14. Velicer WF, DiClemente CC, Prochaska JO, et al. Decisional balance measure for assessing and predicting smoking status. *J Pers Soc Psychol.* 1985;5:1279-1289.
 15. Bandura A. Toward a unifying theory of behavioral change. *Psychol Rev.* 1977;84:191-215.
 16. Marcus BH, Eaton C, Rossi JS, et al. Self-efficacy, decision-making and stage of change: an integrative model of physical exercise. *J Appl Soc Psychol.* 1994;24:489-509.
 17. American College of Sports Medicine. Position statement on the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness in healthy adults. *Med Sci Sports Exerc.* 1990;22:265-274.
 18. Scarinci IC, Ames SC, Brantley PJ. Chronic minor stressors and major life events experienced by low-income patients attending primary care clinics: a longitudinal examination. *J Behav Med.* 1999;22:143-156.
 19. U.S. Bureau of the Census. Low income uninsured children by state (on-line). Available: <http://www.census.gov/hhes/hlthins/lowinckid.html>. Accessed July 8, 2002.
 20. Boudreaux E, Carmack CL, Scarinci IC, et al. Predicting smoking stage of change among a sample of low socioeconomic status, primary care outpatients: replication and extension using decisional balance and self-efficacy. *International Journal of Behavioral Medicine.* 1998;5(2):148-165.
 21. Marcus BH, Selby VC, Niaura RS, et al. Self-efficacy and the stages of exercise behavior change. *Res Q Exerc Sport.* 1992;63(1):60-66.
 22. Prochaska JO, Marcus BH. The transtheoretical model: applications to exercise. In RK Dishman (Ed.), *Advances in Exercise Adherence.* Human Kinetics 1994;161-180.
 23. Marcus BH, Rakowski W, Rossi JS. Assessing motivational readiness and decision making for exercise. *Health Psychol.* 1992;11(4):257-261.
 24. Centers for Disease Control. Behavioral Risk Factor Surveillance System (on-line). Available: <http://www.cdc.gov/brfss/brfssquestionnaires.htm>. Accessed July 8, 2002.
 25. Shea S, Stein AD, Lantigu R, et al. Reliability of the Behavioral Risk Factor Survey in a triethnic population. *Am J Epidemiol.* 1991;133:489-500.
 26. Ford ES, Merritt RK, Heath GW, et al. Physical activity behaviors in lower and higher socioeconomic status populations. *Am J Epidemiol.* 1991;133:1246-1256.
 27. Centers for Disease Control. Notice to readers publication of surgeon general's report on physical activity and health. *Mor Mortal Wkly Rep.* 1996;45(27):591-592.
 28. Centers for Disease Control. Prevalence of sedentary lifestyle - Behavioral Risk Factor Surveillance System, United States, 1991. *Mor Mortal Wkly Rep - CDC - Surveill Summ.* 1993;42(29):576-579.
 29. Garrison RJ, Gold RS, Wilson P, et al. Educational attainment and coronary heart disease risk: The Framingham Offspring Study. *Prev Med.* 1993;22:54-64.

