CREATOR(S):

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YEAR:

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mHealth optimisation for education and physical activity in type 1 diabetes: MEDPAT1

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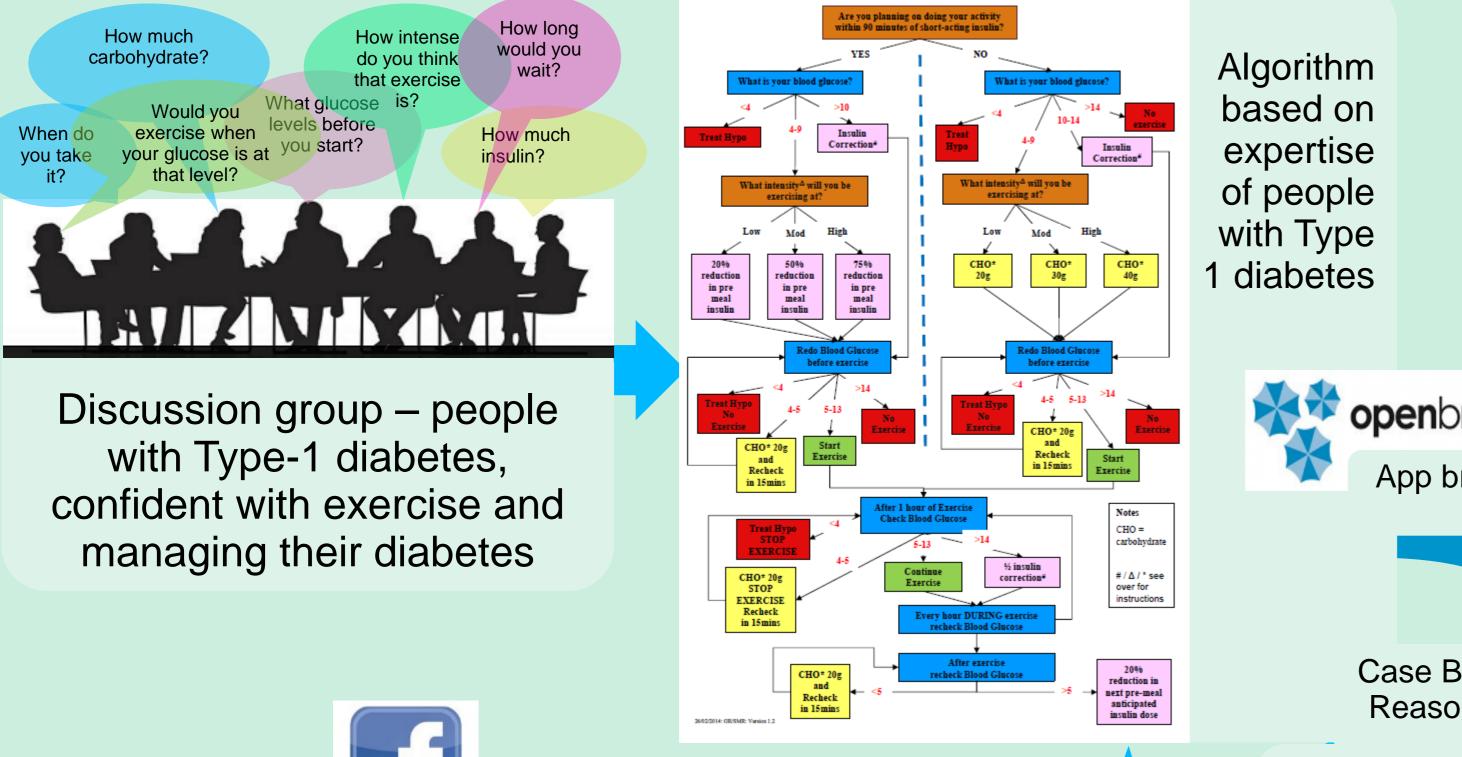
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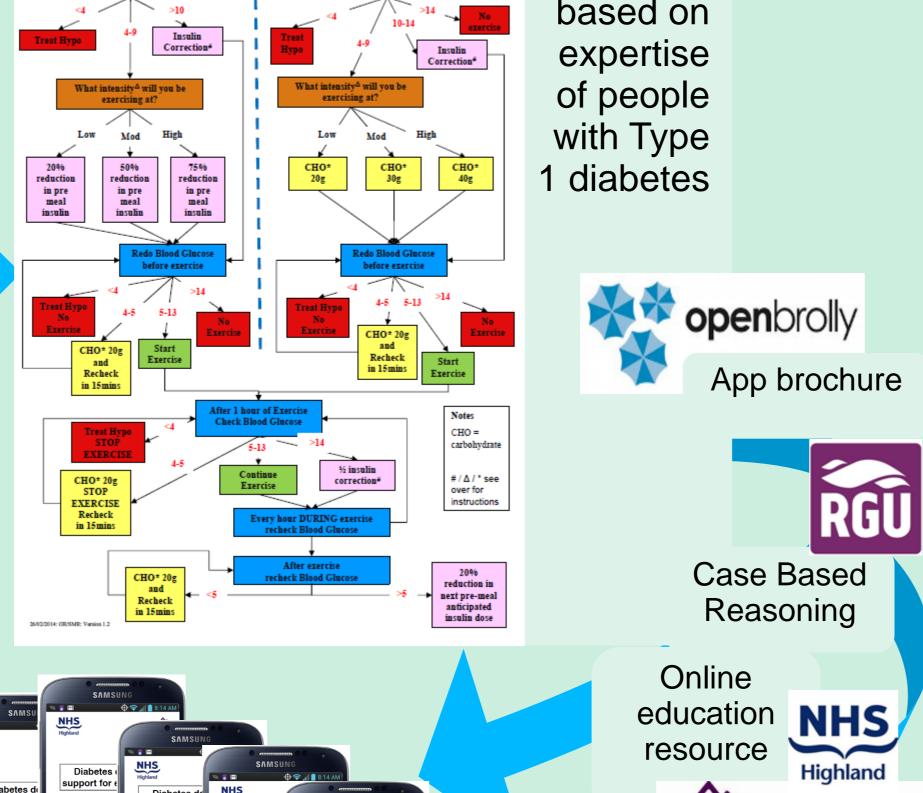[4]School of Computing Science and Digital Media, Robert Gordon University, Aberdeen

AIMS

To develop and evaluate the usability of prototype personalised prediction algorithms for people with type 1 diabetes to optimise blood glucose control associated with physical activity using smart phone technology. To explore the potential to build a knowledge repository founded on case-based reasoning and linkage with an online structured education programme that will increase confidence and levels of participation in physical activity.
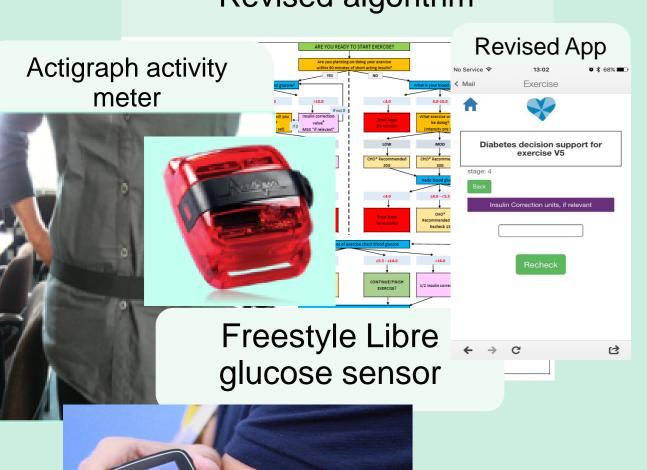
METHODS

An algorithm for insulin adjustment during a variety of exercise activity was developed in a co-production model comprising health care professionals and people with type 1 diabetes. A closed Facebook type 1 diabetes forum was established to test an app prototype to define data capture points, refine the algorithm and the interface. Focus groups and questionnaires were employed to capture experience and recommendations for further development.

Discussion group – people with Type-1 diabetes, confident with exercise and managing their diabetes

Algorithm based on expertise of people with Type 1 diabetes

openbrolly
App brochure

RGU
Case Based Reasoning

Online education resource
NHS Highland
University of the Highlands and Islands Oilthigh na Gàidhealtachd agus nan Eilean

App brochure review and feedback

openbrolly
App refinement

Revised algorithm
Revised App

Actigraph activity meter

Freestyle Libre glucose sensor

Study participants (n=10) recruited through Facebook
- Physically very active
- Type 1 Diabetes
- Confident diabetes management
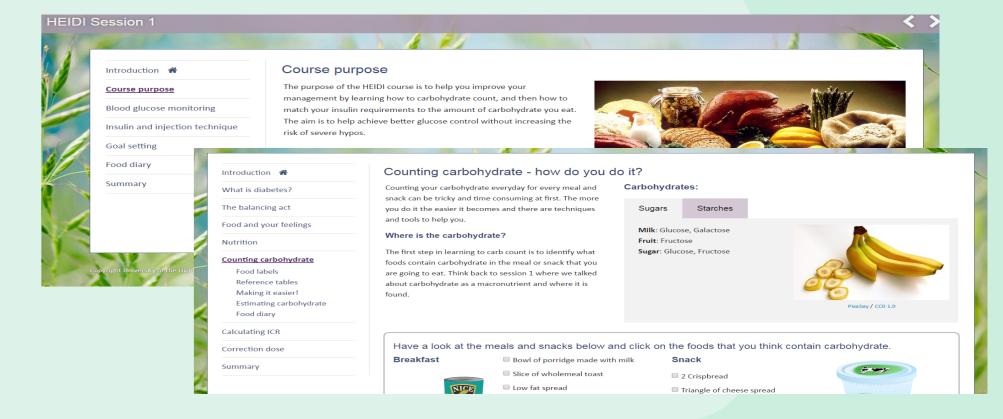- Insulin pump users and multiple daily injectors

facebook
Private Group

Participants
- Used the app during exercise
- Wore an activity monitor
- Wore continuous glucose sensor
- Took part in discussion and feedback on Facebook forum
- Participated in focus groups
- Ranked approaches to visual representation of CBR data
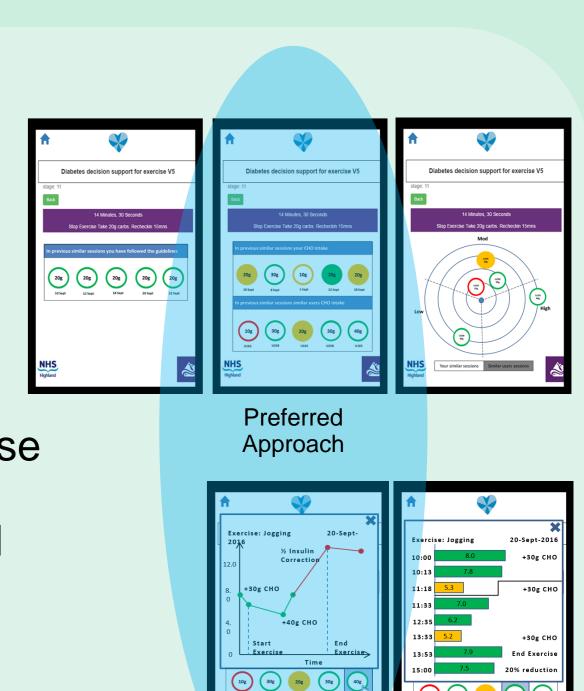- Provided feedback on online education resources

EDUCATION

App users directed to relevant HEIDI online education resources based on outcomes of exercise session.

CBR VISUALISATION OPTIONS

Study participants given

- choice of ways of presenting similar exercise sessions with likely outcomes illustrated using a traffic light system
- options to see more detail for specific exercise sessions where click on different circles (exercise sessions) allows comparison of actions around carbohydrate intake and insulin corrections and outcomes
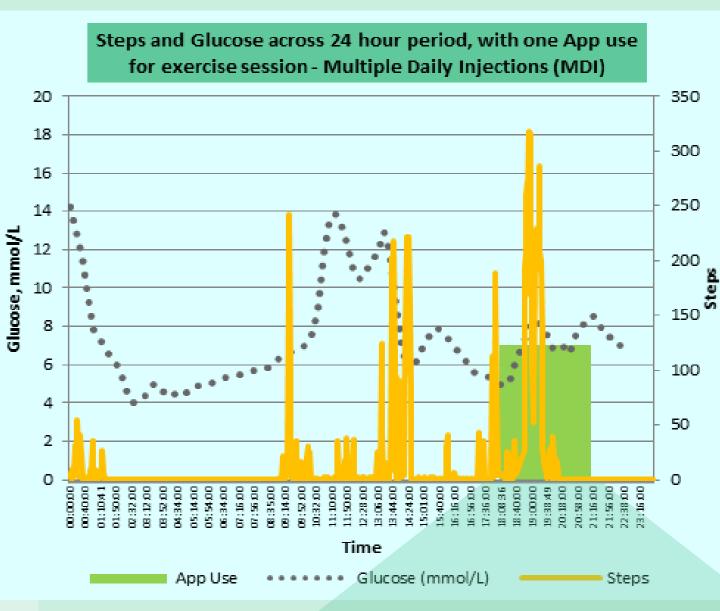
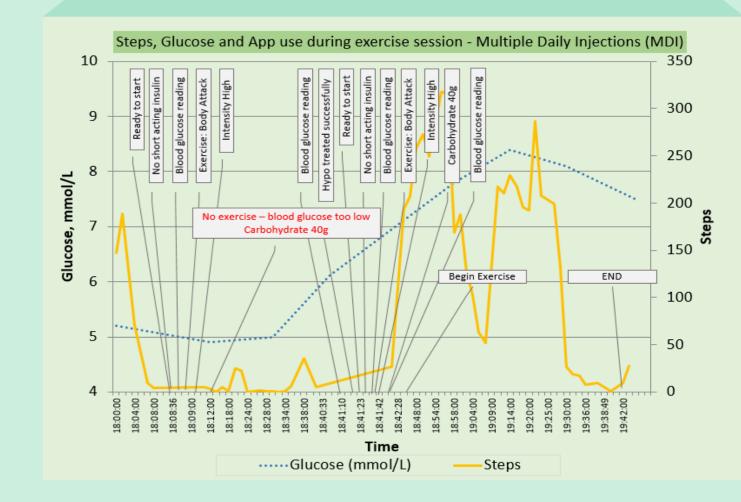
Preferred Approach

RESULTS

10 participants, undertaking a range of activities, were recruited from the Facebook community to evaluate function and usability of the app over a period of eight weeks. A total of 119 app uses were logged across the evaluation period, with an average of 3 uses per week per user. A peak of 4 uses per user was observed during week 3. This coincided with a modification to the algorithm due to Facebook forum feedback and discussion.

An example of app use.

The user wanted to start exercising however the app indicated that blood glucose was too low. CHO intake and retest was recommended. Blood glucose increased to an acceptable level. The user entered their chosen activity. Based on exercise intensity further CHO intake was recommended by the app before starting exercise.

Steps and Glucose across 24 hour period, with one App use for exercise session - Multiple Daily Injections (MDI)

Detail of app use

Steps, Glucose and App use during exercise session - Multiple Daily Injections (MDI)

CONCLUSIONS

Use of the app initiated Facebook forum discussions which established that while the sample algorithm developed with users reflected ideal behaviour, in practice, different behaviours were adopted. Focus group discussions and one-to-one feedback identified significant real life issues which impacted user behaviour

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DIABETES SCOTLAND CARE. CONNECT. CAMPAIGN.