

An exploration of issues faced by physically active people with type 1 diabetes

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It is commonly believed that fear of hypoglycaemia during or after exercise is a major deterrent to exercise in individuals with type 1 diabetes (Brazeau et al, 2008). Exercise is important for a healthy lifestyle (Francescato et al, 2005) and is encouraged in people with diabetes as a lifestyle modification (SIGN, 2010). However, controlling blood glucose levels while exercising is a challenge for people with type 1 diabetes (Brazeau et al, 2008) and may make them less likely to undertake exercise than people with other chronic conditions (Boyle et al, 1998). To help inform practice and future studies, a small study ($n=4$) was undertaken to explore this topic from the perspective of the individual with type 1 diabetes. The study sought to ascertain whether fear of hypoglycaemia during or after exercise was real among physically active people with type 1 diabetes, and to explore the self-management strategies they used to overcome problems.

Exercise in people with type 1 diabetes has been shown to improve cardiovascular risk, lipid profile and blood pressure (Lehmann et al, 1997), in addition to improving endothelial function (Robitaille et al, 2007) and insulin sensitivity (Francescato et al, 2005). Multiple factors, such as type of insulin and type, duration and intensity of exercise, can potentially influence the impact of exercise on blood glucose levels (Perry and Gallen, 2009).

General advice offered by healthcare professionals to people with type 1 diabetes

who wish to exercise centres on increasing carbohydrate intake and reducing insulin doses to prevent blood glucose levels falling too low during and after exercise. However, the provision of this advice is inconsistent and much of the decision making is left to the person with diabetes. As people with type 1 diabetes who exercise regularly will have experienced firsthand the challenges of exercising and maintaining glycaemic control, with or without advice from healthcare professionals, their experience was seen as critical to the understanding of this complex

Article points

1. The experience of participating in exercise was explored within a focus group of four physically active people with type 1 diabetes.
2. The issues explored were self-management, hypoglycaemia and coping strategies.
3. Findings suggest that motivated individuals will develop, through trial and error, coping strategies to overcome the problems of maintaining glycaemic control that arise during and after exercise.
4. Healthcare professionals need to explore strategies to assist regular exercisers and encourage participation from non-exercisers.

Key words

- Exercise
- Hypoglycaemia
- Self-management
- Type 1 diabetes

Authors' details can be found at the end of this article.

Page points

1. The focus group consisted of two men and two women: mean age 48.5 years, HbA_{1c} 7.35% (56.8 mmol/mol), BMI 21.7, and total daily insulin dose 43 units.
2. All participants used a basal bolus insulin regimen with an insulin analogue and were experienced in carbohydrate counting and insulin dose adjustment.
3. All participants had type 1 diabetes that had been reasonably well controlled for at least 2 years and were physically active for 30 minutes three or more times a week.
4. Participants had not received any specific advice from healthcare professionals on managing their diabetes when exercising, other than as part of routine clinic visits.

area.

The experience of participating in exercise was explored in a small focus group of four people with established type 1 diabetes who exercised regularly. This small explorative study was undertaken as part of a larger study that aimed to explore the reproducibility of glucose response to exercise and the effectiveness of an algorithm for carbohydrate and insulin dose adjustment in maintaining glycaemic control during and after exercise for people with type 1 diabetes.

The focus group consisted of a convenience sample of four individuals selected from the larger study sample. All had type 1 diabetes that had been reasonably well controlled (HbA_{1c} <8.0% [<64 mmol/mol]) for at least 2 years and were physically active for 30 minutes three or more times a week. They undertook a mixture of recreational activities and competitive sports.

All participants used a basal–bolus insulin regimen with an insulin analogue and were experienced in carbohydrate counting and insulin dose adjustment. The participants had not received any specific advice from healthcare professionals on managing their diabetes when exercising, other than as part of routine clinic visits.

Aim of the study

The aim of the focus group was to explore the experience of participating in exercise among people with type 1 diabetes who exercised regularly.

Method

The focus group was undertaken in a local sports laboratory by two independent researchers and lasted 1 hour. The group was conducted using a topic guide developed from issues frequently raised in the literature, such as insulin management when exercising, alteration to food intake when exercising, problems with glycaemic control relating to exercise and how these are addressed, and the significance of exercise.

To ensure accuracy of data transcription the focus group was recorded using a digital

Box 1. Stages of content analysis.

- Selecting the unit of analysis.
- Creating and defining the categories.
- Pretesting the category definitions and rules.
- Assessing reliability and validity.
- Revising the coding rules if necessary.
- Pretesting the revisited category scheme.
- Coding all the data.
- Reassessing reliability and validity.

Adapted from: Krippendorff (1980)

recorder; in addition, one researcher took notes of the focus group while the other facilitated the discussion using the topic guide.

Using content analysis the two researchers studied the transcript of the focus group and developed emergent themes. Content analysis is a systematic and objective process that allows the researcher to break down the emergent data into units. These are then coded and explored, based on the shared experiences of the participants (Krippendorff, 1980; Silverman, 2004). To undertake content analysis the researcher must identify the units of analysis from each of the participant's transcripts, and these units must be guided by the research questions (Downe-Wamboldt, 1992). The stages of content analysis followed by the researchers are shown in *Box 1*.

Results

Demographics

The focus group consisted of two men and two women: age 48.5±2.5 years, HbA_{1c} level 7.35±0.5% (56.8±5.5 mmol/mol), BMI 21.7±1.5 kg/m², and total daily insulin dose 43±13 units (all mean ± standard deviation).

Content analysis

Three main themes emerged from content analysis of the transcript: trial and error, trade-off and locus of control.

Trial and error

(self-managing unpredictable situations)

The theme of trial and error emerged from

continuing discussion throughout the focus group about how people managed – or, from close analysis of the transcript, juggled – their diet, their long-acting insulin dose and their short-acting insulin dose according to the type of exercise, the time of day and their experience to date.

All the participants had experienced, and at times continued to experience, difficulties in controlling their blood glucose levels when exercising, but could describe the strategies they would take to overcome these for current and new exercise regimens. However, even these experienced exercisers stated that the unpredictable effect of carbohydrate on blood glucose levels, and the variability of blood glucose levels during and after exercise, posed particular problems.

There was no single strategy that would maintain their glycaemic control before, during and after exercise in all situations. All the participants had spent a significant amount of time and energy trying different ways of altering food intake in conjunction with adjusting insulin doses to coincide with the time and type of exercise.

As extracts from the transcript indicate (see below), participants could not even depend on the development of their own strategy through experience to control their blood glucose; at times these proved inconsistent and unpredictable, and could let them down.

“I’ve been caught out once or twice sort of in coming back down ... you think, oh I feel really exhausted, and then you do a test, you know, and your sugar levels are really low and you, you know, you’ve had quite a big meal because you’ve thought I’ve been out in the hills all day and you go into a pub or whatever it is and, you know, you have a good feed [laughs] and you think, oh that should be plenty, and then you’re sort of ... you know, about an hour or half an hour later on, you know, you’re ... low.” (participant 1)

“You can’t just take anything for granted. All right, this’ll be fine, you’ve always

got to sort of be ten steps ahead of it and trying to work out what’s going to happen, you know, because you can’t sort of say, ‘oh yeah, this is going to happen’, because it just depends on ... the exercise that you’ve been doing.” (participant 1)

“My brain sometimes tells me to put more carbohydrate in ... as opposed to thinking I will reduce the insulin.” (participant 2)

Interestingly, what was highlighted within this theme was the ongoing nature of this adjustment, with participants who had grown up with diabetes and those who had been diagnosed more recently all still adjusting regimens and learning to manage their glycaemic control. While one thought they had “a lot to learn”, another, who had grown up with it, was still describing different bespoke regimens for different forms of exercise, and said: “So that’s something you occasionally ... miss the signs [of hypoglycaemia].”

Trade-off

The following quote encapsulates all the sentiments that allowed the theme of motivation to be developed:

“I think diabetes is really quite hard work.” (participant 2)

In order to exercise, participants needed to overcome the fear of hypoglycaemia, understand the effect of physical activity on their own bodies, spend an inordinate amount of time adjusting insulin doses and food intake, testing blood glucose levels, and then reviewing and modifying strategies to prevent the potentially severe consequences of exercise.

When questioned about the value of exercise in light of all the effort required, participants were very positive about the experience of exercise. It seemed that despite all of the difficulties they described, they still considered exercise worth the effort.

“So that was my initial, you know, reason

Page points

1. There was no single strategy that would maintain participants’ glycaemic control before, during and after exercise in all situations.
2. All participants had spent a significant amount of time and energy trying different ways of altering food intake and adjusting insulin doses to coincide with the time and type of exercise.
3. The ongoing nature of adjustment was highlighted, with participants who had grown up with diabetes, as well as those who had been diagnosed more recently, all still adjusting regimens and learning to manage their glycaemic control during and after exercise.
4. Despite all the difficulties they experienced, participants were very positive about the value of exercise, and considered it worth the effort.

Page points

1. All participants were highly motivated to exercise, and handled the risks and complications of exercise by implementing self-management strategies and learning from them.
2. Findings show that advice regarding reducing insulin dose before exercise and adjusting carbohydrate intake is not readily available, and where it is available it is not adequate for tailored exercise regimens.
3. Exercising is problematic for people with diabetes, and healthcare professionals need to consider the implications when encouraging individuals to exercise.

for going back to exercise. But once I actually started exercise it's really quite addictive ... I mean I just loved it, you know, I just love it and I still do, but at the same time you get to a stage where ... you know, you're getting so many things going wrong." (participant 3)

"I think an awful lot is to do with your own education, you know, about yourself ..." (participant 3)

"So I really think exercise is really quite important for diabetes ... Like for my own diabetes because I don't think it would ... be as well controlled as it is at the moment if I hadn't taken up exercise, you know; I think I would have been [laughs] probably admitted by this stage." (participant 3)

"... think the thought of having a hypo doesn't put me off the exercise but I think, you know, sometimes if you have a mild hypo when you are exercising, you know, you maybe don't realise, you know. Especially again in a competitive sort of situation, you might, you know, get bolshy or, you know, get bad tempered." (participant 1)

"I, you know, participate in [exercise] but, you know, I think a positive side-effect of that is it makes ... your sugar levels a bit more consistent." (participant 1)

Locus of control

(willingness to overcome problems)

All the participants were very highly motivated to exercise, and therefore took personal control of the situation and handled the risks and complications of exercise by implementing self-management strategies and learning from them:

"Once you ... understand your own body a bit, then you're not as frightened ... I used to be really frightened about ... having hypos when I was exercising."

(participant 2)

"I can't do as much as I used to in swimming because I used to really push myself, but ... I know my limits ... and I just take my time. I just do it because I haven't got the same energy that I used to have and I find that frustrating, but it's just something you have to live with and you've got to adjust everything accordingly kind of ... I do get frustrated though." (participant 3)

Discussion

The findings from this small study suggest that this group of people with type 1 diabetes must be fully committed to exercise and be prepared to overcome obstacles through a trial-and-error approach to ascertain which management techniques work for them in preventing problems with glycaemic control during and after exercise.

These results support the work of Lumb and Gallen (2009), which suggests that different types of exercise cause different problems with blood glucose control and require different management strategies. Lumb and Gallen suggest that basic advice can be given regarding reducing insulin dose before exercise and adjusting carbohydrate intake. However, the current study has shown that this advice is not readily available, and that where it is available it is not adequate for tailored exercise regimens.

The physiological response to exercise in this group varied and this has important implications for practice. When healthcare professionals are discussing exercise with people with diabetes, the underlying physiological process should be discussed to increase patients' understanding of what they are experiencing when exercising. There is a need for further training of healthcare professionals to ensure that appropriate information is provided, and for further research to be undertaken to increase knowledge in this area (Perry and Gallen, 2009).

Exercising is problematic for people with diabetes, and the implications of this need to be considered when encouraging individuals

to exercise. Findings indicate that the fears and concerns that are said to prevent people with diabetes from exercising are real, and that appropriate advice and support need to be readily available from healthcare professionals if they are to be overcome. This issue needs to be considered in light of the increasing emphasis on the need for exercise in this population.

Ethical considerations/limitations

Ethical approval for this study was sought and gained from NHS Lothian Regional Ethics Committee.

The findings of this study have to be considered in light of the small number of participants. Although the themes generated may reflect the experience of a number of regular exercisers with diabetes, the study would need to be replicated with a greater number of participants from a larger geographical area for them to be representative of the population under study.

Conclusion

These preliminary findings suggest that individuals with enough motivation will develop, through trial and error, effective coping strategies for the problems in diabetes management that arise through participation in exercise. Fear of hypoglycaemia is not a deterrent to exercise in this group as they have calculated that the risk of a hypoglycaemic episode is lower than the risk of not participating in exercise.

Healthcare professionals need to encourage a change in the beliefs of people with diabetes about the risks of exercise, and focus on the potential benefits. Through discussion regarding practical management strategies and the provision of good advice, healthcare professionals can highlight how the benefits of exercising outweigh the risks of not exercising and provide the support and guidance to facilitate this change. ■

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