Effectiveness of the First Step Program Delivered by Professionals Versus Peers

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Background: To compare the effectiveness of a theory-based lifestyle physical activity (PA) program delivered to individuals with type 2 diabetes in diabetes education centers by professionals and peers. Methods: Changes over 16 weeks in PA (steps/day) and related variables (weight, waist girth, resting heart rate, systolic and diastolic blood pressures) were compared (RMANOVA) for two groups: 157 participants led by 13 different professionals versus 63 participants led by 5 peer leaders. Results: Overall, the 81 male and 139 female participants (age = 55.7 ± 7.3 years, BMI = 35.2 ± 6.6) showed an incremental change of 4,059 ± 3,563 steps/day, which translates into an extra 37 minutes of daily walking (P < .001). Statistically significant improvements were also seen in weight, waist girth, and blood pressure (all P < .001) and resting heart rate (P < .05). There were no significant differences in outcomes between professional and peer-led groups. Conclusions: A theory-based behavior modification program featuring simple feedback and monitoring tools, and with a proven element of flexibility in delivery, can be effective under real-world conditions while addressing inevitable concerns about resource allocation. Program delivery by peer leaders, in particular, could address a potential obstacle to dissemination by helping to alleviate existing high caseload demands on diabetes educators.

Keywords: pedometer, intervention, translation, dissemination

Physical activity (PA) remains one of the hallmark lifestyle factors targeted for intervention when people are diagnosed with type 2 diabetes. Despite this clear treatment focus, the question remains how best to help such individuals make and sustain such challenging behavioral changes, while balancing issues of patient-centered care with concerns for practicality and resource allocation. In response to these concerns, there has been a growing interest in the delivery of “lifestyle-based” programs that offer individuals with type 2 diabetes flexibility in how, when and where they obtain their PA. Two recent meta-analyses (including studies of individuals with type 2 diabetes) have documented the efficacy of pedometer-based programs in terms of increasing walking behaviors and affecting weight loss and blood pressure.1,2

The First Step Program (FSP), originally created by Catrine Tudor-Locke as part of her doctoral training3 is one such pedometer-based intervention. Inspired by the work of Yamanouchi et al,4 the FSP uses an electronic pedometer to serve as a stimulus for walking and a tool for individual goal-setting, self-monitoring, and feedback.5 Formative evaluation indicated that the FSP appealed both to people with type 2 diabetes and to diabetes educators.6 A preliminary outcome evaluation, followed by a controlled trial, supported the efficacy of the program; on average, participants increased their steps/day by ~3000 (equivalent to 30 min/day).7,8

A detailed description of the program theory underlying the FSP is available elsewhere.5 Briefly, the FSP is
a facilitated behavior modification program built on the framework of social cognitive theory, emphasizing the components of self-efficacy and social support. The FSP is organized into two phases: an initial 4-week adoption phase and a subsequent 12-week adherence phase. During the adoption phase, participants monitor their own walking and attend weekly facilitated group meetings (approximately 1 to 2 hours long) to review the previous week’s walking behaviors, discuss preferred strategies for success, and set personally-relevant and incremental steps/day goals. Each meeting also includes a short group walk. During the adherence phase, participants continue with their self-monitoring and goal-setting, with little direct program contact (ie, limited specifically to contact necessary to schedule assessment appointments).

In all previous studies, the FSP has been delivered to individuals with type 2 diabetes (Participants) by members of the research team and their associates, within a research setting. As part of the on-going development of a practical program, we recognized that it was necessary to evaluate program effectiveness under real-world conditions, that is, delivery through existing diabetes education centers by diabetes educators (Professionals). We also examined the effectiveness of FSP delivery by peer leaders (Peers), to investigate the potential for using this delivery mode as a way to increase program feasibility and sustainability.

Research Design and Methods

Overview

We undertook a quasi-experimental design (ie, intervention without randomization) to evaluate effectiveness by delivery mode (ie, Professionals vs. Peers) under real world conditions.

Professional FSP Leaders

A letter of information and invitation to participate was circulated to diabetes education centers throughout Canada via the Canadian Diabetes Association network, and specifically to Aboriginal groups via contacts in the National Indian & Inuit Community Health Representatives Organization.

Diabetes education centers were asked to send a “front-line” Professional staff member to a two-day FSP Leader training workshop, as well as to provide an in-time contribution and support for program delivery and collection of evaluation data. Diabetes education centers were given some financial compensation ($1,500 to $2,000) for staff involvement.

The Professional FSP Leader training workshop detailed the program background and objectives, discussed participant recruitment strategies, reviewed the weekly curriculum, and provided training and practice in participant assessment and data collection procedures. Professionals also gained experience with facilitation skills specific to increasing PA using pedometers (Yamax SW-200, Tokyo, Japan). Other resource materials such as overhead transparencies and a facilitator checklist detailing critical components of the group meetings were provided to ensure that the FSP would be implemented consistently across various sites.

Nineteen Professionals from 18 diabetes education centers across Canada attended one of four FSP Leader training workshops. The majority (n = 17) were trained in one of two group training events; the two remaining Professionals (both from Aboriginal centers) were trained individually. Before recruitment of FSP Participants (ie, the target population of the program, recruited locally), four diabetes education centers dropped out of the project due to: 1) union regulations related to staff participation in research projects; 2) FSP Leader illness; 3) inability to obtain local ethics approval in a timely manner; and 4) staff turnover of the trained FSP Leader. Although staff turnover occurred in another diabetes education center, an alternative staff member was identified, attended FSP Leader training, and continued with the project.

Ultimately, fourteen Professionals (8 nurse- or dietitian-diabetes educators, 4 diabetes education coordinators, 1 exercise therapist, and 1 community health representative; 13 females and 1 male; 13 White and 1 Asian) implemented and delivered the FSP in their respective centers. Of these, 13 submitted evaluation-related data: one Aboriginal center failed to collect and/or submit data leaving a single Aboriginal center in the final sample. Four diabetes education centers were described as serving urban, 6 as rural, and 3 served both rural and urban geographic areas. All diabetes education centers offered both individual and group diabetes education in English, while two offered French-language programming and one offered programming in a local Aboriginal dialect.

Peer FSP Leaders

Upon completion of the professionally led, 16-week FSP, interested Participants who were successful at increasing their steps/day were nominated by their Professional Leader to attend an FSP Leader training workshop tailored to Peer Leaders. Diabetes education centers sponsoring Peers were asked to provide time and support for the Professional Leader to assist the Peer, especially by recruiting Participants and collecting all evaluation-related data.

Similar in content to the Professional workshop, the Peer Leader training workshop devoted an additional half day to adult learning principles and facilitation skills. Peers were also given the same resource materials (eg, overhead transparencies, checklists) as the Professional Leaders. Nine former FSP participants (5 females, 4 males; all White) from eight diabetes education centers in five provinces attended the workshop held at the data coordinating center (Canadian Center for Activity and Aging in London, Ontario). Travel costs were covered by the project grant.
FSP Intervention
The 16-week FSP was delivered in a standard fashion as outlined previously. Briefly, at the beginning of the 4-week adoption phase, Participants were given pedometers and a program manual containing goal-setting and problem-solving exercises, as well as calendars for self-monitoring and recording steps/day, and encouraged to attend weekly group meetings. The program manual and its implemented curriculum has been published as a self-help book. During the 12 week adherence phase, Participants were asked to independently continue to use their pedometers and calendars.

Data Treatment and Statistical Analyses
All data are presented as mean ± SD (range) unless otherwise stated; a p-value of 0.05 was considered statistically significant. Baseline differences between the two groups (ie, those in the Professional versus Peer-led programs) were examined using independent t tests or chi-squared tests, as appropriate. For continuous variables, a delta (Δ = follow-up–baseline) was constructed. A repeated measures (RM) ANOVA (with delivery mode group as the between-subjects factor and time as the within-subjects factor) was used to assess differences between baseline and follow-up in these continuous variables in the full sample. The analysis (ie, again with delivery mode group as the between-subjects factor and time as the within-subjects factor) was repeated among those Participants who were trained by either Professionals or Peers at matched diabetes education centers to consider potential for clustering effects.

Results
Baseline Characteristics
In total, 347 people with type 2 diabetes were recruited to take part in the screening for the (combined) Professionals and Peer-led programs. Twenty were excluded because they took more than 8,800 steps/day at baseline (mean = 10,749 ± 2,107; range = 8,905 to 18,031 steps/day). Two were excluded due to medical concerns. An additional 30 did not complete baseline measures. Of the 295 eligible individuals, 220 provided a measure of steps/day at the 16 week follow-up, for an attrition rate of 25%. There were no significant differences in baseline characteristics between those who did (n = 220) vs. did not (n = 75) complete the FSP.

Average time since diagnosis of type 2 diabetes for the total sample was 70.4 ± 93.6 (0.25 to 528) months. In addition to diabetes, the most commonly reported health problems were high blood pressure (58.6%), high cholesterol (47.3%), and arthritis (32.3%). Seven percent smoked regularly, 7.5% smoked occasionally, 52.7% were former smokers, and 35.9% had never smoked. Baseline characteristics of all Participants and
grouped by delivery mode, are shown in Table 1. No significant differences were apparent with the exception of weight; Participants led by Professionals were approximately 5 kg heavier ($P = .04$); however, BMI was not significantly different in Participants compared by delivery mode.

### Program Compliance

Checklists indicated consistent implementation of the FSP across delivery mode. Attendance data were available for 200 Participants (of the originally eligible 295 Participants) across both delivery modes. There was no significant difference in total attendance between delivery modes. Sixty-four percent attended all four meetings during the adoption phase, 17% attended three, 9% attended two, 6% attended one meeting, and 4% attended no meetings (but independently participated following at least one face-to-face meeting with a leader and final measurements).

### Program Effectiveness

Pedometer-determined PA, anthropometric measures and cardiovascular measures for the Participants (grouped by delivery mode) at follow-up and the change between follow-up and baseline ($\Delta$) are presented in Table 2. On average, steps/day for all Participants increased by $4,059 \pm 3,563$. Considering all Participants, there was a statistically significant effect of time for all variables measured. There was no significant time by delivery mode interaction. When the analysis was limited to Participants who attended a diabetes education center where they could have received either delivery mode, similar findings were observed with a single exception: there was no effect of time on resting heart rate ($P = .07$).

### Conclusions

The FSP was originally conceived and created after extensive consultation with individuals with type 2 diabetes and their health care providers, particularly diabetes educators, where both groups indicated a need for practical, sustainable, effective programs to help increase PA in this population. Results from the current study provide convincing evidence that the FSP addresses these issues in a real-life setting, specifically diabetes education centers representing diverse geographical and cultural settings. This study highlights the fact that Participants' PA and related health outcome changes were similar when two different groups of interveners, Professionals and Peers, acted as leaders to deliver the program. The implications of these findings are that a theory-based behavior modification program featuring simple feedback and monitoring tools, and with a proven element of flexibility in delivery, can be effective under real-world conditions while addressing inevitable concerns about resource allocation. FSP delivery by Peer leaders, in particular, could address a potential obstacle to program delivery by helping to alleviate existing high workday time demands on diabetes educators, thereby freeing them up to attend to patients and issues that require their unique expertise.

### Table 1  Baseline Characteristics of FSP Participants Who Completed Follow-Up Measures (Including PA, Anthropometric, and Cardiovascular Status)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All participants (n = 220)</th>
<th>Professional-led (n = 157)</th>
<th>Peer-led (n = 63)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>81 M, 139 F</td>
<td>54 M, 103 F</td>
<td>27 M, 36 F</td>
</tr>
<tr>
<td>Age (years)</td>
<td>55.7 ± 7.3; Range 38–71</td>
<td>54.8 ± 7.2; Range 38–70</td>
<td>57.8 ± 7.4; Range 42–71</td>
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<tr>
<td>Treatment n (%)</td>
<td></td>
<td></td>
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<tr>
<td>Diet only</td>
<td>37 (17%)</td>
<td>25 (16%)</td>
<td>12 (19%)</td>
</tr>
<tr>
<td>Oral hypoglycemics</td>
<td>147 (67%)</td>
<td>104 (66%)</td>
<td>43 (68%)</td>
</tr>
<tr>
<td>Insulin</td>
<td>36 (16%)</td>
<td>28 (18%)</td>
<td>8 (13%)</td>
</tr>
<tr>
<td>PA (steps/day)</td>
<td>4,099 ± 2,152; Range 308–8,703</td>
<td>3,980 ± 2,189; Range 308–8,703</td>
<td>4,396 ± 2,045; Range 1,026–8,021</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>165.7 ± 9.9; Range 131.0–203.0</td>
<td>165.6 ± 10.0; Range 142.0–203.0</td>
<td>165.9 ± 9.6; Range 131.0–182.0</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>96.7 ± 20.0; Range 58.6–158.0</td>
<td>98.1 ± 21.3*; Range 62.4–158.0</td>
<td>93.3 ± 16.2*; Range 58.6–130.5</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>35.2 ± 6.6; Range 23.1–58.8</td>
<td>35.7 ± 6.9; Range 23.1–58.8</td>
<td>34.0 ± 5.5; Range 23.8–49.0</td>
</tr>
<tr>
<td>Waist girth (cm)</td>
<td>109.8 ± 14.8; Range 76–150</td>
<td>111.1 ± 15.3; Range 82–150</td>
<td>107.0 ± 13.0; Range 76–130</td>
</tr>
<tr>
<td>Resting HR (bpm)</td>
<td>76.1 ± 12.1; Range 44–112</td>
<td>77.0 ± 11.5; Range 48–112</td>
<td>73.7 ± 13.2; Range 44–108</td>
</tr>
<tr>
<td>Resting Systolic (mmHg)</td>
<td>132.7 ± 15.5; Range 100–186</td>
<td>132.5 ± 16.5; Range 100–186</td>
<td>133.3 ± 13.1; Range 110–160</td>
</tr>
<tr>
<td>Resting Diastolic (mmHg)</td>
<td>79.4 ± 10.0; Range 50–109</td>
<td>79.9 ± 10.0; Range 50–109</td>
<td>78.0 ± 9.8; Range 58–98</td>
</tr>
</tbody>
</table>

Note: Values are mean ± SD unless otherwise indicated. *Significantly different at $P < .05$, (independent $t$ test).
Table 2  Physical Activity, Anthropometric, and Cardiovascular Status at Week 16 and Change from Baseline (Δ = Follow-up to baseline) of FSP Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Professional-led (n = 157)</th>
<th>Peer-led (n = 63)</th>
<th>Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 16</td>
<td>Week 16</td>
<td></td>
</tr>
<tr>
<td>PA (steps/day)**</td>
<td>7,976 ± 4,118 (682 to 23,926)</td>
<td>3,996 ± 3,746 (−4,841 to 20,966)</td>
<td>3,080 ± 2,020 (−1,734 to 20,966)</td>
</tr>
<tr>
<td>Weight (kg)**</td>
<td>96.5 ± 21.1 (62.5 to 148.0)</td>
<td>−1.4 ± 3.3 (−18.0 to 5.9)</td>
<td>91.6 ± 17.2 (53.3 to 130.0)</td>
</tr>
<tr>
<td>Waist girth (cm)**</td>
<td>109.4 ± 15.5 (83.0–146.0)</td>
<td>−1.5 ± 4.3 (−13.0 to 10.0)</td>
<td>105.1 ± 14.2 (74.0 to 136.0)</td>
</tr>
<tr>
<td>Resting HR (bpm)*</td>
<td>75.4 ± 11.6 (52 to 112)</td>
<td>−1.6 ± 11.1 (−28 to 36)</td>
<td>71.3 ± 12.9 (40 to 104)</td>
</tr>
<tr>
<td>Resting Systolic (mmHg)**</td>
<td>128.7 ± 16.3 (94 to 180)</td>
<td>−3.6 ± 15.2 (−60 to 42)</td>
<td>128.7 ± 13.7 (106 to 170)</td>
</tr>
<tr>
<td>Resting Diastolic (mmHg)**</td>
<td>77.2 ± 8.8 (50 to 98)</td>
<td>−2.8 ± 9.3 (−26 to 37)</td>
<td>74.1 ± 10.0 (58 to 100)</td>
</tr>
</tbody>
</table>

Values are means ± SD (range); RMANOVA significant for time. No significant differences between delivery modes. *P < .05, **P < .0001.

Professional diabetes educators were still involved in Participant recruitment and assessment efforts even during the Peer-led programs. These administrative aspects were required parts of the larger research project, however, and would not necessarily be as demanding in day-to-day program delivery. Given that the programs were run through diabetes education centers, this personal involvement may have been important to ensure that the Peer leader was integrated into the center. Beyond serving as a simple point of contact, the Professionals can also mentor the Peer leaders by helping them address other aspects of diabetes management that could arise during weekly sessions. The administrative aspects of recruiting, data collection and reporting that were necessary for this particular research endeavor may not be required for an individual center. Relief from such requirements may further reduce the day-to-day demands of actual program delivery, although on-going training and supervision is recommended to ensure program integrity.

The changes in steps/day that Participants in this study achieved were consistent with our earlier published reports. Participants attending FSP programs that were led by either Professionals or Peers immediately increased their daily walking and sustained this behavior to at least until the end of the adherence phase of the study. Overall, Participants doubled their baseline PA. Since individuals with type 2 diabetes take ≈2,200 steps in 20 minutes of self-paced walking (1), the mean incremental change of 4,059 steps/day between baseline and follow-up for all Participants represents an average increase of approximately 37 minutes of extra walking per day.

Group meetings during the adoption phase were equally well attended by Participants whose programs were led by both types of leaders (based on attendance data from 200 of the originally eligible 295 Participants). This suggests that Participants in both groups were comfortable with the different delivery modes and considered that their leaders had insights that would support them in becoming more physically active.

Participants in the current study took somewhat fewer steps per day during the baseline assessment than those in our previous intervention study (4,099 steps/day vs. 6,011 steps/day) The current study included individuals who managed their diabetes with insulin while our previous studies used this as an exclusion criteria. Another recently published study reported baseline values of @6,700 steps/day in a sample of people with type 2 diabetes who were treated with oral medications only. Since the aim of the current study was to evaluate the FSP under real-world conditions, individuals whose treatment regimen included all common forms of treatment were necessarily included. The 36 individuals who used insulin as part of their diabetes management took significantly fewer steps/day at baseline than the 181 who managed their diabetes in some other way (3,094 ± 1,730 vs. 4,300 ± 2,172, P = .002; note that 3 individuals did not indicate whether they used insulin). It is possible that those using insulin are a group considered by their primary health care providers to have more advanced disease, or disease that is more difficult to manage with the first and second-line treatments of lifestyle and oral hypoglycemic agents. It is also possible that treatment by insulin is a proxy indicator of other age/time-dependent comorbidities (eg, obesity, osteoarthritis, cardiac problems) that independently may limit PA. Such questions are beyond the purview of this study but do beg additional lines of future investigation.

Our baseline sample was also less active (4,099 vs. 6,662 steps/day) and had a higher BMI (35.2 vs. 32.3 kg/m²) than an independent cross-sectional sample of individuals with type 2 diabetes that we studied previously. In fact, we identified at least 5% of the Participants herein took less than 1,000 steps/day at baseline, a
value reflective of extreme sedentarism. Although there is evidence suggesting increased pedometer error with increasing BMI,
we did not observe significant differences in this variable (or weight) between individuals stratified as taking less than or greater than 1,000 steps/day. We decided not to delete these few cases from the analysis since we believe that such extreme values would be naturally expected in a population of individuals with type 2 diabetes who are consistently characterized as sedentary. During the actual intervention, FSP curriculum dictates that Participants practice appropriate pedometer placement and regularly check their pedometer’s accuracy using a simple brief walking test.18

The changes in the PA behaviors measured in this study were comparable to those noted previously7,8,16 and were similar between delivery modes. This underlines the fact that the FSP, and similar programs, is truly a “first step” in helping people achieve one aspect of their treatment, ie, a positive lifestyle change. Sustained increases in PA, along with additional attention to speed of walking,9 appropriate diet modification, and other health behavior change should optimize treatment goals including maximizing health benefits, reducing risk of cardiovascular disease and assisting with glycemic control.

Although the magnitude of the average changes in health outcomes was similar to what has been previously reported, we note that there is wide range in the responses observed. For example, waist girth decreased by 1.5 to 1.7 cm on average, a decrease of 1.5%. However, the range of the change in waist girths was as high as a 16-cm decrease and a 10-cm increase. Mode of program delivery was not associated with a different range of responses. While it is not within the scope of this study to examine the unique characteristics of those individuals who responded differently to the same program, such an exploration is warranted if we are to identify programs that work well for different individuals under different conditions. This question has clear clinical implications for people with type 2 diabetes.

This was a quasi-experimental design lacking both a true control condition and also random allocation procedures. A true control condition was not necessary given the stated purpose of this comparative evaluation. All recruited Participants represented a population of volunteers and none had the option to select their preferred delivery mode, so a selection bias was not likely.

Without a specifically directed effort we did manage to recruit at least 37% male Participants; other research has suggested that when delivered to a more general population, pedometer-based programs are typically more appealing to women.20 Another limitation of this study is that the physical assessments were conducted in different centers across Canada by different diabetes educators. The actual assessments were simple, and most measures were typical of those routinely collected in clinical practice. Diabetes educators received training and opportunity for practice at the leadership workshops in an effort to standardize assessments. The values obtained are within expected ranges for this population. Finally, this study was limited to 16 weeks in duration. Previously we have documented that by 24 weeks, people in the FSP reduce their steps/day to levels that are below their peak values, but still higher than their baseline.8 An important caveat to this observation is that in that study, the people returned their pedometers at the completion of the program (Participants herein kept their pedometers); thus, walking behavior may have decreased because of cessation of available feedback. The issue of sustainability of changes in walking deserves further study. Daily recording of steps/day using calendars appears to be an important form of self-monitoring that may facilitate continued adherence.21 Availability of on-going, regular opportunities for check-ups or “booster sessions,” may also help perpetuate behavior changes. Peer leadership delivery may make this type of extended commitment feasible.

In summary, this study confirms that a practical and simple theory-based daily PA program is effective and can be successfully delivered in diabetes education centers across Canada. The increases in walking behaviors achieved by people with type 2 diabetes were similar when the program was delivered by either health care professionals or peer leaders. Standardized training of both groups of leaders along with well-developed program support materials likely contributed to the consistency of delivery, and also to the consistency of responses. Such flexibility in program delivery mode could ease resource allocation in busy diabetes education centers striving to assist patients with cornerstone elements of a well-rounded treatment plan for type 2 diabetes. Future lines of research include: 1) assessing methods of sustaining long-term behavior change; 2) deepening our understanding of the unique characteristics of program responders; and 3) evaluating dissemination in terms of proliferation of the FSP.

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