Investigating telephone support as a strategy to increase the physical activity levels of people with diabetes

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Article points

1. Regular physical activity is fundamental to the control of diabetes.
2. Treatment of diabetes is based on continuous education and changes in lifestyle and behaviour.
3. Telephone support as an intervention strategy can be an important tool to stimulate increased physical activity levels among people with diabetes.

Key words

- Diabetes
- Health education
- Physical activity
- Telephone support

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Regular physical activity is fundamental to therapeutic programmes for people with diabetes. Studies have shown that telephone support is an innovative strategy that can increase adherence to exercise programmes. This study tested activity levels before and after a 4-month intervention where participants were given an exercise programme and telephone support either with or without a structured education programme. The results verify the efficacy of telephone support as a strategy to increase physical activity levels and identified improvements in metabolic profile in people with diabetes who were given this support alongside a structured education programme.

The prevalence of diabetes is rising and this is partly due to changes in lifestyle that have made people less physically active and increased the prevalence of obesity (Shaw et al, 2010). Diabetes therapy is based on continuous education and relies on important changes in behaviour. It includes drug therapy, self-monitoring of capillary blood glucose, dietary changes through re-education, and regular physical activity (American Diabetes Association [ADA], 2013).

It has been recognised that regular exercise improves functional fitness and independence in older people and is especially important for health improvements in people with diabetes (ADA, 2013; Chomistek et al, 2013). Exercise can result in an increase in insulin sensitivity, improved body composition, increased oxidation of lipids, a reduction of triglycerides and total cholesterol, and a reduction of glycated haemoglobin (Boulé et al, 2001; Bajpeyi et al, 2009; Church et al, 2010; Bacchi et al, 2012). However, a low adherence to education programmes, especially regarding physical exercise, has often been found among people with diabetes (Hays and Clark, 1999; Lutfey and Wishner, 1999; Cazarini et al, 2002; Morrato et al, 2007).

This situation poses a need to find strategies that aim to increase adherence to education programmes, as these are important to help people with diabetes manage their disease. One possible and viable strategy found in the literature is the use of telephone support for interventions for people with diabetes (Kim and Oh, 2003; Long et al, 2005; Handley et al, 2008; Lawler et al, 2010; Piette et al, 2011; Plotnikoff et al, 2012).

Studies regarding telephone encouragement to engage in physical activity are unfortunately scarce. This small study, carried out in Brazil, aimed to investigate the efficacy of telephone support as a strategy to increase physical activity level in people with diabetes.

Methods

Participants

Participants were recruited in a primary care service at a public hospital in São Paulo state, Brazil. Data was collected from April to September 2012. The selection criteria were:

- Diagnosis of diabetes.
- Male or female, aged 18–80 years.
- No comorbidities that would limit physical exercise.

- Able to hear and answer questions.
- Access to a mobile and/or landline telephone.
- Attendance of at least 75% of the proposed activities.

Participants were selected by convenience, and 29 people met the selection criteria and gave consent to participate in the study. The participants were divided into two groups: Group 1 (G1, *n*=14) and Group 2 (G2, *n*=15). Twenty-six people completed the study (13 in each group); three people were excluded as they had attended less than 75% of the proposed activities.

All procedures were approved by the Research Ethics Committee of the Nursing School of Ribeirão Preto, University of São Paulo.

Telephone support and educational programme

Participants from G1 were enrolled in a diabetes education group and had a weekly meeting and telephone support. Participants in G2 were just monitored by telephone support during the intervention. The participants filled in a consent form, and sociodemographic and clinical data were recorded. All participants received an exercise schedule with suggestions about how to improve their levels of daily physical activity.

The diabetes education group (G1) had eight weekly hour-long meetings. The meetings were led by a multi-professional team, including physicians, nurses, psychologists, nutritionists, physiotherapists, occupational therapists, pharmacists and physical education professionals. The diabetes *Conversation Map*™ educational tool was used in these meetings (Healthy Interactions Inc, 2006). This tool uses maps in group discussion in order to promote interaction between educators and people with diabetes, and encourages changing attitudes to improve self-efficacy and increase effective clinical results.

In addition to participating in the diabetes education group, G1 received telephone calls over the 4-month study period. The calls lasted about 20 minutes once per week during the first two months, and once every 15 days in the following two months, totalling 12 telephone contacts. The telephone calls were scheduled according to the individuals' availability and were brief interventions based on feedback, responsibility, advice, menu of option (this involved identifying barriers to adherence and possible strategies to overcome these barriers), empathy and self-efficacy (FRAMES; Miller and Sanchez, 1994). During the telephone calls, the participants received advice about the importance of practising regular physical activity and were encouraged to engage in the activity. G2 had the same telephone support for four months, with the same duration and frequency as the calls for G1, totalling 12 telephone contacts.

Physical activity level

Daily physical activity level was determined using the International Physical Activity Questionnaire (IPAQ; www.ipaq.ki.se). Participants were classified as:

- Sedentary: If they did not perform physical activity for at least 10 continuous minutes during the week.
- Irregular B active: If they performed physical activity but insufficiently, or they performed regular physical exercise for less than five days per week, for less than 150 minutes per week.
- Irregular A active: Those who performed insufficient physical activity but who attained at least one of the recommended criteria (frequency five days per week or duration 150 minutes per week).
- Active: Participants who fulfilled the recommendations of vigorous physical exercise three or more days per week for a minimum duration of 20 minutes per session or who practise moderate physical exercise/walking five or more days per week for a minimum duration of 30 minutes per session, or any activity practised five or more days per week for a minimum duration of 150 minutes per session.
- Very active: Participants who fulfil the frequency recommendation of a minimum of five days per week of vigorous physical activity, with a minimum duration of 30 minutes per session, or practised vigorous physical activity at least three times per week for a minimum duration of 20 minutes per session and moderate physical activity and/or walking a minimum of five days per week with a minimum duration of 30 minutes per session.

Anthropometric and cardiovascular parameters

Height, weight and BMI were measured. Abdominal circumference was measured at the midpoint between the last rib and the iliac crest, and determined using a flexible tape. The blood pressure measurement was obtained by averaging three measurements after 15 minutes of seated quiet rest with an aneroid sphygmomanometer.

Page points

1. The participants were divided into two groups. Both groups were given an exercise programme and telephone support but Group 1 were also given an education programme.
2. The International Physical Activity Questionnaire was used to assess levels of activity before and after the intervention.
3. Height, weight and BMI were measured. Abdominal circumference was measured at the midpoint between the last rib and the iliac crest, and determined using a flexible tape. The blood pressure measurement was obtained by averaging three measurements.

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Table 1. Socio-demographic characteristics and clinical features of the study participants.

	Group 1 (education and telephone support)	Group 2 (telephone support only)
Age (years)	67 (±13)	68 (±8)
Female	10 (77%)	10 (77%)
Male	3 (23%)	3 (23%)
Marital status		
Divorced	2 (15%)	2 (15%)
Married	6 (46%)	3 (23%)
Widowed	4 (31%)	7 (54%)
Single	1 (8%)	1 (8%)
Employment		
In work	3 (23%)	1 (8%)
Retired	5 (38%)	7 (54%)
Home	4 (31%)	1 (8%)
Other	1 (8%)	4 (31%)
Education and employment		
Years of study	4.9 (±3.3)	3.8 (±2.9)
Monthly income (USD)	785 (±365)	598 (±316)
Diabetes history		
Diagnosis of diabetes and length of treatment (years)	11.6 ± 8.2	7.2 (±6.6)

Data are mean ± standard deviation or *n* (%).

Biochemical parameters

Venous blood samples were collected after 12 hours of overnight fasting to determine glucose, low-density lipoprotein (LDL-C), high-density lipoprotein (HDL-C), triglycerides (TG) and glycated haemoglobin (HbA_{1c}). Reference values were used according to the ADA (2013). After the four-month intervention period clinical conditions and daily physical activity level were measured again.

Data analysis

Descriptive statistics were carried out to show socio-demographic and clinical parameters (expressed as mean and standard deviation) and physical activity level. The linear fixed effects model (random and fixed effects) was used for the metabolic profile variables. In the mixed effects model, the individuals were considered a randomising effect, and the groups, times and interaction were fixed effects. Such a model follows the premise that the residue obtained through the difference between the values predicted by the model and the values observed have normal distribution with zero median and constant variance. Adjustment of the model was made through the procedure PROC MIXED using statistics software SAS® 9.0 (SAS, 2004).

Results

Socio-demographic and clinical findings

At baseline there were no differences in socio-demographic and clinical characteristics. The majority were older women, married or widowed, retired and had a lower level of education. Diagnosis of diabetes and treatment duration was similar between the two groups (*Table 1*).

Physical activity level

Telephone support was found to be effective in improving physical activity level in G2. The number of participants classified as active increased by 31% and 85% of the participants were considered physically active at the end of the intervention. An improvement of about 15% in physical activity level was seen in G1 participants, and by the end 62% were considered as physically active (*Table 2*).

Metabolic profile

A significant reduction was observed in abdominal circumference, diastolic blood pressure and triglycerides in G1 after the intervention period. There were no observed changes in anthropometric or metabolic variables in G2 (*Table 3*).

Discussion

The main study finding was that telephone support increased physical activity levels in people with diabetes. The number of participants classified as active increased by approximately 15% in G1 and 31% in G2, and by the end of the study period no participants were classified as sedentary. This data is important when considering that an increase in daily physical activity improves functional fitness and independence in older people. Additionally, physical

inactivity is related to a greater risk of development of cardiovascular diseases, which can be aggravated in people with diabetes (Chomistek et al, 2013). Thus, the clinical importance of telephone support as an approach to increase physical activity level in people with diabetes is clear.

Comparing the improvement in physical activity between groups, an increase of 15% was seen in active classification in the diabetes education group (G1). The number of people in G1 classified as sedentary or irregularly active A that did not reach the minimum of 150 minutes per week of physical activities remained the same by the end of the study period. However, G2 showed an increase of about 31% in the active category and a reduction in participants classified as sedentary.

The lack of studies on the use of IPAQ for classifying the level of physical activity of people with diabetes following telephone interview made comparison of the data difficult. However, studies that used other instruments to measure the level of physical activity in people with diabetes – such as questionnaires and pedometers – after the use of the telephone as an intervention tool have had satisfactory results. In these studies, people increased their amount of physical activity and the number of steps taken per day, reaching values close to that recommended by the ADA (Eakin et al, 2009; Eakin et al, 2010; Goode et al, 2011; Piette et al, 2011).

Kim and Oh (2003) investigated the effects of telephone contacts on HbA_{1c} and adherence to recommendations for diabetes control in a control group and an experimental group for 12 weeks, but found no significant differences regarding adherence to exercise in either group after analysing the questionnaires. Another study using a similar methodology for 12 months also found no increase in physical activity level in people with diabetes after analysing the questionnaires (Plotnikoff et al, 2012).

The results of these studies show controversies regarding the efficacy of the use of telephone support as a strategy to improve physical activity and there needs to be more research into the intervention. Furthermore, there is no clear evidence of the amount of phone calls necessary to improve the level of physical activity in people with diabetes. A study using a large number of people linked to a structured protocol is needed. Interestingly, G1 exhibited improvements in abdominal circumference, diastolic

Table 2. Classification of the participants of the study according to IPAQ.

IPAQ Classification	G1				G2			
	Baseline		Final		Baseline		Final	
	n	%	*n*	%	*n*	%	*n*	%
Sedentary	2	15.4	0	0	1	7.7	0	0
Irregularly active A	2	15.4	4	30.8	2	15.4	2	15.4
Irregularly active B	3	23.0	1	7.7	3	23.1	0	0
Active	6	46.2	8	61.5	7	53.8	11	84.6
Very active	0	0	0	0	0	0	0	0
Total	13	100	13	100	13	100	13	100

IPAQ= International physical activity questionnaire

Table 3. Anthropometric and metabolic parameters in G1 (*n*=13) and G2 (*n*=13).

Variables		Baseline	Final	*P*-value
BMI (kg/m²)	G1	25.5 (±6.8)	25.7 (±6.7)	0.3026
	G2	24.2 (±2.4)	24.3 (±2.2)	0.7326
Abdominal circumference (cm)	G1	110.0 (±18.0)	107.5 (±17.3)	0.0074*
	G2	99.6 (±11.0)	99.3 (±9.3)	0.6958
Systolic BP (mmHg)	G1	148.9 (±24.9)	144.1 (±24.8)	0.5983
	G2	142.5 (±19.1)	150.5 (±29.8)	0.3839
Diastolic BP (mmHg)	G1	81.3 (±8.8)	73.3 (±8.3)	0.0063*
	G2	82.9 (±9.1)	81.5 (±15.2)	0.6093
Glucose (mg/dL)	G1	119.5 (±24.9)	110.1 (±23.8)	0.2260
	G2	121.5 ± 34.2	115.1 (±25.5)	0.4063
LDL-C (mg/dL)	G1	109.0 (±23.6)	104.6 (±23.7)	0.6520
	G2	118.3 (±44.7)	110.0 (±28.9)	0.3955
HDL-C (mg/dL)	G1	40.1 (±5.5)	40.4 (±8.4)	0.9113
	G2	47.3 (±9.3)	49.3 (±15.0)	0.4714
TC (mg/dL)	G1	179.6 (±23.2)	167.7 (±32.8)	0.2589
	G2	180.7 (±51.7)	184.5 (±36.1)	0.7179
TG (mg/dL)	G1	152.2 (±63.8)	113.3 (±51.1)	0.0096*
	G2	131.8 (±46.0)	125.8 (±63.1)	0.6682
HbA_{1c} (%)	G1	7.0 (±1.0)	6.9 (±0.7)	0.3425
	G2	6.9 (±0.8)	7.1 (±0.8)	0.4349

Data are mean ± standard deviation, a mixed effects model; *Significant change from baseline, $P \leq 0.01$. TC: total cholesterol; TG: triglycerides; HbA_{1c}: glycated haemoglobin

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blood pressure and triglyceride concentration. These results corroborated the findings of Kirk et al (2009), which showed a significant reduction in the values of abdominal circumference and diastolic blood pressure after intervention with the use of telephone support and face-to-face meetings. Fukuda et al (1999) performed another study that showed similar results for triglycerides and blood pressure; there were important statistical reductions for these variables in the intervention group after telephone intervention and face-to-face meetings.

However, when investigating the effects of telephone counselling followed by a walking programme, Piette et al (2011) did not find reductions in blood pressure when comparing groups before and after the intervention. Similarly, a more recent study did not show important statistical differences in the reduction of triglycerides after 12 months of telephone and printed materials intervention in people with diabetes (Plotnikoff et al, 2012).

It is interesting to note that, at the beginning of the intervention, the values of waist circumference and triglycerides were higher in G1 than those in G2, which predisposes ease of change by those in G1, which may have had an impact on the results. Again, larger studies into these interventions are required.

It can be concluded that telephone support can be used as an approach to increase physical activity level in people with diabetes. The advantages are the low costs and the possibility to reach a large number of patients. Since physical activity is an important issue in diabetes therapy the increase of physical activity level in this population could improve wellbeing and also reduce treatment costs.

Study limitations

Many people did not agree to participate in the study. The main reasons were difficulty of travelling to the hospital and lack of time and interest. It has also been suggested that intervention time, age of the person and the high temperatures of the city interfere with adherence to the proposed strategies.

Conclusion

The strategy of using telephone support to increase the level of physical activity was shown to be effective. The results showed an increase in the number of individuals with higher levels of physical activity. However, regarding metabolic control, telephone support was only successful in conjunction with a structured educational programme. Participants who had both interventions displayed a significant reduction in abdominal circumference, diastolic blood pressure and triglycerides, and some improvements to their level of activity. ■

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