

# Correlates of Leisure-Time Physical Activity in an Elderly Population in Singapore

## ABSTRACT

**Objectives.** This study assessed correlates of leisure-time physical activity among the elderly in Singapore.

**Methods.** A cross-sectional household survey was conducted in 1998 with 2494 subjects 60 years and older.

**Results.** Regular leisure-time physical activity was practiced by 47.0% of men and 38.5% of women. It was significantly correlated with family support, proportion of family members exercising, awareness of benefits of exercise, and healthy dietary habits. Other significant but negative correlates were smoking and barriers to exercise, such as lack of time and poor health.

**Conclusions.** Exercise programs for the elderly should aim at helping them overcome barriers to exercise, informing them of the benefits of exercise, and involving their families. (*Am J Public Health.* 1999;89:1578-1580)

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Exercise improves the health and functioning of the elderly.<sup>1</sup> A significant proportion of the elderly, however, report no leisure-time physical activity, with figures ranging from 18% in Europe<sup>2</sup> to 38% in the United States.<sup>3</sup> In the Western countries, the strongest correlates of exercise include self-efficacy, perceived barriers to exercise, modeling, support from friends, and age.<sup>4,5</sup> Adherence to exercise among the elderly is better with home-based exercises than with structured exercises.<sup>6</sup>

This study examined correlates of leisure-time physical activity and its association with falls among the elderly in Singapore.

## Methods

A cross-sectional household survey was conducted with 2494 subjects 60 years and older in Singapore (population of 3 million) in 1998. The response rate was 88.8%.

Leisure-time physical activity was assessed by self-reported weekly frequency of vigorous or moderately intense activity lasting at least 20 minutes. Vigorous leisure-time physical activities included jogging, cycling, and swimming. Moderate activities included walking, gardening, tai chi chuan, and qigong (an ancient Chinese breathing exercise that combines aerobics, isometric, and isotonic movements and meditation). Regular leisure-time physical activity was defined as moderate or vigorous physical activity during leisure time of 20 minutes' duration at least 3 times per week, which is similar to the definition used in the European study by Bijnen et al.<sup>2</sup>

The PRECEDE health promotion framework<sup>7</sup> and our previous research on working adults<sup>8</sup> were used to select variables influencing leisure-time physical activity. The PRECEDE framework classifies factors influencing behavior into the following 3 categories: (1) predisposing factors such as knowledge and values that motivate a person to exercise; (2) enabling factors, such as time, environment, skills, and lack of barriers, that allow a person to exercise; and (3) reinforcing factors such as rewards and social support from family members and friends. The list of barriers was identified from focus group discussions with elderly subjects (and is given in

the first footnote of Table 2), and social support variables were adapted from a study by Sallis et al.<sup>4</sup>

Multiple regression analysis by the stepwise method was used to evaluate the combined effect of the independent variables on the frequency of leisure-time physical activity.

## Results

Table 1 shows the sociodemographic characteristics of our respondents. Our sample differed from the general elderly population in Singapore in having fewer persons older than 75 years (20.9% vs 26.2%); however, there were no sex differences.

About half (42.1%) of the elderly respondents participated in regular leisure-time physical activity, with significantly higher percentages of men than women (Table 1). Walking was most popular (40.6%), followed by qigong (3.5%), gardening (3.1%), tai chi chuan (2.4%), cycling (1.3%), jogging (1.0%), and swimming (0.6%). Exercise varied with age, with qigong being more prevalent among older persons.

Table 2 shows the results of the multiple regression analysis of correlates of exercise. For men, variables significantly associated with leisure-time physical activity were barriers, family encouragement, proportion of family members exercising, smoking status, fruit consumption, educational level, age, and knowledge of benefits of exercise. Findings were similar for women, with the following exceptions: physical activity was also significantly associated with frequency of contact with people and dietary habits such as frequency of whole grain bread consumption and trimming fat off food; it was not significantly associated with age, educational level,

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or smoking status. The multicomponent item "barriers to exercise" was the most important variable, accounting for 39.5% of the variation in men and 38.0% of the variation in women. On examining the specific barriers in this multicomponent item, we found that lack of time and poor health were most strongly correlated (in an inverse manner) with leisure-time physical activity ( $r \geq -0.4$ ).

Almost 10% (9.2%) of survey respondents reported falls in the last year. Falls were less frequent among those who practiced qigong than among those who did not (3.2% vs 9.6%). After adjustment for age, sex, and medical problems, the rate ratio of falls among participants who did not practice qigong compared with those who did was 3.2 (95% confidence interval = 0.8, 13.0). Falls were not correlated with other types of leisure-time physical activity.

## Discussion

Slightly more than half (58%) of the elderly in our study did not participate in regular leisure-time physical activity. This rate was higher than the rates found in Finland<sup>2</sup> and the Netherlands,<sup>9</sup> which were 33% and 50%, respectively. Our measure of physical activity may have been biased because it excluded occupational activity or housework and gave equal weight to moderate and vigorous activity; the latter, however, should not have introduced much bias, because almost all exercisers ( $\geq 90\%$ ) engaged in moderate activities. Prevalence of regular activity might be overestimated in our study compared with the study by Pate et al. in the United States, in which the cutoff point was 30 minutes per day every day of the week.<sup>3</sup>

Significant correlates with exercise included barriers to physical activity, family encouragement, proportion of family members exercising, and awareness of the benefits of exercise. These findings are similar to those of the study by Sallis et al. in the United States,<sup>4</sup> which showed barriers, modeling, and support from friends as important factors. The difference lies in family being a more significant factor than friends in our study.

Our finding that those practicing qigong had fewer falls than other participants was close to statistical significance ( $P = .06$ ). We cannot determine from this cross-sectional survey whether qigong contributed to the decreased number of falls. Randomized trials among the elderly have shown that exercise<sup>10</sup> and tai chi chuan<sup>11</sup> lead to a reduced risk of falls. There are no data on the relationship of qigong to falls, although qigong has been found to improve

**TABLE 1—Distribution of Survey Participants by Selected Sociodemographic Characteristics and Leisure-Time Physical Activity: Singapore Household Survey of Elderly Persons, 1998**

	Male, n (%) (n = 1052)	Female, n (%) (n = 1442)	Overall, n (%) (n = 2494)
<b>Age group, y</b>			
60–64	381 (36.2)	551 (38.2)	932 (37.4)
65–69	232 (22.1)	284 (19.7)	516 (20.7)
70–74	218 (20.7)	305 (21.2)	523 (21.0)
75–79	95 (9.0)	142 (9.8)	237 (9.5)
$\geq 80$	126 (12.0)	160 (11.1)	286 (11.5)
<b>Race/ethnicity</b>			
Chinese	918 (87.3)	1280 (88.8)	2198 (88.1)
Malay	100 (9.5)	123 (8.5)	223 (8.9)
Indian	34 (3.2)	39 (2.7)	73 (2.9)
<b>Marital status</b>			
Single	41 (3.9)	36 (2.5)	77 (3.1)
Married	878 (83.5)	696 (48.3)	1574 (63.1)
Widowed	133 (12.6)	710 (49.2)	843 (33.8)
<b>Schooling, y</b>			
None	387 (36.8)**	1109 (76.9)	1496 (60.0)
Primary (1–6)	530 (50.4)	295 (20.5)	825 (33.1)
Secondary (7–12)	124 (11.8)	32 (2.2)	156 (6.3)
Tertiary	11 (1.0)	6 (0.4)	17 (0.7)
<b>Gainfully employed</b>	239 (22.7)**	99 (6.9)	338 (13.6)
<b>Living alone</b>	41 (3.9)	79 (5.5)	120 (4.8)
<b>Self-reported medical conditions</b>			
Hypertension	210 (20.0)	371 (25.7)	581 (23.3)
Joint problems	162 (15.4)*	383 (26.6)	545 (21.9)
Diabetes	117 (11.1)	201 (13.9)	318 (12.8)
Heart disease	84 (8.0)	123 (8.5)	207 (8.3)
Lung disease	38 (3.6)	22 (1.5)	60 (2.4)
Stroke	19 (1.8)	29 (2.0)	48 (1.9)
<b>Frequency of leisure-time physical activity/wk</b>			
Never	436 (41.4)	719 (49.9)	1155 (46.3)
Less than once	30 (2.9)	41 (2.8)	71 (2.8)
1–2 times	92 (8.7)	127 (8.8)	219 (8.8)
$\geq 3$ times	494 (47.0)	555 (38.5)*	1049 (42.1)

\* $P < .05$ ; \*\* $P < .01$  males vs females.

**TABLE 2—Relationship of Barriers, Social Support, Knowledge, and Sociodemographic Variables to Exercise: Singapore Household Survey of Elderly Persons, 1998**

Independent Variable <sup>a</sup>	Dependent Variable: Exercise Score <sup>b</sup>	
	Standardized Regression Coefficient ( $\beta$ )	t Statistic
<b>Male (n = 1052)</b>		
Proximal/direct influences		
Barriers (lack of enabling factors)	-0.537	-22.484***
Social support (reinforcing factors)		
Family encouragement	0.131	5.115***
Exercising among family members	0.108	4.165***
Knowledge (predisposing factors)		
Knowledge score on benefits of exercise	0.051	2.074*
Lifestyle behaviors		
Fruit consumption	0.080	3.204**
Smoking	0.097	3.995***
Distal/indirect influences		
Age	0.067	2.854**
Educational level	0.071	3.042**
Multiple R (Correlation Coefficient) = 0.703		
Adjusted R <sup>2</sup> = 0.495		

Continued

TABLE 2—Continued

Female (n = 1442)		
Proximal/direct influences		
Barriers (lack of enabling factors)	-0.527	-25.637***
Social support (reinforcing factors)		
Family encouragement	0.154	6.942***
Exercising among family members	0.138	6.369***
Frequency of contact with people	0.052	2.490*
Knowledge (predisposing factors)		
Knowledge score on benefits of exercise	0.067	3.240**
Lifestyle behaviors		
Fruit consumption	0.054	2.601**
Wholemeal bread consumption	0.062	3.005**
Trim fat off food	0.040	2.004**
Multiple R (Correlation Coefficient)=0.691		
Adjusted R <sup>2</sup> =0.475		

<sup>a</sup>Only those variables that are significantly correlated with exercise score are listed. Variables are defined as follows. (1) Barrier score (0–7). Number of barriers to exercise: no time, too tiring, too weak, fear of falling, bad weather, no facilities, no company. (2) Social support. Family encouragement to exercise: 1, no; 2, yes. Exercise among family members: 1, none; 2, some; 3, all. Frequency of contact with people other than those staying with respondent: 1, never; 2, rarely; 3, at least once a month; 4, at least once a week; 5, daily. (3) Knowledge score on benefits of exercise (0–7), derived from 7 knowledge statements of health benefits of exercise (e.g., exercise can lower blood pressure, provide sounder sleep, relieve stress). (4) Lifestyle behaviors. Fruit consumption: frequency per week. Wholemeal bread consumption and trim fat off food: 1, never; 2, rarely; 3, sometimes; 4, often; 5, always. Smoking: 1, current smoker; 2, ex-smoker; 3, nonsmoker. (5) Educational level: 1, no schooling; 2, 1–6 years; 3, 7–12 years; 4, university.

<sup>b</sup>Exercise score indicates the frequency of exercise/leisure-time physical activity per week: 1 = never exercise, 2 = less than once, 3 = 1–2 times, 4 = 3 times or more.

\* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$ .

oxygen uptake.<sup>12</sup> Since qigong is practiced in Singapore and is appropriate for the older frail elderly, we recommend randomized trials to assess the effects of qigong on risk of falls.

In conclusion, fewer than half (42%) of the elderly respondents engaged in regular leisure-time physical activity. Walking was most popular, followed by qigong and gardening, with activity varying according to age. Leisure-time physical activity was inversely correlated with barriers such as lack of time and poor health but positively correlated with beliefs about benefits of exercise, proportion of family members exercising, and family encouragement. Exercise promotion strategies for the elderly should aim at helping them overcome barriers

to exercise, involving the family, disseminating information about the benefits of exercise, and recommending exercises appropriate for the age and physical condition of the subject. □

### Contributors

Wong Mee Lian is the principal investigator of the project. She planned the study, designed the questionnaire, trained the interviewers, analyzed the data, and wrote the paper. Goh Lee Gan contributed to the writing of the paper. Chia Hwee Pin contributed to the sampling methodology of the study and produced the sampling frame. Sharon Wee was Wong Mee Lian's research assistant; she helped train and monitor interviewers and performed data entry. Hong Ching Ye contributed to the planning and questionnaire design of the study.

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