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Short communication

The effects of a pedometer-based behavioral modification program with telephone support on physical activity and sedentary behavior in type 2 diabetes patients

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ABSTRACT

Objective: Effectiveness of a behavioral modification program on physical activity (PA) and sedentary behavior in diabetes patients.
Methods: Ninety-two patients were randomly assigned to an intervention or control group. The 24-weeks intervention consisted of a face-to-face session, pedometer and seven telephone follow-ups. Mean selection criteria were 35–75 years; 25–35 kg/m^2; ≤12% HbA1c, treated for type 2 diabetes; no PA limitations. PA and sedentary behavior were measured by pedometer, accelerometer and questionnaire over the short- (24 weeks) and intermediate- (1 year) term.
Results: The intervention group increased their steps/day by 2744, their total PA by 23 min/day ($p < 0.001$) and decreased their sedentary behavior by 23 min/day ($p < 0.05$) post-intervention. After 1 year the intervention group still had an increase of 1872 steps/day, 11 min/day total PA and a decrease of 12 min/day in sedentary behavior ($p < 0.001$).
Conclusion: This pedometer-based behavioral modification program with telephone support showed lasting positive effects on steps/day, PA and sedentary behavior.
Practice implications: This study tested a convenient way to increase PA among type 2 diabetes patients.

1. Introduction

A number of lifestyle intervention studies have already successfully employed behavioral or cognitive-behavioral methods in type 2 diabetes populations [1–4]. Also the use of a pedometer seems to elicit successful outcomes [1,4,5]. The pedometer is considered to be a motivator, source of feedback, memory prompt and PA reminder [5]. However, most positive short-term effects disappeared over the longer-term [2,4]. These labor-intensive lifestyle interventions were given face-to-face in group or individual sessions, both in primary and secondary care, and sometimes by a behavioral expert [3,4,6]. Telephone support is a lower cost and more feasible alternative, resulting in better adherence rates over extended periods of time in comparison to face-to-face interventions [7]. To our knowledge, telephone support has never been combined with a pedometer-based program in a type 2 diabetes population.

As recent studies have shown that sedentary behavior is associated with coronary heart disease risk factors and obesity, independently of PA, lifestyle PA interventions should also deal with decreasing sedentary behavior [8]. To our knowledge, this has not yet been done in a type 2 diabetes population. Therefore, we investigated the effects of a pedometer-based behavioral modification program with telephone support on PA and sedentary behavior. We hypothesized that the intervention group would have more favorable PA and sedentary behavior outcomes, over the short- and intermediate-term, compared to the non-intervention control group.

2. Methods

A sampling pool of potential participants was generated through a search of electronic medical records from the

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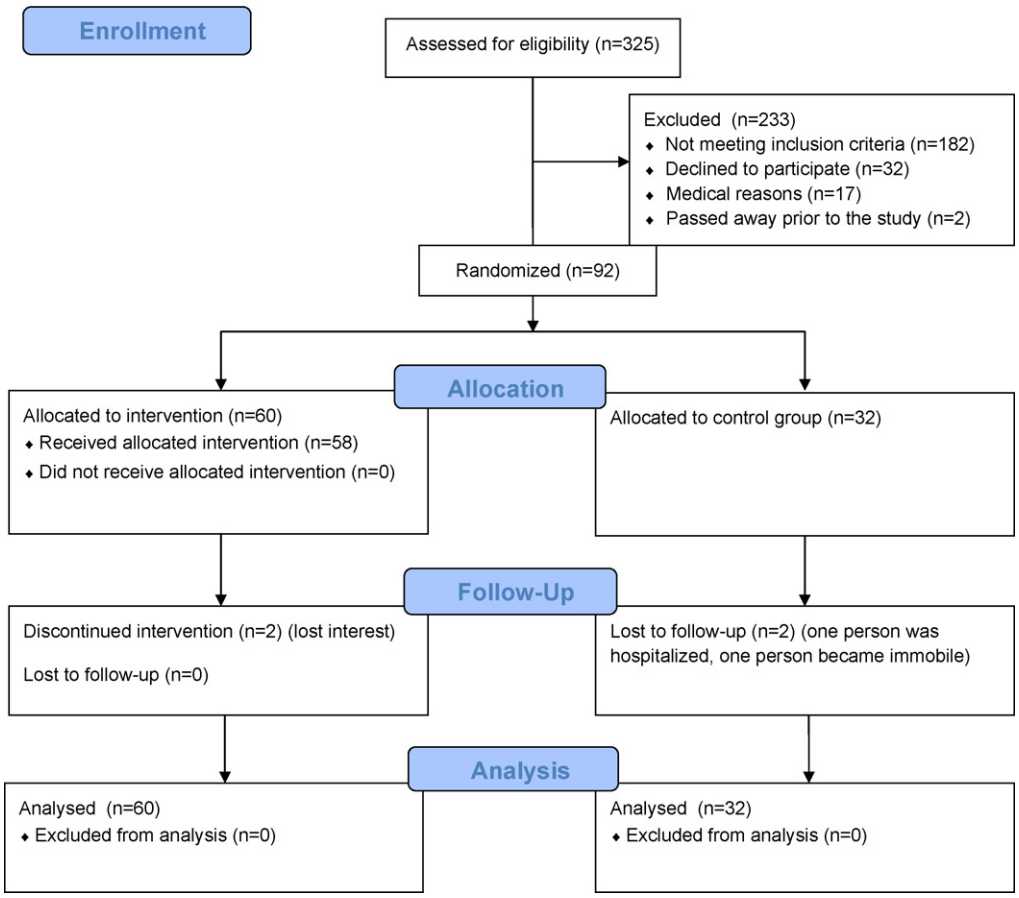

Fig. 1. Participants' Flow Diagram.

endocrinology department of the Ghent University Hospital, Belgium. Selection criteria were: 35–75 years, 25–35 kg/m^2, ≤12% HbA1c, ≥6 months post-diagnosis of type 2 diabetes, pharmaceutically treated for type 2 diabetes, no documented physical or medical limitations, Dutch speaking, having a telephone number and having a follow-up appointment with their endocrinologist during the recruiting period from July till December 2007. Based on these criteria, 92 type 2 diabetes patients were recruited. They were randomly assigned to an intervention ($n = 60$) or a (usual care) control group ($n = 32$) using a 2:1 randomization ratio. Every participant signed an informed consent form. The Ethical Committee of the Ghent University Hospital approved the study (Fig. 1).

The intervention was lead by a psychologist and based on the principles of cognitive-behavioral therapy [3], the Diabetes Prevention Program [9], the First Step Program [1] and Motivational Interviewing [10]. The intervention aimed at promoting PA and decreasing sedentary behavior (see Table 1). It consisted of a face-to-face session, a pedometer and telephone support. The face-to-face session took place at the hospital's endocrinology department and lasted approximately 30 min. During this session participants were told that they could keep their pedometer as an integral part of the intervention. The session started with a motivational interview phase. The psychologist together with the participants made an individualized lifestyle plan on where, when and how the behavior changes would take place. After this session patients started a 24-week telephone support program given by the psychologist. Patients received a call every 2 weeks for the first 4 weeks and every 4 weeks for the next 20 weeks, for a total of seven calls. The calls lasted approximately 20 min. The telephone support followed specific, but flexible scripts and was constructed to include counseling on goal-setting, self-monitoring, self-efficacy, benefits, decisional balance, problem-solving strategies, social support and relapse prevention (see Table 1). The pedometer and a pedometer diary were used as monitoring tools and were crucial components of the intervention. Participants were asked to wear the pedometer and to record their PA type, duration and number of steps in the diary at the end of each day. The pedometer diary was used to track progress and to encourage discussion with the psychologist. For most participants, a gradual increase in PA, starting from their baseline levels, was used. Those who succeeded in this goal were encouraged to increase their PA level again after 1 and 3 months. However for those who entered the program at very sedentary levels (444–2000 steps/day), patients-tailored goals were set. The focus for those who were already sufficiently active (≥10,000 steps/day), was on maintaining their current levels and participants who reached 10,000 steps/day at any time during the program were also encouraged to maintain that level (Table 1).

Participants were continually recruited over a 6-month period. There were three one-week assessments during home visits: at baseline, immediately after the 24-weeks intervention (short-term effects) and 1 year after baseline (intermediate-term effects). The primary outcomes were PA and sedentary behavior measured by pedometer (steps/day), accelerometer (min/day) and interview-based International Physical Activity Questionnaire (IPAQ)