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Developing an aerobic exercise intervention for patients with psoriasis to support lifestyle behaviour change and improve health outcomes

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Abstract

Background Patients with psoriasis do not exercise to the extent recommended for cardiovascular health, which may contribute to the increased risk of cardiovascular disease (CVD) and metabolic syndrome observed in this patient group. We previously identified that patients with psoriasis have significant disease-specific barriers to exercise. Others have reported that individuals with psoriasis develop higher heart rates and systolic blood pressure during bouts of exercise, followed by a slower recovery than healthy control subjects.

Aims We hypothesized that a bespoke, evidenced-based, exercise programme could be developed for patients with psoriasis.

Methods We convened a multidisciplinary Working Group comprising key stakeholders, including patients with psoriasis, along with sports scientists and clinicians, to develop the programme.

Results To allow for different levels of fitness, lifestyle and motivation a 10-week intervention comprising two group walking sessions per week each of 1 h duration [led by a sports scientist (RS)] was designed using the Mapometer website. Walking distance was validated by a Walkmeter application, which uses global positioning system technology. The volume of exercise per session was calculated so that participants could incrementally progress to heart-healthy levels of exercise over the course of the programme. Maps of 20 unique walking routes were developed. A GENEactiv Original accelerometer and Newfeel Onwalk 900 pedometer were selected as wearable devices.

Conclusion We developed an exercise programme which specifically removed barriers to exercise for those with psoriasis, in partnership with patients. Regular exercise may offer significant health benefits for patients with psoriasis, including reduced CVD risk and increased psychosocial functioning, and this programme merits further investigation.

Introduction

Psoriasis is a chronic inflammatory skin disease that affects approximately 1–3% of the UK population,[1] and is associated with significant psychosocial impairment.[2] Physical activity is measured in metabolic equivalents (METs). Each activity has a MET value (e.g. jogging is 8·7 METs) enabling the volume of physical activity to be computed from the energy requirements for an activity (MET), weighted by duration (min per week; Fig. 1).[3,4] The American Heart Association (AHA) proposes that a combination of moderate- and vigorous-intensity physical activity, totalling an energy expenditure of ≥500–1000 MET-min/week, will result in a number of health benefits, including regulation of blood pressure, management of anxiety/depression and prevention of weight gain.[3] Patients with psoriasis do not exercise to the extent recommended for cardiovascular health, which may contribute to the increased risk of cardiovascular disease (CVD) and metabolic syndrome observed in this patient group.[5]

We have previously shown that patients with psoriasis face disease-specific barriers that limit exercise participation, including skin severity and sensitivity, clothing choice, treatments and participation in social/leisure activities.[5] Others have reported that individuals with psoriasis develop higher heart rates and systolic blood pressure during bouts of exercise, followed by a slower recovery than healthy control subjects.[6] Plaques of psoriasis limit normal sweating and heat dissipation, features that reduce the tolerability of vigorous-intensity exercise for patients with psoriasis.[7] Taken together, this limits the ability of patients with psoriasis to adhere to current exercise programmes and to benefit from health-promoting levels of adequate physical activity while minimizing sedentary behaviour.

Obesity is a risk factor for CVD and is a significant and growing problem worldwide.[8] Obesity is associated with increased risk of developing psoriasis,[9] and body mass index correlates with clinical severity of psoriasis.[10] Exercise can improve weight management in patients with psoriasis,[11]

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How to quantify physical activity

Physical activity is measured in metabolic equivalents (METs). Each activity has a MET value which represents the intensity of the activity.

The total amount of physical activity completed over time can be quantified as MET-minutes (METs multiplied by time spent).

The American Heart Association recommends ≥ 500-1000 MET-minutes per week.

MET values examples

Activity	MET
Slow walking	2.5
Walking up a gentle incline	4.1
Brisk walking	4.9
Walking up a steep hill	6.2
Jogging	8.7

How to achieve healthy levels of activity (weekly example, MET-minutes/week)

Activity	Calculating MET-minutes	MET-minutes
Slow walking	2.5 METs x 30 minutes	75
Walking up a gentle incline	4.1 METs x 20 minutes	82
Brisk walking	4.9 METs x 60 minutes	294
Walking up a steep hill	6.2 METs x 15 minutes	93
Jogging	8.7 METs x 10 minutes	87
	Total (MET-minutes/week)	631

Figure 1 Quantification of physical activity is important in order to establish whether individuals are achieving a combination of moderate- and vigorous-intensity physical activity, totalling an energy expenditure of ≥ 500–1000 MET-min/week, as recommended by the American Heart Association (AHA). Physical activity is measured in metabolic equivalents or METs. Each activity has a MET value thus enabling the volume of physical activity to be computed from the energy requirements for an activity (MET), weighted by duration (min/week).

and this, in conjunction with promotion of an anti-inflammatory phenotype observed with exercise, may directly benefit psoriasis control.[12] Indeed, median skin involvement with psoriasis is 5% among regular exercisers compared with 10% in those who are physically inactive.[13]

Despite the significant shift in the management of psoriasis, with advances in pharmacological treatments, poor outcomes are still common.[14] Coupling lifestyle behaviour change strategies, such as increasing physical activity and reducing sedentary behaviour, with standard therapies for psoriasis could improve disease outcomes and reduce the risk of comorbidities such as CVD and metabolic syndrome.[15] Indeed, the role of lifestyle behaviour change in the management of psoriasis was recently identified as the most important priority for psoriasis research in the UK Psoriasis Priority Setting Partnership, which is a James Lind Alliance-facilitated collaboration involving healthcare professionals (HCPs) and people with lived experience of psoriasis.[16]

Methods

Partnership with patients

Having established that psoriasis-specific barriers limit exercise engagement and prevent patients with psoriasis gaining the health benefits associated with regular exercise, we hypothesized that a bespoke, evidenced-based, exercise programme could be developed for individuals with psoriasis. We convened a multi-disciplinary Working Group (WG) representing sports science, dermatology and those with lived experience of psoriasis ($n=8$) in order to design our intervention in partnership with key stakeholders. Two independent advisors facilitated the discussion.

The design brief from the Working Group

The WG advocated that the exercise programme should involve coach-led group activities that were free, fun and achievable, while also providing social support and having measurable health benefits. Neither vigorous-intensity exercises or swimming were considered acceptable. The WG suggested that walking was the most inclusive exercise, given its acceptability to those both exercise-naïve and exercise-experienced individuals. Therefore, to allow for different levels of fitness, lifestyle and motivation, the WG endorsed a 10-week intervention comprising two walking sessions per week (each of 1 h duration, led by a sports scientist within a green-space location).

Quantification of health-promoting physical activity

The WG recommended that participants should incrementally progress from even a sedentary baseline to cardiovascular health-promoting levels of exercise over the course of the programme. In addition, the WG recommended that, despite concern over tolerability and skin irritation, participants should use wearable devices to objectively quantify volume of physical behaviour (physical activity and sedentary behaviour), thus permitting evaluation of the health outcomes derived from the intervention. There was consensus on the use of an accelerometer (GENEActiv Original; Activinsights Ltd, Kimbolton, UK), which is usually worn on the wrist but has removable straps to permit wearability elsewhere (any limb, hip, chest, back, head). In addition, a pedometer (Onwalk 900; Decathlon Group, Villeneuve d'Ascq, France) was chosen to enable recording of real-time step counts. Pedometers offer greater cost-effectiveness than accelerometers, including provision of immediate physical activity feedback to users, and a reduced requirement for recharging. However, accelerometers offer more detailed physical activity readouts such as exercise intensity, frequency, duration of activity and energy expenditure, permitting assessment of the dose–response relationship between physical activity and health outcomes.[17]

Results

The Working Group

The WG comprised 12 individuals (6 men, 6 women), of whom 8 (5 men, 3 women) had lived experience of psoriasis, while the other members were an exercise scientist, an HCP and two facilitators. The group had a median age of 50 years (range 30–73 years). The patient representatives included those with skin-only disease and those with both skin and joint disease.

Developing an exercise intervention in conjunction with those with lived experience of psoriasis

Having established in previous work that patients with psoriasis do not exercise to the extent recommended by the AHA guidelines, we designed our intervention to cater for those having a relatively sedentary baseline. In addition, we followed best practice for exercise programmes, which aim for participants to reach a specific exercise volume by adopting a gradual and incremental progression strategy.[3]

Our target was to achieve heart-healthy levels of exercise (as defined by the AHA, totalling an energy expenditure of ≥ 500 MET-min/week) within 3 weeks of programme participation, and then sustain these for the remainder of the intervention. To do this, we extrapolated the walking speed for our first session (3 mph), the rate of progression (0·1 mph per session) and the maximum walking speed (4 mph) from exercise interventions previously used for populations with cardiometabolic diseases.[18,19] We then used Mapometer (https://gb.mapometer.com), which provides detailed maps of green spaces, including footpaths not seen using other well-known mapping applications, to identify a variety of easy and challenging walking routes within three different parks in Greater Manchester. This allowed us to incorporate walking distance and walking speed with measurements of terrain gradient to calculate the energy intensity and MET rating per walking session.

We then used the drawing tools in Mapometer to finalize a series of route maps for the intervention (matching the energy intensity requirements previously identified) to ensure that participants could incrementally progress to health-promoting levels of exercise over the course of the programme (Table 1). Maps of each of the unique walking routes were downloaded (Fig. 2) and walking distance was validated using a Walkmeter application (https://walkmeter.com), which utilizes global positioning system (GPS) technology.[20] Each walk was then undertaken by members of the study team to ensure that our theoretical considerations had been realized. Warm-ups, pre-exercise stretching and cool-downs, each of 5 min duration, were designed and added to each session.

Tailored entry points

Although our intervention was specifically designed to accommodate individuals having a relatively sedentary baseline, we also wanted to ensure utility for those who were exercise-experienced. We therefore designed a series of cardiorespiratory fitness assessments to establish usual levels of physical activity, which could be conducted prior

Table 1 Walking speed, distance walked and energy expenditure per week of the exercise intervention

Week	Session	Warm-up and cool-down speed, mph	METs during warm-up/ cool-down	Walking distance, miles	Walking speed, mph	METs during walks	Total session MET-min	Total weekly MET-min
1	1	2	2·5	3	3	3·3	199[a,b]	404[a,b]
	2	2	2·5	3·1	3·1	3·4	205[a,b]	
2	3	2	2·5	3·2	3·2	3·5	212[a,b]	432[a,b]
	4	2	2·5	3·3	3·3	3·7	220[a,b]	
3	5	2	2·5	3·4	3·4	3·8	228[a,b]	465[a,b]
	6	2	2·5	3·5	3·5	3·9	237[a,b]	
4	7	2	2·5	3·6	3·6	4·1	247[a,b]	504[a,b]
	8	2	2·5	3·7	3·7	4·3	257[a,b]	
5	9	2	2·5	3·8	3·8	4·5	268[a,b]	548[a,b]
	10	2	2·5	3·9	3·9	4·7	280[a,b]	
6	11	2·5	2·9	4	4	4·9	293[a,b]	586[a,b]
	12	2·5	2·9	4	4	4·9	293[a,b]	
7	13	2·5	2·9	4	4	4·9	293[a,b]	586[a,b]
	14	2·5	2·9	4	4	4·9	293[a,b]	
8	15	2·5	2·9	4	4	4·9	293[a,b]	586[a,b]
	16	2·5	2·9	4	4	4·9	293[a,b]	
9	17	2·5	2·9	4	4	4·9	293[a,b]	586[a,b]
	18	2·5	2·9	4	4	4·9	293[a,b]	
10	19	2·5	2·9	4	4	4·9	293[a,b]	586[a,b]
	20	2·5	2·9	4	4	4·9	293[a,b]	

METs, metabolic equivalents. [a]MET values and total weekly MET-min were calculated.[4,26] [b]Heart-healthy levels of weekly exercise engagement were reached by Week 4 of the exercise programme (exercise volume in Weeks 1–3 was below that recommended by the American Heart Association; exercise volumes from Week 4 onwards were healthy levels of exercise).

to starting the intervention and could be used to identify a suitable entry point on our programme. Instructional videos were also developed to support these cardiorespiratory assessments, including the 30-s sit-to-stand test, timed up-and-go test, single-leg balance test and wall-squat test.

Discussion

We report the development of an evidence-based, moderate-intensity exercise programme for patients with psoriasis, designed in collaboration with those who have lived experience of the disease. The final exercise intervention comprised a baseline cardiorespiratory fitness assessment to allow for individualized entry points to cater for different levels of fitness, lifestyle and motivation, and comprised a programme offering an incremental and sustainable pathway to health-promoting levels of activity for all. The suite of walking sessions, each of 1-h duration and augmented with warm-ups, pre-exercise stretches and cool-downs, were designed to be completed twice weekly within green spaces over 10 weeks. The intervention specifically incorporated physical activity that was free, requiring no equipment other than comfortable trainers. We plan in future work to offer this programme locally and for an exercise physiologist to lead small group-based sessions to enable peer support and, by using wearable technologies, to evaluate the health outcomes for individuals with psoriasis.

Patients with psoriasis report feeling excluded from society, which can result in loneliness, embarrassment and a lack of self-esteem.[21] Inclusivity emerged as a key theme during discussions with the WG. Our patient representatives wanted activities to be led by a coach who understood psoriasis, and to gain health benefits as a group rather than individually. Therefore, we needed to develop a programme that fostered a safe environment free of stigmatization to encourage exercise re-engagement for those with psoriasis. Walking as an exercise also offered inclusivity because it is a cost-effective exercise that can be undertaken comfortably at a moderate exercise intensity and poses minimal risk of injury.[3] Indeed, walking requires no sports equipment or prior skill development. Recognized as the most popular physical activity for adults,[3] walking also works well as a group-based activity, and previous studies have shown improved health outcomes and high adherence rates with walking interventions in clinical populations.[22]

The burden of living with psoriasis can be significant,[21] and patient representatives on the WG highlighted the importance of the intervention offering peer support from fellow walkers/patients. Indeed, in a recent review of factors associated with exercise adherence in patients with chronic diseases, the role of social support from peers, staff and family was identified as a key component that increased adherence with exercise programmes.[23] Adequate social support from exercise participation can also improve self-esteem and optimism, and reduce stress and depression.[24] Furthermore, exercise programmes supervised by exercise professionals are known to improve exercise adherence, as they offer enhanced opportunities for further social support and feedback, and promote a relationship between the exercise professional and the patient.[23]

Given the importance of collecting valuable data on exercise engagement and health outcomes, wearable technology was advocated by all representatives of the WG. However, concern was expressed by patient representatives that direct contact with skin may cause local irritation. We therefore selected devices that will accommodate a dressing between the skin and the device, or can be worn on various body sites. The pedometers have screens displaying real-time step counts, which gives users ownership of their current activity data. This is important for self-monitoring and reflection, providing users with immediate

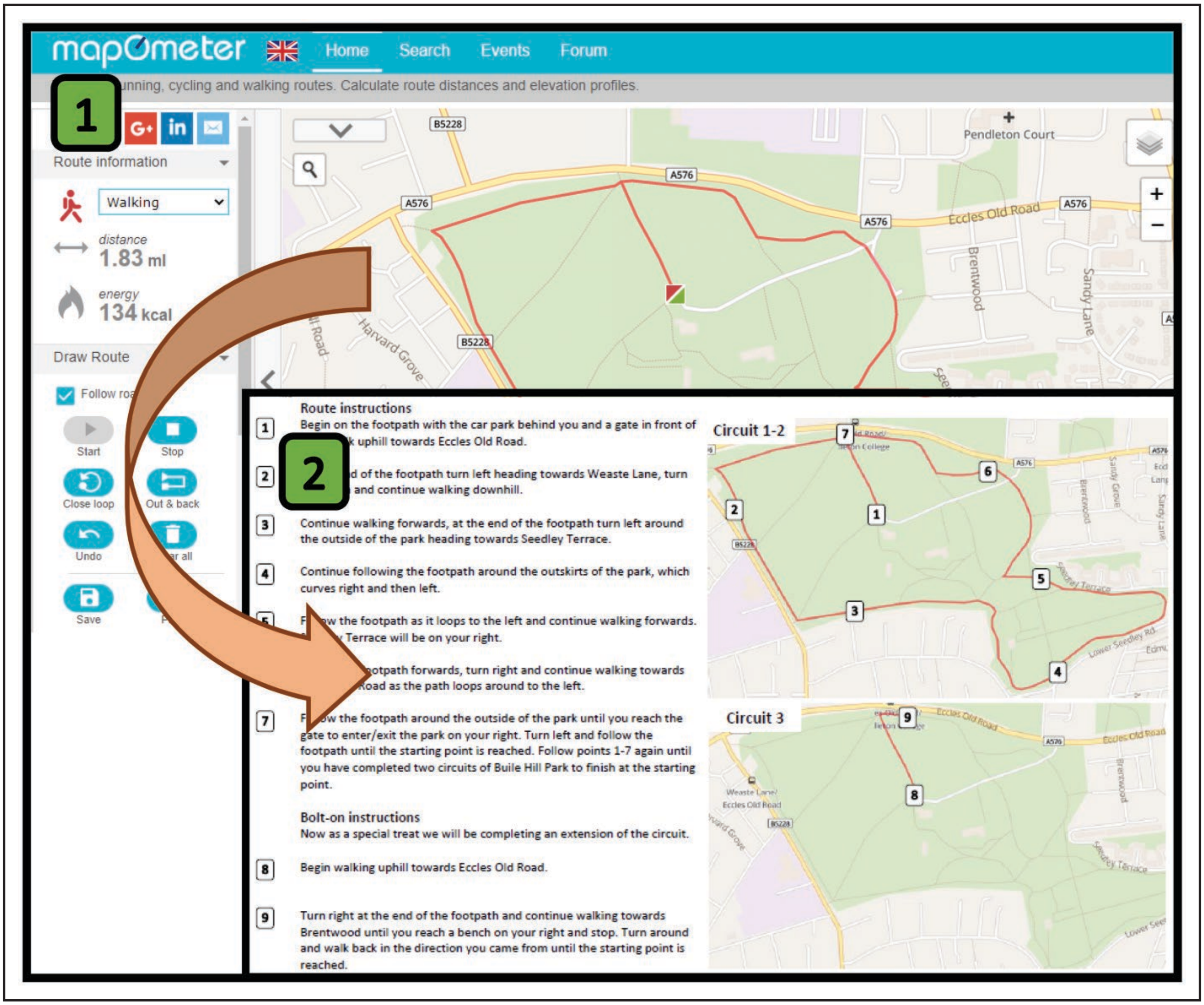

Figure 2 (1) Walking routes were drawn using Mapometer, which also enabled measurement of walk distance. (2) Numbered markers to aid route planning, in addition to meeting place, walk-distance, -time and -speed were added to the maps.

feedback and acting as a cue to prompt physical activity.[25] Furthermore, using pedometers in conjunction with physical activity diaries to record daily progress may also increase levels of physical activity.[25] However, increased physical activity can result in substitution of pre-existing exercise/movement with a new activity while sedentary behaviour remains the same, thus keeping exercise rates static. Use of wearable devices permits quantification of physical activity with respect to overall daily mobility.

This study had some limitations. First, self-selection bias may have influenced the composition of the WG. However, the patient representatives comprised both men and women across a range of ages and a variety of psoriasis-associated comorbidities. Furthermore, we benefited from having individuals who were willing to share their views, which enabled us to gain key insights. Secondly, the programme was designed to accommodate both physically inactive and exercise-experienced patients with psoriasis. Designing an inclusive exercise intervention was challenging, although our design incorporated careful evaluation of baseline cardiorespiratory fitness at baseline and a mechanism to tailor the point of entry to the programme based on this evaluation. Finally, it is possible that GPS errors caused by higher tree canopy and building height may have overestimated walking route distance during validation of GPS-measured walks. However, where possible, walking routes were planned around green spaces without buildings and low/little tree canopy to interfere with distance measurements, and smartphone applications using GPS sensors to accurately measure distance walked were used to validate measurements.[20]

Conclusion

Previous work has shown that patients with psoriasis are less physically active than those without psoriasis.[5] In this study, we developed an evidence-based exercise programme for patients with psoriasis. Regular exercise is associated with many health benefits, which we plan to investigate in future work. We anticipate that these data may influence current guidelines on exercise and fragmentation of sedentary behaviour for patients with psoriasis. This will ensure that health messaging about optimal physical behaviour is tailored to the population with psoriasis.

What's already known about this topic?

- Patients with psoriasis face psoriasis-specific barriers that limit exercise participation.
- Psoriasis is associated with significant psychosocial impairment and comorbidities such as CVD, obesity, Type 2 diabetes mellitus and inflammatory arthritis.
- Exercise is well established in the prevention and treatment of CVD, obesity, metabolic syndrome, depression and anxiety among the general population, and may help to prevent and treat psoriasis and psoriatic comorbidities.
- The impact of exercise on health-related parameters has not been investigated in a population with psoriasis.

What does this study add?

- We developed an evidence-based, progressive exercise programme in partnership with patients with psoriasis to specifically remove barriers that prohibit exercise engagement for this group.
- The materials generated from this study may be used to investigate the therapeutic utility of our exercise programme in future work.

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Conflict of interest

The authors declare that they have no conflict of interest.

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Ethics statement

The study was approved by the Local Research Ethics Committee (20/NW/0443) and conducted in accordance with the principles of the Declaration of Helsinki. Participants provided written informed consent for participation and for publication of their data.

Data availability

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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