

## Personality Factors Differentially Predict Exercise Behavior in Men and Women

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Personality assessed with the Minnesota Multiphasic Personality Inventory (MMPI) in college was used to predict exercise behavior measured at midlife in 3,630 men and 796 women enrolled in the University of North Carolina Alumni Heart Study. Logistic regression models were fitted for each of the MMPI clinical scales to test the predictive effect of personality, gender, and their interaction on adult exercise behavior. Lower depression, social introversion, and psychopathic deviance scores

were associated with increased probability of exercising in midlife for both men and women. Furthermore, better psychological health (indexed by lower hypochondriases and psychasthenia) in college was generally predictive of increased exercise for men, whereas higher scores on these same factors predicted midlife exercise for women. There were two other patterns of gender interactions: (a) for men, lower scores on hysteria and schizophrenia scales were associated with increased probability of exercising at midlife, whereas these factors were unrelated to exercise for women and (b) for women, lower ego strength and higher college scores on paranoia and mania were associated with exercise behavior at midlife. These data suggest that early adulthood personality predictors of exercise behavior at midlife are both gender-neutral and gender-specific; that is, where no gender differences exist, healthier personality traits predict exercise at midlife, and when gender differences do occur, healthier college patterns of personality predict exercise behavior for men and sedentary behavior for women.

Key words: exercise, personality, gender, MMPI, prospective

High levels of physical activity (Paffenbarger, Hyde, Wing, & Hsieh, 1986) and physical fitness increase longevity and reduce all-cause mortality. The health benefits of exercise are similar for men and women (Blair et al., 1996). Thus, it is important to evaluate the extent to which factors found to influence exercise behavior for men also predict exercise behavior for women (Lenfant, 1992). In an earlier study, we investigated factors related to exercise compliance in a cardiac rehabilitation program (Blumenthal, Williams, Wallace, Williams, & Needles, 1982). Controlling for heart disease status, severity of illness and other personality indices in a discriminant analysis, post-myocardial infarction (32 men and 3 women) with low social introversion and high ego strength, as measured by the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943), were more likely to adhere to a supervised exercise program. Surprisingly, hours of exercise, controlling for age and sex, was positively associated with hostility prospectively in the University of North Carolina (UNC) Alumni Heart Study, suggesting that exercise as a health behavior may function differently (Siegler, Peterson, Barefoot, & Williams, 1992). Although considerable cross-sectional evidence exists for the impact exercise has on psychosocial functioning (Dishman, 1988), the literature on how personality may predict exercise behavior is limited because the direction of the relation cannot be determined from cross-sectional designs. The data primarily pertain to men (Renfrow & Bolton 1979; Schnurr, Vaillant, & Vaillant 1990; Sharp & Reilly, 1975). However, when women are included, both gender differences and similarities emerged (Bolton & Renfrow 1979; Sallis, Hovell, & Hofstetter, 1992). Overall, the consistent findings suggest that those with a general well-being and lower social introversion tend to adopt nonsedentary lifestyles.

Our purpose in this study was to determine the role of young adult personality characteristics as predictors of exercise behavior in adulthood using a prospective design. The inclusion of women in this sample allows an evaluation of gender differences in personality predictors of exercise.

## METHOD

### Participants

The participants in this study were members of the UNC Alumni Heart Study, which began in 1986 with students who took the MMPI for research purposes at UNC at Chapel Hill from 1964 to 1966. An initial mailing and two follow-up mailings resulted in a total of 3,829 men and 845 women (84.9%) returning a baseline questionnaire by the fall of 1990, when they were 43 to 45 years old. The gender distribution and minority enrollment (<1%) are reflective of the population at UNC in the 1960s. Those who joined the study did not differ in personality functioning assessed by the MMPI clinical scales in the 1960s (Siegler et al., 1992).

Of the 4,674 who returned the baseline questionnaire, 4,426 persons (3,630 men and 796 women) had valid MMPI data from 1964 to 1966. Individuals with extreme scores on the infrequently endorsed items suggesting carelessness or random responding ( $F$  scale  $> 80$ ;  $n = 60$ ) or on the lie scale suggesting the respondent is presenting the self in an overly favorable way ( $L$  scale  $\geq 70$ ;  $n = 14$ ), and persons missing more than 10% of the MMPI items ( $n = 174$ ) were excluded from the analyses. Those excluded were slightly older (19.2 years vs. 18.8 years), but similar with respect to gender. Most important, 85.8% with and 86.3% without valid personality data reported exercise at midlife, suggesting minimal bias was introduced with MMPI validity criteria.

### Measures

*Exercise behavior.* Exercise behavior was indexed on the single item, "How many hours a week on average do you exercise for sports or fitness?" Of the men, 13.4% reported no exercise in middle age, 76.1% reported 1 to 7 hr of exercise per week, 9.3% reported 8 to 14 hr per week, and 1.2% reported more than 15 hr per week. For the women, 18.2% reported no exercise, 77.2% exercised 1 to 7 hr per week, and 4.6% exercised more than 8 hr per week. Gender comparisons indicated that men were more likely to exercise ( $\chi^2 = 12.55$ ,  $df = 1$ ,  $p < .0001$ ). Among those who exercised, men averaged 1 hr more per week than women ( $M = 3.28$  hr per week for women and  $M = 4.22$  hr per week for men,  $t = 7.15$ ,  $p < .0001$ ). This question was used to classify participants as either nonexercisers (no exercise reported for sport or fitness) or exercisers (86.6% of men and 81.8% of women reported any amount of exercise for sport or fitness). The percentages of exercising

individuals are high compared with 1990 national statistics, which report 44.3% of men and 40.1% of women between the ages of 30 to 44 exercise regularly (U.S. Department of Health & Human Services, 1993). The intensity and duration of the exercise activity was not assessed in this study; thus, the exercising grouping includes casual as well as serious exercisers

### Personality

Personality was assessed by the MMPI. To replicate our previous work (Blumenthal et al., 1982), we examined differences between exercisers and nonexercisers on the 10 clinical scales and 3 research scales, anxiety (*A*), ego strength (*Es*), and repression (*R*). Relatively few persons were in the clinical or diagnostic ( $T > 70$ ) range of the scales, as would be expected from a normal college sample. Raw scores were standardized to *t* scores on the basis of sex-specific national norms, with a mean of 50 and a standard deviation of 10. Whereas the MMPI is primarily a clinical instrument, the scales have been used to describe nonclinical samples (see norms in Swenson, Pearson, & Osborne, 1973, and the reviews of the MMPI scales by Dahlstrom, Welsh, & Dahlstrom 1975). Brief descriptions of the MMPI scales by number and name are given in the Appendix.

### Analysis

The prediction of exercise in middle age by personality measured in college was assessed by a series of logistic regression models that included sex, each MMPI subscale, and their interaction. Nonsignificant interaction terms were dropped from subsequent main effect models, and they were then refitted without the interaction terms. Odds ratios (OR) and 95% confidence intervals (95% CI) were calculated corresponding to an increase of 10 units (approximately 1 standard deviation) in the personality factor. Due to the large number of comparisons, statistical significance was set at .01. To evaluate the size of the effect, predicted outcomes were calculated at  $\pm 1$  standard deviation of the scale grand means.

## RESULTS

### Prediction of Exercise Behavior at Midlife

The beta coefficients and associated odds ratios for the logistic regression models are shown in Table 1. The scale difference predicting adult exercise did not reach criterion for masculinity-femininity (*Mf*), anxiety (*A*), and repression (*R*) scales and therefore they are not included in the tables. There were significant gender differences in exercise behavior for all the models as shown in the first column of

TABLE 1  
Logistic Models Predicting Exercise Status for Non *K*-Corrected  
Minnesota Multiphasic Personality Inventory Scales

Scale	Sex (Men)	Scale	Sex*Scale	Sex	OR	95% Confidence Interval
<i>D</i>	0.3944	-0.0169	—	Combined	0.844	0.788, 0.904
<i>Pd</i>	0.3835	-0.0103	—	Combined	0.902	0.837, 0.973
<i>Si</i>	0.2985	-0.0190	—	Combined	0.827	0.762, 0.897
<i>Hy</i>	2.5091	0.0235	-0.0381	Men	0.864	0.764, 0.977
				Women	1.264	1.016, 1.573
<i>Pt</i>	1.8760	0.0183	-0.0287	Men	0.901	0.823, 0.987
				Women	1.201	1.003, 1.439
<i>Hs</i>	2.1699	0.0201	-0.0369	Men	0.845	0.752, 0.950
				Women	1.223	0.952, 1.571
<i>Sc</i>	1.9041	0.0137	-0.0289	Men	0.859	0.785, 0.941
				Women	1.147	0.955, 1.377
<i>Pa</i>	2.3878	0.0293	-0.0358	Men	0.938	0.838, 1.050
				Women	1.341	1.090, 1.649
<i>Ma</i>	2.0333	0.0287	-0.0299	Men	0.988	0.896, 1.089
				Women	1.332	1.101, 1.611
<i>Es</i>	-1.5091	-0.0279	0.0328	Men	1.051	0.941, 1.173
				Women	0.757	0.609, 0.941

Note. *D* = depression; *Pd* = psychopathic deviate; *Si* = social introversion; *Hy* = hysteria; *Pt* = psychasthenia; *Hs* = hypochondriasis; *Sc* = schizophrenia; *Pa* = paranoia; *Ma* = hypomania; *Es* = ego strength. All terms significant  $\leq 0.01$ .

Table 1, labeled sex (men). The effect sizes indicating the magnitude of a 1 standard deviation change for each significant effect are shown in Table 2.

Three of the MMPI personality subscales, depression (*D*), psychopathic deviance (*Pd*), and social introversion (*Si*) significantly predicted exercise behavior independent of gender. Individuals who were less depressed, less rebellious, and less socially introverted in college were more likely to be exercising in middle-age. For the remaining seven scales, the pattern of response varied by gender in three different ways. First, for hysteria (*Hy*) and psychasthenia (*Pt*), the findings for men and for women were both statistically significant, but in the opposite direction. For men, lower scores were associated with a higher likelihood of exercise at midlife, whereas for women, lower scores were associated with sedentary behavior at midlife. The second pattern is seen with the data from the hypochondriasis (*Hs*) and schizophrenia (*Sc*) scales. For men, lower scores were predictive of an increased probability of exercising, but there were no significant associations of these factors for the women. Third, higher paranoia (*Pa*) and mania (*Ma*) scores and lower ego

TABLE 2  
 Estimate of Effect Sizes: Change in Predicted Probability of Exercise  
 Resulting From  $\pm 1$  Standard Deviation From the Mean

Scale	Grand Mean	Men	Women
<i>D</i>	55.21	-3.91	-5.11
<i>Pd</i>	57.94	-2.39	-3.11
<i>Si</i>	51.06	-4.43	-5.44
<i>Hs</i>	50.28	-3.88	+5.78
<i>Hy</i>	57.68	-3.38	+6.75
<i>Pt</i>	54.52	-2.41	+5.26
<i>Sc</i>	54.48	-3.54	+4.00
<i>Pa</i>	56.34	-1.52	+8.82
<i>Ma</i>	58.29	-0.27	+8.14
<i>Es</i>	58.25	+1.07	-8.11

*Note.* *D* = depression; *Pd* = psychopathic deviate; *Si* = social introversion; *Hs* = hypochondriasis; *Hy* = hysteria; *Pt* = psychasthenia; *Sc* = schizophrenia; *Pa* = paranoia; *Ma* = hypomania; *Es* = ego strength.

strength (*Es*) scores in college were more likely to be associated with exercise for adult women, but not for men.

## DISCUSSION

Our results indicate that higher psychological well-being (indexed by lower scores on depression and introversion) in college and more conventional behavior (indexed by lower psychopathic deviance scores) predict increased likelihood of exercising as adults for both men and women. This replicates our findings with coronary patients on extraversion (Blumenthal et al., 1982) and demonstrates the generalizability of those findings beyond an organized rehabilitation program. Inverse relations between depression and exercise behavior have been demonstrated previously (Farmer et al., 1988; Lobstein, Mosbacher, & Ismail, 1983). However, this replication is timely, considering the recent evidence implicating depression as a coronary risk factor (Barefoot & Schroll, 1996), a relation possibly mediated by exercise behavior. Furthermore, the tendency for women to exercise less may be related to the increased rates of depression seen in women (Farmer et al., 1988).

The gender differences found in this study were particularly intriguing and complex. The consistent pattern of gender differences suggests that college men who described themselves more favorably on the MMPI scales were more likely to exercise as adults, whereas the women who described themselves more favorably in college were less likely to exercise as adults. Although the findings for men essentially replicate those of Schnurr et al. (1990), interpretation of the gender differences is difficult.

Motivation may help explain these personality differences between men and women. Existing evidence argues that women and men exercise for different reasons. Men report exercising for the competition, whereas women exercise to lose weight (Finkenbergh, DiNucci, McCune, McCune, & Donice, 1994). These different motivations may be more or less salient due to differing personality profiles. Women who are more distressed may be more uncomfortable with their physical identity and therefore more likely to adopt exercise behaviors (McDonald & Thompson, 1992). An alternative explanation is that exercise is used to compensate for less robust personality functioning. Women may adopt exercise behavior because of the therapeutic effects exercise has on mood states (McDonald & Hodgdon, 1991).

A second interpretation of our findings may reflect historical cohort differences. During the 1960s, exercising was a more congruent sex role behavior for men than for women (Dan, Wilbur, Hendricks, O' Connor, & Holm, 1990). Gender differences in personality associations of exercise behavior may not be found in current cohorts of college students, but may persist in an older cohort of women. One limitation of this study is the brief way that exercise was measured. The single question we used does not allow us to speak to the type or intensity of exercise behavior and the extent to which it provides for aerobic fitness or conditioning, and it does not take into account possible seasonal variations in exercise behavior. In addition, without a measure of exercise behavior in college, it is unclear whether these personality profiles are predicting adoption of or adherence to exercise behaviors. The distributions of the exercise behavior and the sex differences in frequency of exercising found in this study, however, are similar to the more extensive data on the Framingham Offspring cohort (Dannenberg, Keller, Wilson, & Castelli, 1989), increasing confidence in our findings.

A second limitation concerns the use of the clinical scales from the MMPI to assess normal personality. The literature on normal personality from the MMPI is limited and there are few descriptions of how to interpret scores in the normal range (Greene, 1991). However, MMPI clinical scales have been used in large community-based samples to assess the impact of personality on health outcomes as well as risk factor behavior (e.g., Barefoot & Schroll, 1996; Lebovits, Lichter, & Moses, 1975; Lebovits, Shekelle, Ostfeld, & Paul, 1967).

In conclusion, it is hoped that further evaluation of how personality predicts exercise behavior may improve the success rate of exercise promotion programs, especially for women. Increasing exercise behavior for all middle age and older persons should help reduce the burden of disease and premature mortality (Blair et al., 1996).

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APPENDIX  
Brief Description of Minnesota Multiphasic Personality Inventory Scales

<i>MMPI Scale Designations</i>	<i>Correlates</i>
1 <i>Hs</i> Hypochondriasis	Somatic preoccupations, cynicism, narcissism
2 <i>D</i> Depression	Depressive affect, pessimism, dysphoria
3 <i>Hy</i> Hysteria	Physical complaints, dependency, repression
4 <i>Pd</i> Psychopathic Deviate	Rebellious, impulsive, conflict with authority
5 <i>Mf</i> Masculinity-Femininity	Low scores for men—aggressiveness, "masculine" pursuits; high scores for men—sensitivity, passivity; aesthetics opposite for women
6 <i>Pa</i> Paranoia	Mistrust, guardedness, difficulty with blame
7 <i>Pt</i> Psychasthenia	Anxiety, fears, ruminative, rigid personal standards
8 <i>Sc</i> Schizophrenia	Unusual thoughts and beliefs, social withdrawal
9 <i>Ma</i> Hypomania	Outgoing, sociable, overly energetic, impulsive
10 <i>Si</i> Social Introversion	Social shyness, inhibited, self-effacing
<i>A</i> Anxiety	Lack of poise, easily upset, overconcern with evaluations
<i>R</i> Repression	Submissiveness, conventionality, phlegmatic style
<i>Es</i> Ego strength	Independence, persistence, self-confidence, poise

*Note.* Scales marked 1 to 10 are the clinical scales; the last three are research scales.