The feasibility of a physical activity intervention for adults within routine diabetes care: a process evaluation

Abstract
Physical activity is an important factor in diabetes management but is rarely implemented within routine diabetes care. The purpose of this process evaluation was to explore the feasibility of a 12-month pilot physical activity consultation intervention delivered for adults within routine diabetes care.

A 12-month pilot physical activity consultation intervention was delivered, including face-to-face consultations at baseline, and at six and 12 months. Additional brief consultations were conducted monthly between baseline and six months via telephone, email or face-to-face. Consultations were led by a physical activity consultant trained and experienced in health psychology and lifestyle behaviour change. Multiple process evaluation measures were conducted including: interviews; email communication; online survey; and intervention session summaries. Additional outcomes explored participant characteristics (n=89), attendance, adherence and the feasibility of collecting measurable outcomes for physical activity, BMI, HbA1c and psychological wellbeing. Appropriate methods and outcomes were used to facilitate implementation in a ‘real-life’ setting, as opposed to typical research settings.

The intervention was feasible with high protocol fidelity, adoption by staff, and positive participant feedback. The role of ‘champions’ (consultant diabetologist and two health psychologists) was identified as a key factor in the positive evaluation of the intervention. Three changes were made to the intervention to address the complex support needs of the sample. Challenges were identified with collecting questionnaire data within the time allocation of consultations. Although not reaching statistical significance, findings suggest improvements in physical activity levels, BMI and several aspects of psychological wellbeing.

It was concluded that physical activity consultation is a feasible method of promoting physical activity to adults with diabetes in routine diabetes care. The challenge lies in the translation of physical activity interventions for everyday practice while balancing the need for measurable outcomes with effective delivery. Copyright © 2017 John Wiley & Sons.

Key words
physical activity; diabetes; process evaluation; routine diabetes care; translation

Background
Physical activity is an important factor in the management of diabetes. Engaging in appropriate levels of activity can improve insulin sensitivity, facilitate glucose uptake, reduce the progression of diabetes-related complications and all-cause mortality, and have a positive effect on mental wellbeing and quality of life. Despite these benefits most adults with diabetes engage in low levels of physical activity and high levels of sedentary behaviour.

Theory-based interventions can be effective in achieving greater physical activity and in improving health outcomes. A review of 17 randomised controlled trials found that theory-based interventions using multiple behaviour change techniques resulted in improvements in both physical activity and health outcomes for adults with diabetes. Incorporating techniques such as goal setting, problem solving, self-monitoring and decisional balance is an important facilitator of physical activity behaviour change.

Physical activity consultation (PAC) is a theory-based intervention, utilising behaviour change techniques shown to be effective for promoting physical activity in people with diabetes. These include: goal setting, self-monitoring, decisional balance, enhancing self-efficacy, problem solving, social support, and relapse prevention. Studies have demonstrated success at maintenance of behaviour change up to 24 months. Guidelines for using
PAC in people with diabetes have been published.8

Despite strong evidence for physical activity in the management of diabetes, most published physical activity interventions have been performed in a controlled research setting, with often resource intensive methods, short duration and lack of long-term follow up.9 Minimal information is available on how these interventions work within everyday practice.10,11 A limited number of process evaluations for physical activity interventions within diabetes care have been performed.12,13

Aim
The aim of this process evaluation was to explore the feasibility of a 12-month pilot PAC intervention delivered within routine care for adults with diabetes.

Methods
A 12-month intervention was implemented within routine diabetes care. The intervention was designed (1) for delivery by a qualified physical activity consultant experienced in physical activity behaviour change; (2) for integration with other elements of routine diabetes care; and (3) to reflect implementation with everyday practice.

Importantly, the intervention was implemented not as a research study but as a pilot service for exploration and evaluation. This approach is reflected in the absence of a control group and power calculation.

Description of the physical activity consultation service

Participants and recruitment
Exclusion criteria were minimal to ensure wide access for all people with diabetes. Adults (≥18 years, no upper age limit) with type 1 or type 2 diabetes were eligible to participate. This combined approach was chosen to reflect routine diabetes care. People with a contraindication for physical activity were excluded, e.g. unstable cardiovascular condition (i.e. angina, heart failure, tachycardia) or undergoing laser eye treatment. The service was publicised by: posters, leaflets and promotion by health professionals in one hospital-based diabetes clinic and two general practices; newspaper and radio advertisements; and promotion by physical activity instructors at local diabetes exercise classes. Interested patients self-referred by contacting the physical activity consultant directly. Despite introduction of bias, this targeted ‘self-referral’ approach was chosen to reach people with diabetes who were ready to change their physical activity behaviour, improve retention rates, and minimise the input required by busy health professionals working in a clinical setting.

Physical activity consultation (PAC).
The 12-month intervention (Figure 1) was based on PAC guidelines for adults with type 2 diabetes.8

This intervention was guided by the Transtheoretical Model of Change (TTM),14 and supported by behaviour change strategies identified in the Behaviour Change Technique Taxonomy.5 All consultations were delivered by an accredited health psychologist with qualifications and experience in exercise and health psychology.

Training of other health care professionals (i.e. dietitians, physiotherapists and nurses) should be explored. The physical activity consultant was originally funded to deliver the intervention for 4 hours per week, which after several months was increased to 11 hours per week for the remainder of the intervention. This time allocation reflected the limited funding secured from NHS Grampian Endowments and a Paths for All grant for pedometers.

Participants received an initial 30-minute manualised face-to-face consultation. This included assessing current activity levels, past and present activities; pros and cons of being more active; advice on hypoglycaemia risk and referral to the diabetes specialist nurse team (if appropriate) overcoming barriers; recommendations for increasing physical activity (frequency, duration and intensity), writing down goals, planning social support and relapse prevention.

The initial consultation was followed by five-monthly shorter follow-up consultations delivered via participants’ chosen method of contact (face-to-face, telephone or email). Follow-up consultations were participant-led and varied in format and duration (approximately 10 minutes per follow up) depending on stage of change and the level of support required. Two further face-to-face 30-minute consultations were undertaken at both six months and 12 months. Between six and 12 months, no formal contact with participants was made; however, participants were encouraged to contact the physical activity consultant for advice if needed. Maintenance of behaviour change was encouraged via the use of specific behaviour change strategies (e.g. relapse prevention) in addition

Figure 1. Intervention timeline

Baseline measures
Demographic information

30-min face-to-face physical activity consultation (PAC); baseline

5-monthly follow-up consultations delivered by choice of face-to-face, telephone or email (1–5 months)

30-min face-to-face PAC (6 months)

6-month follow-up measures

30-min face-to-face PAC (12 months)

12-month follow-up measures
to decreasing frequency of contact over time.15

Resources. Throughout the 12-month intervention period, participants were encouraged to increase their physical activity to meet the current UK recommendations of 30 minutes of moderate physical activity on at least five days per week.16

Keeping participants clinically safe was a priority. Relevant health care professionals involved in supporting the patient (i.e. GP, diabetologist and dietitian) were informed of the intervention. Participants were encouraged to increase their physical activity but only to a level which was comfortable for them. Most participants were encouraged to gradually reach accumulated extra activity on five days a week or more. Hypoglycaemia risk (during or after exercise) was explained to patients taking sulphonylureas or insulin. As a group the risk of hypoglycaemia was not high as only 27% were on insulin. Participants were advised to talk to their diabetes nurse to get advice if dosage adjustment was required. Participants were also advised to choose activities they enjoyed. Participation in local diabetes exercise classes was recommended and walking was encouraged as a cheap and effective form of activity.17 Pedometers (SilvaEx10) and step diaries were provided and participants were encouraged to self-monitor their daily step count and set achievable walking goals – for example, 1500 steps (approximately 15 minutes of activity broken down in 5-minute chunks). A physical activity resource booklet detailing various local activity opportunities was provided.

Measurable outcomes. Physical activity levels in addition to some physical and psychological outcomes were assessed. Measures were chosen to minimise the challenge of obtaining data in everyday practice. Physical activity was measured at baseline, and at six and 12 months, using the International Physical Activity Questionnaire-Short Version (IPAQ-S).18 Stage of change was assessed by asking: ‘Would you say you are thinking about increasing your activity or ready to change/increase your activity?’; additional questions assessed participants’ motivation and confidence for increasing or maintaining their level of physical activity. Body mass index (BMI) and HbA1c data were obtained at baseline and at 12 months from routine data stored on a central computer data system. Routine HbA1c data were not updated on SCI Diabetes as often as anticipated, and it was often hard to identify a six-month midpoint in routine data. Therefore, focus was given to collection of 12-month data. Psychological wellbeing was measured at baseline, and at six and 12 months using the Positive and Negative Affect Scale (PANAS),19 and the Hospital Anxiety and Depression Scale (HADS).20 Participants were encouraged to monitor their weight and self-report these data at each follow up. Data were analysed using repeated measures of ANOVA (using SPSS Version 21.0) and reported as mean and standard deviation.

Description of the process evaluation

A process evaluation, guided by the World Health Organisation21 and Steckler and Linnan,22 was performed by an independent researcher not involved in the delivery of the intervention. Multiple process evaluation measures were collected during the initial 30 months of the intervention. Measures were chosen to minimise participant burden and reflect the setting of everyday practice. Three 1-hour semi-structured interviews were undertaken with the physical activity consultant delivering the intervention to explore issues of implementation and protocol fidelity. Additional qualitative insight was gained from local health professionals (n=10) and participants (n=6) via telephone interview, email correspondence or online survey, regarding their experience of the intervention. Interviews were transcribed verbatim and analysed for process information related to the feasibility, implementation and adoption of the intervention. A session summary, capturing data on each consultation, was recorded by the physical activity consultant. A data input spreadsheet was used to record additional information, e.g. attendance, missed appointments and reasons for non-attendance. Session summaries and the data input spreadsheet were analysed for process data related to fidelity and implementation. Qualitative and quantitative data were then collectively analysed to identify key issues related to the delivery of the intervention in practice.

Ethical approval was granted by the North of Scotland Research Ethics Committee. Informed consent was obtained from all individuals in the study.

Results

Participant characteristics

A total of 89 participants enrolled in the intervention during the initial 30 months of recruitment. Enrolment was on an ongoing basis and, at the time of data analysis, 89 participants had baseline data; 53 participants had reached six-month follow up, and 35 participants had reached 12-month follow up. Funding for continuing the pilot service then ended. It had been anticipated that further funding would be secured; however, given the current financial climate, this was not the case and the final participants were unable to complete the follow-up time points. The difference in numbers at baseline, six and 12-months therefore reflects the nature of rolling recruitment and not attrition.

At baseline participants had a mean (±SD) age of 59.5±11.3 years; mean BMI 34.1±7.8kg/m²; mean HbA1c of 62.6±15.5mmol/mol (7.9±3.5%); mean years since diagnosis was 11.4±11.4 years. A total of 82.0% (n=73) had type 2 diabetes; 18.0% (n=16) had type 1 diabetes; 49% (n=44) were female; 58% (n=52) had multiple comorbidities (including obesity; osteoarthritis; COPD; cancer; heart conditions; chronic fatigue; depression and anxiety); and 59% (n=53) were from the two least deprived areas as assessed by the Scottish Index of Multiple Deprivation. All participants were of Caucasian origin. No information was collated on medication, other than insulin use. Future research should include these data.

Most participants self-referred after receiving an information leaflet from diabetes health care
professionals or the local diabetes exercise class (49.4%, n=44), or were referred by primary or secondary care health professionals (46.1%, n=41). The remaining participants self-referred following a press release or by word of mouth (5.6%, n=5).

Of the participants who self-referred, three patients were excluded due to: (1) an active foot ulcer; (2) not ready to change physical activity level; and (3) required further psychological support.

### Attendance and participation

Seven participants withdrew before six-month follow up, and one participant withdrew before 12-month follow up. Reasons for attrition were ill health (n=5), work commitments (n=1), childcare issues (n=1), and relocation (n=1). The remaining participants attended all three face-to-face PACs. Between baseline and six months, all participants received monthly contact with the physical activity consultant. The preferred method of follow-up contact was telephone 45.1% (n=37 of 82) and email 54.9% (n=45 of 82).

### Protocol fidelity

The physical activity consultant kept a summary of session content to assess protocol fidelity. Fidelity was observed with participants receiving all components of the intervention at each time point. Behaviour change techniques included were: goal-setting cards; problem solving sheets; and the provision of pedometers and step diaries for self-monitoring.

Three protocol adaptations were required to ensure effective delivery of the PAC in practice. Firstly, allocation of 30 minutes for each PAC was insufficient and was increased to 45 minutes. Secondly, many participants were of older age, had multiple comorbidities and required more intensive support (including relapse prevention; planning social support; setting and adjusting physical activity goals). The gap of six months between the initial and follow-up consultation was too long. An additional 30-minute PAC at three months was offered to participants requiring greater support (10 participants [11.2%] accepted the additional face-to-face consultation). Finally, a follow-up telephone call was added one week after the initial PAC, to ensure patient understanding.

### Issues regarding implementation

Access to good local activity facilities, including diabetes-specific activity sessions and health walks provided by the Paths for All Partnership, played a key role in the intervention. Many participants attended the diabetes exercise classes (38.2%; n=34 of 89). Patients attending the diabetes exercise classes tended to be more able and achieved better outcomes. They highlighted the classes provided a source of social support, peer advice and diabetes education.

Pedometers were identified as effective for self-monitoring and forming intentional behaviours. Participants used pedometers to profile their activity, set progressive and achievable goals, and increase their self-efficacy. We did not record whether use of pedometers tailed off towards the end of the intervention. Lack of administration support was identified as the main barrier for ongoing intervention delivery. This was partly addressed by the provision of minimal secretarial support from 12 months onwards, which assisted with the preparation of letters to participants’ health care providers, and sending email updates to relevant staff.

### Insight from participants and health care staff

Insight was gained from six participants who had completed the 12-month intervention. Responses were gathered from participants who had (n=4) and had not (n=2) achieved greater physical activity levels or weight loss. They all reported high satisfaction with the intervention and identified several factors that contributed to their positive experience. Firstly, the approachability and helpfulness of the physical activity consultant delivering the intervention was highlighted. Secondly, the provision of pedometers and step diaries was considered motivational, informative and useful. Finally, participants who did not achieve greater physical activity levels or weight loss highlighted ill-health and impaired mobility as the main barrier. All participants found the intervention beneficial and would recommend the service to others.

Insight was gained from 10 health care professionals regarding their adoption of the intervention within primary and secondary care. All health professionals agreed that the intervention complemented current diabetes care.

Health professionals adopted and promoted the intervention for several reasons. They considered the intervention protocol to be of a high standard; the service integrated well with current diabetes care; referral to the service was not time-consuming; and positive patient feedback was received.

They also valued the expertise of the physical activity consultant and identified the important role of ‘champions’ for the service. The ‘champions’ (a consultant diabetologist and two health psychologists) provided an easy route to promote the service, e.g. attendance at regular staff meetings in both primary and secondary care; use of existing electronic communications; and shadowing of both primary and secondary care patient consultations.

### Feasibility of measurable outcomes

This unpowered study did not attempt to assess the effectiveness of the intervention but, rather, the feasibility of obtaining measurable outcomes. Table 1 presents results for interest.

In brief, they demonstrated: an increase in the number of participants achieving the physical activity recommendations; an increase in stage of physical activity behaviour change; a reduction in self-reported weight; an increase in positive affect (PANAS); a reduction in levels of depression (HADS); and a decrease in BMI. Although we did not collect a detailed recording of adverse events, none of the participants specifically reported an adverse hypoglycaemic event related to increasing physical activity.

Several issues with obtaining measurable outcomes were identified. These included: (1) lack of...
time within consultations to complete questionnaires; (2) a lack of time to look at data on medication use; (3) routine BMI and HbA1c data not being updated on the central computer system as frequently as anticipated, leading to missing follow-up data; and (4) challenges with completing the detailed IPAQ data within the time-constraint of the consultations.

Rather than calculating the estimated minutes per day spent in various intensities of physical activity, the physical activity consultant briefly discussed with participants whether they were achieving the current UK physical activity recommendations. The outcome was therefore amended to reflect participants who were and were not achieving the physical activity recommendations at baseline, and at six months and 12 months.

### Discussion

This study demonstrated that a PAC intervention within routine diabetes care can be a feasible method of promoting physical activity. The intervention was delivered with high protocol fidelity and positive feedback from both participants and health professionals. Several aspects of the intervention may have contributed to its feasibility in practice. Firstly, the intervention was delivered by an experienced physical activity consultant accredit health psychologist. While an expensive resource, participants reported their relationship with the health psychologist as a key factor in their positive experience of the intervention. The role of health psychologists in supporting physical activity behaviour change for diabetes has not been previously explored. Health psychologists are trained to work with patients to improve self-management across a range of long-term conditions (for example, monitoring/testing, decision making, administering treatments or engaging appropriately with health care systems); they are also trained to work with patients on emotional wellbeing and stress reduction strategies. They can work alongside other diabetes health care professionals to provide an integrated approach to diabetes management. Their knowledge and skills in complex behaviour change may be beneficial for individuals with diabetes who require intense support due to multiple comorbidities.

Secondly, the individual approach of the PAC provided one-to-one support for many participants with complex support needs. This is supported by findings from the Time2Act study where, despite no overall difference in physical activity being observed for participants receiving a face-to-face PAC, a significant increase was found for a sub-group of participants with low physical activity levels at baseline. This suggests that one-to-one support delivered in person was most beneficial for individuals requiring additional support to change their behaviour.

Participants also had the opportunity to gain further support from a group environment by attending the diabetes exercise classes or health walks. Group settings are known to provide peer motivation and support and have been effective in achieving greater physical activity levels in adults with diabetes.

Thirdly, flexibility in the method of monthly follow up allowed participants to have autonomy over their preference for support. Participants could tailor their monthly follow up to suit their individual circumstances. The ability to contact participants via email or by telephone allowed the service to continue at a comfortable rate without creating a back-log of participants waiting for face-to-face appointments.

Finally, the intervention was integrated with other aspects of routine diabetes care. It reinforced messages by other health professionals (e.g. dietary education) and did not operate as a ‘stand-alone’ service. Health professionals highlighted that, while they are aware of the need for physical activity promotion, they often struggle to provide tailored information within relatively short diabetes consultations as well as providing of long-term support, and do not have the confidence to effectively promote physical activity.
Consequently, the intervention was well received and adopted by health professionals within both primary and secondary care, reflected in the rate of referrals received from health professionals.

Recruitment of 89 participants, despite the limited time resources of 4–11 hours per week, is encouraging. If delivered on a full-time basis, this intervention had the potential to support 364 participants per year.

The intervention was based on a theoretical framework of behaviour change and evidence-based guidelines for the delivery of PAC for people with diabetes. A range of behaviour change techniques were used, supported by the Behaviour Change Technique Taxonomy by Michie et al. and research by Avery et al. Pedometers were particularly effective for self-monitoring and forming intentional behaviours. Previous research has shown pedometers to be effective in achieving greater levels of physical activity in people with type 2 diabetes in both the short term and long term. Their feasibility in this sample of mainly older adults with multiple comorbidities is encouraging. Formally collecting pedometer diaries may be a more feasible method of assessing change in physical activity rather than completing the IPAQ in this sample.

Participants in this study required support to complete many of the questionnaires. This was not feasible within the PAC timeframe and is an aspect of the study that requires further consideration for future work.

Although the study was not powered for effectiveness, it demonstrated promising findings in relation to clinically meaningful outcomes. Individuals with type 2 diabetes, who are often sedentary and overweight, are known to achieve metabolic improvements from small changes in physical activity. 

Several minor adaptations were made to the intervention protocol to ensure effective delivery of the intervention. Each of the adaptations increased the intensity of support received by participants, factors identified in previous research as important in both achieving and maintaining behaviour change. A review of physical activity and dietary interventions in the general population found that maintenance of behaviour change was associated with interventions that included face-to-face contact, were greater than six months’ duration, included brief follow-up throughout the intervention, and used greater than six behaviour change strategies. This intervention achieved each of these criteria.

**Strengths and limitations**

This is the first process evaluation performed in the UK exploring the implementation of a PAC intervention within routine diabetes care. Reporting bias was minimised, as the evaluation was undertaken by an independent researcher. Due to the nature of rolling recruitment and limited funding, the process evaluation was conducted at a time when not all participants had reached 12-month follow up.

**Conclusions**

Physical activity consultation, delivered by a skilled health professional, can be a feasible method of supporting people with diabetes and multiple comorbidities to change their physical activity behaviour. These promising findings now need exploring further in a powered trial assessing the effectiveness of PAC interventions delivered within routine diabetes care. The focus of this process evaluation was to explore the feasibility of delivering a PAC intervention within routine diabetes care, to see if health professionals and patients would refer/self-refer and participate, and to explore how the intervention could be delivered. Future research should explore how to adapt this intervention for cost-effective delivery within routine care. The challenge lies in the translation of physical activity interventions for everyday practice while balancing the need for measurable outcomes with effective delivery.

Health care professionals or researchers involved in the development of future physical activity interventions should consider integrating their intervention protocol with other aspects of diabetes care, such as dietary advice and self-care education. Training other health professionals to deliver the PAC intervention would keep costs down. An emerging theme at present is the development of social prescribing (that is, linking patients with non-medical sources of support in the community). Exploring how the PAC intervention could fit into the social prescribing model would also be worthwhile.

**Acknowledgements**

Many thanks to:
- All those who took part in the physical activity service.
- The health professionals within NHS Grampian who supported and engaged with the intervention.

The study was funded by an endowment fund of NHS Grampian, Aberdeen, UK.

**Declaration of interests**

There are no conflicts of interest declared.

**References**

References are available online at www.practicalediabetes.com.
References


