Does Walking 15 Minutes per Day Keep the Obesity Epidemic Away? Simulation of the Efficacy of a Populationwide Campaign

Alfredo Morabia, MD, PhD,
and Michael C. Costanza, PhD

Small physical activity increases may prevent weight gain in most populations. Geneva residents completed validated quantitative physical activity frequency questionnaires from 1997 to 2001. Fifteen minutes per day of moderate or brisk walking, or 30 minutes per day of slow walking, could increase physical activity at the population level; however, if the specific goal is to approach expending 420 kJ/d (100 kcal/d) through walking, the duration should be closer to 60 minutes for slow walking and 30 minutes for moderate or brisk walking.

A worldwide obesity epidemic[1,2] has led to an urgent need to design populationwide weight-control campaigns. A postulate is that small increases in physical activity may prevent weight gain in most populations because an extra 420 kJ/d (100 kcal/d) can compensate for the observed weight gain.[3] However, how much daily walking is needed to reach that goal is unknown.

The intensity of a physical activity can be assessed by the energy expenditure it produces in terms of a multiple of an individual's (sex-age-height-weight-specific) basal metabolic rate, which is the resting energy expenditure rate.[4] The typical basal metabolic rate of a Western adult is 4.2 kJ/min. Walking slowly expends 3.1 times one's basal metabolic rate. Hence, someone with a basal metabolic rate of 4.2 who walks slowly for 15 minutes expends 195 kJ.

TABLE 1—Prevalence, Weekly Frequency (Performers Only), and Daily Duration (Performers Only) of Slow, Moderate, and Brisk Walking by 3014 Men and 2996 Women: Geneva, Switzerland, 1997–2001

		Men					Women					Total Sample				
	Walking Intensity[a]	Age Group, y					Age Group, y					Age Group, y				
		35–44	45–54	55–64	65–74	All Ages	35–44	45–54	55–64	65–74	All Ages	35–44	45–54	55–64	65–74	All Ages
All adults (n)		945	923	704	442	3014	1036	949	615	396	2996	1981	1872	1319	838	6010
Prevalence, %	Brisk	25.7	20.4	20.2	17.4	21.6	34.8	30.2	26.2	19.2	29.5	30.4	25.4	23.0	18.3	25.5
	Moderate	34.1	25.4	25.1	32.6	29.1	62.5	52.9	52.9	56.3	56.7	49.0	39.3	38.1	44.0	42.9
	Slow	68.9	70.2	70.3	83.5	71.8	78.3	74.0	79.0	84.6	77.9	73.8	72.2	74.4	84.0	74.8
Performing adults only																
Days per week, median	Brisk	3	2	3	3	3	4	3	4	3	4	4	3	3	3	3
	Moderate	2	2	2	3	2	3	3	3	3	3	2	2	3	3	3
	Slow	7	6	7	7	7	7	6	7	7	7	7	6	7	7	7
Minutes per day, median	Brisk	30	30	60	60	30	30	45	60	60	45	30	30	60	60	30
	Moderate	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	Slow	45	60	60	60	60	60	60	60	60	60	60	60	60	60	60

[a]In terms of basal metabolic rate multiples: slow walking: 3.1 basal metabolic rate; moderate walking: 3.9 basal metabolic rate; brisk walking: 4.7 basal metabolic rate.

We used a unique monitoring system for measuring the total energy expenditure of the adult resident population of Geneva, Switzerland, to simulate the potential effect of campaigns promoting different combinations of duration and intensity of daily walking on the population's total energy expenditure.

METHODS

As recently described in detail, the Bus Santé is an ongoing, community-based surveillance project designed to monitor chronic disease risk factors among Geneva's approximately 100 000 male and 100 000 female, primarily French-speaking, noninstitutionalized residents aged 35 to 74 years continuously since 1993.[2] Since 1997, the Bus Santé survey has included a validated, self-administered quantitative physical activity frequency questionnaire to measure total and activity-specific energy expenditures, with special attention to light- and moderate-intensity activities.[5]

We used the 1997 to 2001 physical activity frequency questionnaire data first to estimate the existing population distribution of total energy expenditure (kJ/d). We then simulated the potential effects of a hypothetical public health campaign to persuade all adults to walk at least 15 minutes per day at various recommended intensity levels on the total energy expenditure. In the calculations, we assumed that (1) adults who already walked 15 minutes or more per day at a given recommended intensity level (prevalent compliers) would continue to do so with no change; (2) adults who did *not* walk at least 15 minutes per day at a given recommended intensity (nor at a higher intensity level) (eligible adults) would be persuaded to walk at *exactly the minimum* campaign-recommended level (unless noted otherwise); and (3) the individual basal metabolic rate multiples were 3.1 for slow walking, 3.9 for moderate walking, 4.7 for brisk walking, and 6.0 for athletic/brisk walking.

Sedentarism was defined as spending less than 10% of one's total energy expenditure in physical activities with at least an intensity of 3.9 basal metabolic rate, which corresponds to moderate walking. We repeated the calculations assuming various degrees of less-than-full participation by eligible adults. For a given participation rate, we generated a random number from the uniform distribution on the interval from 0 to 1 for each eligible adult to randomly classify each participant as a complier or noncomplier with the campaign recommendation.

RESULTS

Table 1 describes the walking characteristics of the 3014 men and 2996 women who completed the physical activity frequency questionnaire during the 5 years from 1997 through 2001.

Results of the simulation are in Table 2. The estimated (mean) population energy expenditure gain for slow walking would be only around +38 kJ/d, even if the campaign were 100% successful, and only +19 kJ/d if the campaign were 50% successful. Furthermore, a 100% (or 50%) successful campaign to promote slow walking for 30 minutes per day would provide only a modest +105 (or +53) kJ/d gain.

Assuming 100% campaign success, the gain achieved by walking moderately for 15 minutes per day is +150 kJ/d or for 30 minutes per day is +356 kJ/d. However, if only 50% of the eligible men and women walked moderately for 15 minutes per day, the population energy expenditure would increase by only +76 kJ/d. If only 50% of the eligible adults walked moderately for 30 minutes per day, the population energy

TABLE 2—Population Gains in Energy Expenditure and Reductions in Population Prevalence of Sedentarism for Hypothetical Intervention Campaigns of Varying Degrees of Recommended Walking Intensity and Duration and of Population Compliance: General Adult (35–74 y) Population of Geneva, Switzerland, 1997–2001

Walking Activity	Intensity (× BMR)	Duration, min/d	Maximal Gain, kJ/d[a]	Compliance by Eligible Adults, %	Population Mean Gain, kJ/d	Sedentarism[b] Reduction, %
Slow	3.1	15	+195	100	+38	Reduction not possible
				50	+19	
		30	+389	100	+105	(58% sedentary)
				50	+53	
Moderate	3.9	15	+245	100	+150	–4
				50	+76	–2
		30	+490	100	+356	–14
				50	+178	–7
Brisk	4.7	15	+295	100	+255	–10
				50	+127	–5
		30	+590	100	+541	–29
				50	+264	–14
Athletic-brisk	6.0	15	+377	100	+326	–14
				50	+165	–7
		30	+754	100	+690	–40
				50	+336	–19

Note. BMR = basal metabolic rate.
[a]Assumes BMR = 4.2 kJ/d.
[b]Sedentarism is defined as less than 10% of total energy expenditure spent in physical activities with an intensity of 3.9 BMR or more.

expenditure gain would be +178 kJ/d (Figures 1a,1b).

For brisk walking at 100% compliance, the gains would be +255 kJ/d for 15 minutes per day and +541 kJ/d for 30 minutes per day. If the brisk walking recommendations were adhered to by only 50% of the eligible adults, the population energy expenditure gains would be +127 kJ/d for 15 minutes per day and +264 kJ/d for 30 minutes per day (Figures 1c,1d).

For athletic-brisk walking at 6.0 basal metabolic rate and 100% compliance, the energy expenditure gains would be +326 kJ/d for 15 minutes per day and +690 kJ/d for 30 minutes per day. With only 50% compliance by eligible adults, these gains would be reduced to +165 kJ/d and +336 kJ/d, respectively.

DISCUSSION

Fifteen minutes per day of moderate or brisk walking, or 30 minutes per day of slow walking, could increase physical activity at the population level. However, if the specific goal is to approach expending 420 kJ/d through walking, the duration should be closer to 60 minutes for slow walking and 30 minutes for moderate or brisk walking. Moreover, to actually meet the goal of a +420 kJ/d gain in the population, total energy expenditure would require that at least 50% of the eligible adults perform athletic/brisk (6.0 basal metabolic rate) walking, which is clearly an unrealistic goal.

We have used these data to promote brisk walking and to compute the statistical power to monitor its effect in collaboration with the Geneva Public Health Department. Brisk walking is a high energy-expending activity, and it can be almost universally performed in populations. In addition, changes in urban environments can be conceived to promote walking rather than other means of transportation in the population.[6] This campaign will allow us to assess the validity of our simulation because changes in physical activity and other health-related behaviors will be monitored. It may well be that the effect of the intervention is greater than expected under our linear model. The walking habit may grow more rapidly once it has been adopted by a minority (i.e., a snowball effect), and it may stimulate weight-reducing dietary changes.

The population-based simulation approach proposed here can be extended to other candidate activities that can be integrated easily into everyday life by the whole population (e.g., bicycling instead of driving, climbing stairs instead of taking elevators) or by subgroups (e.g., sports). ■

About the Authors

Alfredo Morabia and Michael C. Costanza are with the Division of Clinical Epidemiology, Geneva University Hospitals, Geneva, Switzerland.

Requests for reprints should be sent to Alfredo Morabia, MD, PhD, Division of Clinical Epidemiology, Geneva University Hospitals, 25, Rue Micheli-du-Crest, 1211 Geneva 14, Switzerland (e-mail: alfredo.morabia@hcuge.ch).

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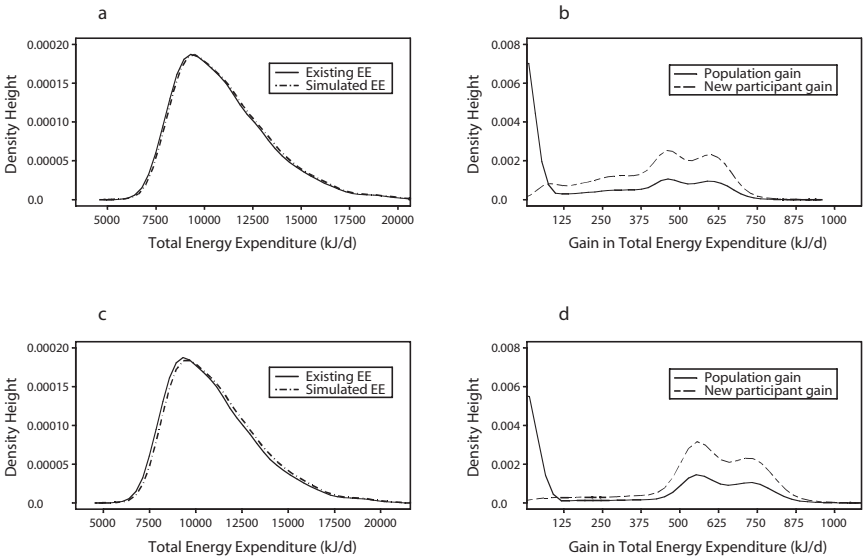

Note. EE = energy expenditure. Increases to recommended frequency, duration, and intensity of walking were assumed to be possible *only* for persons walking less than the recommendation (eligible adults), and prevalent compliers were assumed to continue their walking habits without change. Gains are for moderate walking (3.9 basal metabolic rate) for 30 minutes per day by prevalent compliers and 50% of eligible adults and for brisk walking (4.7 basal metabolic rate) for 30 minutes per day by prevalent compliers and 50% of eligible adults.

FIGURE 1—Population distributions of (a) daily total energy expenditure (1 kJ/d = 4.2 kcal/d) for 30 minutes of daily moderate walking, (b) gains in energy expenditure for 30 minutes of daily moderate walking, (c) daily total energy expenditure for 30 minutes of daily brisk walking, and (d) gains in energy expenditure for 30 minutes of daily brisk walking by 6010 randomly selected adult (3014 men, 2996 women, aged 35–74 y) residents of Geneva, Switzerland, 1997–2001.

Contributors

A. Morabia conceived, developed, and supervised the Bus Santé survey from its inception in 1992. M.C. Costanza designed, performed, and interpreted the simulations and statistical analyses. Both authors contributed equally to the conception and writing of the brief.

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Human Participant Protection

All study subjects provided written informed consent to participate in the study, which was approved by the University of Geneva ethics committee.

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