

Individual prevention courses for occupational skin diseases: changes in and relationships between proximal and distal outcomes

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Summary

Background. To treat people with occupational contact dermatitis, the German Accident Prevention and Insurance Association in the Health and Welfare Services offers 2-day individual prevention (IP) seminars.

Objectives. We investigated whether there are short-term and medium-term changes in proximal (e.g. behaviour) and distal (e.g. symptoms) outcomes after an IP seminar, whether changes in proximal outcomes are associated with changes in distal outcomes, and whether subgroups can be identified that benefit in particular.

Patients/materials/methods. In a prospective study, 502 participants of 85 IP courses completed the health education impact questionnaire (heiQ™) and skin symptom questionnaire (Skindex-29) at the start of the course, immediately thereafter, and after 6 months. Change was assessed according to standardized effect size. Regression techniques were used to analyse associations between proximal and distal outcomes.

Results. After 6 months, participants showed improved self-management skills and preventive behaviour, and less fear of job loss, disease-related symptoms, and emotional distress. Significant associations between proximal and distal outcomes were found. Participants who felt more limited by their skin disease showed greater effects.

Conclusions. The results are consistent with the assumption that IP courses provide a range of benefits for people with occupational contact dermatitis. Changes in distal outcomes may be influenced by changes in proximal outcomes.

Key words: heiQ™; intervention; occupational skin disease; prevention; self-management; Skindex-29.

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Work-related dermatoses constitute the most prevalent form of occupational disease in many countries (1, 2), with occupational contact dermatitis (OCD) constituting approximately 90–95% of all cases. For instance, OCD prevalence in Germany is 0.5/1000, and similar rates can be found in other countries (1). OCD is triggered by contact with allergenic or irritant substances (e.g. wet work, cleaning agents, and cooling lubricants) (3), and causes eczema on the hands or other body parts. Especially affected are hairdressers and employees working in healthcare, home economics, or the metal-processing industry (2, 4). OCD is associated with a higher prevalence of anxiety and depression (5),

impairments in everyday functioning, social interactions (2), health-related quality of life (6), and higher rates of sick leave (7). Its economic consequences were analysed in a recent study, which estimated that OCD-related costs amount to €8800 per year and patient (8). The prognosis is rather unfavourable, especially in people with advanced disease stage, and may even lead to the loss of ability to work. Early-stage symptoms and impairments are often regarded as 'part of the job' (6) rather than as a condition requiring treatment.

Given their unfavourable prognosis, occupational skin diseases should be identified and treated as early as possible. Apart from preventing exposure to trigger substances (7), technical (e.g. use of automated cleaning equipment), organizational (e.g. separating tasks involving working in wet conditions) and individual (e.g. using protective gloves) preventive measures should be implemented (3). Apart from dermatological treatment, skin care (including avoiding excessive hand washing) is important (3, 7). Even for patients with advanced disease stages, a combination of dermatological treatment, patient education and continuous surveillance might improve the prognosis remarkably (9).

A preventive approach that has been implemented in Germany by the Accident Prevention and Insurance Association in the Health and Welfare Services [Berufsgenossenschaft für Gesundheit und Wohlfahrtspflege (BGW)] includes individual prevention (IP) seminars (formerly called secondary IP seminars). These courses are offered as outpatient courses for people with work-related dermatoses, and last for 2 days. As many people affected by OCD lack knowledge about the individual behavioural determinants of their skin disease (10), IP courses are aimed at delivering and promoting disease-related information and knowledge, changing dysfunctional attitudes towards the disease, and improving self-management skills and preventive/protective behaviour, for example wearing gloves or using hand lotions (proximal goals). A broad spectrum of didactic methods are used, including the active involvement of participants. A detailed description of IP course contents and methods has been published elsewhere (11).

Earlier studies showed positive changes in participants' protective behaviours (e.g. a higher prevalence of glove use), improvement of dermatological symptoms and better health-related quality of life at 12 months after they had attended the course (12, 13). However, the data in these studies were collected by direct change measurement (perceived improvement since the intervention) via telephone interviews. It is known that the direct change measure of a certain parameter is highly correlated with its current value; thus, it is unclear whether a change in

the relevant variable was assessed or the current state (14). Moreover, changes in health-related quality of life were not assessed with a standardized and validated instrument. Telephone interviews are also susceptible to social desirability bias (15). Finally, it remains unclear whether changes in other proximal (e.g. self-management skills) and distal (e.g. days of sick leave) outcomes may be observed, and whether changes in proximal outcomes are associated with changes in distal outcomes.

Therefore, this study sought to answer the following questions:

1. Can significant (short-term and medium term) changes in proximal and distal outcomes be seen after an IP course? We expected at least small ($d = 0.2$) effects.
2. Are changes in proximal outcomes associated with changes in distal outcomes?
3. Can subgroups of participants be identified who benefit in particular from attending an IP course?

Patients, Materials, and Methods

Patients

The study sample consisted of 502 participants of 85 IP courses that were held between January and March 2011 in 10 German cities. Most courses took place on two consecutive days, but 12 courses were conducted on two separate weekends. Inclusion criteria were work-related dermatoses (allergic and/or irritant and/or work-triggered and/or atopic eczema), diagnosed by a dermatologist (including patch testing), working in healthcare or home economy, and a good knowledge of German. Participants completed questionnaires at the start of the course (T1), immediately after the course (T2), and 6 months after the second day of the course (T3).

Materials

Health education impact questionnaire (heiQ™). The heiQ™ (16, 17) is a generic measure of proximal outcomes of self-management programmes. It contains 40 items (four-point response scale) to measure eight independent scales: 'Positive and active engagement in life', 'Health-directed activities', 'Skill and technique acquisition', 'Constructive attitudes and approaches', 'Self-monitoring and insight', 'Health services navigation', 'Social integration and support', and 'Emotional distress'. The factorial structure was tested and replicated in different languages (16–18), and the reliability coefficients of the German version range from 0.71 to

Table 1. Selected items of the Deutsche Gesetzliche Unfallversicherung questionnaire

Number	Abbreviation	Item contents	Higher values indicating:	Range
0	Work	Giving up work because of skin disease	Worse	0–1
1	Skin irritations	Currently, I suffer from skin irritations	Worse	1–5
2	Limitation	I feel restricted because of my skin disease	Worse	1–5
4	Future coping	I am confident that I will be able to deal with my disease in the future	Worse	1–5
5	Influence	I am able to influence my skin condition by applying protective measures	Worse	1–5
6	Fear of job loss	I am afraid that I won't be able to stay in my job because of my skin disease	Better	1–5
8a + b	Skin protection (work)	During work, I use skin protection devices: hand lotion (a); protective gloves (b)	Better	0–1
9a + b	Skin protection (spare time)	In my spare time, I use skin protection devices: hand lotion (a); protective gloves (b)	Better	0–1
21	Medical treatment	I have sought medical treatment because of my skin disease	Worse	0–1
22	Sick leave	I am on sick leave because of my skin disease	Worse	0–1

0.87 (17). The scales were computed by using the mean of the respective items. Generally, higher values in the scales indicate better status, except for 'Emotional distress', where higher values indicate higher distress. The heiQ™ was used to assess proximal outcomes of self-management programmes for patients from different disease groups (19) in inpatient (20) and outpatient (21) settings.

Skindex-29. Skindex-29 (22, 23) measures quality of life related to skin symptoms and impairments. The 29 items (five-point response scale) form three scales: 'Functioning', 'Emotional distress', and 'Symptoms'. Responses are transformed on a scale ranging from 0 to 100. The scales were computed by taking the mean of the respective items. Higher values indicate lower quality of life. The German version shows reliability estimates ranging from 0.80 to 0.94 (22).

Deutsche Gesetzliche Unfallversicherung (DGUV) questionnaire. The DGUV questionnaire is a self-report instrument constructed by the German statutory accident insurance (DGUV) to evaluate IP courses. It captures several aspects of life, work and coping of people with skin-related diseases, for example skin lesions, skin-related distress, skin protection behaviours, and self-efficacy (patient's beliefs in their ability to influence the skin condition). The items used for this study are shown in Table 1.

Proximal versus distal outcomes. Outcomes were classified into proximal and distal outcomes. Proximal outcomes are outcomes that are immediately targeted by IP seminars, for example knowledge or self-management skills. Distal

outcomes depend on other factors as well as IP seminars, for example sick leave or quality of life. All heiQ™ scales (except for 'Emotional distress') and the DGUV questionnaire items 'Future coping', 'Influence', 'Fear of job loss' and 'Skin protection' were used as proximal outcomes. Distal outcomes were all Skindex-29 scales, the DGUV questionnaire items 'Work', 'Skin irritation', 'Limitation', 'Medical treatment', and 'Sick leave', and the heiQ™ scale 'Emotional distress'.

Methods

Hierarchical data structure. To test for potential effects of course location, one-way ANOVAs with random effects (24) were computed for all outcomes, with course participants considered as level 1 units and course locations as level 2 units. The variance between locations was very small in all outcomes ($v < 0.001$, $p > 0.05$); therefore, the influence of course location was regarded as negligible. All subsequent analyses were conducted as level 1 analyses.

Changes in outcomes. Mean changes were tested for significance with the Wald test. Standardized effect sizes (SESs) (25) and 95% confidence intervals (26) were computed to describe the magnitude of change (25, 27), with $SES = 0.2$, $SES = 0.5$ and $SES = 0.8$ indicating small, medium and large effects. The SES is the mean difference between two data points divided by the standard deviation (SD) of the first measurement occasion. For dichotomous variables, thresholds were computed with Mplus V7.1 (28); whether the variables remained constant across data points was determined with the Wald test.

Baseline predictor analysis. To identify socio-demographic and health-related baseline variables that predict changes in distal outcomes between T1 and T3, linear [for continuous dependent variables (DVs)] or logistic (for dichotomous DVs) regression analysis was conducted. T3 distal outcomes were used as DVs, and baseline variables were used as predictors. DVs were adjusted for their respective T1 values, and therefore represent estimates of change between T1 and T3 (29). For a subgroup of participants who were highly distressed at T1, before and after differences were computed for proximal and distal outcomes.

Associations between changes in proximal and distal outcomes. Associations between changes in proximal and distal outcomes were tested with linear or logistic regression analysis. Again, T3 distal outcomes were used as DVs, and they were adjusted for their respective T1 values to represent changes between T1 and T3. T1 and T3 proximal outcome values were used as predictors (29). In this model, β -values of T3 proximal variables thus indicate the association between changes in the respective proximal and distal outcome. In a second step, the effect of changes in all proximal outcomes (separately for each distal outcome) was modelled. To control for potential confounding effects of socio-demographic or clinical baseline parameters, DVs were adjusted for age, sex, 'Skin irritation' and 'Limitation' in all regression analyses.

Missing data, software, and α -value. The number of missing values varied between 0% and 4%. Multiple imputations were conducted (30, 31), with five imputed datasets being generated with SPSS. SESs were computed with R, (32) and results were pooled by use of the R-package BaBooN (33). All subsequent analyses were performed with Mplus v7.1 (28); results were aggregated across all imputed datasets. The α -value was set at 5% in all analyses.

Results

Sample

T1 and T2 data from 502 IP course participants were available. Socio-demographic information is shown in Table 2. A total of 304 participants (60.6%) returned questionnaires at T3. Ten completers (3.2%) left or interrupted their job after 6 months because of their skin disease.

Completers were younger [arithmetic mean (M_{co}) = 36.08, SD_{co} = 11.64 versus M_{do} = 42.33, SD_{do} = 11.99] than drop-outs, and were (according to

Table 2. Socio-demographic and health-related parameters of the whole sample at the start of the course (T1) (n = 502)

		n	%
Sex	Female	468	93.2
	Male	34	6.8
Living with partner	Yes	356	70.9
	No	146	29.1
Marital status	Single	210	41.8
	Married	212	42.2
	Separated/divorced	70	13.9
	Widowed	10	2.0
Occupational group	Health professional	448	89.2
	Home duties	54	10.8
Employment status	Full-time	285	56.8
	Part-time	208	41.4
	Unemployed	9	1.8
Nationality	German	486	96.8
	Other	16	3.2
Skin-irritating job	Yes	466	92.9
	No	36	7.1
Medical treatment	Yes	476	94.8
	No	26	5.2
Sick leave	Yes	100	20.0
	No	402	80.0
Skindex-29 functioning	Very mild (0–3.9)	39	7.77
	Mild (4–10.9)	91	18.1
	Moderate (11–32.9)	238	47.4
	Severe (>33)	134	26.7
Skindex-29 emotion	Very mild (0–5.9)	26	5.2
	Mild (6–24.9)	97	19.3
	Moderate (25–49.9)	224	44.6
	Severe (>50)	155	30.9
Skindex-29 symptoms	Very mild (0–3.9)	1	0.2
	Mild (4–10.9)	3	0.6
	Moderate (11–25.9)	35	6.9
	Severe (26–49.9)	110	21.9
	Very severe (>50)	362	72.1
Mean			SD
Age (years)	39.9		12.2
Skin lesions	2.76		0.95
Limitations	2.08		1.05

Skindex-29 data) less emotionally distressed (M_{co} = 2.47, SD_{co} = 0.78 versus M_{do} = 2.64, SD_{do} = 0.82) and less afraid of losing their job because of skin disease (M_{co} = 2.70, SD_{co} = 1.36 versus M_{co} = 2.44, SD_{co} = 1.38).

Changes in proximal and distal outcomes

Table 3 shows that, at T2, small to medium changes were found in health-directed 'Emotional distress' (Skindex-29), in 'Skill and technique acquisition' (heiQ™), and in the DGUV questionnaire items 'Future coping', 'Influence', and 'Fear of job loss'. No changes

Table 3. Mean differences in proximal and distal outcome between the start of the course (T1) and immediately after the course (T2)

Scale	M (SD) T1	M (SD) T2	SES	95% CI of SES
Proximal outcomes				
heiQ™				
Positive and active engagement in life	3.18 (0.47)	3.22 (0.48)	0.09	0.03–0.15
Health-directed activities	2.96 (0.66)	2.92 (0.67)	–0.05	–0.001 to –0.10
Skill and technique acquisition	3.11 (0.50)	3.22 (0.46)	0.23	0.15–0.31
Constructive attitudes and approaches	3.49 (0.48)	3.46 (0.47)	–0.07	–0.14 to –0.001
Self-monitoring and insight	3.22 (0.42)	3.28 (0.41)	0.13	0.05–0.20
Health services navigation	3.28 (0.50)	3.26 (0.49)	–0.06	–0.12 to 0.01
Social integration and support	3.29 (0.57)	3.27 (0.59)	–0.03	–0.08 to 0.02
DGUV questionnaire				
Future	2.14 (0.91)	1.80 (0.70)	–0.37	–0.47 to –0.27
Impact	2.00 (0.94)	1.54 (0.69)	–0.49	–0.59 to –0.39
Fear of job loss	2.60 (1.37)	3.13 (1.40)	0.39	0.31–0.47
Distal outcomes				
heiQ™				
Emotional distress	1.96 (0.66)	1.90 (0.63)	–0.09	–0.14 to –0.03
Skindex-29				
Functioning	23.39 (17.79)	22.94 (17.26)	–0.03	–0.03 to 0.06
Emotional distress	39.43 (20.54)	34.72 (19.84)	–0.23	–0.27 to –0.16
Symptoms	57.88 (17.44)	56.27 (17.30)	–0.09	–0.14 to –0.04

CI, confidence interval; DGUV, Deutsche Gesetzliche Unfallversicherung; heiQ™, health education impact questionnaire; M, arithmetic mean; SD, standard deviation; SES, standardized effect size.

At least small effects (SES ≥ 0.2) are in bold.

Table 4. Mean differences between the start of the course (T1) and 6 months after the second day of the course (T3)

Scale	M (SD) T1	M (SD) T3	SES	95% CI of SES
Proximal outcomes				
heiQ™				
Positive and active engagement in life	3.16 (0.48)	3.16 (0.49)	<0.001	–0.10 to 0.10
Health-directed activities	3.00 (0.68)	2.96 (0.65)	–0.06	–0.15 to 0.04
Skill and technique acquisition	3.13 (0.50)	3.24 (0.50)	0.22	0.10–0.33
Constructive attitudes and approaches	3.51 (0.48)	3.47 (0.50)	–0.11	–0.17 to 0.02
Self-monitoring and insight	3.24 (0.42)	3.39 (0.38)	0.36	0.23–0.47
Health services navigation	3.30 (0.50)	3.33 (0.52)	0.05	–0.07 to 0.17
Social integration and support	3.28 (0.55)	3.22 (0.58)	–0.10	–0.19 to –0.01
DGUV				
Future coping	2.12 (0.90)	1.93 (0.88)	–0.21	–0.33 to –0.09
Influence	2.01 (0.96)	1.82 (0.93)	–0.20	–0.32 to –0.07
Fear of job loss	2.71 (1.35)	3.15 (1.38)	0.33	0.21–0.45
Distal outcomes				
heiQ™				
Emotional distress	1.94 (0.66)	1.84 (0.67)	–0.15	–0.25 to 0.06
Skindex-29				
Functioning	22.13 (17.53)	21.68 (16.48)	–0.19	–0.26 to –0.09
Emotional distress	37.58 (19.92)	29.86 (20.01)	–0.39	–0.47 to –0.28
Symptoms	56.89 (17.08)	49.07 (19.72)	–0.46	–0.57 to –0.35
DGUV items 1–2				
Skin irritation	2.75 (0.97)	2.51 (0.96)	–0.24	–0.37 to –0.11
Limitation	2.06 (1.04)	1.91 (1.01)	–0.14	–0.26 to –0.02

CI, confidence interval; DGUV, Deutsche Gesetzliche Unfallversicherung; heiQ™, health education impact questionnaire; M, arithmetic mean; SD, standard deviation; SES, standardized effect size.

At least small effects (SES ≥ 0.2) are in bold.

Table 5. Rates of approval in dichotomous outcomes (Deutsche Gesetzliche Unfallversicherung questionnaire) at the start of the course (T1) and 6 months after the second day of the course (T3) (n = 304)

	% T1	% T3	<i>p</i>
Proximal outcomes			
Use of skin lotion at work	85.5	95.7	<0.001
Use of skin lotion in spare time	93.4	96.7	0.147
Use of gloves at work	81.2	89.1	0.006
Use of gloves in spare time	58.2	81.6	<0.001
Distal outcomes			
Medical treatment	95.4	87.2	<0.001
Sick leave	17.8	21.8	0.474

were observed in other heiQ™ scales, or in the Skindex-29 'Functioning' or 'Symptoms' scales.

At T3, small changes were found in the heiQ™ scales 'Skill and technique acquisition' and 'Self-monitoring and insight', and in the DGUV questionnaire items 'Skin irritation', 'Future coping', 'Influence', and 'Fear of job loss' (Table 4). Small to medium changes were found in the Skindex-29 'Emotional distress' and 'Symptoms' scales.

Table 5 shows that the number of participants using skin protection products increased between T1 and T3, both at work and in their spare time. Almost all participants used skin lotion in their spare time (96.7) or at work (95.7%) at T3. The highest increase (23.4%) was observed in the number of participants using gloves in their spare time.

Table 5 also shows that the number of participants who sought medical treatment because of their skin disease decreased between T1 and T3. However, the number of participants with skin-related sick leave in the last 6 months did not decrease.

Baseline predictor variables

Table 6 shows that, for most outcomes, higher age and greater limitation resulting from skin disease at T1 were associated with worse outcomes at T3. Besides the respective baseline variables, no other socio-demographic or health-related variables were independently associated with distal outcomes at T3.

To further explore the influence of limitations resulting from skin disease at T1 on changes in the outcomes, we computed effect sizes for distal and proximal outcomes in a subgroup of participants who reported feeling at least moderately limited by their skin disease (Table 7).

Most effect sizes were higher for this subgroup than for the whole sample. However, in scales that showed no

Table 6. Standardized regression coefficients (with 95% confidence intervals) of socio-demographic and health-related baseline variables [at the start of the course (T1)] for distal outcomes [6 months after the second day of the course (T3)]

Predictor	Outcome					
	Skin irritation T3	Limitations T3	Medical treatment T3	Sick leave T3	Function T3	Emotion T3
Sex	0.17 (−0.14 to 0.46)	−0.22 (−0.66 to 0.22)	0.04 (−1.37 to 1.44)	−0.23 (−1.64 to 1.18)	−0.22 (−0.46 to 0.02)	−0.15 (−0.38 to 0.09)
Age	0.11 (0.00–0.22)	0.11 (0.01–0.22)	0.15 (−0.04 to 0.34)	0.1 (−0.09 to 0.28)	0.14 (0.05–0.22)	0.08 (0.00–0.16)
Skin irritation T1	0.25 (0.11–0.38)	0.05 (−0.08 to 0.17)	0.019 (−0.21 to 0.25)	−0.14 (−0.41 to 0.14)	−0.03 (−0.13 to 0.06)	−0.05 (−0.15 to 0.05)
Limitation T1	0.18 (0.03–0.32)	0.41 (0.26–0.55)	0.39 (0.15–0.63)	0.27 (−0.04 to 0.58)	0.18 (0.05–0.31)	0.19 (0.07–0.31)
Medical treatment T1	−0.11 (−0.67 to 0.46)	−0.25 (−0.78 to 0.27)	2.28 (1.14–3.41)	1.35 (−0.46 to 3.15)	0.14 (−0.10 to 0.39)	0.19 (−0.06 to 0.44)
Sick leave T1	0.05 (−0.24 to 0.33)	0.17 (−0.16 to 0.51)	0.29 (−0.77 to 1.34)	1.34 (0.61–2.07)	0 (−0.18 to 0.17)	0.04 (−0.17 to 0.24)

Skindex-29 scales for T1 are only included to adjust for T1 values, not as predictors. Statistical significant coefficients are printed in bold.

Table 7. Effect sizes for participants who feel at least moderately limited by their skin disease at the start of the course (T1)

Scale	SES T1–T2	95% CI	SES T1–T3	95% CI
Proximal outcomes				
heiQ™				
Health-directed activities	–0.08	–0.18 to 0.02	–0.08	–0.24 to 0.08
Active engagement in life	0.07	–0.03 to 0.17	–0.05	–0.20 to 0.10
Skill and technique acquisition	0.34	0.17–0.49	0.29	0.07–0.51
Constructive attitudes and approaches	0.02	–0.09 to 0.14	–0.03	–0.20 to 0.13
Self-monitoring and insight	0.09	–0.04 to 0.23	0.41	0.18–0.64
Health service navigation	–0.02	–0.13 to 0.10	0.15	–0.07 to 0.37
Social integration and support	–0.01	–0.09 to 0.07	–0.12	0.26–0.03
DGUV items 4–6				
Future	–0.54	–0.71 to –0.36	–0.23	–0.46 to 0.01
Impact	–0.72	–0.90 to 0.54	–0.42	–0.67 to –0.16
Fear of job loss	0.37	0.22–0.51	0.33	0.13–0.54
Distal outcomes				
heiQ™				
Emotional distress	–0.05	–0.14 to 0.05	–0.11	–0.26 to 0.05
Skindex-29				
Functioning	–0.05	–0.13 to 0.04	–0.25	–0.42 to –0.08
Emotional distress	–0.29	–0.40 to –0.18	–0.52	–0.70 to –0.32
Symptoms	–0.13	–0.23 to –0.02	–0.63	–0.83 to –0.41
DGUV items 1–2				
Skin irritation	–	–	–0.66	–0.92 to –0.39
Limitation	–	–	–1.66	–1.98 to –1.31

CI, confidence interval; DGUV, Deutsche Gesetzliche Unfallversicherung; heiQ™, health education impact questionnaire; SES, standardized effect size; T2, immediately after the course; T3, 6 months after the second day of the course.

At least small effects ($SES \geq 0.2$) are in bold.

changes in the whole sample, no changes were found in this subsample either.

Associations of changes in proximal and distal outcomes

The upper part of Table 8 shows that changes in the heiQ™ scale ‘Skill and technique acquisition’ and changes in the DGUV questionnaire items ‘Future coping’, ‘Influence’ and ‘Fear of job loss’ were associated with changes in all distal outcomes, except for ‘Sick leave’ and ‘Medical treatment’. The change in ‘Self-monitoring and insight’ was related to the change in ‘Medical treatment’. Changes in skin protection behaviours were not related to changes in distal outcomes (not shown in Table 8). The lower part of Table 8 shows that, when all proximal outcomes (but without skin protection behaviours) were included simultaneously in the regression models, changes in the DGUV questionnaire items ‘Future coping’ and ‘Fear of job loss’ were still independently associated with all distal outcomes except for sick leave. Changes in the DGUV questionnaire item ‘Influence’ still significantly explained some variance of changes in skin lesions and skin distress, and changes in the heiQ™ ‘Skill and technique acquisition’ scale were independently associated with changes in the Skindex-29 ‘Functioning’ and ‘Emotional distress’ scales. Changes in the heiQ™ ‘Self-monitoring

and insight’ scale were not associated with changes in distal outcomes.

Conclusions

IP courses seek to educate and train people with occupational skin diseases with regard to better management of their disease, improvement of quality of life, and retention of ability (13, 34, 35). This study showed that positive short-term and medium-term changes in the above-mentioned outcomes could be achieved 6 months after the course, and that IP participants showed better self-reported disease management skills (heiQ™ ‘Skill and technique acquisition’ scale; DGUV questionnaire ‘Future coping’ item), a better understanding of their condition (heiQ™ ‘Self-monitoring and insight’ scale), and a higher level of efficacy regarding personal control over their disease (DGUV questionnaire ‘Influence’ item); moreover, they were less afraid to lose their job because of their skin disease (DGUV questionnaire ‘Fear of job loss’ item), had fewer disease-related symptoms and emotional distress (Skindex-29 ‘Emotion’ and ‘Symptoms’ scales) and were more likely to apply skin protection measures during both work and leisure time than before the course. Whereas the number of participants undergoing medical

Table 8. Standardized regression coefficients (with 95% confidence intervals) of changes in proximal outcomes [adjusted 6 months after the second day of the course (T3) values] for adjusted^a changes in distal outcomes between the start of the course (T1) and T3, univariate predictors (upper part), and all predictors combined (lower part)

Proximal outcome	Distal outcome						
	Skin irritation T3	Limitation T3	Function T3	Emotion T3	Symptom T3	Medical treatment T3	Sick leave T3
Future T3	0.49 (0.37–0.61)	0.50 (0.37–0.64)	0.40 (0.29–0.52)	0.41 (0.28–0.53)	0.38 (0.30–0.46)	0.2 (–0.02 to 0.41)	0.04 (–0.14 to 0.22)
Influence T3	0.41 (0.37–0.61)	0.40 (0.28–0.52)	0.23 (0.12–0.33)	0.29 (0.18–0.40)	0.25 (0.12–0.38)	0.12 (–0.14 to 0.38)	0.05 (–0.15 to 0.24)
Fear of job loss T3	–0.33 (–0.45 to –0.20)	–0.40 (–0.51 to –0.29)	–0.32 (–0.40 to –0.23)	–0.15 (–0.26 to –0.05)	–0.36 (–0.46 to –0.25)	–0.16 (–0.40 to 0.07)	–0.10 (–0.37 to 0.17)
Skill and technique acquisition T3	–0.26 (–0.50 to 0.02)	–0.18 (–0.29 to –0.06)	–0.17 (–0.27 to –0.07)	–0.17 (–0.27 to –0.06)	–0.11 (–0.21 to <0.00)	–0.14 (–0.38 to 0.10)	0.06 (–0.14 to 0.27)
Self-monitoring and insight T3	–0.06 (–0.20 to 0.07)	–0.09 (–0.21 to 0.02)	–0.09 (–0.19 to 0.01)	–0.07 (–0.18 to 0.03)	–0.08 (–0.18 to 0.03)	–0.23 (–0.43 to –0.04)	–0.11 (–0.10 to 0.31)
Future T3	0.31 (0.17–0.45)	0.31 (0.15–0.47)	0.34 (0.22–0.46)	0.28 (0.14–0.42)	0.27 (0.11–0.42)	0.04 (–0.17 to 0.26)	–0.06 (–0.31 to 0.19)
Influence T3	0.2 (0.08–0.33)	0.16 (0.04–0.28)	–0.02 (–0.12 to 0.08)	–0.08 (–0.03 to 0.18)	0.05 (–0.07 to 0.18)	0.13 (–0.11 to 0.36)	0.02 (–0.23 to 0.19)
Fear of job loss T3	–0.2 (–0.33 to –0.07)	–0.28 (–0.39 to –0.16)	–0.23 (–0.33 to –0.12)	–0.26 (–0.37 to –0.15)	–0.28 (–0.41 to –0.15)	–0.12 (–0.34 to 0.11)	–0.27 (–0.47 to –0.07)
Skill and technique acquisition T3	–0.01 (–0.14 to 0.12)	–0.06 (–0.17 to –0.05)	–0.12 (–0.22 to –0.03)	–0.11 (–0.22 to 0.00)	–0.01 (–0.13 to 0.12)	–0.01 (–0.31 to 0.29)	0.02 (–0.23 to 0.26)
Self-monitoring and insight T3	0.05 (–0.09 to 0.19)	0.06 (–0.05 to 0.17)	0.06 (–0.03 to 0.16)	0.09 (–0.22 to 0.00)	0.01 (–0.12 to 0.13)	–0.17 (–0.42 to 0.08)	0.07 (–0.15 to 0.30)

Statistically significant parameters are in bold.

^aAll regression coefficients are adjusted for T1 values of the respective outcomes, for T1 values of the respective predictors, and for sex, age, 'skin irritation' T1 and 'limited' T1.

treatment decreased over time, the number of employees on sick leave during the last 6 months did not change.

Our study results are consistent with the findings of Apfelbacher et al. (12), who also showed improvements in dermatological symptoms, and increases in health-related quality of life and protective behaviours, among IP participants at a single BGW centre. These authors used direct change measurement (via telephone interviews), whereas change was assessed indirectly by means of standardized questionnaires in our study. Considering that direct and indirect change measurement may yield different results (14), the agreement between the results can be regarded as evidence for actual change processes rather than methodological effects.

According to the Skindex-29 scales, the level of initial burden in IP participants in this study is comparable to that of other IP cohorts (13). The heiQTM scales showed that participants felt less distressed than patients with other medical conditions at the beginning of their inpatient rehabilitation programme (20). Of the participants, 42.2% reported that they had no or only minor dermatological problems, and 61.7% reported no or only marginal limitations caused by their skin disease at T1. These findings imply that the BGW succeeds in including persons with early-stage skin diseases in its programme. This is of particular importance given that early interventions can help to prevent health problems from becoming chronic conditions. Low initial distress may, however, lead to ceiling effects, resulting in an underestimation of the effectiveness of the programme. This is in line with findings showing that higher subjective burden caused by the skin disease was a significant predictor of several outcomes. For instance, participants with higher distress at T1 had larger effects in most outcomes than the whole sample. More severely impaired participants may benefit more from the course. However, we cannot rule out the possibility that the above-mentioned subgroup effects are caused by ceiling effects in less distressed participants or regression towards the mean.

Theoretical models of the effects of patient education assume that more distal outcomes (e.g. quality of life) can be positively influenced by promoting proximal outcomes (e.g. self-management skills) (36, 37). For example, Wulfhorst et al. showed that educational interventions might reduce job loss 5 years after the intervention (38). In accordance with these assumptions, we clearly showed that changes in proximal outcomes were associated with changes in distal outcomes. More precisely, changes in beliefs regarding disease and symptom management, and reduced concerns regarding potential job loss, were related to changes in functioning, symptom burden, and emotional distress. Given the study design, it remains

unclear whether changes in proximal outcomes really result in changes in more distal parameters; other causal models might be more appropriate for describing the associations, and should be considered in future studies.

Limitations

One important study limitation pertains to the study design. Given the single-group before-and-after design, the changes found cannot be causally attributed to the effects of the IP seminars. As mentioned above, alternative explanations (e.g. spontaneous symptom remission and regression to the mean) cannot be ruled out (39). The inclusion of a non-treatment control group would be preferable on methodological grounds, but is difficult to achieve in Germany, owing to legal restrictions (12, 40).

Participants with data available from T1 to T3 were somewhat younger and reported less emotional distress than the initial sample. It is conceivable that results are underestimated or overestimated because of this selection process. However, as higher baseline distress was associated with more pronounced change, the medium-term changes may be underestimated rather than overestimated.

A continuum of more proximal versus more distal outcomes may be preferable to the dichotomous distinction that was made between proximal and distal outcomes. Although some outcomes may be clearly classified as proximal (e.g. the heiQ™ 'Skill and technique acquisition' scale) or distal (e.g. sick leave), the assignment is more disputable for other outcomes, such as the heiQ™ 'Emotional distress' scale. To improve our understanding of the effects of the IP courses, more studies on causal relationships between outcomes of IP courses are needed.

At present, no statement can be made regarding the reliability of the DGUV questionnaire items. Usually, single items show lower reliability than multi-item scales; therefore, the changes found in our study may be underestimated.

Another disadvantage of this study concerns the fact that several important distal and proximal outcomes were not (or were inadequately) assessed. For instance, the number of participants on sick leave because of their skin disease during the last 6 months was documented (no significant change was found here), but not the number of days of sick leave resulting from general work disability (which may have decreased).

In addition, there are some inconsistent results. Significant changes were found regarding the DGUV questionnaire item 'Influence', but not for the heiQ™ 'Constructive attitudes and approaches' scale, which assesses similar aspects. The heiQ™ has proven to be sensitive to change by the use of different rehabilitation patient samples (e.g. rheumatoid disorders, chronic obstructive pulmonary disease, and cancer) (20). As IP participants reported high baseline scores in the heiQ™ scales, it can be assumed that changes in at least some constructs cannot be adequately measured for those IP participants with relatively little subjective disease burden.

Implications

The study results imply that the IP prevention approach succeeds in including people with BGW insurance with skin diseases at a relatively early stage of their condition. IP course participants show significant improvements in a variety of relevant proximal (e.g. self-management skills) and distal (e.g. health-related quality of life) outcomes. Changes in proximal outcomes are associated with changes in distal outcomes.

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