

# Barriers to Physical Activity: Developing and Validating a New Scale

This scale measures the perceived barriers toward the practice of regular physical activity in patients with type 1 diabetes, in order to identify potential targets for future interventions.

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**A**lthough it is considered important to motivate patients with diabetes to become (and stay) active, the public health message about physical activity addressed to this population has failed to increase their participation. A significant number of individuals aged 35 to 64 years remain inactive. For example, 63% and 61% of the diabetic and nondiabetic population in Canada, respectively, are inactive.<sup>1</sup> To improve the effectiveness of these public messages, factors that impede the practice of physical activity in type 1 diabetes must be identified. In the general population, people who perceive barriers toward physical activity (eg, cost or distance) are less active than those who do not perceive barriers.

We conducted a study to develop and validate a questionnaire measuring the perceived barriers of regular physical activity in patients with type 1 diabetes, in order to identify potential targets for future interventions.<sup>2</sup>

## QUESTIONNAIRE DEVELOPMENT

The questionnaire — Barriers to Physical Activity in Diabetes, type 1 (BAPAD1) — was developed in three steps: elicitation of salient barriers, evaluation of the content validity of the scale and verification of the scale's reliability. Patients with type 1 diabetes in the metropolitan area of Quebec City participated in the city; this area is almost 100% French, and therefore, the questionnaire was developed and vali-

**TABLE 1. INITIAL 12 ITEMS OF THE BARRIERS TO PHYSICAL ACTIVITY IN DIABETES, TYPE 1 SCALE, MEANS AND ITEM-TOTAL CORRELATIONS**

Indicate the likelihood that each of these items would keep you from practicing regular physical activity during the next 6 months (1, extremely unlikely to 7, extremely likely)

Items	Mean Score $\pm$ SD	$r_{it}$ <sup>†</sup>
1. The loss of control over your diabetes*	2.8 $\pm$ 1.6	0.68
2. The risk of hypoglycemia*	3.5 $\pm$ 2.0	0.67
3. The fear of being tired	2.5 $\pm$ 1.5	0.67
4. The fear of hurting yourself	2.2 $\pm$ 1.2	0.64
5. The fear of suffering a heart attack*	2.0 $\pm$ 1.4	0.63
6. A low fitness level	3.2 $\pm$ 1.8	0.62
7. The fact that you have diabetes*	2.6 $\pm$ 1.8	0.59
8. The risk of hyperglycemia*	2.6 $\pm$ 1.6	0.57
9. Your actual physical health status excluding your diabetes	3.5 $\pm$ 1.8	0.44
10. Weather conditions	3.7 $\pm$ 1.8	0.43
11. The location of a gym	3.7 $\pm$ 1.9	0.37
12. Your work schedule	5.2 $\pm$ 1.5	0.15

\* Diabetes or medical related perceived barriers

<sup>†</sup> Indicates item-total correlation

dated in French (for the purpose of our population) but was presented in English for the purpose of international publication.

In an initial pilot study, patients were asked to identify factors that likely impede upon physical activity (ie, "What do you believe are the factors that can impede your participation in regular physical activity in the forthcoming 6 months?"). Data collection was then carried out among an independent sample composed of 15 women and 21 men with diabetes. This procedure, designed to determine the salient perceived barriers, resulted in a preliminary 12-item questionnaire (Table 1).

In an initial pilot study, patients were asked to identify factors that likely impede upon physical activity.

A total of 74 patients (35 men and 39 women) with type 1 diabetes rated the likelihood that each barrier would keep them from practicing regular physical activity during the next 6 months. All answers were coded on a 7-point scale ranging from 1 (extremely unlikely) to 7 (extremely likely). Mean age was 31 years in men and 35 years in women; the mean duration of diabetes was 15 and 18 years, respectively.

Two physical activity and diabetes experts reviewed the BAPAD1 questionnaire to examine the scale's content validity. Both experts indicated that the items were relevant and were a representative sample of possible barriers toward the practice of physical activity that may be perceived by type 1 diabetic patients. Reliability was evaluated by the Cronbach's alpha, the test-retest coefficient and a nonparametric item analysis approach (TestGraf), which estimated the test characteristic curves of each item. An item characteristic curve is normally represented by an S-shaped curve or ogive. The item characteristic curves (ICC) may generally differ as to (1) slope: the steeper the slope, the more highly discriminating the item is and (2) the location: the further the function falls to the left, the more endorsed the item is (eg, many respondents perceive that there are barriers toward the practice of physical activity).

## RESULTS OF THE BAPAD1

The global test average mean was 3 of 7. Patients responded highest to question 12. With this question, they demonstrated that work schedule may impede upon their practice of physical activity in the next 6 months. Patients responded lowest to question 5, they demonstrated that

the fear of suffering a heart attack would be unlikely to impede upon physical activities in the next 6 months.

The Cronbach's alpha (0.85) showed that the reliability of the barriers scale is very satisfactory. Results also showed that 11 of the 12 questions have moderate-to-high discriminative power. Only question 12, which is weakly correlated with the total score (0.15), showed low discriminative power. The correlation between the test-retest scores was 0.84, which demonstrates adequate stability of the barriers scale.

The 12-item characteristic curves behaved in a monotonically increasing function, with the exception of question 12 for which the ICC was relatively flat. This question was then withdrawn.

## IMPACT OF PERCEIVED BARRIERS ON BEHAVIOR

It is generally accepted that people who perceive barriers toward physical activity are less active than those without perceived barriers. Changes in modifiable health-risk behaviors (eg, obesity, smoking status and alcohol consumption) in diabetic individuals have been examined. Encouraging positive changes in these behaviors and preventive care practices among persons with diabetes may minimize the disease's impact.<sup>3</sup>

Sedentarity was not assessed as a health-risk behavior, however, these results raise the possibility that behavior modification such as physical activity may yield similar results. Thus, the BAPAD1 scale could be useful in identifying salient barriers to physical activity, particularly diabetes-related ones.

When assessed by parametric and nonparametric item analysis methods, risk of hypoglycemia presented excellent psychometric qualities. The fear of hypoglycemia figured among commonly self-reported barriers to diabetes control. Moreover, research on the perceptions and experiences of insulin-treated diabetes<sup>4</sup> showed that hypoglycemia plays a significant role in the lives of these patients and that concern of hypoglycemic reactions is constantly present.

Hypoglycemia is the most frequent and most feared acute complication of physical exercise in type 1 diabetic patients, as reported by nonspecific questionnaires.<sup>5</sup> Hypoglycemia was not directly evaluated until now as a barrier to physical activity and the development, and validation of the BAPAD1 scale will allow assessment of this barrier and others related to physical activity.

## PHYSICAL ACTIVITY LEVELS IN DIABETES

To our knowledge, this is the first time that the development and validation of a questionnaire focusing on this important clinical aspect in type 1 diabetic patients

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is presented. The levels of physical activity and the perceived factors that prevent patients with type 1 and type 2 diabetes from physical activity have been assessed in a Scottish population.<sup>6</sup> Approximately 67% of the study population was considered inactive because they did not participate in exercise, sport or physically active hobbies across a 2-week period. It seems that key modifiable barriers to participation in exercise included availability of inexpensive facilities and education regarding the health benefits of exercise and mechanisms of avoiding hypoglycemia.<sup>6</sup>

Interestingly, some of these modifiable barriers were also identified and validated in our study. Active patients were more positive and believed that strenuous exercise would aid diabetes control. These patients were less likely to think that exercise would increase the chance of hypoglycemia. Such findings are reassuring and suggest that once barriers to physical activity are identified, the development of strategies to overcome them may allow diabetic patients to profit from an active lifestyle.

### FUTURE PRACTICAL USE OF THE BAPAD1 SCALE

The development and validation of the BAPAD1 scale is a preliminary step in identifying the most important barriers toward the practice of physical activity in subjects with type 1 diabetes. Now that the quality of this questionnaire is demonstrated, a larger sample (currently under investigation) will be needed to confirm salient barriers along with other psychosocial measures (eg, physical activity stages of change, attitude toward the practice of physical activity and social support).

Information gained from the BAPAD1 scale should eventually permit focused interventions, resulting in higher regular physical activity in type 1 diabetic patients, a key element in the management of this chronic disease. ■

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