
Effects of “10,000 Steps Ghent”

A Whole-Community Intervention

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Background: Currently there is a great deal of interest in multistrategy community-based approaches to changing physical activity or health behaviors. The aim of this article is to describe the effectiveness of the physical activity promotion project “10,000 Steps Ghent” after 1 year of intervention.

Methods: A multistrategy community-based intervention was implemented in 2005 with follow-up measurements in 2006 to promote physical activity to adults. A local media campaign, environmental approaches, the sale and loan of pedometers, and several local physical activity projects were concurrently implemented. In 2005, 872 randomly selected subjects (aged 25 to 75), from the intervention community Ghent and 810 from a comparison community, participated in the baseline measurements. Of these, 660 intervention subjects and 634 comparison subjects completed the follow-up measurements in 2006. Statistical analyses were performed in 2006.

Results: After one year there was an increase of 8% in the number of people reaching the “10,000 steps” standard in Ghent, compared with no increase in the comparison community. Average daily steps increased by 896 (95% CI=599–1192) in the intervention community, but there was no increase in the comparison community (mean change –135 [95% CI=–432 to 162]) (F time \times community=22.8, $p<0.001$). Results are supported by self-reported International Physical Activity Questionnaire (IPAQ) data.

Conclusions: The “10,000 steps/day” message reached the Ghent population and the project succeeded in increasing pedometer-determined physical activity levels in Ghent, after 1 year of intervention.

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Introduction

Regular physical activity is essential for maintaining health and reducing the risk of many causes of morbidity and mortality.¹ However, most adults in Europe (43%–87%),² the United States (60%),¹ and Australia (43%)³ lead a sedentary lifestyle. International guidelines recommend the accumulation of a minimum of 30 minutes of at least moderate intensity physical activity on most, if not all, days of the week.¹ An alternative guideline recommends the accumulation of 10,000 steps/day,⁴ and both recommendations are being used in lifestyle physical activity interventions in different populations and in controlled settings.⁵

The “10,000 Steps Ghent” project was built on the approach used in the Australian “10,000 Steps Rockhampton” project⁶ and served as a pilot intervention for Europe. In Rockhampton, which has high levels of

overweight and obesity,⁶ physical activity was promoted through a media campaign, health professionals, environmental support, and community initiatives. The present intervention also used multiple concurrent community-based strategies to promote physical activity to less at-risk adults. Guided by the social ecologic model,⁷ this whole community intervention was designed to intervene at the individual (e.g., pedometer sale), social (e.g., workplace projects), and environmental (e.g., walking circuits) level.⁸ Previous multistrategy community interventions (combining media advertising; community-based face-to-face instructions; walking groups; school, worksite, church and environmental initiatives), have reported no or only small physical activity changes,^{9–13} and none have used objective pedometer assessment of physical activity as their main outcome measure.¹⁰

The primary aim of this paper was to report changes in both pedometer-determined and self-reported physical activity levels in Ghent after 1 year of intervention, compared with those in a comparison community. Since the project involved a pedometer step-count intervention, an influence on walking behavior was expected; this was assessed using pedometers and

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through the “walking” item of the International Physical Activity Questionnaire (IPAQ). A secondary aim was to evaluate whether the intervention was effective with insufficiently active people. Respondents who did not reach the 10,000 steps target at baseline were identified, and changes in their physical activity were compared in the intervention and comparison community. The final aim was to describe awareness of the project and the most common sources of project information in the intervention community.

Methods

Design

The study utilized a controlled pre–post design, with baseline data collected in March–May 2005 and follow-up data 12 months later. The intervention community was Ghent (capital of the East Flanders province of Belgium; population, 228,000), and the comparison community was the smaller city of Aalst (located 35 km to the southeast of Ghent; population, 77,000). Both communities were selected because of their demographic and geographic comparability.

Intervention Development and Implementation

The intervention was based on and performed in cooperation with researchers from the 10,000 Steps Rockhampton project.⁶ The present project was developed by the Department of Movement and Sports Sciences of Ghent University, in collaboration with local city and provincial governments, three health insurance companies, and the local health promotion service. Physical activity was promoted to all adults in the defined Ghent community, using a central theme of 10,000 steps/day, with a secondary tagline of “Every step counts.” The accumulation of at least 30 minutes of moderate-intensity physical activity on most, preferably all, days of the week,^{14,15} and participation in more-vigorous activity or sport for a minimum of 20 minutes 3 days each week,¹⁴ were also promoted. The implementation included several strategies at the different levels of the social ecologic model¹⁶ (see Table 1).

Local media project. Press conferences were organized at the start of the intervention and again on six occasions during the year, with subsequent publicity about the project in local newspapers. A full-page advertisement was also published in the town magazine, a periodical delivered to every household. The project was mentioned about six times in local newscasts, and billboards were placed at 20 different locations.

Website. Information about the project, physical activity and health, tips on how to increase daily activity, frequently asked questions, contacts, and reports on planned or completed activities (e.g., a culinary walk in the city center) were placed on the project website (www.10000stappen.be).

Environmental approaches. Street signs were placed strategically throughout the city to raise awareness of walkable distances and to encourage walking. For example, from every public parking place, signs showed the number of steps to get to the city center. In addition, walking circuits were laid out in two local town parks, with signs along these to show distances traveled and the number of steps likely to be accumulated.

Table 1. The social–ecologic approach of the 10,000 Steps Ghent intervention

Ecologic level	Intervention strategy
Intrapersonal	Local media campaign Website use
Interpersonal	Sale and loan of pedometers Dissemination of information through all associations
Organizational/ institutional	Workplace projects Projects for older people Dissemination of information through health professionals Dissemination of information through all schools
Community	Local media campaign Environmental approaches
Social structure, policy, and systems	Local media campaign Sale and loan of pedometers through the local town shop Sale and loan of pedometers through Ghent sport services department

Sale and loan of pedometers. A booklet with “how-to” information and a step-count log were designed to be sold with pedometers that were used as both individual self-monitoring and motivational tools. The pedometer package (pedometer and booklet) was sold for €20 (about \$26) by the local government information store, by the Ghent sport services department, by pharmacies, and by local divisions of the health insurance companies. The local sport services also coordinated a pedometer loan system of 15 kits through which schools, companies, and community groups could borrow a kit with flyers, posters, and 30 pedometers.

Workplace projects. A plan of action with specific information on how to promote physical activity in the workplace was given to the health/personnel departments of all companies with at least 100 employees ($n=23$). Kits were made available but no other (financial) support was given to the worksites.

Projects for groups of older people. In order to reach the large population of older, mostly inactive¹ people, all clubs ($n=26$) and services ($n=8$) for older people were given promotional materials and instructed on how to promote physical activity. All members of the clubs and services were also invited to a walk-event in the local town park.

Dissemination of information. Flyers, posters, and information about the pedometer loan system were sent to all schools ($n=169$), general practitioners ($n=592$), dieticians ($n=26$), and physical therapists ($n=308$), as well as to all associations and societies.

Evaluation

Recruitment and response rates. Twenty-five hundred citizens (25–75 years) were randomly selected from the population registers of each city (500 for each age group: 25–35, 36–45, 46–55, 56–65, 66–75). For those with a telephone number (1765 in Ghent, 1919 in Aalst), a minimum of four calls were made before recording the person as “not contactable” (419 in Ghent, 516 in Aalst). The response rate for this telephone recruitment was 54% (729 of 1346) in Ghent

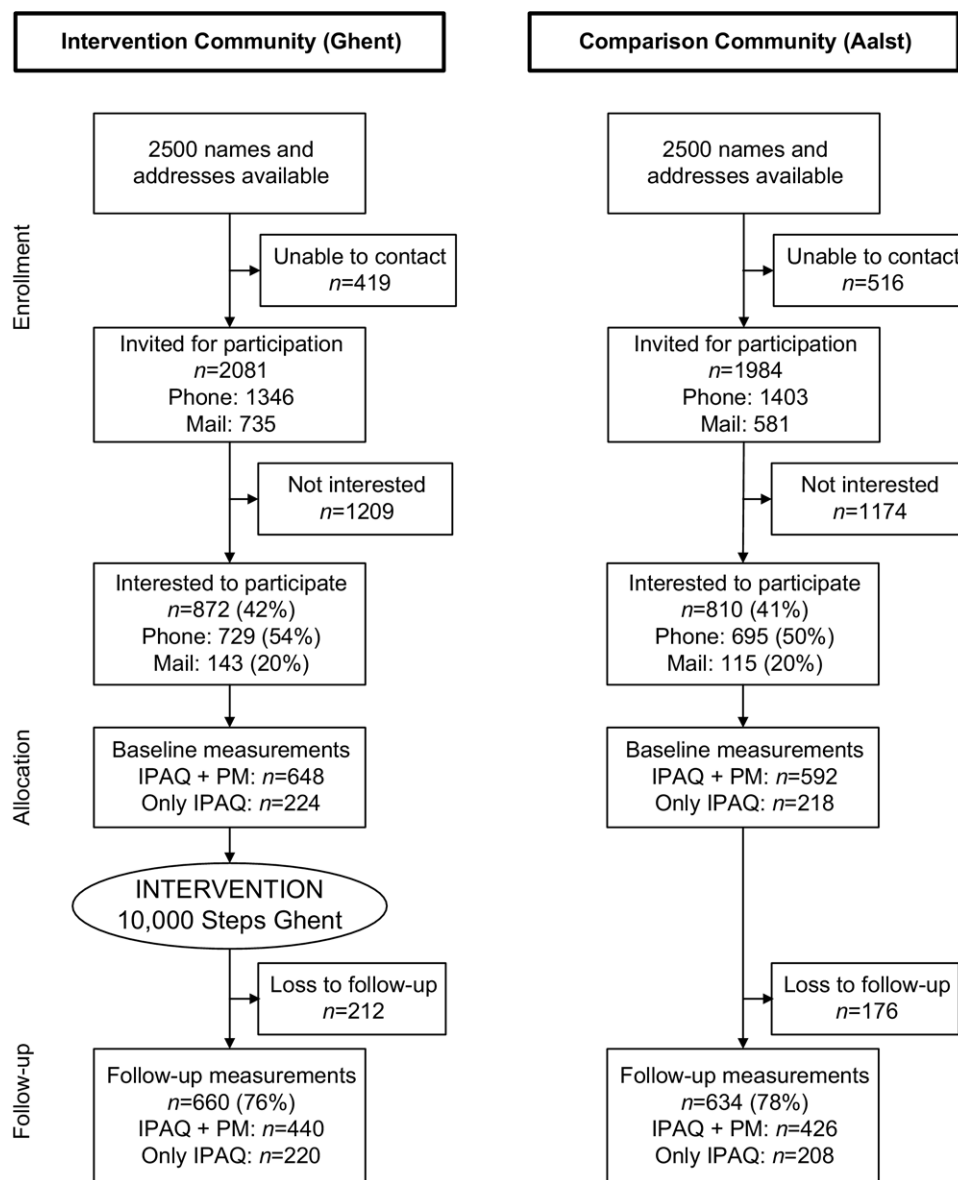


Figure 1. Participant flow. IPAQ, completion of the International Physical Activity Questionnaire; PM, completion of the pedometer records.

and 50% (695 of 1403) in Aalst. All those without a telephone number were sent a written invitation to participate in the study (735 in Ghent; 581 in Aalst). The response rate for this mailed recruitment was 20% in both communities, making the overall response rate 42% ($n=872$) in Ghent and 41% ($n=810$) in Aalst. More than three quarters of the initial respondents (Ghent: 76%, $n=660$; Aalst: 78%, $n=634$) completed the follow-up protocol. (see Figure 1).

Procedures for data collection. Participants were asked to complete the telephone-administered long version of the IPAQ and to monitor their pedometer steps daily for 7 consecutive days. Based on previous methods,¹⁷ a package was mailed to all participants who completed the IPAQ and agreed to monitor their steps. The package included a pedometer, a protocol describing how and when to use it, an activity log for noting daily steps and keeping daily activity records, a written informed consent form, and a stamped

addressed envelope for return mailing. All participants were instructed to wear the pedometer on their waistband or belt during waking hours. They were requested to reset their pedometer to zero at the beginning of each day, to continue with their usual activities, and to remove the pedometer only while showering, bathing, or swimming. They were asked to complete the activity log at the end of each day.

After 1 year of intervention, all participants who completed baseline measurements were contacted again by telephone or mail. They were asked to complete the IPAQ (baseline procedures) and a questionnaire relating to awareness of the 10,000 Steps Ghent project. After completion of the questionnaires, a package was mailed to them to monitor their steps for 7 consecutive days, if they had done this at baseline. All participants gave written informed consent and the study protocols were approved by the Ethical Committee of the Ghent University.

Seven interviewers (master degree, native speakers) were given 2 hours of interview training, focusing on the potential problem of overreporting, and were supervised throughout data collection.

Instruments

Physical activity questionnaire. The long form of the IPAQ was used to assess the different domains of physical activity in a usual week, namely physical activity at work, transport-related physical activity, domestic and gardening activities, and physical activity during leisure time. The IPAQ has been shown to be a valid and reliable instrument for assessing physical activity at the population level in Europe¹⁸ and in Flanders, Belgium.¹⁹ Total time for physical activity in the four domains and total time for walking, moderate, and vigorous physical activity, all expressed in minutes/week, were computed (www.ipaq.ki.se). Questions were also asked about participants' employment status (employed/unemployed), and about number of years of education and self-reported health (excellent/very good/good/moderate/poor).

Pedometers. The Yamax Digiwalker SW-200 (Yamax, Tokyo, Japan) was used in this study as it is known to be valid, accurate, and reliable for counting steps in adults.²⁰

Activity log. Participants were requested to record the date, steps taken at the end of the day, and the type and duration of nonambulatory activities (i.e., biking and swimming) in an activity log.²¹ Following established guidelines,²² researchers added 150 steps to the daily total for every minute of reported biking and/or swimming.

Questionnaire relating to awareness of the project at follow-up. In 2006, additional items were used to assess awareness of the project. Participants were asked to complete the following questions: Have you heard or seen any messages about physical activity? (yes/no); If you have heard informa-

tion about physical activity, where did you hear it? (open-ended); Have you heard of the 10,000 Steps Ghent project? (yes/no); Where did you hear about 10,000 Steps Ghent? (radio, TV, print media, Internet, street signs, workplace, health service, (para)medic, society, family, friends, or school); Are you aware of any of the following activities which are being supported by 10,000 Steps Ghent?: sale of pedometers, loan of pedometer boxes, walk circuits in local town parks? (yes/no); Have you used a pedometer in the last 10 months? (yes/no), and Where did you get your pedometer? (bought at 10,000 Steps point of sales/borrowed at 10,000 Steps/elsewhere). A timeframe of 10 months was used to avoid inclusion of baseline pedometer measurements.

Data Analysis

All data were analyzed in 2006 using SPSS 12.0 for Windows. Demographic characteristics of intervention and comparison respondents were compared, using independent-sample t-tests and chi-square tests. Average daily steps were calculated for the two periods of 7 days (baseline and follow-up). Values over 20,000 steps/day were recorded as 20,000 to limit unrealistically high average step counts and to ensure normal distribution.¹⁷ Repeated measures of analysis of covariance (ANCOVAs) with time (baseline/follow-up) as the within-subjects factor and community (Ghent/Aalst) as the between-subjects factor, were conducted to evaluate the effects of the project on pedometer-determined and self-reported physical activity. These analyses were done for (1) the total sample and (2) those who did not reach the 10,000 steps/day target at baseline. Analyses were adjusted for age and number of years of education. Time \times community interactions were used to test for intervention effects. Effect sizes (Cohen's d) were computed by subtracting the change in Aalst from the change in Ghent, and dividing this score by the pooled standard deviation of change.²³ Effect sizes were interpreted as negli-

Table 2. Characteristics of participants who completed pedometer and IPAQ registrations

Demographics	Ghent baseline (n=648) ^a	Follow-up (n=440) ^a	Aalst baseline (n=592) ^a	Follow-up (n=426) ^a	Baseline comparison t/ χ^2 (p)	Follow-up comparison t/ χ^2 (p)
Age (years)					0.2 (ns)	0.2 (ns)
Years (mean \pm SD)	48.7 \pm 14	49.8 \pm 13.3	48.5 \pm 13.3	50 \pm 12.9		
25–35 (%)	21.6	16.1	18.9	14.8	2.2 (ns)	1 (ns)
36–45 (%)	20.5	22	23	21.1		
46–55 (%)	22.8	25.2	23.5	26.8		
56–65 (%)	19.8	22.5	20.3	21.6		
66–75 (%)	15.3	14.1	14.4	15.7		
Gender (%)					1.3 (ns)	2.2 (ns)
Men	47.2	47.5	50.5	52.6		
Level of education (%)					2.9 (ns)	2.3 (ns)
College or university degree	60	58.9	55.2	53.8		
Employment status (%)					0.1 (ns)	5.8 ($p \leq 0.05$)
Employed	68.1	62.4	67.3	54.4		
Self-related state of health (%)					2.4 (ns)	8.5 (ns)
Excellent	9.6	11.2	8.3	7.8		
Very good	2.9	30.5	29.3	29.6		
Good	51.2	49	48.7	49.4		
Poor	9.9	8.2	11.2	9.6		
Weak	1.9	1.1	2	3.5		

^aNumbers vary slightly due to missing data for some items.

IPAQ, International Physical Activity Questionnaire; ns, not significant ($p > 0.05$).

Table 3. Mean physical activity at baseline and follow-up for respondents in each community

	Respondents who completed IPAQ and pedometer records					Respondents who only completed IPAQ				
	Baseline (n=440)	Follow-up (n=426)	Δ (95% CI)	F(p)	d	Baseline (n=220)	Follow-up (n=208)	Δ (95% CI)	F(p)	d
Pedometer-determined PA (steps/day)				22.6 (***)	0.33					
Ghent	9596 \pm 4256	10,491 \pm 4306	+896 (599 to 1192)							
Aalst	9669 \pm 4018	9534 \pm 3978	-135 (-432 to 162)							
Walking (min/week)				4.7 (***)	0.15				5.7 (*)	0.23
Ghent	288 \pm 357	305 \pm 382	+17 (-47 to 14)			321 \pm 391	323 \pm 407	+2 (-53 to 49)		
Aalst	301 \pm 387	271 \pm 353	-30 (1 to 61)			308 \pm 423	219 \pm 335	-89 (31 to 145)		
Moderate PA (min/week)				7 (***)	0.17				1.1 (ns)	0.12
Ghent	480 \pm 385	468 \pm 372	-12 (-28 to 52)			448 \pm 428	445 \pm 390	-3 (-55 to 59)		
Aalst	554 \pm 432	470 \pm 401	-84 (43 to 125)			513 \pm 427	461 \pm 385	-52 (-7 to 111)		
Vigorous PA (min/week)				1.4 (ns)	0.05				0.1 (ns)	0.01
Ghent	112 \pm 276	99 \pm 255	-13 (-10 to 36)			120 \pm 284	106 \pm 271	-14 (-16 to 45)		
Aalst	106 \pm 258	80 \pm 200	-26 (1 to 50)			103 \pm 258	93 \pm 231	-10 (-25 to 46)		
Work-related PA (min/week)				15.9 (***)	0.27				5.3 (*)	0.23
Ghent	286 \pm 561	355 \pm 625	+68 (-111 to -26)			333 \pm 619	355 \pm 642	+22 (-98 to 54)		
Aalst	350 \pm 642	300 \pm 591	-50 (10 to 89)			410 \pm 675	306 \pm 576	-104 (33 to 175)		
Transport-related PA (min/week)				0.2 (ns)	0.03				0 (ns)	0.02
Ghent	140 \pm 189	134 \pm 168	-6 (-12 to 23)			144 \pm 205	126 \pm 193	-18 (-11 to 48)		
Aalst	110 \pm 170	99 \pm 131	-11 (-6 to 26)			101 \pm 185	78 \pm 118	-23 (1 to 45)		
Household PA (min/week)				1.5 (ns)	0.08				2.5 (ns)	0.17
Ghent	347 \pm 375	308 \pm 304	-39 (6 to 72)			299 \pm 361	300 \pm 318	+1 (-50 to 48)		
Aalst	423 \pm 439	351 \pm 369	-72 (31 to 113)			380 \pm 415	317 \pm 327	-63 (7 to 120)		
Leisure time PA (min/week)				4.4 (*)	0.15				0.1 (ns)	0.02
Ghent	140 \pm 185	125 \pm 178	-15 (-3 to 34)			140 \pm 195	127 \pm 206	-13 (13 to -12)		
Aalst	172 \pm 264	125 \pm 173	-47 (26 to 68)			118 \pm 148	107 \pm 143	-11 (-13 to 34)		

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.IPAQ, International Physical Activity Questionnaire; ns, not significant ($p > 0.05$); PA, physical activity.

gible (<0.15), small (0.15–0.40), medium (0.40–0.75) or large (>0.75).²³ Descriptive statistics and chi-square tests were used to analyze the responses to questions about awareness of the project. A statistical significance level of 0.05 was used in all analyses.

Results

Participant characteristics

Demographic characteristics of the respondents who completed both the IPAQ survey and the pedometer/activity logs are shown in Table 2. Both samples were representative of the general population in each city, with the exception that respondents in Ghent were significantly older than the total community population (Ghent: 48.7 vs 46.5, $t=4.0$, $p<0.001$; Aalst: 48.5 vs 48.6, $t=0.1$, $p=0.910$). The proportion of men in both samples (Ghent: 48%; Aalst: 53%) were comparable to those in the total populations (Ghent: 50%, chi-square=22.1, $p=0.605$; Aalst: 50%, chi-square=0.3, $p=0.603$). There were no significant differences between Ghent and Aalst at baseline but at follow-up the proportion of employed participants was significantly higher in Ghent than in Aalst (see Table 2).

For the total sample, comparisons were made between subjects who provided step-count data at baseline and those who did not. Subjects who had a job were more likely to complete the pedometer protocol than unemployed subjects (odds ratio=1.58, $p=0.002$). Analy-

ses of gender, age, level of education, state of health, and total amount of physical activity (based on IPAQ reports) showed no significant differences between the two groups.

Physical activity measures

Significant intervention effects were found for mean steps/day with an average increase of 896 steps/day in Ghent and a decrease of 135 in Aalst (see Table 3). In Ghent, 48% of the respondents had a minimum increase of 896 steps/day and average daily step counts increased significantly in both men ($F=10.5$, $p=0.001$) and women ($F=12.8$, $p<0.001$); and in young (25–45 years) ($F=4.9$, $p=0.029$), middle-aged (46–65 years) ($F=6.8$, $p=0.009$), and older (66–75 years) ($F=9.3$, $p=0.002$) adults.

Pedometer-based data revealed that the proportion of participants reaching the 10,000 steps/day target had increased from baseline (42%) to follow-up (50%) in Ghent ($t=3.2$, $p=0.001$). Extrapolation of this increase of 8% to the total population of Ghent indicates that 18,500 citizens became more active. Corresponding proportions in Aalst were 41% and 40% ($t=1.3$, $p=0.205$).

There were significant intervention effects for reported time spent in walking, moderate, work-related, and leisure-time physical activity for participants completing the IPAQ and pedometer protocol (see Table 3).

Table 4. Mean physical activity at baseline and follow-up for respondents in each community who did not reach the 10,000 steps target at baseline

	Baseline (n=250)	Follow-up (n=242)	Δ (95% CI)	F(p)	d
Pedometer-determined PA (steps/day)					
Ghent	6660 \pm 2284	8247 \pm 3137	+1586 (–1934 to –1239)	12.2 (***)	0.31
Aalst	6961 \pm 2128	7710 \pm 3051	+749 (–1070 to –428)		
Walking (minutes/week)				0.4 (ns)	0.03
Ghent	243 \pm 333	242 \pm 339	–1 (–32 to 35)	1.8 (ns)	0.09
Aalst	224 \pm 329	210 \pm 308	–14 (–16 to 43)		
Moderate PA (minutes/week)				4.4 (*)	0.15
Ghent	444 \pm 397	421 \pm 370	–23 (–26 to 72)	9.6 (**)	0.26
Aalst	488 \pm 421	429 \pm 389	–59 (10 to 108)		
Vigorous PA (minutes/week)				0.4 (ns)	0.03
Ghent	81 \pm 240	78 \pm 235	–3 (–22 to 26)	0.6 (ns)	0.05
Aalst	81 \pm 233	44 \pm 131	–37 (9 to 63)		
Work-related PA (minutes/week)				0 (ns)	0.02
Ghent	211 \pm 496	280 \pm 566	+68 (–121 to –16)	0.4 (ns)	0.03
Aalst	248 \pm 556	206 \pm 503	–42 (–4 to 87)		
Transport-related PA (minutes/week)					
Ghent	113 \pm 179	100 \pm 145	–13 (–7 to 31)	0.6 (ns)	0.05
Aalst	97 \pm 153	80 \pm 108	–17 (–1 to 34)		
Household PA (minutes/week)					
Ghent	356 \pm 393	303 \pm 307	–53 (9 to 97)	0 (ns)	0.02
Aalst	414 \pm 454	341 \pm 372	–73 (20 to 126)		
Leisure time PA (minutes/week)					
Ghent	116 \pm 174	87 \pm 145	–29 (8 to 49)	0 (ns)	0.02
Aalst	124 \pm 208	100 \pm 141	–24 (–1 to 49)		

* $p\leq 0.05$; ** $p\leq 0.01$; *** $p\leq 0.001$.

ns, not significant ($p>0.05$); PA, physical activity.

Table 5. Project awareness

	Ghent (n=660) (%)	Aalst (n=634) (%)	χ^2	Ghent gender comparison χ^2
Have you heard or seen any messages about PA?				
Yes (total group)	54	41.3	20.9 (***)	
Yes (men/women)	44.7/62.8	39.4/43.3		21.7 (***)
If you had information about PA, where did you get it from?			86.6 (***)	
10,000 Steps Ghent	12.1	0.2		
Men/women	11.9/12.3	0.3/0		4.4 (ns)
Media	30.3	32.8		
Men/women	25.4/34.9	32.7/32.9		5.1 (*)
Health services	11.2	8.4		
Men/women	6.9/15.2	6.0/10.7		10.2 (***)
Have you heard of the project “10,000 Steps Ghent”?				
Yes (total group)	63.2	10.4	384.9 (***)	
Yes (men/ women)	55.2/70.7	10.2/10.7		17 (***)
Are you aware of any of the following activities which are being supported by 10,000 Steps Ghent?				
Sale of pedometers (yes)	32.9	0.5	240.6 (***)	
Men/women	25.1/40.2	0/0.9		17 (***)
Loan of pedometer boxes (yes)	12.4	0.2	81.1 (***)	
Men/women	9.4/15.2	0.3/0		5.2 (*)
Walk circuits in local town-parks (yes)	6.5	0	42.7 (***)	
Men/women	4.1/8.8	0/0		6 (*)
Have you used a pedometer in the last 10 months?				
Yes (total group)	13.9	9.5	6.2 (*)	
Yes (men/women)	10/17.6	8.0/11.0		7.9 (**)
If you used a pedometer, where did you get it?			11.1 (ns)	
Bought at 10,000 Steps point of sales	2.0	0.3		
Borrowed at 10,000 Steps	1.2	0.3		
Elsewhere	10.7	8.9		

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

ns, not significant ($p > 0.05$); PA, physical activity.

Separate within-group changes were significant in Ghent for vigorous physical activity ($F=1.6$, $p=0.029$) and there was a trend of significance for moderate physical activity ($F=1.4$, $p=0.058$). In Aalst, transport-related physical activity decreased significantly ($F=6.3$, $p=0.012$). In the group that only completed the IPAQ, intervention effects were significant for walking and work-related physical activity (see Table 3). Within-group changes revealed that work-related physical activity increased significantly in Ghent ($F=6.8$, $p=0.010$) and decreased significantly in Aalst ($F=11.5$, $p=0.001$).

In participants, who did not reach the 10,000 steps/day target at baseline (at-risk group), there was an increase of 1586 steps/day in Ghent (+23%), compared with 749 steps/day (+11%) in Aalst ($F_{\text{time} \times \text{community} \times \text{group (at risk/not at risk)}}=1.1$, $p=0.285$). Intervention effects were also significant for reported vigorous physical activity and work-related physical activity (see Table 4).

Awareness of the 10,000 Steps Project

In 2006, 54% of the Ghent sample and 41% of the Aalst sample reported hearing or seeing information about physical activity promotion (Table 5). In Ghent, about 12% voluntarily indicated 10,000 Steps Ghent as the

source of their information, while in Aalst only one person answered 10,000 Steps Ghent. Almost two thirds (63%) of the Ghent respondents confirmed having heard of the project, compared with 10% in Aalst. The most commonly cited sources of information about the project were the print media, local TV, and street signs. In Ghent, more than 32% of respondents were aware of the sale of pedometers and about 12% of the loan system, but only 7% were aware of the walking circuits. About 14% of the Ghent sample reported using a pedometer in the last 10 months, compared with 10% in Aalst. In Ghent, 2% purchased a pedometer through one of the project's points of sale, and 1% borrowed one from the loan system. In the Ghent sample, significantly more women than men answered positively to most of the awareness questions (see Table 5).

Discussion

These findings demonstrate that the 10,000 Steps Ghent project was successful in increasing physical activity levels and reaching the population in the intervention community. Evidence of this positive impact was the significant increase in both pedometer-determined physical activity and self-reported physical

activity from the IPAQ, as well as high project awareness in the intervention sample. The average increase of 896 steps/day was commensurate with a 9% increase from baseline steps/day in Ghent. This finding, together with the increase of 8% in the number of individuals who reached the 10,000 steps standard, is noteworthy on a population level. Even though effect sizes were relatively small (0.15–0.33), they are considerable for a whole-community intervention. Importantly, effect sizes for the pedometer data did not differ between the total study sample and the at-risk group, indicating that the intervention reached many who were deemed at risk at baseline. Surprisingly, the intervention was effective for total physical activity and not only for walking, as hypothesized.

Few other studies have examined the effect of multistrategy population-level interventions on physical activity behaviors.^{11–13,24,25} In general, increases in physical activity have been reported among motivated subgroups of volunteers who register for intervention studies, but few of these have reported increases in physical activity on a community level. In contrast, in this study, there were significant increases in physical activity in randomly recruited community residents, as well as in those who were not initially meeting guidelines for physical activity. Self-reports revealed that the at-risk group increased their physical activity mostly at work, which suggests that the workplace might be an appropriate setting to reach this group.

The Australian 10,000 Steps Rockhampton project was the first whole-community multistrategy intervention to promote the 10,000 steps/day concept. Based on self-reported physical activity data from interview surveys, the main outcome of the Rockhampton project was that the downward trend in the percentage of citizens categorized as active (–6%) in the comparison community for the current study was not evident in Rockhampton (+1%). In contrast, in Ghent, there was a much greater increase (8%) in physical activity, as measured by objective pedometer data, and a much smaller decline in the comparison community of Aalst (–2%).

However, in Rockhampton (population 60,000), which is considerably smaller than Ghent (population 228,000), almost 95% of all respondents had heard of the project, compared with 63% in Ghent. This probably reflects the greater emphasis on social marketing in the Rockhampton project.⁶ Interestingly, in both countries, women showed a greater awareness of the project strategies than men, and in Rockhampton there were significant increases in physical activity in women but not in men. This gender difference was not apparent in Ghent.

In Australia, 34% of the comparison community had heard of the project, compared with only 10% in the present study. Once again, this may reflect the greater emphasis on social marketing in the Australian project,

with TV reports being picked up in both the comparison and intervention Australian communities. Apparently, the Aalst residents were less likely to have been exposed to the social and environmental intervention strategies, despite the close distance between present communities.

Even though Aalst (population 77,000) is the second largest city in East Flanders after Ghent, there is a reasonable difference in the size of these two communities. In terms of demographic variables however, respondents from each community were comparable, except that the proportion of employed participants was higher in Ghent at follow-up. Although this may have influenced pedometer-determined physical activity, the evidence is somewhat ambiguous.^{22,26} Baseline step-count levels in both communities were also comparable, and relatively high compared with American samples (6000–6800 steps/day),²² but lower than those reported in the UK (11,300 steps/day).²⁷ The present sample included more highly educated people than the total Belgian population (43%) (www.iph.fgov.be); this can be a potential source of bias. Furthermore, the intervention sample was slightly but significantly older than the general Ghent population. This is important because pedometer-determined physical activity is negatively associated with increasing age.^{17,28}

The strengths of this study include the random recruitment of participants, intervention in a real-life setting, use of objective step data, and relatively small loss to follow-up. The main limitation of the study is that only short-term effects are described. Additionally, it is important to note that awareness may have been influenced by study participation; this would however have been true for both the Ghent and Aalst samples. Moreover, the awareness questionnaire reported only on descriptive items, so that further theoretic implications of the effect of the specific ecologic components on behavior could not be made.

Conclusion

The preliminary results of this pilot study for Europe are promising. The 10,000 Steps Ghent project is the first pedometer-based intervention to show an increase in physical activity levels at the whole-community level, supporting the implementation of multistrategy intervention programs in whole communities. Consequently, the intervention will be continued in Ghent and will now be implemented in other parts of Flanders, Belgium, and possibly in other European cities.

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