Activity Levels, Fitness Status, Exercise Knowledge, and Exercise Beliefs Among Healthy, Older African American and White Women

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This study examined self-reported activity, measured fitness status, exercise knowledge, and exercise beliefs of 48 African American and 51 White females in good health between the ages of 50 and 80 years enrolled in a health promotion project. Examination of fitness status by ethnicity indicated a higher level of fitness among White females. Ethnic differences were found on 2 of 6 exercise belief items and 2 of 3 exercise knowledge questions. A multiple regression analysis found that activity level was predicted by the knowledge question concerning heart rate during exercise necessary to maintain fitness, the belief concerning the difficulty "to stick to a regular schedule of physical activity," and the belief concerning the difficulty "to find the time to exercise on a regular basis." The findings suggest that health promotion efforts need to determine exercise attitudes and beliefs of older women, provide basic exercise knowledge, and include fitness programs designed specifically for older women.

Maintaining health in older adults becomes more important as this segment of the population increases in size. The benefits of exercise in improving cardiovascular risk factors and measured fitness status

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are well documented (Badenhop, Cleary, Schaal, Fox, & Bartell, 1983; Bortz, 1980; Harris, Caspersen, DeFriese, & Estes, 1989; Haskell, Montoye, & Orenstein, 1985; Laporte et al., 1984; Morris, Pollard, Everitt, & Chave, 1980; Siscovick, Laporte, & Newman, 1985). It is clear that vigorous activity slows the decline in aerobic capacity associated with aging (Hodgson & Boskirk, 1977) and that a regular exercise program improves cardiovascular fitness among older adults (deVries, 1970; Tzankoff, Robinson, Pyke, & Brown, 1972). Exercise by older adults also increases muscle strength, bone density, and lowers blood pressure (Centers for Disease Control, 1989; Fiatarone et al., 1990; Reavon, Barrett-Conner, & Edelstein, 1991). Thus exercise is an important component in health maintenance for the older adult.

A number of studies have investigated relationships between activity levels and age as well as other demographic factors. The 1985 National Health Interview Survey (NHIS) found that activity levels decline with age, that older men were more active than older women, and that individuals with higher levels of income and education exercised more than those with lower income and education (Caspersen, Christenson, & Pollard, 1986; Schoenburn, 1986).

Investigations that have compared activity levels of African Americans and Whites have generally shown African Americans to be somewhat less active. A 1986 telephone survey of 576 Pittsburgh residents compared the activity patterns of persons from a low socioeconomic status (SES) area (predominantly African American) to persons from a high SES area (predominantly White). Lower SES women were found to be the least active, whereas high SES women reported the highest activity levels (Ford et al., 1991). Similarly, the Minnesota Heart Survey found the African American population in their study to be less active than the White population even when education and income were controlled (Folsom et al., 1991). The NHIS found that the percentages of African Americans and Whites

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who reported being either "irregularly active" or who met the minimum frequency and duration criteria for aerobic fitness (exercises at least 3 days per week for 20 minutes or more) were similar; the study also found a slightly lower percentage of Whites reported being sedentary (Caspersen et al., 1986). Few studies have examined the activity levels of African American and White women. A separate analysis of the NHIS data did show that African American women were more sedentary than White women, but failed to report if the difference was related to disparities in age or SES (Schoenburn, 1986).

The high prevalence of obesity among African American women has been documented (Schoenburn, 1986) and may be both a cause and an effect of a sedentary lifestyle. The degree to which exercise knowledge and exercise beliefs are related to activity patterns in older women, particularly older African American women, is potentially of great significance for health professionals dealing with this population. Attempts to identify psychological factors that influence activity levels in older women have important public health implications.

Psychological factors play a critical role in exercise behavior. Individuals who believe exercise confers health benefits tend to have higher levels of physical activity (Dishman, Sallis, & Orenstein, 1985; Godin, Shephard, & Colontonia, 1986; Sallis et al., 1986). Related to this are the perceived barriers to exercising. Lack of social support and time constraints are the most frequently cited reasons individuals report for remaining inactive or dropping out of exercise programs (Andrew et al., 1981; Dishman et al., 1985; Sallis et al., 1986; Song, Shephard, & Cox, 1983). Sharpe and Connell (1992) also found that the level of confidence in one's ability to exercise three times per week was a significant predictor of intention to exercise over the course of the subsequent year.

This study focuses on self-reported exercise patterns, exercise beliefs, exercise knowledge, and measured fitness status of healthy, older women aged 50-80 years. Ethnic differences were examined as well as the relationships between fitness, activity patterns, exercise beliefs, and exercise knowledge. This article addresses three questions:

1. What are the self-reported exercise habits of healthy African American and White females 50-80 years old?

2. What is the relationship between self-reported activity and measured fitness status in this group?
3. What are the exercise knowledge and beliefs of this group and how do exercise knowledge and beliefs relate to measured fitness status and exercise behavior?

Method

STUDY PARTICIPANTS

The women in this study ($N = 99$) were randomly selected from among participants in a health promotion screening and intervention project conducted by the Wayne State University School of Medicine between the years 1987 and 1990. Volunteer participants were recruited from four churches within the city of Detroit and from articles/advertisements placed in two local newspapers. Eligibility criteria were an age between 50 and 80 years and freedom from serious chronic or debilitating medical conditions. Such conditions included severe hypertension, diabetes mellitus requiring treatment with medications, a history of kidney failure, a history of liver failure, severe anemia or sickle cell disease, a history of angina pectoris, a heart attack within the past year, and a diagnosis of cancer within the past year. Criteria for enrollment in the project reflected a major goal of the study, to assess the exercise habits and fitness status of healthy older adults. Participants were responsible for their own transportation to the screening locations.

Forty-eight African American women and 51 White women participated in the study. The ages of the women ranged from 50 to 77 years old, with the average age being 61 years old. Almost half (44%) held a bachelor's or graduate degree, and 69% had an annual household income of at least $25,000. A majority of the women were married (62%).

FITNESS STATUS ASSESSMENT

Fitness was determined by a treadmill test using a modified Naughton protocol (Naughton & Haider, 1973). Each participant was

asked to continue the test until reaching 70% of her predicted maximum heart rate (220 – age). The length of time it took each participant to reach 70% of her predicted maximum heart rate (PMHR) was recorded in seconds.

Because fitness levels decrease with age, a time of 500 seconds to 70% of PMHR in a 55-year-old is not equivalent to a time of 500 seconds to 70% of PMHR in a 75-year-old. In this scenario, the older person would be considered to be more fit. For comparing the fitness of individuals of different ages, a number of conversion tables or methods are available, but there is debate over their validity or usefulness. For this study, a relative fitness status was determined for each woman who completed the treadmill test. For each age decade, the measured times to 70% of PMHR were ordered and divided into quartiles. An individual whose time fell in the 1st quartile (the shortest times) was given the lowest fitness status of 1, whereas the longest times (the 4th quartile) were assigned a status of 4. For women over 70 years of age, quartile ranges of the 60s decade were used because of the small number of women in the upper age category.

ACTIVITY ASSESSMENT

A 7-Day Activity Recall (Singleton, Fitzgerald, & Neale, 1994) provided self-reported estimates of the frequency and duration of significant cardiovascular exercise. The instrument was a modification of the Physical Activity Index Questionnaire developed by Paffenbarger for the longitudinal study of Harvard alumni (Paffenbarger, Wing, & Hyde, 1978; Paffenbarger, Wing, Hyde, & Jung, 1983). In an interview conducted by a trained health professional, each subject was asked if she had engaged in one or more cardiovascular activities such as brisk walking or biking during the previous week. Because most respondents were retired or held sedentary occupations, the questioning was limited to leisure time activities rather than work activities. If an exercise activity had been performed, the length of each session was recorded. Each activity listed in the 7-Day Activity Recall questionnaire was assigned an intensity level based on its metabolic equivalent (MET) level (Taylor et al., 1984; Wilson, Paffenbarger, & Morris, 1986). For the activities of walking, jogging, and cycling, average distances per exercise session were obtained and miles per hour

calculated. The MET level for each of these activities varied according to the miles per hour. For activities where there is a wide range of intensity (e.g., swimming, tennis, and calisthenics), MET levels at the lower end of the published values were assigned. This decision was based on the older ages of the participants.

An Exercise Index Score was determined for each participant using her reported activities and the associated MET levels. This score was calculated by multiplying the number of times during the week the exercise was performed by the duration of each exercise session in minutes by the MET level for the activity. For example, an individual who reported walking 5 days per week for 60 minutes at 4.5 METs (4 miles per hour) would be assigned an Exercise Index Score of 1,350 (Frequency × Duration × Intensity).

A simpler, dichotomous activity classification was also created. Individuals who participated in at least one session of exercise in the previous week were classified as "active," whereas individuals that had not exercised in the previous week were classified as "not active." To determine the individual's usual activity habits and the representativeness of the previous week's activity, the participants were asked, "How many days per week do you usually engage in planned exercise?"

EXERCISE BELIEFS AND KNOWLEDGE

Participants were asked to respond to six exercise attitude statements. The statements were

1. Older people should avoid vigorous exercise.
2. I usually drive or ride short distances rather than walk.
3. It is hard for me to find the time to exercise on a regular basis.
4. When I exercise or play sports, I feel self-conscious about the way I look to others.
5. It is hard for me to stick to a regular schedule of physical activity.
6. By the time a person gets to be my age, exercise doesn't provide all that much benefit.

Items 2 through 5 were taken from the Stanford Five City Study questionnaire (IOX Assessment Associates, 1983). Items 1 and 6 were constructed by the project's health educator. Exercise beliefs were

determined from their Likert scale responses (1 = *strongly agree*, 2 = *somewhat agree*, 3 = *not sure/no opinion*, 4 = *somewhat disagree*, and 5 = *strongly disagree*). The alpha coefficient indicated an internal consistency of .645.

Exercise knowledge was assessed from three questions derived from the American College of Sport Medicine guidelines for cardiovascular fitness (American College of Sports Medicine, 1990). Participants were asked, "How many days per week must a person exercise to maintain fitness?" "How many minutes does a person have to exercise?" and "How fast does your heart have to beat over your normal rate during exercise?" Answers to these questions were scored as correct or incorrect.

STATISTICAL ANALYSIS

Comparisons between African American and White women in age, income, education, fitness status, activity status, and percentage correct for the knowledge questions were made with chi-square analyses. Student *t* tests were used to determine differences in Exercise Index scores. A multivariate analysis of variance (MANOVA) was used to determine if the two ethnic groups differed on the six exercise belief questions. Student *t* tests were performed post hoc to determine the specific exercise beliefs where the two groups differed. The accepted level of significance was, $p \leq .05$.

To examine the relationship of Exercise Index scores, ethnicity, income level, education, exercise beliefs, and exercise knowledge to fitness status (the ordinal scaled dependent variable), a logistic regression was performed. Multiple regression was performed to examine the relationship of ethnicity, age, income level, education, exercise beliefs, and exercise knowledge to the Exercise Index Score. Because nominal and ordinal scaled variables were used in the model, effect tests rather than beta weights were used to determine the significant predictors. "The effect tests are joint tests that all parameters for an individual effect are zero" (SAS Institute Inc., 1989, p. 333). Interval variables have one parameter, whereas nominal and ordinal variables have multiple parameters designating the different levels of the constructed and corresponding dummy variable.

Table 1
Demographic Description of Women Participants by Ethnicity (in percentages)

	African American	White
Age decade		
50-59	35.5	49.0
60-69	54.0	47.0
70-80	10.5	4.0
Income level[a,b]		
Low	44.0	20.0
Middle	39.0	33.0
High	17.0	47.0
Education		
Elementary/high	25.0	23.5
Some college	40.0	23.5
College graduate	23.0	29.5
Postgraduate	12.0	23.5
Marital status		
Married	52.0	71.0
Single	4.0	4.0
Divorced	27.0	10.0
Widowed	17.0	16.0
n	48	51

a. $\chi^2 = 11.13, p < 0.01$
b. Income levels are defined as: Low = A household income of less than $25,000; Middle = A household income of $25,000 to $39,000; High = A household income of $40,000 or more.

Results

DEMOGRAPHICS

Demographic comparisons are provided in Table 1. African American and White females differed by income levels, with White women having higher mean incomes than African American women. No differences by ethnicity were found in age by decade, educational attainment, or marital status.

FITNESS STATUS

Fitness status was examined in relation to ethnicity and income level, because income differences existed between the two ethnic

Table 2
Fitness Status of Women by Ethnicity[a] *(in percentages)*

	Fitness Status Quartile[b]			
	1st	2nd	3rd	4th
African American	29	46	17	8
White	24	18	27	31

a. $\chi^2 = 14.36, p < .01$.
b. Fitness Status Quartile = For each age decade, the time (in seconds) to 70% maximum heart rate was categorized into quartiles. The shortest times were given a fitness status of 1 and the longest times were given a fitness status of 4.

groups. Generally, women in the lower income levels were less fit ($p = .03$). A chi-square analysis of income level and fitness status while controlling for ethnicity indicated no differences in the fitness status by income level ($p = .36$). However, a chi-square analysis of ethnicity and fitness status while controlling for income found a difference in the fitness status of African American and White females ($p = .02$).

Examination of fitness status by ethnicity indicated a difference between African American and White females (see Table 2). African American females were more likely to be in the two lower fitness status quartiles (75% of the African American females), whereas White females were more likely to be in the two higher status quartiles (58%).

ACTIVITY LEVELS

The correlation between the Exercise Index Score and the response to the question "How many days per week do you usually engage in planned exercise?" was .78 ($p < .001$), suggesting that the previous week's exercise activities were representative of usual exercise patterns.

Although 57% of White females were recently active (had exercised in the past week) compared with 42% of African American females, this was not a statistically significant difference, $\chi^2 = 2.28$, $p = .13$. White women had higher average Exercise Index scores than African American women, 486 versus 233, $t = -2.44$, $p = .02$, indicating greater activity levels. However, the difference between the Exercise Index scores of active African American (mean = 559) and active White (mean = 854) women was marginal, $t = -1.89$, $p = .06$.

Table 3
Percentage of Women Engaging in Sport or Recreational Activities[a] in the Past Week by Ethnicity (in percentages)

Activity	African American	White
Walking	23	41
Jogging	0	2
Calisthenics	17	26
Swimming	6	6
Biking	8	12
Racquet sport	0	6
None reported	58	43
n	48	51

a. Some women engaged in more than one exercise type.

Table 3 presents participation rates during the past week for specific activities. No difference was found in the participation rates by ethnic group.

EXERCISE BELIEFS AND KNOWLEDGE

The results of the MANOVA indicated a significant group effect ($p < .01$). Ethnic group differences were found on two of the six exercise belief items ($p < .01$). White females were less likely to agree that older people should avoid vigorous exercise and less likely to find it difficult to adhere to a regular schedule of physical activity (see Table 4).

The ethnic groups also differed on two of the three knowledge questions. White females were more likely to answer correctly the question concerning the number of minutes per session a person needs to exercise to achieve fitness, 67% versus 38%, $p \leq .01$, and also the question concerning how fast the heart must beat over the normal rate during exercise, 18% versus 2%, $p < .01$. There was no significant difference in the percentage correct for the item concerning the number of days per week a person needs to exercise to achieve aerobic fitness (57% of the White women and 69% of the African American women answered correctly).

In general, women answering incorrectly tended to overestimate the amount of exercise required to maintain aerobic fitness. Of the incorrect responses concerning exercise frequency, 78% overesti-

Table 4
Mean Exercise Beliefs[a] *of Women by Ethnicity*

	Older people should avoid vigorous exercise.[b]	I usually drive or ride short distances rather than walk.	It is hard for me to find the time to exercise on a regular basis.	When I exercise or play sports, I feel self-conscious about the way I look to others.	It is hard for me to stick to a regular schedule of physical activity.[b]	By the time a person gets to be my age, exercise doesn't provide all that much benefit.
African American	3.46 ± 1.69	2.85 ± 1.73	3.17 ± 1.72	4.42 ± 1.01	2.06 ± 1.46	4.70 ± 0.77
White	4.55 ± 1.08	3.37 ± 1.61	3.45 ± 1.76	4.16 ± 1.19	2.98 ± 1.79	4.96 ± 0.20

a. Scores ranged from 1 = *strongly agree* to 5 = *strongly disagree*.
b. Difference between African American and White women significant, $p < .01$.

mated the number of days per week needed to achieve aerobic fitness. Likewise, 62% of the incorrect responses concerning exercise duration overestimated the number of minutes per session needed to achieve aerobic fitness.

REGRESSION ANALYSES

To examine how Exercise Index scores, ethnicity, income level, education, exercise beliefs, and exercise knowledge related to fitness status, a logistic regression was performed. The log likelihood statistics indicated the model was a poor fit of the data, that is, the independent variables did not explain fitness status (likelihood ratio chi-square $p = .38$). Models employing just the exercise beliefs (likelihood ratio chi-square $p = .83$), just exercise knowledge (likelihood ratio chi-square $p = .94$), and just the Exercise Index score (likelihood ratio chi-square $p = .08$) as the independent variable(s) also proved to be inadequate. Neither income level nor education proved to be useful in predicting fitness status.

Multiple regression was used to examine the relationship of ethnicity, age, income level, education, exercise beliefs, and exercise knowledge to the Exercise Index score. The results are provided in Table 5. Three items were significant predictors of Exercise Index scores: the exercise knowledge question concerning the heart rate during exercise necessary to maintain aerobic fitness, the exercise belief concerning the difficulty of sticking to a regular schedule of physical activity, and the exercise belief concerning the difficulty of finding the time to exercise on a regular basis.

Discussion

In the study population, White women exercised more and had higher levels of measured fitness than the African American women. Differences between White and African American women were also found for 2 of 6 exercise belief items and on 2 of 3 exercise knowledge questions. The multiple regression analysis indicates that exercise beliefs and knowledge do influence exercise habits.

Table 5
Multiple Regression Analysis of the Predictors of Exercise Index Score

Predictor Variable	Effect Tests	
	F Ratio	Prob > *F*
Demographic variables		
Age	0.0464	0.8300
Income level	1.1111	0.3342
Education	0.5471	0.6515
Ethnicity	0.0003	0.9862
Exercise knowledge questions		
Required exercise days/week	0.6515	0.4220
Required exercise minutes/session	0.0004	0.9836
Required heart rate during exercise	10.3550	0.0019
Exercise belief items		
Older people should avoid exercise	0.0879	0.7677
I usually ride, not walk	0.0003	0.9868
Hard to find time for exercise	5.0722	0.0271
Self-conscious when exercising	0.0084	0.9271
Hard to stick to a schedule	11.4045	0.0011
Exercise doesn't provide benefits	0.0327	0.8569

Note. Model's $R^2 = .49$.

Two theoretical approaches of health psychology may aid in understanding these findings. The first approach is Bandura's concept of self-efficacy that has been defined as "the conviction that one can successfully execute a specific behavior" (Kingery, 1990) or one's view of his or her ability (confidence level) in particular areas of life (Bandura, 1977, 1986). The second approach is the Health Belief Model that focuses, in part, on the interaction of the perceived benefits of performing a specific health behavior and the obstacles seen as preventing or inhibiting one's efforts (Becker, 1974; Janz & Becker, 1984). For example, individuals who feel they will attain health benefits from exercise are more likely to adhere to a regular exercise regimen (Dishman et al., 1985).

A difference by ethnicity was found for the question that measures self-efficacy ("It is hard for me to stick to a regular schedule of physical activity."). White women were less likely to agree with this statement (i.e., had more confidence in their ability to participate in regular exercise). White women also had higher activity levels. This

is consistent with the Sallis, Hovell, and Hofstetter (1992) finding that self-efficacy was highly correlated with both the adoption and maintenance of vigorous physical activity among men and women in a random sample drawn from San Diego, California. Similarly, a recent study of initially sedentary females found that efficacy cognitions were a significant predictor of subsequent changes in exercise behavior during an intervention program (McCauley & Jacobson, 1991).

The fact that White females were less likely to agree that "older people should avoid vigorous exercise" suggests that they were less inclined to view age as a barrier to exercise. Furthermore, the fact that White females were more likely to know the correct number of minutes per exercise session recommended to achieve fitness suggests that accurate exercise knowledge enhances self-efficacy. It is interesting that most of the incorrect responses to the questions concerning the number of days per week recommended for exercise and the number of minutes per exercise session overestimated required levels. Individuals who overestimate the amount of time needed to achieve fitness may respond by not exercising at all. It should be remembered that this is a healthy group for whom vigorous activity would not be contra-indicated. The reasons why the African American females in the sample were less active and less physically fit than the White females may include differential perceptions of the appropriateness of vigorous activity for older adults as well as erroneous beliefs concerning the time and effort necessary to achieve a reasonable level of fitness.

It is clear the women in the study understand the value of regular exercise for older adults, because the majority of both ethnic groups strongly disagreed with the statement "By the time a person gets to be my age, exercise doesn't provide all that much benefit." Yet a large number (58% of the African American women and 43% of the White women) had not been active in the past week. The multiple regression analysis found that the responses to the statements "It is hard for me to find the time to exercise on a regular basis" and "It is hard for me to stick to a regular schedule of physical activity" were significant contributors to the prediction of exercise behavior (i.e., the Exercise Index Score). This suggests that although these older women understand the importance of exercise, their participation is influenced by

their perception of obstacles, specifically the amount of time required for exercise and the time they have available.

The results of other studies addressing this issue also report that time constraints are an important limitation on exercise participation (Dishman et al., 1985; Sallis et al., 1989; Sallis et al., 1992). The two health psychology models would suggest the women not confident in their ability to find and spend the time to exercise will tend to exercise less, and that this perceived time constraint is a sufficient barrier to inhibit exercise despite the acknowledged benefits. The fact that many of the women overestimate exercise time can only strengthen these perceived barriers.

Interventions to increase activity levels in older women must include a component that addresses exercise knowledge and beliefs. In addition, to better understand and address the impact of exercise beliefs on exercise habits, one must determine how exercise beliefs develop and are modified throughout an individual's life. The cross sectional design of this study limits the interpretations that can be made on this progression. Longitudinal studies focusing on this issue would be costly; however, studies crosscutting various ethnic, socioeconomic, and age groups may provide useful insights despite the inherent limitations of comparability across different groups.

Social factors that may influence health promoting behavior were not accounted for in this study. For example, household members and/or friends who practice healthy lifestyles may influence a person's health attitudes, beliefs, and subsequent behavior. Such social factors should be examined in future studies.

Because this was a self-selected sample of volunteers, it is difficult to generalize to the larger population of older African American and White women. However, these results are similar to studies using random samples that found African American women less active than White women. Many older African American women may hold beliefs that discourage exercise even while recognizing the health benefits. If other studies find exercise self-efficacy to be low among African American women, interventions that address perceived obstacles to exercise may be helpful. This question should be further explored because of the implications for health education efforts aimed at increasing activity levels among older adults, particularly women and minorities.

Our findings have several implications for health educators and health programs attempting to promote active lifestyles in older women. The results suggest that health promotion efforts should include the following components:

- Surveys that determine the exercise attitudes and beliefs of older women of different ethnic backgrounds.
- Educational interventions that provide basic knowledge about exercise and address misconceptions.
- Fitness programs that acknowledge and incorporate the unique aspects and needs of older women of different ethnic groups.

Approaches that increase exercise knowledge levels, determine and correct misconceptions, offer appropriate role models, and provide positive experiences are essential for improving the exercise behavior of older women. Increasing activity levels in older women requires a commitment to understanding psychological determinants of exercise behavior as well as providing a supportive environment.

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