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A telephone-based motivational interviewing intervention has positive effects on psoriasis severity and self-management: a randomized controlled trial

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Summary

Background Psoriasis is a common skin disease with extensive comorbidity risks, which may affect multiple aspects of life. Self-management is essential for skin treatment and lifestyle choices, but few disease-specific tailored self-management and educational programmes appear to be available.

Objectives To evaluate the effects of a 3-month individual motivational interviewing intervention in patients with psoriasis (with a total follow-up of 6 months) after climate therapy/heliotherapy (CHT).

Methods A randomized controlled trial with 169 patients with psoriasis was conducted in the context of CHT at Gran Canaria, Spain. The main outcome measures were Self-Administered Psoriasis Area and Severity Index (SAPASI) and Health Education Impact Questionnaire (heiQ), and the secondary outcomes were illness perception, psoriasis knowledge and lifestyle change assessments. Outcomes were measured at baseline, after 3 weeks of CHT, and 3 months and 6 months later.

Results There were significant overall treatment effects in the study group in terms of the SAPASI score, three self-management domains of heiQ and the self-efficacy scores ($P < 0{\cdot}05$). The lifestyle change parameters were significantly better in the study group. Illness perception differed between the groups at 3 months ($P = 0{\cdot}014$), and psoriasis knowledge was significantly better in the study group at 6 months ($P = 0{\cdot}017$).

Conclusions A 3-month motivational interviewing intervention following CHT had positive overall effects on disease severity, self-efficacy, psoriasis knowledge and health behaviour change. This approach has the potential to be an important complement to medical management, self-management and education in patients with psoriasis.

What's already known about this topic?

- Psoriasis requires extensive self-management with respect to skin treatment and lifestyle choices.
- Motivational interviewing is a form of patient-centred counselling that aims to facilitate change and increase self-efficacy.

What does this study add?

- The first evaluation of motivational interviewing in patients with psoriasis.
- Motivational interviewing could be an important self-management support method in psoriasis, leading to reduced disease severity, increased self-efficacy and psoriasis knowledge, and better lifestyle patterns.

Living with psoriasis may be a challenge for individuals, not only in terms of physical and mental ailments, but also in terms of satisfaction with life.[1–3] Treatments are often time consuming,[4] and patients report limited effects,[5] while the nonadherence rates are high.[6,7] Recent studies show that patients with psoriasis have an increased risk of lifestyle-related concurrent disorders, including hypertension, obesity, diabetes and cardiovascular disease.[8,9] A certain level of knowledge and technical skills related to psoriasis may be required to become an effective and proactive self-manager. However, core skills in self-management education and support also appear to be essential for achieving sustained health-related behavioural change and making choices that improve psoriasis-related outcomes.[10,11]

The aim of self-management support for patients is to enhance problem-solving skills, action planning and self-efficacy.[12,13] However, core self-management skills have received little attention in previous psoriasis research.[14,15] There is a lack of well-designed studies, and methodological weaknesses are apparent.[15]

Motivational interviewing (MI) is a self-management support method.[16] MI is a well-known, scientifically tested[17–20] collaborative communication method for strengthening a person's own motivation and commitment for behaviour change[21] and treatment adherence.[22,23] MI hypothesizes that persons considering behaviour change always experience ambivalence related to the pros and cons of change.[21] The conversation style seeks to evoke the client's own motivation for change, develop commitment to change, and eventually verbalize concrete plans for behaviour change. Affirmations, reflections, summarizing and open-ended questions are all approaches that can empower patients to make desirable health-related changes.[21]

MI has been applied to various health problems and settings,[24–26] including chronic diseases that demand daily treatment decisions by patients, such as chronic obstructive pulmonary disease and diabetes.[27–29] However, to the best of our knowledge, MI has never been tested in patients with psoriasis. A recent systematic review[24] concluded that MI appears to be useful in various clinical settings, and that only one MI session may be effective in enhancing readiness to change and action directed towards reaching health behaviour change goals.

Climate therapy/heliotherapy (CHT) is one of the therapeutic options available to Norwegian patients with moderate-to-severe psoriasis. A 3-week multidisciplinary programme is provided in the Canary Islands (located in the Atlantic Ocean at 28°N, 16°W), which includes tailored sunlight ultraviolet (UV)B radiation,[30] physical exercise, group discussions and comprehensive education (Table 1).

Previous studies have reported that CHT has positive effects on disease severity,[31–34] mental health,[35] level of knowledge[36] and health-related quality of life.[31,32] However, most of these positive changes last for only 2–3 months.[31,32] There are no previous reports about whether this effect might be negatively influenced by low treatment adherence, unhealthy lifestyle choices or lack of follow-up after CHT. However, tailored patient education and self-management interventions appear to be important for successful psoriasis treatment because they can enhance treatment behaviour and lifestyle choices, as well as prolonging the positive effects on clinical outcomes.[37–39]

Thus, we developed a telephone-based individualized self-management support programme, which comprised an extended follow-up with tailored MI following CHT treatment. The focus of the programme was daily psoriasis treatment and desirable behavioural change. Our hypothesis was

Table 1 Aims and content of the 3-week climate therapy/heliotherapy programme in Gran Canaria

Aim
Reduce disease severity
Increase knowledge and insight about the disease, treatment and symptom management
Increase awareness about how to reduce deteriorating risk factors such as smoking, stress and overweight
Discuss recent knowledge about psoriasis comorbidity, how to reduce risk profiles and motivate positive lifestyle changes
Content
Examination by the dermatologist and nurse at three time points (on arrival, after 1 week and after 3 weeks) and follow-ups when needed
A combination of tailored sun treatment (on average 250 standard erythemal doses)[30] and salt-water bathing. Exposure according to skin type and current ultraviolet index
Physical activities: morning 'workout' and voluntary participation in other physical activities such as water aerobics, walking/running, swimming, muscular training and relaxation techniques
Interactive educational sessions conducted by a dermatologist, nurses and physiotherapist about psoriasis pathogenesis, manifestations, comorbidity, quality of life and treatment options and the importance of a healthy lifestyle focusing on physical activity, stress reduction and healthy eating. Educational sessions: creams and ointments (2 h), sun treatment (1 h), nutrition (2 h), physical activity (1 h), education about psoriasis (2 h), comorbidity related to the disease (1 h), medical treatment (2 h) and research (1 h)
Group meetings (eight to 12 participants) focused on experiences of living with psoriasis, coping with stress, nutrition in daily life and self-management (1–3 h)
Smoking cessation course (4–6 h)
Interaction with others with similar health challenges in formal and informal settings

that this intervention would provide significant clinical benefits, enhance disease knowledge and improve self-management in patients with psoriasis.

Patients and methods

Study design and participants

The present study was a randomized controlled trial that included 169 Norwegian patients with psoriasis who received CHT in Gran Canaria, Spain. The sample was recruited between September 2011 and June 2012, and data collection was completed in December 2012. The inclusion and exclusion criteria are shown in Table 2. The participants signed an informed consent form and were informed according to the Declaration of Helsinki.[40] The study was approved by the research director and by the Centre for Privacy and Information Security at Oslo University Hospital. The study was recommended by the Regional Committee for Medical Research Ethics for Southern Norway (ID 2011/1019) and registered on ClinicalTrials.gov (NCT01352780).

CHT nurses invited eligible patients to participate when they arrived. Overall 113 of the 291 invited patients (38·8%) decided not to participate for unknown reasons. In total, 178 patients were recruited to the trial. Of these, 169 completed both T1 and T2 questionnaires (before CHT and after 3 weeks of CHT) and were then allocated randomly to the control (83 patients) or intervention (86 patients) group. The nine patients not reaching randomization reported different reasons for abandoning the study (Fig. 1) The patients were assessed at four time points: before the start of CHT (T1), after 3 weeks of CHT (T2), 3 months after CHT (T3) and 6 months after CHT (T4). After 3 and 6 months, questionnaires were sent by mail with a stamped, addressed return envelope. One reminder was sent to participants each time to request missing questionnaires. Data were obtained for T1 (169 participants), T2 (169), T3 (135, 80%) and T4 (125, 74%). Significantly more of the dropouts were male, younger and unmarried. The participant flow throughout the trial is shown in Figure 1.

Sample size

The sample sizes were calculated based on the primary outcome (Health Education Impact Questionnaire, heiQ) and determined by a power calculation. Medium effect sizes (Cohen's criteria,[41] which differed between overall groups by half an SD, $d = 0{\cdot}5$) were obtained using a test strength of 80 (β) and a significance level of 5% (α) when 64 participants were included in each group. Thus, a sample of 169 was more than sufficient.

Randomization

The participants were assigned randomly (1 : 1) to normal care in Norway or normal care with the additional MI intervention. This procedure involved the use of sequentially numbered, sealed, opaque envelopes to ensure adequate allocation concealment. The envelopes were stored in a locked cabinet. The study nurse at the CHT centre opened the next consecutively numbered envelope in the presence of the participant after they completed the second questionnaire (T2). Randomly permuted small blocks were used to ensure equal-sized treatment groups while eliminating deciphering. The person who generated the allocation scheme did not allocate the patients to the two groups and was not part of the research team. Blinding of patients and the MI counsellor was not possible in this type of study. However, all of the outcomes were self-reported questionnaires and the data plotters were blinded to the group allocations.

Motivational interviewing intervention

The intervention comprised one motivational mapping session (45–60 min) with the MI nurse counsellor just before returning home, followed by six follow-up telephone calls during the next 12 weeks. The main author (M.H.L.), who was formally educated in MI counselling, conducted these mapping talks, as well as the telephone calls with participants. The motivational calls lasted 15–60 min. The mean conversation time was $32{\cdot}5 \pm 12{\cdot}7$ min and each participant received an average of $3{\cdot}3 \pm 1{\cdot}3$ h of phone counselling.

An important aspect of the mapping session was to develop a collaborative relationship between the counsellor and the participant, this being their first encounter. The counsellor encouraged participants to tell how psoriasis affected their everyday life (colouring exercise) and share their thoughts regarding lifestyle choices related to psoriasis. By letting patients 'tell their stories' and describe their own motivation and potential thoughts on change, the patient-centred approach of MI was ensured.[21,42] Skin and skin treatment was presented as a mandatory topic in each follow-up call.

Table 2 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Age 20–70 years (born 1 January 1941 to 31 December 1991)	Participated in CHT more than eight times during the last 10 years (excluding the current stay)
Diagnosed with psoriasis with PASI > 7·0 when applying CHT	
Capable of answering questionnaires and communicating by telephone	

PASI, Psoriasis Area and Severity Index; CHT, climate therapy/heliotherapy.

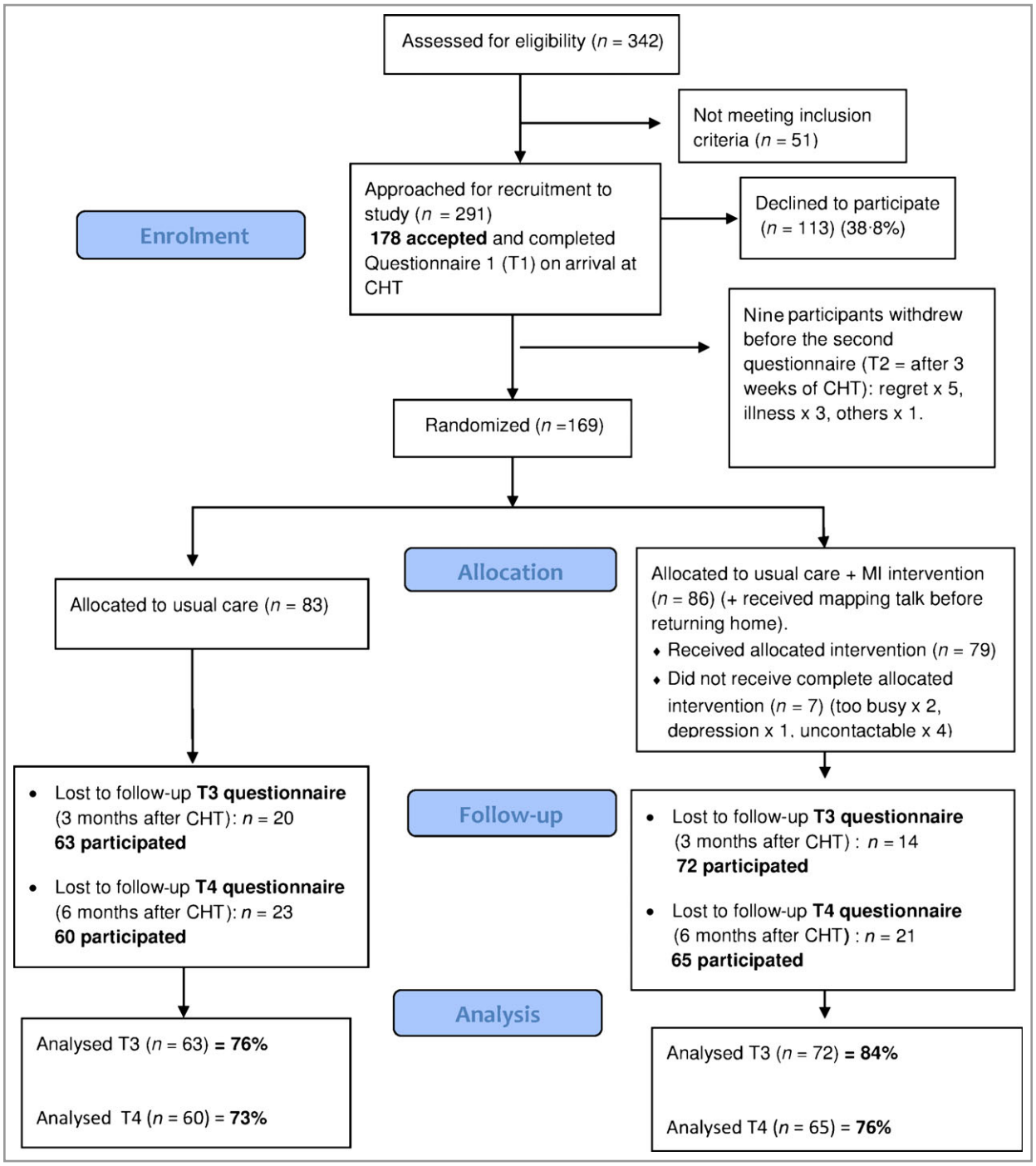

Fig 1. Flowchart of the inclusion procedure. CHT, climate therapy/heliotherapy; MI, motivational interviewing.

Additional key areas for the follow-up calls were presented on a 'bubble sheet' (Figure S1; see Supporting Information), representing three psoriasis-tailored self-management domains: diet, physical activity and stress management. The agenda mapping was introduced as, 'These are some of the subjects which we could talk about. Would you like to talk about any of these, or do you have something else (pointing to the blank spaces) you would prefer to talk about?'[21] The patient's own focuses varied from behavioural topics such as smoking cessation, weight reduction or alcohol abuse to domains of life causing stress or concern, such as demanding work situations, personality traits or traumatic life events.

Prochaska and Di Clemente's transtheoretical model of change (TTM)[43,44] was briefly described and, if applicable, participants assessed their current stage of change related to their desired topic. The stages are precontemplation (not intending to change soon), contemplation (change is being considered but not definitely planned), preparation (behaviour

change is imminent), action (behaviour change is occurring) and maintenance (behaviour change has been consolidated). By identifying where a person is in the change cycle, the MI communication can be tailored to the individual's readiness to progress in the change process.[43] Relevant MI tools were shared, and behavioural focus and the time for the first follow-up call were agreed upon.

Additionally, participants were provided with a personal workbook, which they used to varying degrees, depending on the patient's focus and preference. The workbook outlined some key MI principles and presented a figure and a brief description of the TTM. In addition it contained the 'bubble sheet', some open questions for reflections and some visual MI tools and exercises. Some of these were dependent on specific phases of change and were therefore not applicable to all participants.

A pilot study that included six patients was conducted in June 2011 to evaluate the workbook and to obtain feedback on the relevance of the topics and patient experiences of MI counselling.

Motivational Interviewing Treatment Integrity code

The behaviours of the counsellor during the motivational interventions were compared with the MI proficiency levels.[45] A random sample of calls was recorded, a selection of which were evaluated and rated by the Motivational Interviewing Coding Laboratory at The Karolinska Institute in Sweden (www.miclab.org) using Motivational Interviewing Treatment Integrity (MITI) code 3.0.[39] Table 3 shows that the counsellor exceeded all of the threshold criteria, including global empathy and MI spirit levels, reflection to question ratios, proportion of complex reflections to total reflections, percentage of open-ended questions and percentage MI adherence.

Standard care

The participants in the control and study groups received their usual psoriasis treatment, which could include consultations with a dermatologist or general practitioner, UV radiation treatment and/or self-management in terms of topical treatment, exercise and stress management. However, it is known that there is considerable variation among patients with psoriasis in healthcare uptake and the administration of their own treatment.[4,46]

Measures

The sociodemographic characteristics recorded at baseline included age, sex, marital status and years of education (Table 4). The clinical parameters were collected from the CHT medical records at Oslo University Hospital. Medical comorbidity was measured using the Self-Administered Comorbidity Questionnaire-18,[47] where higher scores indicate a more severe comorbidity profile.

Primary outcomes

The primary outcomes in this trial were disease activity measured by the Self-Administered Psoriasis Area and Severity Index (SAPASI) and self-management measured using the heiQ. The heiQ facilitates comprehensive evaluations of patient education and self-management interventions for people with chronic conditions.[48] The questionnaire comprises 40 items from eight independent domains, which cover areas such as behaviours, skills, attitudes, self-monitoring, health service navigation and emotional well-being (Cronbach's α for the heiQ domains ranged from 0·65 to 0·89).

Table 3 Behaviour of the nurse counsellor in the current study compared with established thresholds for proficiency

MITI 3.1.1 indicator of proficiency	Recommended proficiency threshold[a]	Current study average (n = 8)	Current study range
Global scores (1–5, high = good)			
Global empathy	≥ 4·0	5	5–5
Global MI spirit	≥ 3·5	4·47	4·0–4·67
Global direction (focus on target behaviour)	–	5	5–5
Summary of behaviour counts			
Reflection to question ratio (R:Q) = (SR + CR)/(CQ + OQ)	1 : 1	3·60 : 1	1·60 : 1 to 5·56 : 1
Open-ended questions = OQ/(OQ + CQ)	≥ 50%	58%	50–70%
Complex reflections = CR/(SR + CR)	≥ 40%	56%	46–77%
MI adherence = MiA/(MiA + MiNa)	≥ 90%	93%	87·5–100%

MITI, Motivational Interviewing Treatment Integrity; Global MI spirit, (average of evocation + collaboration + autonomy/support)/3; SR, simple reflection; CR, complex reflections; CQ, closed questions; OQ, open questions; MiA, MI adherent; MiNa, MI nonadherent. [a]According to Forsberg *et al.*[57]

Table 4 Baseline characteristics of participants allocated to the motivational interviewing counselling intervention (study group) or treatment as usual (control group)

Variable	Full sample (n = 169)	Study (n = 86)	Control (n = 83)	Between-group difference (95% CI), P-value
Male, n (%)	95 (56·2)	51 (59)	44 (53)	χ^2 = 0·68, P = 0·41[b]
Female, n (%)	74 (43·8)	35 (41)	39 (47)	
Age (years), mean ± SD	46·31 ± 12·8	46·16 ± 12·71	46·46 ± 13·02	0·30 (−4·2, 3·6), P = 0·88[a]
Duration of disease (years), mean ± SD	22·9 ± 13·93	24·6 ± 14·29	21·2 ± 13·42	3·39 (−0·84, 7·63), P = 0·12[a]
Previous CHT, n (%)	89 (52·7)	47 (55)	42 (51)	χ^2 = 0·13, P = 0·72[b]
Number of previous CHT treatments, median	2·0	2·0	2·0	z = −1·26, P = 0·21[c]
Marital status, n (%)	n = 165	n = 83	n = 82	χ^2 = 2·43, P = 0·49[b]
Married/cohabiting	106 (64·2)	53 (64)	53 (65)	
Unmarried	34 (20·6)	15 (18)	19 (23)	
Divorced/separated/widowed	22 (13·3)	14 (17)	8 (10)	
Other	3 (1·8)	1 (1)	2 (2)	
Level of education, n (%)	n = 161	n = 81	n = 80	χ^2 = 0·98, P = 0·41[b]
Primary/secondary school ≤ 10 years	22 (13·7)	13 (16)	9 (11)	
High school ≤ 13 years	74 (46·0)	37 (46)	37 (46)	
College/university < 4 years	30 (18·6)	15 (19)	15 (19)	
College/university ≥ 4 years	35 (21·7)	16 (20)	19 (24)	
BMI, mean ± SD	n = 168; 28·78 ± 5·51	n = 86; 29·07 ± 4·89	n = 82; 28·48 ± 5·54	0·47 (−1·00, 2·18), P = 0·47[a]
Current smoker on arrival, n (%)	n = 168	n = 85	n = 83	χ^2 = 0·19, P = 0·66[b]
Yes	56 (33·3)	27 (32)	29 (35)	
No	112 (66·7)	58 (68)	54 (65)	
Comorbidity profile (SCQ-18) (range 0–54), median	n = 169; 4·0	n = 86; 4·0	n = 83; 3·0	z = −1·74, P = 0·082[c]
Health condition (VAS 0–100), mean ± SD	n = 166; 65·15 ± 17·24	n = 85; 63·24 ± 17·14	n = 81; 67·16 ± 17·2	−3·93 (−9·19, 1·34), P = 0·14[a]
Self-assessed health status [1 (poor) to 5 excellent)], mean ± SD	2·90 ± 0·92	2·70 ± 0·90	3·10 ± 0·89	−0·40 (−0·67, −0·12), P = 0·005[a]
SAPASI on arrival at CHT, mean ± SD	n = 166; 8·59 ± 5·06	n = 84; 8·38 ± 5·11	n = 82; 8·81 ± 5·05	−0·43 (−1·98, 1·13), P = 0·59[a]
SAPASI on departure from CHT, mean ± SD	1·84 ± 2·85	1·77 ± 2·53	1·91 ± 3·15	−0·14 (−1·01, 0·73), P = 0·75[a]
PASI on arrival at CHT, mean ± SD	8·6 ± 5·1	7·8 ± 4·78	8·4 ± 4·04	−0·63 (−1·98, 0·72), P = 0·36[a]
PASI on departure from CHT, mean ± SD	2·1 ± 1·86	1·9 ± 1·85	2·3 ± 1·87	−0·38 (−0·94, 0·19), P = 0·19[a]
DLQI on arrival at CHT (range 0–30, low = good), mean ± SD	n = 163; 11·2 ± 5·89	n = 82; 11·3 ± 5·71	n = 81; 11·0 ± 6·1	0·34 (−1·49, 2·17), P = 0·71[a]

n differs among individual analyses because of missing values. BIPQ, Brief Illness Perception Questionnaire; BMI, body mass index; CHT, climate therapy/heliotherapy; CI, confidence interval; DLQI, Dermatology Life Quality Index; PASI, Psoriasis Area and Severity Index; SAPASI, Self-Administered PASI; SCQ-18, Self-administered Comorbidity Questionnaire; VAS, visual analogue scale. Difference between groups: [a]independent-samples t-test of means; [b]Pearson's χ^2-test of proportions; [c]Mann–Whitney U-test of medians.

Secondary outcomes

The Psoriasis Knowledge Questionnaire (PKQ)[36] assesses psoriasis knowledge based on 49 statements about psoriasis. The responses are reported as valid, uncertain or invalid, and the total calculated score range is 0–49, where higher scores indicate higher levels of knowledge (Cronbach's α = 0·87).

The Brief Illness Perception Questionnaire (BIPQ) comprises eight items, each of which assesses one dimension of illness perception. The overall mean summed score for BIPQ was computed as proposed on the BIPQ website (http://www.uib.no/ipq/index.html), where the summed score (range 0–80) represents the degree to which the illness is perceived as threatening (high score) or benign (Cronbach's α = 0·70).

Other assessments

Participants completed visual analogue scale ratings on perceived self-efficacy with respect to desired lifestyle change (Figure S2; see Supporting Information). The stages of change (precontemplation, contemplation, preparation, action and maintenance) described in the 'transtheoretical model of health behaviour change' reported by Prochaska and De Clemente[43] were assessed in the study using questions adapted to lifestyle and psoriasis. These questions had response alternatives according to the different stages: for example the question, 'Do you exercise?' had responses such as 'Currently I do not exercise and I have no plans to start exercising' (precontemplation) or 'Currently I do not exercise, but I have specific plans to begin within the next month' (preparation).

Analyses

SPSS version 19 (IBM, Armonk, NY, U.S.A.) was used for data analysis. Between-group differences were analysed using t-tests (for parametric data) and χ^2 statistics, or Mann–Whitney U-tests for nonparametric data. Each outcome measure was estimated separately using multivariate ANOVA (SPSS), a general linear model (ANCOVA) after adjusting for the T2 values (i.e. after CHT, before randomization). For some measures, we used the baseline scores as covariates instead of T2 (as indicated in Table 5). The results are reported as marginal means and their 95% confidence intervals (CIs). Two-sided P-values $< 0{\cdot}05$ were considered statistically significant. To assess whether the effect of the intervention might have been confounded by an uneven allocation between the intervention and control groups in terms of sex, age, educational level, health status and disease duration, ANCOVAs were performed that adjusted for the effects of these variables. However, these adjustments did not alter the effects of the grouping variable. To support the data interpretation, we also report Cohen's *d* for effect sizes, where 0·2 is considered a small effect, 0·5 is a medium effect and $\geq 0{\cdot}8$ is a large effect.[49]

Results

At baseline, the two groups were well matched in terms of their disease characteristics and demographics (Table 4). The only significant difference was in health status perception, where the control group rated their health status more favourably than the study group (between-group difference −0·40; 95% CI −0·67 to −0·12, P = 0·005).

Primary outcomes

The between-group difference in SAPASI at 3 months after CHT was −2·47 (95% CI −3·94 to −1·00, P = 0·001). After 6 months, the between-group difference was −2·45 (95% CI −4·33 to −0·56, P = 0·011).

The study group had significantly higher heiQ scores in two of eight domains at 3 months after CHT; these were 'skill and technique acquisition' (differential change between groups 0·17, 95% CI 0·019–0·32; P = 0·028) and 'constructive attitudes and approaches' (0·15, 95% CI 0·004–0·29; P = 0·044). At 6 months after CHT, only the domain 'self-monitoring and insight' had significantly higher scores (0·12, 95% CI 0·019–0·22; P = 0·020).

Secondary outcomes

Knowledge

There were no significant between-group differences in psoriasis knowledge (PKQ) at 3 months after CHT (0·46, 95% CI −0·81 to 1·74; P = 0·47). However, the study group had a significantly higher score at 6 months after CHT (1·70, 95% CI 0·31–3·09; P = 0·017).

Illness perception

The study group had a significantly lower BIPQ sum score at 3 months after CHT. The between-group difference was −3·75 (95% CI −6·73 to −0·77; P = 0·014), but this difference was not significant at 6 months after CHT (−1·89, 95% CI −5·18 to 1·40; P = 0·26). The effect sizes ranged from small to medium (Table 5; Fig. 2a).

Lifestyle change

The self-efficacy scores related to desired lifestyle change were significantly higher in the study group at 3 months after CHT (0·91, 95% CI 0·33–1·50; P = 0·002) and at 6 months after CHT (0·71, 95% CI 0·096–1·33; P = 0·024). When asked whether they had planned lifestyle changes in advance, significantly more positive responses were obtained from the study group at 3 months after CHT (P = 0·001), although the difference was not significant at 6 months after CHT (P = 0·059). At 6 months after CHT, significantly more members of the study group agreed that they implemented lifestyle changes following their psoriasis diagnosis (P = 0·035) (Fig. 2b–d).

The health behaviour risk change assessment for 'daily skin treatment' showed that significantly more members of the study group changed their scores from 'risk' (precontemplation, contemplation and preparation stages) to 'no risk' (action or maintenance stages) during the intervention (P = 0·045), and this difference was still significant at 6 months after CHT (P = 0·048). Significantly more members of the study group remained in the 'no risk' group during the intervention with respect to planned lifestyle change (P = 0·06), whereas a significantly higher percentage of the controls remained in the risk group (P = 0·04) (Table 6).

Discussion

The main aim of this study was to evaluate the effect of MI as a follow-up intervention after CHT. The results demonstrated that the study group differed from the control at 6 months

Table 5 Baseline and follow-up data for the patients

Measures	MI study group, mean ± SD				Control group, mean ± SD				Differential change between groups, T2[a,b]	Differential change between groups, T3[a,c]	Differential change between groups, T4[a,c]
	T1	T2	T3	T4	T1	T2	T3	T4			
Primary outcomes											
SAPASI (higher score = greater disease severity)	8·38 ± 5·10	1·77 ± 2·53	5·15 ± 4·04	6·65 ± 4·40	8·81 ± 5·04	1·91 ± 3·15	7·57 ± 4·59	8·70 ± 6·07	−0·068, (−0·94, 0·79), P = 0·88, *d* = −0·08	−2·47 (−3·94, −1·00), P = 0·001, *d* = −0·56	−2·45 (−4·33, −0·56), P = 0·011, *d* = −0·44
heiQ (score 1–4, high score = good)											
Dimension 3: skill and technique acquisition (Cronbach's α = 0·77)	2·70 ± 0·51	2·96 ± 0·44	2·98 ± 0·47	2·93 ± 0·35	2·68 ± 0·54	2·97 ± 0·43	2·84 ± 0·50	2·88 ± 0·59	−0·28 (−0·14, 0·87), P = 0·63, *d* = 0·04	0·17 (0·019, 0·32), P = 0·028, *d* = 0·29	0·11 (−0·025, 0·25), P = 0·11, *d* = 0·11
Dimension 4: constructive attitudes and approaches (Cronbach's α = 0·77)	3·11 ± 0·47	3·25 ± 0·44	3·21 ± 0·47	3·20 ± 0·45	3·13 ± 0·55	3·26 ± 0·49	3·10 ± 0·45	3·15 ± 0·53	0·0 (−0·11, 0·11), P = 1·0, *d* = 0·05	0·15 (0·004, 0·29), P = 0·044, *d* = 0·21	0·07 (−0·080, 0·22), P = 0·36, *d* = 0·10
Dimension 5: self-monitoring and insight (Cronbach's α = 0·65)	2·95 ± 0·39	3·15 ± 0·42	3·19 ± 0·40	3·16 ± 0·35	2·92 ± 0·47	3·09 ± 0·36	3·06 ± 0·36	3·02 ± 0·36	0·048 (−0·046, 0·14), P = 0·32, *d* = 0·15	0·11 (−0·008, 0·22), P = 0·068, *d* = 0·34	0·12 (0·019, 0·22), P = 0·020, *d* = 0·40
Secondary outcomes											
Mean BIPQ sum score (range 0–80, low = good)	44·86 ± 9·29	40·63 ± 10·25	40·08 ± 10·95	40·36 ± 10·36	43·33 ± 10·42	40·31 ± 9·49	43·78 ± 9·86	42·28 ± 10·52	−0·59 (−2·90, 1·72), P = 0·62, *d* = 0·03	−3·75 (−6·73, −0·77), P = 0·014, *d* = −0·36	−1·89 (−5·18, 1·4), P = 0·26, *d* = −0·18
PKQ score (range 0–49, higher score = greater level of knowledge)	25·12 ± 8·11	31·62 ± 7·04	31·96 ± 7·00	32·62 ± 6·36	24·60 ± 8·1	31·95 ± 6·14	31·29 ± 6·19	30·53 ± 7·29	−0·60 (−2·05, 0·84), P = 0·41, *d* = 0·05	0·46 (−0·81, 1·74), P = 0·47, *d* = 0·10	1·70 (0·31, 3·09), P = 0·017, *d* = 0·30

BIPQ, Brief Illness Perception Questionnaire; CHT, climate therapy/heliotherapy; heiQ, Health Education and Impact Questionnaire; MI, motivational interviewing; PKQ, Psoriasis Knowledge Questionnaire; SAPASI, Self-Administered Psoriasis Area and Severity Index. Assessments: T1, on arrival for CHT; T2, after 3 weeks of CHT, before randomization; T3, at 3 months after CHT, with MI intervention; T4, at 6 months after CHT, with MI. [a]Mean (95% confidence interval). [b]Significant differences were tested using ANCOVA, with the score at T1 as the covariate. [c]Significant differences were tested using ANCOVA, with the score at T2 as the covariate.

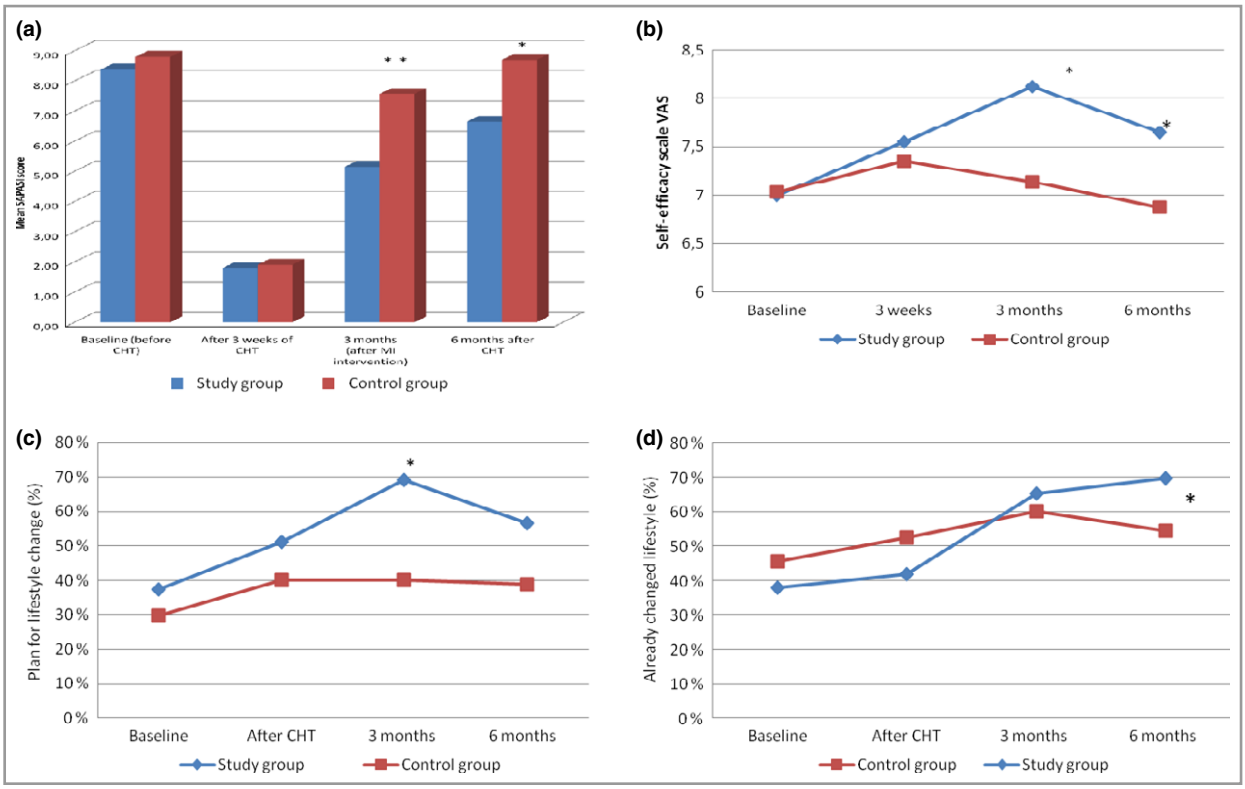

Fig 2. (a) Group differences in the mean Self-Administered Psoriasis Area and Severity Index (SAPASI) scores throughout the trial. Assessments: T1, on arrival for climate therapy/heliotherapy (CHT); T2, after 3 weeks of CHT, before randomization; T3, at 3 months after CHT, with motivational interviewing (MI) intervention; T4, at 6 months after CHT, with MI. *$P < 0{\cdot}05$, **$P < 0{\cdot}001$, one-way ANOVA. (b) Group differences in mean self-efficacy scores [(visual analogue scale, VAS): range 0–10, high = good] in terms of desired lifestyle changes at baseline, after 3 weeks of CHT, at 3 months after CHT and at 6 months after CHT. *$P < 0{\cdot}05$, independent-samples t-test. (c) Group differences in 'Already made plans for lifestyle change' (Yes: strongly agree + agree; No: uncertain + disagree + strongly disagree). *$P < 0{\cdot}05$, χ^2-test for proportions. (d) Group differences in 'Already changed lifestyle after psoriasis diagnosis' (Yes: strongly agree + agree). *$P < 0{\cdot}05$, χ^2-test for proportions.

after CHT in terms of disease severity, psoriasis knowledge, self-efficacy and some lifestyle change parameters.

The difference in disease severity appears to be particularly important. Systemic inflammation with abnormal keratinocyte proliferation is recognized as one of the main drivers of the disease process in psoriasis,[50] and increases the risk of comorbidities such as metabolic syndrome and cardiovascular diseases.[8] The apparent dose–response effect indicates that people with severe psoriasis have a higher risk of myocardial infarction than people with mild psoriasis,[51] which highlights the importance of controlling the systemic inflammation.

Bostoen *et al.*[37] reported a reduction in disease severity after a comprehensive educational intervention, while Fortune *et al.*[38] reported similar results with a cognitive behaviour symptom programme. A recent educational and motivational pilot study by Balato *et al.*[52] using text messages with reminders and educational tools also reported promising results based on SAPASI. Overall, these results indicate that educational and self-management interventions may have positive effects on disease severity, and they could have important roles in psoriasis management. Other studies have shown that MI is effective in reducing health-related clinical parameters, such as blood pressure, the glycosylated haemoglobin test (HbA1c), body mass index and cholesterol.[24,53,54]

In the present study, the MI strategies appeared to have positive effects on the psoriasis self-management levels after CHT. We detected significant between-group differences in three of the eight heiQ domains after the MI intervention. However, these domains encompassed self-management, self-monitoring and insights into living with a health problem, thereby indicating empowerment and that the participants had the attitude that they were not going to let health problems control their lives. Thus, they utilized symptom-relief skills and knowledge-based techniques to manage their own health,[48] which were all consistent with the content of the MI intervention. The change in illness perception may reflect a better perceived control over symptoms, and the study group also increased their level of self-efficacy. An integrative review of psoriasis self-management in daily life stressed that interventions directed at increasing the patient's level of self-efficacy are more likely to produce positive outcomes in terms of behavioural change and health outcomes.[14]

A higher percentage of MI participants had a more health-promoting pattern after the intervention in terms of the phases

Table 6 Health behaviour risk change with respect to motivation to administer daily skin treatment, and planning lifestyle change

Daily skin treatment							
From T2 to T3	Study group (n = 72)	Controls (n = 62)	P-value	From T2 to T4	Study group (n = 65)	Controls (n = 58)	P-value
No risk to no risk	45 (63)	46 (74)	0·21	No risk to no risk	42 (65)	43 (74)	0·29
No risk to risk[a]	4 (6)	2 (3)	0·69	No risk to risk	2 (3)	3 (5)	0·57
Risk to no risk	19 (26)	9 (15)	0·045	Risk to no risk	19 (29)	9 (16)	0·048
Risk to risk	4 (6)	5 (8)	0·74	Risk to risk[a]	2 (3)	3 (5)	0·63
Planning lifestyle change							
From T2 to T3	Study group (n = 68)	Controls (n = 58)	P-value	From T2 to T4	Study group (n = 62)	Controls (n = 53)	P-value
No risk to no risk	32 (47)	15 (26)	0·06	No risk to no risk	24 (39)	11 (21)	0·022
No risk to risk[a]	6 (9)	11 (19)	0·15	No risk to risk	9 (15)	10 (19)	0·66
Risk to no risk	15 (22)	9 (16)	0·21	Risk to no risk	11 (18)	10 (19)	0·96
Risk to risk	15 (22)	23 (40)	0·04	Risk to risk[a]	18 (29)	22 (42)	0·21

Values are n (%), based on the readiness-to-change model. Risk, precontemplation, contemplation and preparation stages; no risk, action and maintenance; T2, after 3 weeks of climate therapy/heliotherapy (CHT), before randomization; T3, at 3 months after CHT, with motivational interviewing intervention; T4, at 6 months after CHT (χ^2-test or [a]Fisher's exact test).

of the TTM of health behaviour change.[43] This implies that they remained in the 'action phase' or moved from 'precontemplation', 'contemplation' or 'preparation' to 'action', thereby indicating that MI positively affects motivation to change. In MI, the patients decide what behaviour, if any, they wish to discuss, and the interactions with the counsellor are collaborative. By articulating their desire to change and estimating the importance of and their personal readiness for change, they strengthen their determination to change and increase self-efficacy. Telephone intervention using MI also has positive effects on lifestyle choices in patient populations other than psoriasis.[25,55]

Timing seems to be important for educational interventions.[56] This MI intervention occurred immediately after 3 weeks of CHT treatment, which promoted a significant decrease in illness severity and an increase in quality of life,[32] and this appeared to be important. The educational programme and peer discussions may have enhanced the knowledge of psoriasis among participants (based on the PKQ scores at T2), as well as showing them how to manage the disease in their everyday lives. The risk of resuming potentially unhealthy lifestyle habits and nonadherence may have been reduced by providing the intervention immediately after CHT. The motivational calls encouraged healthy behaviours and facilitated the development of problem-solving skills, as well as providing emotional support and regular follow-up.

The present study is the first randomized controlled trial of MI in psoriasis and one of the few studies to focus on self-management support in psoriasis. This study confirms the beneficial effects of MI and the potential for prolonging the positive effects of CHT. The reason why 39% of the invited patients declined to participate is unknown. One reason may be lack of motivation to discuss possible lifestyle change; maybe they had already made important changes in lifestyle, or their nonattendance was caused by uncertainty of what the MI intervention actually entailed.

Obvious limitations in the study design are the fact that the MI counsellor (M.H.L.) was also a member of the research team, and that we did not include an 'attention only' or sham control group. Having such a 'placebo' control group might have helped clarify the extent to which the attention from the MI counsellor and thereby the increased therapist time per se contributed to the positive results observed in the study group. However, the application of the MITI code to some of the recorded interviews demonstrated that the study group received MI and that the counsellor used attitudes, principles and communication skills congruent with MI (Table 3). In addition, the participants were not blinded to their treatment allocation. However, the sample was selected randomly and we reduced possible bias due to seasonal variations by recruiting throughout a year of CHT treatment. Another limitation is that the CHT context limits any potential generalizability to the general psoriasis population. In particular, we did not know whether the patients with psoriasis who applied for CHT were different from the overall psoriasis population in Norway in terms of their motivation to change, treatment adherence and lifestyle. Despite these limitations, MI appears to be a promising method for providing self-management support to patients with psoriasis, which affects the disease severity.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Figure S1. 'Bubble sheet' for agenda mapping.

Figure S2. Visual analogue scale for self-efficacy.