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Adding happiness to complement the Dermatology Quality of Life Index in psoriasis and atopic dermatitis healthcare: a cross-sectional study

Background: The Dermatology Quality of Life Index (DLQI) is the most commonly used quality of life questionnaire in dermatology. **Objectives:** The aim of this study was to compare the DLQI to measures of well-being and general quality of life in patients with chronic inflammatory skin diseases. **Materials & Methods:** A cross-sectional study among patients with psoriasis and atopic dermatitis was conducted at a hospital in Munich, Germany (12/2017-04/2019). Participants filled in validated scales measuring happiness, quality of life, and DLQI. **Results:** In 102 patients with chronic inflammatory skin diseases, the DLQI was associated only with physical quality of life and negative emotions, and not psychological quality of life or positive affect. The DLQI alone accounted for 26% of variance in general quality of life. Combining DLQI and happiness accounted for a total of 73% of variance, with both variables contributing to the model. **Conclusion:** The DLQI alone only partially reflected well-being. Assessing happiness in addition to the widely used DLQI can contribute to a more comprehensive evaluation of well-being.

Key words: atopic dermatitis, happiness, mental burden, psoriasis, quality of life, well-being

Quality of life (QoL) is the most commonly used patient reported outcome in medicine [1]. Since the World Health Organization (WHO) famously defined health “as a state of complete physical, mental, and social well-being and not merely the absence of disease” [2], the concept of QoL has received growing attention in medical research. From the 1970s to 1990s, numerous questionnaires measuring health-related QoL have been developed and introduced, including both generic and disease-specific tools [1, 3]. In dermatology, the Dermatology Quality of Life Index (DLQI) [4] is the most well-established tool for measuring skin-related QoL and has proven its worth both in research and care [3]. Simultaneously to the growing efforts to measure well-being in medicine, a psychological sub-discipline focused on well-being and human flourishing was formed in the second half of the 20th century and was given the name “Positive Psychology” in 1990 [5]. Defining and measuring happiness is a major endeavour in positive psychology. Perhaps the most well-known conceptualization of happiness is Ed Diener’s “subjective well-being”, which describes “the cognitive and affective evaluation of life as a whole” [6, 7]. According to this conceptualization, a person is happy if they experience a lot of positive emotions (positive affect [PA]) while experiencing only few negative emotions (negative affect [NA]) and if they are overall satisfied with their life (SWL) [7].

The first studies exploring happiness in dermatologic patients have shown that patients with skin diseases tend to be less happy compared to healthy controls and that patients with chronic inflammatory skin diseases, such as atopic

dermatitis (AD) and psoriasis, are especially unhappy [8, 9], contributing to the considerable body of evidence demonstrating a large mental burden of these diseases [10-14]. In an effort to meet the needs of these patients, the DLQI is commonly used in both clinical research and practice to reflect skin-related quality of life impairment [3]. However, considering the WHO’s holistic definition of health as a state of well-being raises the question whether examining only the DLQI, which was originally developed to measure disability [4], is sufficient in reflecting the patients’ burden of disease or whether other indicators of well-being should be added. To better understand the informative value of the DLQI for the evaluation of psychosocial needs, the aims of this study were to: (1) explore the association between the DLQI and happiness in patients with chronic inflammatory skin diseases and (2) put the results into perspective by making comparisons with a generic QoL assessment tool recommended by the WHO, the WHOQOL-BREF [15], and a control group.

Materials and methods

Data were collected from December 2017 to April 2019. In- and outpatients with psoriasis and atopic dermatitis (AD) at the Department of Dermatology and Allergy of the Technical University of Munich, Germany, filled in a paper-based questionnaire (*see supplementary material*). All in- and outpatients aged 18 years or older who had been diagnosed with psoriasis or AD were eligible to participate. Exclusion criteria were the inability to provide consent and the inability to fill in the German questionnaire. A group of

healthy controls (aged 18 years or older) living in the greater Munich area, recruited with the help of a recruitment service (TestingTime, Zurich, Switzerland), filled in the same questionnaire. The study was conducted in accordance with the Declaration of Helsinki and was approved by the local ethics committee of the Technical University of Munich (reference number: 424/17S).

Questionnaire

The questionnaire consisted of validated scales measuring happiness and QoL (*see supplementary material*). The attending physician documented diagnoses, current treatment, and disease severity using the Psoriasis Area and Severity Index (PASI) for psoriasis and Scoring Atopic Dermatitis (SCORAD) [16] for AD. Disease severity was classified according to the respective manuals (mild: PASI/SCORAD <10/25, moderate to severe: PASI/SCORAD ≥10/25) [17, 18]. Current treatment was categorized as either systemic (*e.g.* immunomodulators, oral antihistamines) or non-systemic (*e.g.* topical steroids, phototherapy).

Happiness was operationalized as the three facets of subjective well-being [6]: positive affect (PA), negative affect (NA), and satisfaction with life (SWL). The German version of the Scale of Positive and Negative Experience (SPANE) was used to measure PA and NA [19, 20] and consists of 12 items (six representing PA, *e.g.* “pleasant”, and six representing NA, *e.g.* “unpleasant”), each rated on a 5-point Likert scale ranging from 1 (“very rarely or never”) to five (“very often or always”). The two distinct subscales measuring PA and NA showed good reliability with Cronbach’s alphas of 0.94 and 0.87, respectively. The items of each subscale were averaged to form an index if at least 80% of items were answered validly. SWL was measured using the German version of the Satisfaction With Life Scale (SWLS), a validated and widely used scale consisting of five items (*e.g.* “in most ways, my life is close to my ideal life”), each measured on a scale from 1 (“strongly disagree”) to 7 (“strongly agree”) [21, 22]. The SWLS showed good reliability in this sample with a Cronbach’s alpha of 0.89. As with the SPANE scales, the items of the SWLS were averaged to form an index if at least 80% of items were answered validly.

Quality of Life was measured using the German version of the World Health Organization Quality of Life (WHOQOL)-BREF questionnaire [15, 23]. The WHOQOL-BREF is a generic health-related QoL instrument consisting of 26 items, 24 of which measure the four domains: physical, psychological, social, and environmental QoL. Each item is scored from 1 to 5. Following the instructions in the manual [23], domain scores were calculated for each domain and transformed to a 0-100 scale. The WHOQOL-BREF domains showed good reliability with Cronbach’s alphas of 0.84, 0.80, 0.74, and 0.80 for the physical, psychological, social, and environmental domain, respectively. The remaining two items of the WHOQOL-BREF represent global assessments of health and QoL, each measured with one single question. As the aim of using the WHOQOL-BREF in this study was to measure QoL as detailed as possible, the domain scores were explored in all further analyses, and the two separate items

providing global assessments of health and QoL were not further analysed.

Dermatology-related quality of life was measured using the Dermatology Quality of Life Index (DLQI) [4]. The DLQI measures QoL impairment in patients with skin diseases. It consists of 10 items to measure the effect of skin conditions on different aspects of daily life. For each item, the participants can choose from the four answer options: “not at all”, “a little”, “a lot”, and “very much”, which correspond to scores of 0, 1, 2, and 3, respectively. The scores are summed up, resulting in possible scores from 0 to 30. According to the manual, the DLQI scores can be classified as follows: 0-1 (no effect at all on patient’s life), 2-5 (small effect on patient’s life), 6-10 (moderate effect on patient’s life), 11-20 (very large effect on patient’s life), and 21-30 (extremely large effect on patient’s life) [4]. The DLQI showed good reliability with a Cronbach’s alpha of 0.91 in this sample.

Analysis

The digitalization procedure and the quality management of the collected data are described elsewhere [9]. Patients’ characteristics were analysed descriptively, and differences in age and gender between the patients and the controls were analysed using Student’s t-test and chi-squared test. As the groups differed in terms of age, age was initially controlled in all analyses. However, as age did not influence the results, it was omitted as a covariate to keep the models as simple as possible.

Descriptive statistics of happiness in both patient groups (psoriasis and AD) have been reported elsewhere in more detail [9]. Student’s t-tests were conducted to compare both patient groups in terms of happiness, DLQI, and QoL. As the analyses did not reveal major differences between the patient groups, all further analyses were conducted on the whole patient sample without further differentiation between the patient groups. Student’s t-tests were used to compare patients and controls, as well as compare patients receiving systemic treatment with patients receiving non-systemic treatment in terms of happiness and QoL. According to Diener’s definition of subjective well-being [6] and following the methodology of existing research [24], a composite score of happiness was calculated as the mean of the z-standardized SWLS score, PA component of the SPANE, and inversely coded NA component of the SPANE. For the WHOQOL-BREF, the value domains were transformed to a scale of 0-100 according to the manual [23] and prior to averaging them into an overall QoL index.

Linear regression models were used to explore the associations between happiness, QoL, and DLQI. Overall happiness, overall QoL, and the DLQI were explored as dependent outcomes. As independent variables, both the overall indices and the separate facets/domains were entered (in separate models) to allow both a detailed and concise analysis of the examined associations. Standardized regression coefficients (β) are reported.

The level of significance was set at $\alpha=0.05$ for all analyses. All statistical analyses were conducted using IBM SPSS Statistics Version 26 (IBM Corporation, Armonk, NY, USA).

Table 1. Quality of life and happiness in patients with psoriasis and atopic dermatitis compared to healthy controls and skin-related quality of life impairment (DLQI) in the patient group.

	Patients n=102		Controls n=106		p ^a
	m / %	SD	m	SD	
Age	47.4	19.1	38.4	13.4	<0.001
Gender (women)	43.1%	-	49.1%	-	3.92
Disease severity					
- mild	33.3%	-	-	-	-
- moderate to severe	66.7%	-	-	-	-
Systemic treatment	46.4%	-	-	-	-
DLQI ^b	13	8.6	-	-	
QoL ^c : physical	64.8	18.7	77.8	16.2	<0.001
QoL ^c : psychological	64.7	16.9	68.9	15.9	0.004
QoL ^c : social	70.1	21.1	68.6	22	0.482
QoL ^c : environmental	74.8	13.7	74.6	15.8	0.932
Overall QoL ^c	68.6	14.5	72.5	14.8	0.057
Satisfaction with life ^d	5	1.2	4.8	1.3	0.519
Positive affect ^e	3.4	0.9	3.8	0.8	0.005
Negative affect ^e	2.4	0.9	2.3	0.8	0.057
Overall happiness ^f	-0.1	0.9	0.1	0.9	0.136

M: mean; SD: standard deviation; ^aStudent's t-tests (for gender: Chi-Square test); ^bDLQI: Dermatology Quality of Life Index, possible range: 0-30; QoL: Quality of Life, measured with the World Health Organization Quality of Life (WHOQOL)-BREF, possible range per domain: 0-10; ^cOverall QoL indicates average of all four domains; ^dMeasured using the Satisfaction with Life Scale, possible range: 1-7; ^eMeasured using the Scale of Positive and Negative Experience, possible range: 1-5; ^fSatisfaction with life, positive and negative affect variables were z-standardized and averaged into an index, range in this sample: -3.03-1.47.

Results

Study sample

In total, the data of 102 patients with chronic inflammatory skin diseases (52 with psoriasis, 50 with AD) and 106 healthy controls were analysed. The mean age of patients was 47.4 ± 19.1 years (range: 18-86 years). Women constituted 43.1% of all participants. While a third of patients were only mildly affected, disease severity was moderate to severe in 67% of patients (psoriasis: 60.4%, AD: 73.3%; $p = 0.187$). Almost half of all patients received a systemic treatment for their skin condition (46.4%, four cases with missing information). Patients with psoriasis and AD did not differ in terms of age or gender distribution ($p = 0.493$ and $p = 0.331$, respectively). Participants of the control group were significantly younger than patients ($m = 38.4$, $SD = 13.4$; $p < 0.001$) but showed a comparable gender distribution (49.1% women, $p = 0.392$).

DLQI, QoL and happiness

Patients with psoriasis and AD did not significantly differ in terms of DLQI ($m = 11.7$ vs. $m = 14.4$, $p = 0.12$) or happiness (PA: $m = 3.5$ vs. $m = 3.3$, $p = 0.14$; NA: $m = 2.3$ vs. $m = 2.6$, $p = 0.17$; SWL: $m = 5$ vs. $m = 4.9$, $p = 0.62$). In terms of QoL, patients with psoriasis reported better physical QoL than patients with AD ($m = 68.7$ vs. $m = 60.8$, $p = 0.03$), but no difference was observed for the other QoL domains (mental: $m = 67.1$ vs. $m = 62.3$, $p = 0.15$; social: $m = 69$ vs. $m = 71.3$, $p = 0.6$; environmental: $m = 75.6$ vs. $m = 74$, $p = 0.54$).

In the total patient sample, the mean DLQI score was 13 ± 8.6 (table 1). Overall, 54 patients (52.9%) reported a very large or an extremely large effect of the respective skin disease on their lives according to the DLQI. For 18 patients (18.6%), the effect was moderate, and for 25 patients (24.5%), the skin diseases only had a small effect or no effect at all on their lives.

In terms of QoL, the patients scored lower than the controls in the physical and the psychological domains of QoL. Patients' results for the social and environmental domains were comparable to those for the control group. In terms of happiness, patients with psoriasis and AD reported lower levels of PA compared to the healthy control group, but they did not differ from the healthy controls in terms of NA or SWL (table 1).

Patients receiving systemic treatment showed a lower DLQI compared to patients receiving non-systematic treatment ($m = 10.7$ vs. $m = 15$, $p = 0.02$), but they did not significantly differ in terms of happiness or QoL, as measured with the WHOQOL-BREF.

The association between DLQI, QoL and happiness

When differentiating the four domains of QoL, only the psychological ($\beta = 0.70$, $p < .001$) domain of QoL significantly predicted happiness in the patient group. In contrast, the psychological domain ($\beta = 0.56$; $p < 0.001$) and the social domain ($\beta = 0.22$; $p = 0.001$) predicted happiness in healthy individuals (table 2).

Table 2. Associations between World Health Organization Quality of Life (WHOQOL)-BREF, the Dermatology Quality of Life Index (DLQI), and happiness: results from linear regression models in patients with chronic inflammatory skin diseases and healthy controls.

Predictors Model Summary	Patients <i>n</i> = 102		Controls <i>n</i> = 106	
DV: Overall happiness				
QoL: physical (β , <i>p</i>)	0.08	0.283	0.09	0.224
QoL: psychological (β , <i>p</i>)	0.70	<0.001	0.56	<0.001
QoL: social (β , <i>p</i>)	0.11	0.066	0.22	0.001
QoL: environmental (β , <i>p</i>)	0.07	0.250	0.13	0.060
Model summary (<i>cR</i> ²)	0.77	<0.001	0.77	<0.001
DV: Overall QoL				
Overall happiness (β , <i>p</i>)	0.84	<0.001	0.86	<0.001
Model summary (<i>cR</i> ²)	0.70	<0.001	0.74	<0.001
Satisfaction with life (β , <i>p</i>)	0.47	<0.001	0.40	<0.001
Positive affect (β , <i>p</i>)	0.27	0.002	0.33	<0.001
Negative affect (β , <i>p</i>)	-0.26	0.001	-0.22	0.006
Model summary (<i>cR</i> ²)	0.71	<0.001	0.74	<0.001
DLQI (β , <i>p</i>)	-0.52	<0.001	-	-
Model summary (<i>cR</i> ²)	0.26	<0.001	-	-
DLQI (β , <i>p</i>)	-0.13	0.031	-	-
Overall happiness (β , <i>p</i>)	0.77	<0.001	-	-
Model summary (<i>cR</i> ²)	0.73	<0.001	-	-

DV: dependent variable, β : standardized correlation coefficients, with positive and negative values indicating positive and negative associations, respectively, and higher absolute values indicating stronger associations between the DV and the predictor variables, *p*: *p* value; QoL: quality of life; *cR*²: corrected *R*², indicating the corrected percentage of variance in the DV explained by the model.

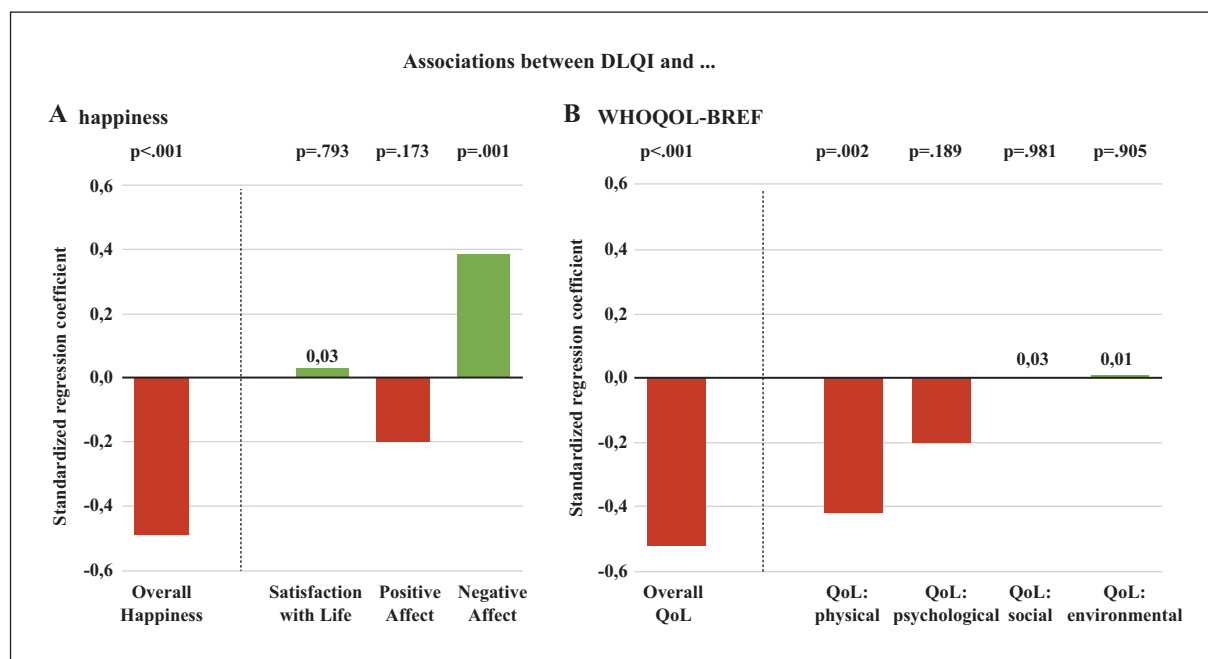


Figure 1. Associations between Dermatology Quality of Life Index (DLQI) and happiness (A) and World Health Organization Quality of Life (WHOQOL)-BREF (B).

Linear regression furthermore revealed a significant association between overall QoL and DLQI (β = -0.52; p < 0.001) (figure 1). More precisely, the DLQI significantly correlated only with the physical (β = -0.42, p = 0.002)

domain and not the psychological, social, and environmental domains of QoL. The DLQI furthermore negatively predicted overall happiness (β = -0.49; p < 0.001) (figure 1). Moreover, an association between the DLQI and NA

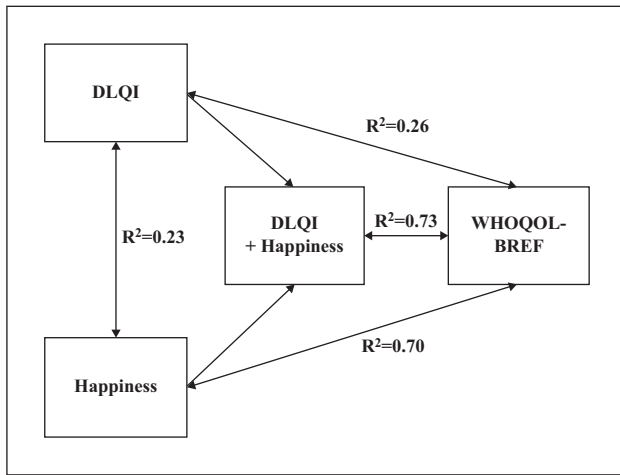


Figure 2. Correlations between happiness, the Dermatology Quality of Life Index (DLQI) and World Health Organization Quality of Life (WHOQOL)-BREF in patients with psoriasis and atopic dermatitis. R^2 indicates the percentage of explained variance in the respective models (corrected R^2).

($\beta=0.39$, $p < 0.001$), and not PA ($\beta = -0.20$, $p = 0.173$) or SWL ($\beta=0.03$, $p = 0.793$), was observed.

Happiness significantly predicted overall QoL in the patient group ($\beta=0.84$, $p < 0.001$) and control group ($\beta=0.86$, $p < 0.001$) (table 2). All three facets of happiness significantly predicted overall QoL in patients and controls, with SWL having the highest effect in both groups (patient: $\beta=0.47$, $p < 0.001$; control: $\beta=0.40$, $p < 0.001$) (table 2).

Figures 2, 3 summarize the associations between DLQI, overall QoL, and happiness in the patient group. The DLQI

alone ($\beta=-0.52$; $p < 0.001$) accounted for 26% of variance in overall QoL. Adding happiness to the model significantly increased the model's goodness of fit ($p < 0.001$), with both happiness ($\beta=0.77$, $p < 0.001$) and DLQI ($\beta=-0.13$, $p = 0.031$) predicting overall QoL, resulting in a total of 73% of variance explained by the model.

Discussion

This study explored the association between happiness, quality of life, and DLQI in patients with chronic inflammatory skin diseases. We found that while the DLQI correlated with both happiness and general QoL, it only reflected the negative emotion component of happiness (NA) and the physical domain of QoL, which in turn did not predict overall happiness. More precisely, the results show that the DLQI primarily measures physical impairment associated with negative emotions, which is in line with its original purpose as a “disability index” [4]. Consequently, the DLQI alone was shown to only partially reflect well-being. This conclusion is supported by a recent qualitative study, which found that patients felt that the DLQI did not adequately reflect their emotional burden [25]. However, the DLQI is still used as the sole indicator of quality of life and well-being in many dermatological studies [26-28].

Happiness, in turn, strongly correlated with general QoL, suggesting that it measures well-being in a more comprehensive manner than the DLQI. Additionally, previous studies found that patients with psoriasis and AD experience less PA than healthy individuals, and that there may be an association between PA and disease severity [8, 9]. PA has been linked to several desirable health

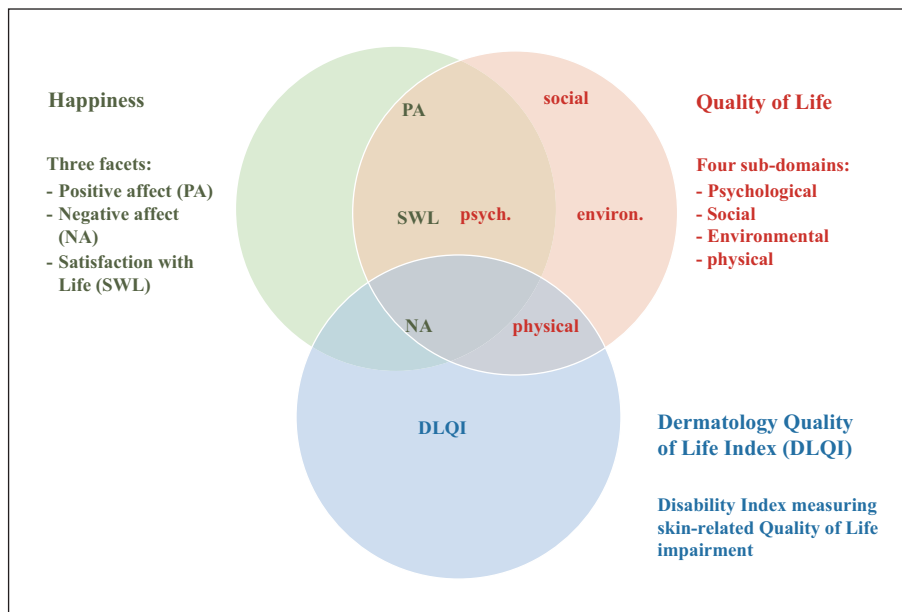


Figure 3. Schematic illustration of the associations between happiness, quality of life (WHOQOL-BREF) and the Dermatology Quality of Life Index (DLQI). Happiness and QoL correlated more strongly than DLQI and happiness/QoL, respectively. All three happiness facets correlated with QoL, with the strongest association observed for Satisfaction with Life (SWL). For QoL, only the psychological domain was associated with happiness. The DLQI correlated only with NA and physical QoL, and thus only reflected a distinct part of well-being.

outcomes such as better immune response, improved health behaviour, and quicker wound healing [29-31], which underlines the importance of PA for not only mental but also physical health. As PA is not reflected in the DLQI, an important aspect of the burden of psoriasis and AD might have been overlooked in most clinical studies which only included the DLQI and not PA. Nevertheless, the DLQI contained information about general QoL, which was not provided by measuring happiness alone. Combining the frequently used DLQI with two short scales that measure happiness could provide a comprehensive assessment of QoL and well-being without the need for additional time-consuming QoL assessments.

While comparing DLQI and happiness is a novel approach, several validation studies have explored the association between DLQI and other generic QoL measures [32]. In patients with psoriasis and AD, the DLQI showed weak to moderate correlations with most generic QoL scores (e.g. the Nottingham Health Profile) [32, 33], which correspond with the comparably weak correlation between DLQI and overall QoL in this study. When considering the different domains of QoL, Shikiar *et al.* showed that the DLQI moderately correlated with both the mental and the physical components of the Short Form 36 [34], while in this study, the DLQI was only associated with the physical and not the mental domain of QoL. However, Shikiar *et al.* used Pearson's correlation coefficients to independently compare the correlations between the single QoL domains and the DLQI [34], whereas in this study, associations were explored using linear regression, controlling for all domains of QoL. When controlling for physical QoL, the association between DLQI and mental QoL seemingly disappeared.

The results of this study are subject to several limitations. First, as this is a cross-sectional study, we can only assess associations and not causality between happiness and QoL. Second, only patients with psoriasis and AD were included in the study. It is possible that the associations between the DLQI and happiness vary for different patient groups. More studies with larger and more diverse samples of dermatological patients are needed to verify this. Furthermore, recruitment took place at only one university hospital in Munich, Germany. While the aim was to include all eligible patients, this was not always feasible and is why the sample is not necessarily representative of the respective patient collectives. Third, the findings only apply to the specific scales used in this study, namely the SPANE [19], the SWLS [21], the WHOQOL-BREF [15], and the DLQI [4]. Although these scores are validated and well-established, it is possible that results vary when using other tools. This is especially true for happiness, as there is an ongoing debate about its operationalization in psychological research [35]. In conclusion, the results of this study show that the DLQI primarily measures physical impairment in patients with skin diseases and that it is predominantly associated with negative emotions. Therefore, the DLQI alone provides only a limited evaluation of well-being. Happiness is a very subjective measure of well-being with high individual relevance. It can complement the information provided by the DLQI and thus contribute to a comprehensive evaluation of well-being consistent with the WHO's definition of health. Happiness should be considered as a new patient reported outcome both in future research and in dermatological care, as it could help to better understand the burden of skin diseases and guide therapy development and decisions.

The development of a score assessing happiness in a comprehensive but uncomplicated manner would facilitate its application in clinical practice.

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Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1684/ejd.2022.4244.

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