



Diabetes & Exercise:

Good Health, One Step at a Time

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Anna's diabetes

Anna, 45, is of Ukrainian heritage. She was recently diagnosed with Type 2 diabetes.

She developed gestational diabetes while she was pregnant with her second child, about 12 years ago. Her blood glucose returned to normal after her pregnancy. She was advised to get regular checkups, maintain a desirable body weight, and engage in regular physical activity.

She has gone for regular checkups, but over the last few years, her body weight has been increasing. At 167 cm tall, she now weighs 84 kg. She is determined to lose weight at this time, because she fears if she doesn't, her diabetes will worsen, and she'll have to take insulin injections.

She works full-time as a high school counsellor, and has two children and a husband who depend on her to keep them organized.

In this article:

1. How important is regular physical activity for people with diabetes?
2. What is the First Step Program?
3. How do pedometers come into play?

The importance of regular physical activity for people with Type 2 diabetes cannot be overstated. Low cardiovascular fitness and physical inactivity are independent predictors of all-cause mortality in men with Type 2 diabetes.¹ Regular physical activity may contribute to improvements in body composition, blood lipid profiles, hypertension, and glycemic control.² The amount of physical activity performed is inversely related to the risk of coronary heart disease.³

What's the state of affairs?

While physical activity is considered a cornerstone in the treatment and management of Type 2

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Table 1

Recommendations of the Canadian Diabetes Association

- Prior to beginning a program of physical activity more vigorous than walking, people with diabetes should be assessed for macro- and microvascular complications. Identify any areas of concern (e.g., cardiovascular complications, retinopathy, neuropathy, foot problems).
- Individualize recommendations for physical activity that minimize risk to the patient, but maximize potential for enjoyment and adherence to the activity.
- Encourage people to follow recommendations in Canada's Physical Activity Guide (i.e., incorporate endurance, strength and flexibility) at a level consistent with their starting level of physical activity and their age.
- People using insulin or oral hypoglycemic agents should monitor their blood glucose regularly, and follow guidelines to prevent hypoglycemia. However, in people with Type 2 diabetes, hypoglycemia during physical activity tends to be a minor problem.

Adapted from: The Canadian Diabetes Association Clinical Practice Guidelines, 1998.

diabetes, a substantial proportion of this population is not physically active. A national U.S. survey found that 66% of individuals with diabetes reported no regular leisure-time physical activity.⁴ Another study found almost 55% of those with Type 2 diabetes reported that they did no regular physical activity, including walking.⁵



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Strong evidence demonstrating the health benefits of physical activity comes from the recently completed Diabetes Prevention Program (DPP).⁶ Nearly 3,000 people at high risk for Type 2 diabetes were randomised to one of three treatment groups: intensive lifestyle intervention, metformin, or placebo control. Within the first year of the study, those in the lifestyle intervention group increased their physical activity to include about seven hours a week of moderate intensity activity, while those in the other groups remained relatively inactive, despite receiving standard

Diabetes among participants in the lifestyle group was 58% lower than those in the placebo group, and 27% lower than those treated with meformin.

encouragement to increase physical activity. The increased activity in the lifestyle intervention group was sustained over the four-year duration of the study. At the end of the trial, the incidence of diabetes among participants in the lifestyle group was 58% lower than those in the placebo group, and 27% lower than those treated with metformin. This provides strong support for the role of physical activity in delaying or preventing Type 2 diabetes.

The caveat is that extensive resources were available for participants in the lifestyle interven-



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tion group of the DPP, including a 16-week core program, followed by access to monthly follow-ups, drop-in activity sessions, and periodic booster sessions on healthy eating and active living.

While feasible for a research study, this approach is not practical and sustainable for the general population with limited resources available.

What is the First Step Program?

Our group has examined the effectiveness of less expensive, practical ways to encourage physical activity in a free-living population of people with Type 2 diabetes. The First Step Program (FSP)^{7,8} was inspired by the work of Yamanouchi et al.⁹ They showed that combining a simple message (for people with Type 2 diabetes) about the amount of physical activity, and a simple tool for monitoring walking, resulted in improved insulin sensitivity while the patients were part of a

supervised, hospital-based program. The exercise involved walking at least 10,000 steps a day. The simple tool was a pedometer, a small, inexpensive device that attaches to the waist and accurately measures walking by registering impulses as steps.¹⁰

The FSP is a facilitated, behaviour modification program based on the theoretical principles of self-efficacy and social support delivered under free-living conditions. Pedometers are used in the FSP to establish baseline levels of physical activity, and facilitate personal goal-setting, self-monitoring, and feedback.

The program starts with participants assessing their usual activity over three days (baseline). Participants then attend four, weekly group meetings during which they discuss realistic daily step goals, personally relevant strategies for increasing physical activity, high-risk situations that may lead to a relapse of sedentary behaviours, and other issues regarding adopting an active lifestyle. Steps per day are recorded in

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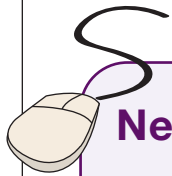
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Net Readings

Web sites, by province, for Professional Fitness and Lifestyle Consultants (PFLCs)

- 1. British Columbia**
B.C. Fitness Appraisal and Accreditation
www.bcfaca.bc.ca
- 2. Alberta**
Provincial Fitness Unit
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- 3. Saskatchewan**
Faculty of Physical Activity Studies,
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- 8. Nova Scotia**
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a personal calendar or diary, and participants share their experiences at weekly meetings. After these four sessions, they continue to self-monitor their physical activity using their pedometer for another 12 weeks (for a total of 16 weeks). The formal sessions have been lead successfully by people with extensive background in exercise counselling,⁸ by diabetes educators,¹¹ and we are currently evaluating whether they can be lead by peer leaders (*i.e.*, graduates of the FSP). There

are no specific recommendations given regarding dietary intake or glycemic control.

How successful is the First Step Program?

Using a randomised control trial, we examined the effectiveness of the FSP in increasing physical activity, measured as steps per day, and examined whether increased physical activity was related to improvements in cardiovascular health, glycemic control, and lipid profiles. In our search for participants in the study, 137 people with Type 2 diabetes were approached. Of that count, 60 agreed (of the refusals, most said they were too busy), and were randomised to the FSP or a wait-list control group. After 16 weeks, those in the FSP group had increased their steps per day from approximately 6,000 to almost 9,200. This increase equates to about an extra 30 minutes of walking per day, and was significantly more than the control group (who had an average decrease of 657 steps per day).

In the FSP group, waist girth decreased by 1.8 cm, and hip girth decreased by 3 cm. It did not change in the control group. These differences between FSP and control groups were not statistically significant. Among the FSP participants, there were no significant changes in:

- the indicators of cardiovascular health (resting heart rate and blood pressure);
- glycemic control (fasting glucose, insulin, hemoglobin A1C (HbA1c), glucose concentration 120 minutes post glucose load); or
- plasma lipid status (total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides).

Since the “dose” of physical activity varied among people in the FSP group, we examined the associations between steps per day and the following:

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- Fasting blood glucose
- HbA1c
- Triglyceride concentration and resting heart rate.

Interestingly, for the FSP group there was a significant inverse association between the steps per day and fasting blood glucose, which was particularly strong among FSP participants treated with oral hypoglycemic medications compared to diet alone. Similar inverse associations were observed in the FSP participants treated with oral hypoglycemic agents between steps per day and HbA1c, as well as with triglycerides. These relationships were not observed in the control group, or in FSP participants treated with diet alone. There was an inverse relationship between steps per day and resting heart rate for FSP participants treated with diet alone, the subgroup with the largest increase in steps per day.

What did the FSP accomplish?

This study confirmed the FSP is effective in eliciting an immediate and profound increase in daily walking behaviour (approximately 3,000 steps per day above baseline) during the intervention. One of the most interesting findings was the inverse relationship

between steps per day with blood glucose, HbA1c, and triglyceride concentrations in FSP participants treated with oral hypoglycemic medications. This suggests that it is important to continue to reinforce regular physical activity to those whose diabetes treatment include such medications. The subtle physiologic impact of the increased physical activity highlights the fact that the dose-response relationship(s) between steps per day and improved health indicators for people with Type 2 diabetes is not well-defined. Results from our study will help patients and practitioners establish realistic goals and timeframes for achieving health benefits. Booster sessions at regular intervals after completion of the 16 weeks may help adherence for some participants.

In summary, this study showed the FSP is an effective, practical program for adults with Type 2 diabetes. By the end of the program, participants walked an additional half hour per day, constituting an important first step towards adopting a more active lifestyle. For those individuals who are successful in sustaining an elevated number of steps per day, the next step would be to encourage additional increases and/or attention to the intensity and duration of exercise bouts, consistent with Canada's Physical Activity Guide. [CME](#)

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Take-home message



Physical activity is an important part of treatment and management of Type 2 diabetes, although many diabetic patients are not physically active. Here are some tips on how to motivate your diabetic patients:

- Give consistent messages about physical activity that are specifically appropriate for that patient.
- Help patients set specific, realistic activity goals, and encourage them to monitor their behaviour objectively. Increasing physical activity is a legitimate goal in itself, physiological changes may come later.
- Use Canada's Physical Activity Guide as the basis for recommendations about physical activity for most people.
- Develop a referral system for help with assessment, recommendations, monitoring and follow-up of physical activity. Look for individuals certified by the Canadian Society of Exercise Physiology (CSEP) as Professional Fitness and Lifestyle Consultants (PFLCs).

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References

1. Wei M, Gibbons L, Kampert J, et al: Low cardiorespiratory fitness and physical inactivity as predictors of mortality in men with Type 2 diabetes. *Ann Intern Med* 2000; 132(8):605-11.
2. Tudor-Locke C, Bell R, Myers A: Re-visiting the role of physical activity and exercise in the treatment of Type 2 diabetes. *Can J Appl Physiol* 2000; 25(6):466-92.
3. Kohl HI: Physical activity and cardiovascular disease: Evidence for a dose response. *Med Sci Sports Exer* 2001; 33(6):S472-83.
4. Ford E, Herman W: Leisure-time physical activity patterns in the U.S. diabetic population. Findings from the 1990 National Health Interview Survey—Health Promotion and Disease Prevention Supplement. *Diabetes Care* 1995; 18(1):27-33.
5. Hays L, Clark D: Correlates of physical activity in a sample of older adults with Type 2 diabetes. *Diabetes Care* 1999; 22(5):706-12.
6. Diabetes Prevention Program Research Group. Reduction in the incidence of Type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002; 346(6):393-403.
7. Tudor-Locke C, Bell R, Myers A, et al: Pedometer-determined ambulatory activity in individuals with Type 2 diabetes. *Diabetes Res Clin Pract* 2002; 55(3):191-9.
8. Tudor-Locke C, Myers A, Bell R, et al: Preliminary outcome evaluation of the First Step Program: A daily physical activity intervention for individuals with Type 2 diabetes. *Patient Educ Couns* 2002; 47(1):23-8.
9. Yamanouchi K, Shinozaki T, Chikada K, et al: Daily walking combined with diet therapy is a useful means for obese NIDDM patients not only to reduce body weight but also to improve insulin sensitivity. *Diabetes Care* 1995; 18(6):775-8.
10. Bassett D, Ainsworth B, Leggett S, et al: Accuracy of five electronic pedometers for measuring distance walked. *Med Sci Sports Exer.* 1996; 28(8):1071-7.
11. Lauzon N, Tudor-Locke C, Myers A, et al: Increased physical activity and improved health measures with a pedometer-based physical activity intervention for Type 2 diabetes. *Diabetes* 2003; 52:A236.

See page 17 for Frequently Asked Questions on diabetes and exercise.

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