Effectiveness of the 2006 Commonwealth Games 10,000 Steps Walking Challenge

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ABSTRACT

HARVEY, J. T., R. M. EIME, and W. R. PAYNE. Effectiveness of the 2006 Commonwealth Games 10,000 Steps Walking Challenge. *Med. Sci. Sports Exerc.*, Vol. 41, No. 8, pp. 1673 1680, 2009. **Introduction**: There is little evidence supporting sustainability of public health interventions based upon the 10,000 steps concept conducted in "real-world" settings. This study investigated the effectiveness of the 10,000 Steps Walking Challenge, initiated in conjunction with the 2006 Commonwealth Games in Melbourne, Australia, in March 2006. **Methods**: This study analyzed characteristics of registrants (n 1836), pedometer counts logged onto a Web site between February 2006 and February 2007 (n 18,032 entries by 914 participants), and two surveys of participants in June 2006 (n 128) and December 2006 (n 62). **Results**: The program reached its target population of females aged 30 49 yr (40.2% of participants), a group known to have low activity levels, which also has potential to influence the behavior of family, friends, and workmates. Compliance was poor; only 49.8% of registrants ever logged steps, and of these, only 45.5% continued beyond the period of the challenge and 16.6% for more than 1 month. Mean (9527 ± 297, 95% confidence interval) and median (9638) recorded steps per day came close to the target of 10,000 steps; 80.1% of participants reached 10,000 steps at least once and 21.9% did so every time they logged steps. For survey respondents who provided complete data (n 53), the mean estimated daily steps increased significantly ($P < 0.001$) from 6401 ± 884 steps before the program to 9921 ± 1039 steps at the first survey and then fell back significantly (P 0.026) to 8727 ± 1284 steps at the second survey but remained significantly higher than the baseline figure ($P < 0.001$). **Conclusion**: The program had immediate effectiveness and was sustainable for a small proportion of participants, but effectiveness was limited by problems with long-term motivation and compliance/adherence. **Key Words:** PEDOMETER, STEP COUNTS, HEALTH PROMOTION, WOMEN, PHYSICAL ACTIVITY

The use of pedometers to measure daily step counts has been shown to be a valid means of assessing physical activity (31). From a public health perspective, walking 10,000 steps per day is an established health promotion strategy and is equivalent to walking 6–8 km. Tudor-Locke and Bassett (30) concluded, based on both cross-sectional and longitudinal studies, that there is "a fair degree of similarity between the 10,000 steps per day recommendation and the current US public health guidelines, if walking is the principal activity mode." People who accumulate 10,000 steps per day tend to have less body fat (29) and lower blood pressure (15) than less active individuals. Women with a history of hypertension or diabetes have been reported to have decreased blood pressure or resting blood glucose levels, respectively, as a result of accumulating 10,000 steps per day (21,27). From a population health perspective, a population-wide intervention based on the 10,000 steps concept has been shown to arrest a general downward trend in physical activity participation, and women were shown to be "early adopters" of this strategy (3). However, there is little evidence to support the sustainability of public health interventions based upon the 10,000 steps concept conducted in "real-world" settings as opposed to tightly controlled studies on the efficacy of the 10,000 steps strategy (30). The need to examine the effectiveness of "real-world" public health interventions has been strongly advocated by public health agencies such as the Centers for Disease Control and Prevention (10) and authors such as Glasgow et al. (14). The need for "real-world" or effectiveness trials recognizes the limited capacity to directly translate the findings of efficacy trials, which are generally conducted in well-controlled, standardized settings by well-resourced staff with little emphasis on sustainability, to the "real world" (14). Effectiveness trials are characterized by randomized time series or quasi-experimental designs where there is a focus upon sustainability within particular settings. The results of effectiveness trials are often able to be implemented by staff with varying capacities in a range of settings (14). The results from such effectiveness trials will enable "real-world" evidence to be used to improve decision making in the primary prevention of chronic disease (5).

This study sought to investigate the effectiveness of a "real-world" 10,000 steps program linked to a major sporting event, concerning both the immediate effects on the

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level of walking undertaken by participants and the extent to which changes were sustained over a longer term.

METHODOLOGY

The 2006 Melbourne Commonwealth Games 10,000 Steps Walking Challenge, in the Australian state of Victoria, was designed by the Victorian Health Promotion Foundation (VicHealth) to encourage and facilitate walking as a health promotion strategy. The challenge was aimed at bringing about changes in awareness, beliefs, and activity levels of the participants. The challenge took place during March 15–26, 2006, in conjunction with the Commonwealth Games. VicHealth engaged a commercial organization with relevant prior experience to manage the challenge and a subsequent ongoing walking program and to market an associated kit, which included a pedometer (Model Y-2012 manufactured by Yingzhijian Technology Manufactory Limited, Shenzhen, China) and instructions regarding how to participate by logging steps on the dedicated Web site. The authors were engaged by VicHealth to evaluate the challenge and the program; however, they did not have any input into the design of the challenge or the program. The challenge and the program were promoted in major daily newspapers, on selected radio stations, and on a mobile billboard at Commonwealth Games venues. Images of women in the 30- to 49-yr age group featured prominently in promotional material, the rationale being that women in this group are likely to be concerned with general health and wellbeing, open to walking as a strategy for increasing their daily level of physical activity, influential on their immediate family in lifestyle habits, and most likely to participate in walking as a social activity. Although the challenge and the program used these strategies, they were not established to test given theories or constructs. In this sense, the evaluation of the challenge and the program was an observational study or "natural experiment."

Participants were required to register and log their daily step counts on a dedicated Web site. During the 12-d challenge period, participants were eligible for daily prize draws (footwear vouchers) and a major prize draw (a holiday package valued at $A 7000). Sales of the pedometer kits continued until June 2006, and the program (i.e., the logging of pedometer counts on the Web site) continued indefinitely, with pedometer purchasers receiving small incentive prizes (printed T-shirts, caps, and badges) for milestones such as one million steps. Participants registering at a promotional booth located in the Commonwealth Games precinct who already had access to a pedometer were permitted to join in the challenge and the program without purchasing a pedometer kit but were not eligible for the incentive prizes in the ongoing program.

Data from three sources are considered in this article: 1) characteristics of all registrants, 2) pedometer counts logged onto the Web site during the study period, and 3) data collected in two Web-based surveys of those who consented at the time of registration to being surveyed.

Registrants supplied an e-mail address, which became their logon identification. Gender, age, and residential postcode were also requested (but not mandated). The pedometer ownership status of registrants was also recorded. At subsequent logons, participants could enter one or more dates and corresponding pedometer counts. A cumulative total step count was displayed, along with a complete history of individual dates and counts, which could be edited to correct errors at any time.

The first survey of consenting participants took place 3 months after the Commonwealth Games and the challenge, and the second survey 6 months later. Children (under 18 yr) were excluded from the surveys, both because the program was targeted primarily at adults and because the survey procedure involved direct e-mail contact with individuals, which precluded the obtaining of parental consent. Furthermore, because it was not mandatory for participants to declare their age when registering on the 10,000 steps Web site, any participants whose age was not known were also excluded from the surveys.

Both surveys included questions about the outcomes desired by VicHealth and a series of questions including a range of demographic and behavioral variables, which were included as potential explanatory variables. Therefore, the questions sought to elicit information regarding the types of walking activities, barriers/discouragements and motivators/enablers, estimated levels of walking (average steps per day) and of physical activity in general (frequency of seven categories of physical activity), perceptions of difficulty and self-efficacy (19), stages of change (19,25), influences on participants and by participants on others, and quality of life (22). The first survey also collected demographic data, including education, employment status, occupation, and languages spoken, and included questions about information sources, reasons for joining the program, and program processes.

With regard to types of walking activities and estimated levels of walking and of physical activity in general, respondents were asked for information about the week before the survey and, in the case of the first survey, also for retrospective baseline information regarding a typical week before joining the program.

The study was approved by the University of Ballarat Human Research Ethics Committee. The survey Web site included a plain-language information statement. Informed consent was implied by completion of the on-line survey.

Analysis

For the pedometer data, several key measures were derived, including total steps logged, total duration of logging, and average steps per day. Breakdowns of each of these by participant characteristics including gender, age, location, and pedometer ownership were conducted using one-factor ANOVA.

Longitudinal analyses of the data from the two surveys were undertaken, and where possible, the retrospective pre-program baseline data were also incorporated. Quantitative and ordinal measures were analyzed using paired *t*-tests and Wilcoxon signed rank tests, respectively. Categorical items were analyzed using the McNemar–Bowker chi-square tests.

RESULTS

Validation of data. Of the 1836 registered participants, 961 (52.3%) logged counts on the 10,000 Steps Web site on at least one occasion during the 13-month period from February 1, 2006 to February 28, 2007. A total of 18,580 counts logged during this period were analyzed.

Because participants' registration dates were not recorded on the Web site, for the purposes of the study, the first date for which steps were logged was taken as the commencement date for each participant. Most participants on most occasions logged their steps for 1 d at a time. However, some entries pertained to longer periods, from 2 d up to 3 months.

Entries with invalid or dubious dates were either excluded (61 or 0.3%) or adjusted if the sequence of logging dates provided sufficient information to enable correction of the error (149 or 0.8%). All average daily counts less than 1000 or greater than 20,000 and all individual daily counts less than 1000 or greater than 30,000 were checked for validity to the extent that it was possible to do so. Notes accompanying some of the counts below 1000 suggested that many of those toward the higher end of the range were explicable in terms of either illness or injury; in light of this, 301 counts (1.6%), below 500 were excluded. In the absence of sufficient information to delineate an objective upper cutoff, in accordance with a recommendation of Tudor-Locke et al. (30), 186 counts (1.0%) above the 99th percentile (33,900) were excluded.

It was also noted that 1668 recorded counts (9.0%) were multiples of 100, and 817 (4.4%) were multiples of 1000; these proportions greatly exceeded the expected chance rates of 186 (1%) and 19 (0.1%), respectively. Most of these entries were made by a relatively small number of participants who consistently entered rounded figures. Although the possibility of fabricated counts cannot be excluded, it is considered more likely that these participants chose to round off the exact values when logging counts on the Web site. Some of the notes accompanying more isolated rounded counts indicated that the counts were estimates made when participants forgot to wear their pedometer, had trouble with the pedometer, or lost the exact count before it was logged. In light of this information and considering that most of the rounded counts were within feasible bounds, they were not excluded from the analyses.

After the data validation process, 914 participants (95.1% of all those who logged counts; 49.8% of registrants) had logged count data regarded as valid; these were regarded as "active participants." The total number of validated step counts was 18,032.

Participant characteristics. The reported mean age of responding active participants (n = 757) was 39.4 yr (SD = 13.8); respondents to the first survey (462 consenting and eligible participants; 128 responses; response rate = 27.7%) had a mean age of 44.7 yr (SD = 10.9). Females made up 79.3% of active participants and 81.1% of survey respondents; 45.3% of active participants and 58.6% of survey respondents were from the target population of women in the 30- to 49-yr age group. Survey respondents were predominantly from high socioeconomic groups, with professional, paraprofessional, managerial, or white-collar occupations (63.7%) and university or technical and further education qualifications (72.4%). Culturally and linguistically diverse groups were underrepresented, with 8.7% of respondents being from households where languages other than English were spoken, compared with 24.7% of Victorians (Australian Bureau of Statistics, 2007). Notably, only 95 survey respondents (74%) were active participants; the remaining 26% had never logged steps on the Web site. Of the 128 who participated in the first survey, 62 responded to the second survey (response rate = 48.4%).

Levels of walking activity. Over three quarters of active participants (80.1%) reached the 10,000 steps target on at least one occasion. Almost a quarter (21.9%) reached it every day for which they logged steps. The percentage of days for which more than 10,000 steps were recorded by individual participants ranged from 0% to 100%, with a mean of 48.6%.

The mean daily pedometer step count for all active participants (mean ± 95% CI) was 9527 ± 297 (n = 914; Fig. 1), and the median was 9638. Survey respondents also estimated their average daily step count before commencement in the program (baseline) and in the week before each survey (Fig. 1). For respondents who provided all three estimates (n = 53), the mean increased significantly ($P < 0.001$) from 6401 ± 884 steps before the program to 9921 ± 1039 steps at the time of the first survey and then fell back significantly (P = 0.026) to 8727 ± 1284 steps at the

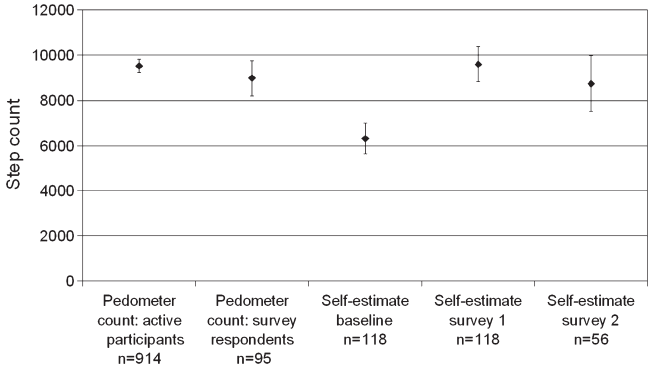

FIGURE 1 Daily step counts: means and 95% CI.

time of the second survey but remained significantly higher than the baseline figure ($P < 0.001$). Figure 1 also shows that mean daily pedometer counts for respondents to the first survey (8973 ± 772; $n = 95$) were consistent with the survey results, lying between the first and second survey estimates.

The pedometer data showed a small positive correlation ($r = 0.10$, $P < 0.001$) between daily step counts and time elapsed since commencement, indicating a weak general tendency for daily step counts to increase over time.

Adherence and compliance. Compliance with the logging of daily step counts was not sustained by most participants. Analysis of the sequences of logged pedometer counts showed that of the 914 participants who logged counts, 21.2% did so only once, 27.1% for up to a week, and 35.0% for up to a month. Only 16.6%, or 8.3% of all registered participants, logged steps for more than 1 month.

From another perspective, most commencements (88.2%) were in March 2006, only 45.5% continued to log steps after the Commonwealth Games finished on March 26, and most discontinuations (83.2%) occurred in March and April 2006. Clearly, most logging took place during the challenge; after the Commonwealth Games, logging activity diminished rapidly. Only 16.6% continued for logging steps for more than 1 month. By February 2007, only 15 participants (1.6%) continued to log step counts. None of the respondents to the second survey were still logging their steps at the time of the survey.

Participants who purchased a pedometer pack logged data for significantly longer periods than those who already owned a pedometer (purchasers: median = 12 d, mean = 38.3 d; owners: median = 6 d, mean = 19.6 d; $F = 12.97$, $P < 0.001$). Participants who took part in the challenge tended to log their steps for longer period than those who commenced later, but this difference was not statistically significant.

Attitudes and behaviors. The factors most frequently reported in the first survey as having the greatest positive influence on participation in the walking program (motivators and facilitators) were perceived fitness (81.3%), health benefits (80.3%), good weather (55.2%), and weight loss (51.6%). Issues of convenience, amenity, and safety, although not as important, were reported as having at least some positive influence by a majority of respondents. The factors least commonly reported as having a positive influence were encouragement from friends/workmates and encouragement from family.

The factors most frequently reported as having the greatest negative influence (barriers) were wet weather (52.4%), work commitments (35.4%), lack of time (32.0%), and family commitments (23.8%). Among the factors least commonly reported as having a large negative influence were lack of encouragement from friends/workmates, lack of encouragement from family, and lack of walking companions. Only small proportions of respondents reported issues of convenience, amenity, and safety as significant barriers to walking.

Large proportions of active participants (77.7%) and survey respondents (80.9%) already owned a pedometer, and many survey respondents reported "moderate" or higher levels of physical activity in general (64.0%), and of walking activity in particular (29.7% in "somewhat active" or higher categories (30)), before commencing the program. These results indicate that a majority of participants already had some commitment to walking and monitoring their activity levels.

Over a third of survey respondents (35.0%) reported influencing family members, friends, and workmates to increase their levels of walking activity. The total numbers influenced by all 914 active participants were estimated (self-report) as 1657 friends and workmates and 578 family members.

In both surveys, respondents reported a high level of self-efficacy concerning confidence in being able to maintain their walking schedule under five adverse circumstances: tiredness, bad mood, time pressure, holidays, and rain. In all circumstances except rain, a majority of respondents expressed at least moderate confidence. There were no significant changes between the first and the second surveys in these indicators. Just over half of the respondents thought it likely that they would achieve one million steps. A majority of respondents attached little or no importance to the incentive prizes on offer. The great majority of survey respondents were satisfied with most aspects of their quality of life, as measured by the World Health Organization Quality of Life-BREF Questionnaire (17). Mean scores for the 26 items (on various five-point scales: 1 = low to 5 = high satisfaction) ranged from 3.6 to 4.6, with no significant changes between the two surveys.

Figure 2 shows five stages of change in walking activity (14) and relates them to the stages of change according to the transtheoretical model developed by Prochaska and Velicer (25). Before the program, a wide range of stages of change were reported by survey respondents, with 21.7% in the contemplative stage, 31.7% in the preparation stage, and 26.7% in the action stage. Because of the specific nature of the change process in this context, 18.3% of participants who were "walking deliberately at least weekly" were

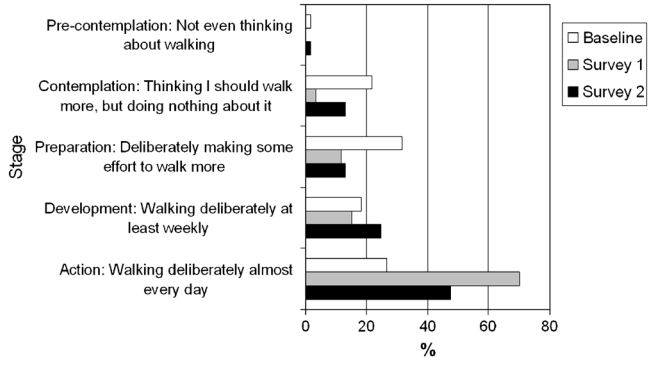

FIGURE 2 Stages of change.

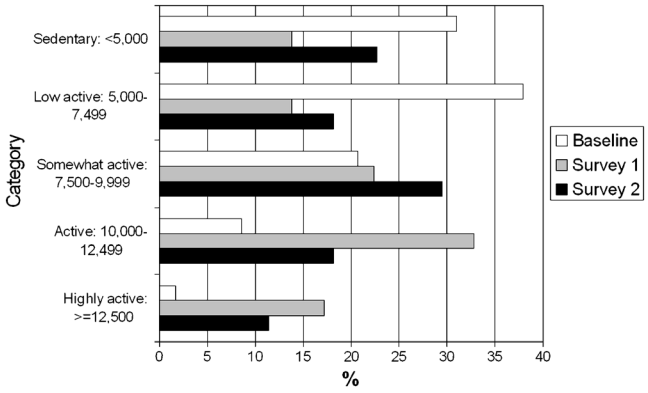

FIGURE 3 Activity categories.

considered to fall into an intermediate stage between the preparation and the action stages of the transtheoretical model. These participants have been categorized as being in a "development" stage. At the time of the first survey, the profile of responses differed to a statistically significant degree ($P < 0.001$), with the corresponding percentages being 3.3% (contemplation), 11.7% (preparation), 15.0% (development), and 70.0% (action). These changes were reversed to some degree in the second survey, although the change was not statistically significant ($P = 0.061$), the resulting profile was not significantly different from the baseline profile ($P = 0.075$).

Nevertheless, the second survey was completed 9 months after the program was initiated, and therefore the 27.1% of respondents who reported that that they were walking almost every day and had not been doing so at baseline had achieved a sufficient level of physical activity for a health benefit and are likely to have entered the "maintenance" stage of behavior change (sustained behavior for more than 6 months).

Figure 3 shows profiles based on the activity categories proposed by Tudor-Locke and Bassett (30). The proportion reportedly achieving the 10,000 steps target increased from 10.3% before the program to 50.0% at the time of the first survey, and the proportion in the sedentary category decreased from 31.0% to 13.8% ($P < 0.001$). The trend was reversed in the second survey (proportions of 29.5% and 22.7%, respectively), and although the change in proportions was not statistically significant ($P = 0.225$), the resulting profile was not significantly different from the baseline profile ($P = 0.120$).

DISCUSSION

This study examined the effectiveness of a mass participation 10,000 steps walking challenge associated with a major international sporting event and a subsequent ongoing daily walking program. The challenge attracted 1836 registered participants, 961 of whom logged their step counts on at least one occasion. After data validation, 914 participants were counted as "active participants." At a fundamental level, the challenge was successful because 80.1% of the active participants reported reaching the 10,000 steps target on at least one occasion, and the mean daily pedometer step count was 9527 ± 152 steps. However, because many survey respondents reported moderate or higher levels of walking (29.7%) before commencing the program, these data may overstate the effectiveness of the challenge. Although the survey data indicated that many individuals significantly increased their level of walking, logging of daily step counts was not sustained by most participants, with only 16.6% (or 8.3% of all registered participants) logging steps for more than 1 month. Further, 875 of the registrants failed to log any step counts. It is not possible to determine the reason for this or whether the challenge had any impact upon the walking habits of this group. It is apparent, however, that the use of Web-based data logging as a strategy to promote walking was of limited value and needs to be reviewed for such community interventions or for this target group (females aged 30–49 yr).

A more critical measure of effectiveness is the proportion of active participants who reported a transition from walking less than the target of 10,000 steps per day to achieving or exceeding the target and thereby being likely to meet the recommended level of physical activity to achieve a health benefit (30). Using the activity classifications of Tudor-Locke and Bassett (30), the proportion of respondents who achieved the target of 10,000 steps per day increased from 10.3% at baseline to 50.0% at 3 months and 29.5% at 9 months.

This overall evidence of change is supported by the data related to the transtheoretical model (25). There was a clear movement by the survey respondents toward more active stages. The inclusion of a development phase (between preparation and action) reflects the fact that many participants moved in an incremental or developmental manner from preparation to the action stage where they were walking to a level sufficient to incur a health benefit (25). Further, given the potential health benefits associated in transferring individuals from the sedentary category into at least one of the active categories (18), it is important to note that the proportion of individuals in the precontemplation, contemplation, and preparation phases decreased from 55.0% at baseline to 15.0% at 3 months and 27.9% at 9 months. The reduced level of change observed at 9 months relative to 3 months postregistration is a noteworthy indicator of the sustainability of the change induced by such programs.

An analysis of the strategies used in the challenge revealed that it used a targeted approach (17) based upon elements of social marketing and social cognitive theory (1). The media campaign included key social marketing concepts of market segmentation (women aged 30–49 yr); market research (suggesting women aged 30–49 were likely to be attracted to the challenge); use of product, price, promotion, and placement (distribution) tactics to encourage

registration and pedometer purchase; and pretesting and ongoing evaluation of the campaign strategies (20). Strategies based on social cognitive theory included the promotion of goal setting (target of 10,000 steps) and the use of a rewards program. However, the Internet was used only as a data logging mechanism; no advantage was taken of its capacity to be used for promotion of motivational readiness, self-efficacy, and decisional balance or to promote the process of change via consciousness raising, helping relationships or reinforcement management (23). The lack of motivational support delivered via the Web site was commented upon negatively by survey participants. In contrast, a similar program that incorporated daily reminder and motivational e-mails achieved much higher adherence rates, with 75.2% of participants completing an 8-wk program (32), compared with 16.6% of challenge commencers or 8.3% of all registered participants logging steps for more than 1 month. However, this difference may be partly attributable to other factors, including the recruitment of participants from a single large health industry employer, the underwriting of costs by the employer, and an incentive prize for completion of the fixed-length program.

The largest proportion of those who responded to the challenge was comprised of women (79.3%) in the target age group of 30–49 yr (45.3%). This finding is consistent with results suggesting that men are likely to be late adopters of walking-focused interventions (3) and that they prefer other forms of physical activity than walking (4,11). It was also apparent that participants in the challenge were largely drawn from higher socioeconomic strata, with occupations in the manager/administrator or professional/paraprofessional classifications and with university or technical and further education qualifications. These data indicate that the population health impact of promotions such as the challenge is likely to be limited because only a small proportion of the participants were from population groups at a high risk of a sedentary lifestyle: those with low levels of education and those from lower socioeconomic strata and men (28,33).

Although the demographic focus of the challenge was limited, the participants reported positive influences on the walking activity of 1657 friends and workmates and 578 family members (or 2.44 people per participant). This is a key finding, and further studies are warranted to explore the potential long-term impact of program members acting as facilitators or "champions" for behavior change. The likely positive impact of this finding is supported by the findings of many studies which have reported that social support from friends/peers and spouse/family has a strong positive influence upon the physical activity habits of adults (13,28).

As expected in a group of self-nominated individuals, a high level of self-efficacy was reported regarding maintenance of their walking schedule under adverse conditions. Further, the great majority were satisfied with most aspects of their quality of life. Given these characteristics, it is not surprising that these measures were not significantly affected by participation in the program. Importantly, and consistent with the high level of self-efficacy reported, the participants reported they either were not affected or were minimally affected by social factors such as encouragement by friends/workmates and family or environmental factors such as convenience, amenity, and safety. The barriers to participation tended to relate to bad weather, work and family commitments, and lack of time. Therefore, the picture that emerges is that the participants in the challenge were largely well-educated, professionally successful women who were self-motivated, self-confident, and independent. They were not overly influenced by social or environmental factors but were potentially negatively affected by competing demands. These results suggest that despite the abundance of literature indicating the importance of social and environmental factors in promoting physical activity (2,6,16,34), these factors may not be particularly relevant or important to individuals who possess high levels of confidence.

The participants also reported that they were not strongly influenced by the incentive prizes. However, they did place great value upon the likely short- and long-term outcomes they associated with walking, such as fitness, weight loss, and health benefits. These findings reinforce the influence of the social cognitive theory in relation to learning by observing the behavior of others and rewards received for different patterns of behavior and the capacity to anticipate and place value on the outcome of different behavior patterns (1).

The characteristics of the Commonwealth Games walking challenge and the methods and findings of our study can be compared and contrasted with those of another recent intervention aimed at promoting walking—Canada on the Move (COTM) (12) and associated studies (7,9,24,26). Common features of both programs were the distribution of pedometers and the use of a Web site for logging of pedometer counts and conduct of surveys (12). However, whereas the challenge was a relatively small and localized state-funded program associated with a specific short-duration high-profile sporting event, COTM was a nationally funded intervention with a longer timeframe and a much broader target population. Notwithstanding these differences, COTM survey respondents had similar gender, age, and educational profiles (24) to those of challenge participants and survey respondents. Our analyses of the impacts of the program on physical activity were based on reported and recorded step counts and responses to questions regarding stages of change; however, although step counts were collected on the COTM Web site (24), analyses of physical activity published to date (7,9,26) were based on the generic short form International Physical Activity Questionnaire (8) rather than on step counts, which makes comparisons difficult. It is noted that in the challenge, where the ongoing logging of steps was the central focus, 78.8% of participants visited the Web site more than once, whereas for COTM, where the logging of steps was perhaps

a more peripheral issue, the corresponding figure was 14.7% (24).

Limitations of the study. Self-reporting of pedometer data was unmediated and unsupervised, with inherent risk of bias. Further, there was no quality control concerning pedometers throughout the program. Many participants reported pedometer problems, and most used their own pedometers, presumably of various brands and qualities. Pedometer data quality was also limited by the lack of validation of dates or counts on entry.

Self-selection operated at three stages in the survey process: consent to being surveyed, completion of the first survey, and completion of the second survey. Notwithstanding this, there was no evidence of bias; the demographic profiles and the average logged daily pedometer counts did not differ significantly from those of nonparticipants. However, both surveys occurred long after most participants had ceased logging their step counts. At the time of the second survey, none of the respondents were still logging their steps, and the respondent group also included registrants who had never logged their steps.

Detection of changes in response to an intervention ideally involves the collection of baseline data before the intervention. That is not feasible with interventions such as this, where the participants are identified and recruited only at the point when the intervention begins and where the measurement of activity is a central feature of the intervention. To the extent that it was considered valid and feasible, some retrospective questions regarding awareness, beliefs, stages of change, and activity levels before commencing the program were included in the first survey. However, the accuracy and the validity of the responses to these questions may be limited as the first survey took place almost 3 months after the Commonwealth Games, when the great majority of participants had commenced the program.

An additional feature of COTM not present in our study was the incorporation of questions regarding COTM in a general population survey, the Canadian Physical Activity Monitor, which enabled investigation of relationships between awareness of COTM, pedometer ownership, pedometer use, and level of physical activity (7,9). Because our study was limited to registered challenge participants, all of whom were of course aware of the program and all of whom owned pedometers, such investigations were precluded.

CONCLUSIONS

The 2006 Commonwealth Games 10,000 Steps Walking Challenge and the associated ongoing walking program effectively promoted moderate to high levels of daily walking activity in the short term for those who actively participated. The program reached its target population of females aged 30–49 yr. Survey respondents perceived health and fitness benefits from the program and reported substantial influence on the walking activities of family members, friends, and workmates. The study also revealed interesting findings in relation to the high level of confidence and social independence of this cohort largely comprised of young to middle aged, professionally successful, highly educated women.

However, the overall effectiveness of the program as a health promotion intervention was limited because many participants were already at least moderately active walkers before commencing the program. Many participants were already aware of the benefits of walking, and the program may have provided a structure within which they could translate awareness into action. There was little evidence that purchasing a kit increased participant physical activity levels. Most active participants already owned their own pedometer and thus had some commitment to monitoring their walking activity. The strategy of encouraging people who did not own a pedometer to purchase one was not successful, and the program had limited impact on the least active segments of the population. Although the program achieved its aim of engaging women, the majority of participants did not display characteristics considered to be most significantly and persistently associated with health inequality, including low education, low occupational status, and unemployment, nor were they culturally and linguistically diverse.

Evidence of changes in participant attitudes and behaviors was limited by the limited extent and retrospective nature of baseline data. However, this is unavoidable in interventions of this type and with this mode of recruitment.

With regard to sustainability, the distinguishing, perhaps unique, feature of this 10,000 steps program was the strategy of linking the program with a high-profile short-duration event and the concentration of resources in recruitment and the 12-d challenge phase. Beyond this phase, the relative lack of communication, encouragement, and support for the continuing program and the absence of ongoing motivators such as team and competitive elements resulted in a general failure to comply with ongoing reporting requirements. The program may have produced sustained benefits for many participants, but evidence of sustainability was limited to the self-reports of a small number of survey respondents and the longer-term logging of step counts by a small minority of participants.

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