Institut für Medizinische Informationsverarbeitung, Biometrie und Epidemiologie (IBE)
der Universität München

Dissertation

zum Erwerb des Doctor of Philosophy (Ph.D.) an der

Medizinischen Fakultät der

Ludwig-Maximilians-Universität zu München

Introducing and Evaluating Happiness as a New Patient Reported Outcome in Dermatology

vorgelegt von:

Barbara Natascha Schuster

aus:

München, Deutschland

Jahr:

2022

Mit Genehmigung der Medizinischen Fakultät der

Ludwig-Maximilians-Universität zu München

First supervisor:	*Priv-Doz. Dr. Dr. Alexander Zink, MPH*
Second supervisor*:*	*apl. Prof. Dr. Heike Künzel*
Dean:	Prof. Dr. Thomas Gudermann
Datum der Verteidigung:	26.10.2022

Affidavit

Affidavit

Schuster, Barbara

Surname, first name

Biedersteiner Str. 29

Street

80802, Munich, Germany

Zip code, town, country

I hereby declare, that the submitted thesis entitled:

Introducing and Evaluating Happiness as a New Patient Reported Outcome in Dermatology

is my own work. I have only used the sources indicated and have not made unauthorised use of services of a third party. Where the work of others has been quoted or reproduced, the source is always given.

I further declare that the submitted thesis or parts thereof have not been presented as part of an examination degree to any other university.

Munich, 9.11.2022 Barbara Schuster

Confirmation of congruency

Confirmation of congruency between printed and electronic version of the doctoral thesis

Schuster, Barbara

Surname, first name

Biedersteiner Str. 29

Street

80802, Munich, Germany

Zip code, town, country

I hereby declare, that the submitted thesis entitled:

Introducing and Evaluating Happiness as a New Patient Reported Outcome in Dermatology

is congruent with the printed version both in content and format.

Munich, 9.11.2022 Barbara Schuster

Table of content

List of abbreviations

DLQI: Dermatology Quality of Life Index

EMA: European Medicines Agency

FDA: (American) Food and Drug Administration

ICD: International Classification of Diseases

HIV: human immunodeficiency virus

m^a: adjusted mean

NA: negative affect

PA: positive affect

PANAS: Positive and Negative Affect Schedule

PROM: patient reported outcome measure

QoL: Quality of Life

SPANE: Scale of Positive and Negative Experience

SWL: satisfaction with life

SWLS: Satisfaction With Life Scale

WHO: World Health Organization

List of publications

Schuster B, Ziehfreund S, Schielein MC, Tizek L, Biedermann T, Peifer C, Zink A. Adding happiness to complement the Dermatology Quality of Life Index in psoriasis and atopic dermatitis healthcare. Eur J Dermatol. Accepted.

Schuster B, Peifer C, Ziehfreund S, Tizek L, Biedermann T, Zink A, Schielein MC. Happiness and depression in psoriasis: a cross-sectional study in Germany. Qual Life Res. 2021 [online ahead of print].

Pilz AC, Schielein MC, **Schuster B**, Heinrich L, Haufe E, Abraham S, Heratizadeh A, Harder I, Kleinheinz A, Wollenberg A, Wiemers F, Weisshaar E, Augustin M, von Kiedrowski R, Pawlak M, Schäkel K, Wildberger J, Hilgers M, Werfel T, Weidinger S, Schmitt J, Biedermann T, Zink A; and the TREATgermany Study Group. Atopic dermatitis: disease characteristics and comorbidities in smoking and non-smoking patients from the TREATgermany registry. J Eur Acad Dermatol Venereol. 2021 [online ahead of print].

Pilz AC, Durner V, Schielein MC, **Schuster B**, Beckmann J, Biedermann T, Eyerich K, Zink A. Addictions in patients with atopic dermatitis: a cross-sectional pilot study in Germany. J Eur Acad Dermatol Venereol. 2021 [online ahead of print].

Schuster B, Tizek L, Schielein MC, Ziehfreund S, Rothe K, Spinner CD, Biedermann T, Zink A. Retracing the COVID-19 Pandemic in Germany from a Public Perspective using Google Search Queries Related to "coronavirus". Gesundheitswesen. 2021;83(5):e9-e14.

Schuster B, Ziehfreund S, Tizek L, Krause J, Biedermann T, Zink A. [Is the Bavarian Population Open for Teledermatology? A Cross-Sectional Study in Rural and Urban Regions of Bavaria, Germany]. Gesundheitswesen. 2021 Jan;83(1):53-58.

Pilz AC, Durner V, Schielein MC, **Schuster B**, Beckmann J, Biedermann T, Eyerich K, Zink A. Addictions in patients with atopic dermatitis: a cross-sectional pilot study in Germany. J Eur Acad Dermatol Venereol. 2021 [online ahead of print].

Schuster B, Zink A, Eyerich K. Medical algorithm: Diagnosis and treatment of hypereosinophilic syndrome. Allergy. 2020;75(11):3003-3006.

Schuster B, Dugas M, Zink A. Medizinische Apps – Möglichkeiten bei Pruritus. Hautarzt. 2020 Jul;71(7):528-534.

Schuster B, Ziehfreund S, Albrecht H, Spinner CD, Peifer C, Zink A. Happiness in Dermatology: a Holistic Evaluation of the Mental Burden of Skin Diseases. J Eur Acad Dermatol Venereol. 2020 Jun;34(6):1331-1339.

Schuster B, Ziehfreund S, Biedermann T, Zink A. Psoriasis 2.0: Facebook as a source of disease-related information for patients with psoriasis. J Dtsch Dermatol Ges 2020; 18(6): 571-581.

Schielein MC, Tizek L, **Schuster B**, Ziehfreund S, Liebram C, Eyerich K, Zink A. Always Online? Internet Addiction and Social Impairment in Psoriasis across Germany. Int J Clin Med 2020; 9(6): 1818.

Schielein MC, Tizek L, **Schuster B**, Ziehfreund S, Biedermann T, Zink A. Genital Psoriasis and Associated Factors of Sexual Avoidance – A People-centered Cross-sectional Study in Germany. Acta Derm Venereol 2020; 100(10): adv00151.

Tizek L, Schielein MC, **Schuster B**, Ziehfreund S, Biedermann T, Zink A.[Effects of an unconventional skin cancer prevention campaign : Impacts on the sun protection behavior of outdoor workers]. Hautarzt. 2020;71(6):455-462.

Schuster B, Zink A, & Peifer C. Happiness in medicine: a comparison of the mental burden of chronic diseases using positive-psychological concepts. In: Brohm-Badry, M., Peifer, C., Greve, J. & Berend, B. (Hrsg.) Zusammen wachsen – Förderung der positiv-psychologischen Entwicklung von Individuen, Organisationen und Gesellschaft. 2019. Lengerich: Pabst Science Publishers.

Zink A, **Schuster B**, Winkler J, Eberlein B, Eyerich K, Brockow K, Biedermann T. Sensitization to Hymenoptera vernoms and insect stings reactions in an unreferred adult population with outdoor activities. World Allergy Organ J 2019; 12(7):100039.

Boehmer D, **Schuster B**, Krause J, Darsow U, Biedermann T, Zink A. Prävalenz und Behandlung von Allergien in ländlichen Regionen Bayerns: Eine Querschnittsstudie. Allergologie 2019; 42(12):529-537.

Ziehfreund S, **Schuster B**, Biedermann T, Zink A. Primary prevention of keratinocyte carcinome among outdoor workers, the general population and medical professionals: a systematic review updated for 2019. J Eur Acad Dermatol Venerol 2019; 33(8): 1477-1495.

Ziehfreund S, **Schuster B**, Biedermann T, Zink A. Understanding roofers‘ sun protection behaviour: A qualitative study. J Eur Acad Dermatol Venereol 2019;33:e187-e229.

Zink A, Rüth M, **Schuster B**, Darsow U, Biedermann T, Ständer S. [Pruritus in Germany–a Google search engine analysis]. Hautarzt 2019; 70 (1): 21-28.

Boehmer D, **Schuster B**, Krause J, Darsow U, Biedermann T, Zink A. Prevalence and treatment of allergies in rural areas of Bavaria – a cross-sectional study. World Allergy Organ J 2018; 11(1): 36.

Zink A, **Schuster B**, Rüth M, Pereira MP, Philipp-Dormston WG, Biedermann T, Ständer S. Medical needs and major complaints related to pruritus in Germany: a 4-year retrospective analysis using Google AdWords Keyword Planner. J Eur Acad Dermatol Venereol 2019;33(1):151-156.

Schuster B, Zink A, Krause J, Rowley A, Ring J. Wenn's "ameiselt" - Bezeichnungen für das Empfinden von Juckreiz im bairischen Dialekt. MMW - Fortschritte der Medizin 2018; 160 (S4): 24 – 29.

Seidl S, **Schuster B**, Rüth M, Biedermann T, Zink A. What Do Germans Want to Know About Skin Cancer? A Nationwide Google Search Analysis From 2013 to 2017. Journal of Medical Internet Research 2018; 20 (5): e10327.

Scherr S, **Schuster B**. Depression und die Nutzung von Social Network Sites (SNS): Differentielle Einflüsse von Selbstwirksamkeit auf die passive Nutzung von SNS und die Entstehung von Neid. Medien Journal 2018;42(3):25-44.

Scherr S, Toma C, **Schuster B**. Depression as a Predictor of Facebook Surveillance and Envy: Longitudinal Evidence From a Cross-Lagged Panel Study in Germany. Journal of Media Psychology 2019; 31:196-202.

1. Your contribution to the publications

1.1 Contribution to paper I

I, Barbara Schuster, was the main investigator for this study. More precisely, I collaborated on conceptualization and writing of the research proposal, setting up the questionnaire and getting the approval of the institutional review board. I was responsible for data collection of dermatologic patients and coordinated the data collection of the other patient groups and controls. I was responsible for data handling and digitalization. I conducted all statistical analyses and wrote the draft of the manuscript, which I finalized with the valuable comments of my co-authors. Finally, I managed the submission process and took care of all required revisions.

1.2 Contribution to paper II

This paper is based on the same data as paper I. I, Barbara Schuster, was the main investigator for this study. More precisely, I collaborated on conceptualization, writing of the research proposal, setting up the questionnaire and getting the approval of the institutional review board. I was responsible for data collection of dermatologic patients as well as for data handling and digitalization. I conducted all statistical analyses and wrote the draft of the manuscript, which I finalized with the valuable comments of my co-authors. Finally, I managed the submission process and took care of all required revisions.

1.3 Contribution to paper III

I, Barbara Schuster, was involved in conceptualization and writing of the research proposal, setting up the questionnaire and getting the approval of the institutional review board. I was responsible for programming the online questionnaire as well as for data handling. I conducted all statistical analyses and wrote the draft of the manuscript, which I finalized with the valuable comments of my co-authors. Finally, I managed the submission process and, with the support of my co-authors, took care of all required revisions.

2. Introductory summary

2.1 Evaluating the mental burden of skin diseases

Skin diseases are common and very diverse. In the International Classification of Diseases (ICD)-11, more than 2000 skin diseases are recognized [1], ranging from acute infections to chronic congenital diseases and cancer. In spite of this diversity, most skin diseases have one thing in common which sets them apart from other diseases: as they affect the skin, which is the outermost layer of our body, they are often clearly visible to our social surrounding. And while a lot of skin diseases are not in fact infectious, subconscious evolutionary cognitions and a lack of education about skin diseases often lead to individuals with skin diseases being stigmatized and socially excluded [2]. In addition, due to these experiences and the existing beauty ideal of clear, flawless skin, people with skin diseases often suffer from low self-esteem and even body image disorders [3-6]. Overall, a large number of studies have shown that patients with skin diseases have a higher risk for mental comorbidities such as depression, anxiety, and addiction, than healthy individuals [7-10].

Over the last decades, the mental burden of skin diseases has received growing attention in dermatologic research, and a considerable body of data has been gathered by researchers all over the world [11-14]. However, previous research has predominantly taken a pathogenic perspective, assessing mental health by measuring mental comorbidities [7, 10, 15-17]. In contrast, it was already in 1948 when 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 or infirmity” [18]. This implies that for the evaluation of mental health, assessing mental disorders and comorbidities is not sufficient, and that factors making people feel and stay well need to be considered as well [19]. As a consequence, patient reported outcome measures (PROMs) and especially the concept of health related quality of life (QoL) has received growing attention in medical research, starting in the 1970s [20]. However, tools for measuring health related QoL assess the patients’ life circumstances using pre-defined criteria, such as mobility, security and health. While these certainly affect well-being, they rather measure antecedents of well-being than well-being itself [21].

Of course, medical research has not been the only discipline aiming to assess well-being. In fact, exploring well-being and its determinants is the main goal of positive psychology, a sub-discipline of psychology which ”is the study of the conditions and processes that contribute to the flourishing or optimal functioning of people, groups, and institutions” [22]. In contrast to medical research, which has rather concentrated on the dimension of ill-being, positive psychology focuses on the dimension of well-being, exploring constructs such as happiness, flourishing, and flow. Therefore, positive-psychological concepts and measures contribute greatly to a holistic evaluation of well-being. However, with the exception of psychiatry,

positive-psychological measures have only rarely been examined in health care research so far (Macaskill, 2016).

One of the most researched constructs of positive psychology is happiness, a measure of hedonic well-being [23]. In contrast to eudaimonic well-being, which means living a meaningful life full of purpose, hedonic well-being means living a pleasant, enjoyable life [24]. While different definitions of happiness have been suggested in psychological literature, happiness is commonly operationalized as subjective well-being [25, 26], which is the "cognitive and affective evaluation of one's life as a whole" [23]. The affective component of subjective well-being encompasses both positive affect (PA) and negative affect (NA), while the cognitive component of subjective well-being is defined as satisfaction with life (SWL) [27, 28]. Following this conceptualization, subjective well-being - and consequently happiness – is considered high if one experiences a lot of PA, little NA, and a general satisfaction with one's life.

Studies exploring subjective well-being in patients with chronic diseases have been conducted before. The results suggest that patients with kidney diseases, stroke, and cancer, experience less subjective well-being than healthy individuals [29-31]. However, studies are rare and operationalizations differ, which makes it hard to compare results and facets of subjective well-being. In dermatology, only very few studies have explored single facets of well-being so far, yielding inconclusive results [32-35]. Thus, more studies were needed in order to clarify if happiness could be a useful tool to better understand the mental burden of skin diseases.

2.2 Happiness in dermatology

The aim of this PhD project was to contribute to a more holistic understanding of the mental burden of skin diseases by introducing and evaluating happiness as a new PROM in dermatology. In order to achieve this goal, three research projects were conducted. While the aim of the first research project was to collect baseline data on happiness in dermatologic patients, the second and third projects aimed to further evaluate the informative value of happiness in dermatologic research by comparing the construct of happiness to both QoL and depression.

2.2.1 Paper I: Collecting baseline data on happiness in dermatology

As the existing data on happiness in patients with skin diseases was very scarce, the aim of the first research project was to collect baseline data on happiness in patients with skin diseases and to put these results into perspective by comparing them to other patient groups and healthy controls. A cross-sectional study was conducted from December 2017 to April 2019. In total, 335 in- and outpatients at the Department of Dermatology and Allergy of the

Technical University of Munich with the diagnoses psoriasis, atopic eczema, nummular eczema, mastocytosis, and skin cancer (keratinocyte carcinoma and malignant melanoma) were recruited. The participants filled in a questionnaire consisting of validated scales measuring the three facets of subjective well-being according to Ed Diener [28]: PA and NA (measured both with the Positive and Negative Affect Schedule, PANAS [36], and the Scale of Positive and Negative Experience, SPANE [37]), and SWL (measured with the Satisfaction with Life Scale, SWLS [38]). Additional to this multidimensional operationalization of happiness, the participants were asked to indicate how happy they were overall on a scale from 0 (extremely unhappy) to 10 (extremely happy). The questionnaire furthermore contained questions on related constructs such as general and disease-related QoL, which were not further analyzed in this paper. In addition to the data collected via these patient questionnaires, diagnosis, disease severity and current treatment were documented by the treating physician.

In order to put the results of the dermatologic patients into perspective, we additionally recruited patients with human immunodeficiency virus (HIV, recruited at the Department of Inner Medicine II of the Technical University of Munich) and patients with chronic inflammatory bowel diseases (Crohn's disease and ulcerative colitis, recruited at Hospital Neumarkt in der Oberpfalz). These two patient groups were chosen for the following reasons: HIV is a chronic infectious disease which – if appropriately treated – does not go a long with physical impairment for the affected individual [39]. However, studies have shown that affected individuals often face stigmatization [40, 41]. In contrast, chronic inflammatory bowel diseases cause strong pain and lead to significant physical impairment for the affected individuals [42]. Both patients with HIV and chronic inflammatory bowel diseases filled in the same questionnaire as the dermatologic patients. Diagnosis, disease severity and treatment were documented by the treating physician. Last but not least, a group of healthy controls living in the greater Munich area was recruited with the help of a recruitment service (Testing Time, Zurich, Switzerland). The healthy controls filled in the same questions as the patient groups, but online.

Group comparisons of the z-standardized and age- and sex-adjusted means (m^a) of the happiness variables showed that dermatologic patients reported significantly less PA (m^a = 3.18 vs. 3.49; p = .001) and judged themselves less happy than the healthy control group (m^a = 6.47 vs. 7.11; p = .023). In contrast, dermatologic patients were more satisfied with their lives than the control group (m^a = 5.13 vs. 4.83; p = .043). No significant difference was found in terms of NA (m^a = 1.99 vs. 1.93; p = .418). In comparison to the other patient groups, dermatologic patients reported less PA than patients with HIV (m^a = 3.18 vs. 3.48; p = .016), but comparable results compared with patients with chronic inflammatory bowel diseases (m^a = 3.18 vs. 2.97; p = .08). Differentiating the dermatologic diseases, we found that patients with psoriasis and atopic dermatitis reported lower PA (psoriasis: m^a = 3.20, atopic dermatitis: m^a = 3.01) and judged themselves less happy (psoriasis: m^a = 5.85, atopic dermatitis: m^a =

6.09) than healthy controls (all p<.05), while patients with skin cancer reported elevated SWL compared to the control group (m^a = 5.53 vs. 4.81; p = .003).

The results indicate that patients with skin diseases are less happy than healthy individuals and patients with HIV. More precisely and most interestingly, they did not report more negative emotions, but less positive emotions. This finding underlines the importance of exploring positive markers of well-being such as happiness in this patient group, as otherwise the mental burden of skin diseases would be underrated. In addition, PA has been linked to several beneficial health outcomes such as better immune reactions, better cardiovascular health and even better skin barrier recovery [43-45]. Consequently, reduced levels of PA could contribute not only to the mental, but also to the physical burden of skin diseases. However, as this study was a cross-sectional study which does not allow to explore causality, more research is needed to verify this hypothesis. Comparing diagnoses, patients with psoriasis and atopic dermatitis seemed to be especially impaired in terms of happiness, which is in line with the large body of existing evidence pointing towards an especially large burden of these two chronic skin diseases [9, 17, 46-49]. In contrast, patients with skin cancer were more satisfied with their lives. While the existing study cannot provide an explanation for this finding, prior studies in patients with breast and colorectal cancer have shown that receiving a cancer diagnosis can trigger reevaluation processes [50], which might explain elevated SWL in skin cancer patients. Overall, these findings support the methodological approach of exploring happiness in patients with skin diseases and encourage further research in that matter.

The results of this study are published under the title “Happiness in Dermatology: a Holistic Evaluation of the Mental Burden of Skin Diseases” in the *Journal of the European Academy of Dermatology and Venereology* [51], where the paper was additionally chosen and presented as ‘Editor’s pick’.

2.2.2 Paper II: Differentiating happiness and (skin-related) quality of life

Encouraged by the WHO’s definition of health as more than just the absence of disease [18], patients’ QoL has received growing attention in medical research, and more and more generic and disease-specific QoL questionnaires have been introduced [20]. While generic QoL questionnaires allow to measure and compare health-related QoL across different diagnoses and disciplines, disease-specific QoL questionnaires provide a more detailed and adapted analysis of the impact of different diseases on QoL. Today, health-related QoL is one of the most commonly used patient-reported outcomes both in clinical research and in practice [52] and is even listed as a relevant criterion for the evaluation of therapies both by the European Medicines Agency (EMA) and the American Food And Drug Administration (FDA) [53].

In dermatology, the Dermatology Quality of Life Index (DLQI) is the most commonly used quality of life questionnaire [54, 55]. It consists of 10 questions focusing on different aspects

of QoL impairment, e.g. the (in)ability to work or to do household chores due to the skin disease, or the impact of the skin disease on social and leisure life. The DLQI is frequently used in both clinical trails and practice in order to indicate the disease burden beyond the physical symptoms [54]. However, considering the WHO definition of health as a state of well-being [18], this raises the question whether the DLQI, which was originally developed as “disability index” [55], is sufficient in reflecting the patients’ disease burden, or whether indicators of well-being such as happiness can provide relevant information besides the DLQI. Thus, the aim of this second research project was to compare happiness to the most commonly used dermatologic QoL instrument, the DLQI. More precisely, the aim was to evaluate whether happiness provides information about the burden of skin diseases going beyond the DLQI, and to put the results into perspective by comparing both happiness and DLQI to a generic QoL instrument recommended by the WHO.

The data presented in this paper was collected in the same study as the data presented in Paper I of this PhD project. Besides the questions on happiness described in the previous chapter, the study questionnaire contained both a generic quality of life measure, namely the WHOQOL BREF (a 26-item short form of the more comprehensive WHOQOL) [56], and the DLQI [55] as a disease-specific QoL measure. For this paper, these results in terms of happiness and QoL were combined and compared. As the analyses in Paper I had shown that patients with different skin diseases show different patterns of well-being, and that patients with psoriasis and atopic dermatitis were especially impaired in terms of happiness [51], only patients with psoriasis and atopic dermatitis were included in this paper.

Linear regression models showed that the DLQI was strongly correlated with NA ($\beta = -.49$; $p < .001$), but not with PA ($\beta = -.03$; $p = .793$) nor SWL ($\beta = -.2$; $p = .173$) in patients with psoriasis and atopic dermatitis. Combining all three facets of happiness, the DLQI explained 23% of variance in happiness. When comparing both happiness and the DLQI to generic QoL, the DLQI explained 26% of variance in overall QoL and was associated only with the physical dimension of QoL ($\beta = -.42$; $p = .002$), but not with the psychological ($\beta = -.02$; $p = .189$), the social ($\beta = .003$; $p = .981$), nor the environmental domain ($\beta = .01$; $p = .905$). In contrast, all happiness variables together explained 70% of variance in generic QoL, with each facet of happiness contributing significantly to the model. Combining both overall happiness and the DLQI in one model predicting generic QoL, the amount of explained variance increased to 73%, with both the DLQI and happiness significantly adding to the model (DLQI: $\beta = -.13$; $p = .031$; happiness: $\beta = .77$; $p < .001$), indicating that both constructs carried unique information about overall QoL.

As a conclusion, we found that the DLQI predominantly measured NA and physical QoL impairment, which is in line with its original purpose of being a disability index. However, the DLQI alone only provided a limited evaluation of QoL as recommended by the WHO. Adding

happiness as a new and very subjective patient reported outcome provides additional information on the mental burden of skin diseases not yet covered by the DLQI and contributes to a more comprehensive assessment of QoL without the need for an additional generic and time-consuming quality of life assessment.

The results of this project have been accepted for publication under the title “Adding happiness to complement the Dermatology Quality of Life Index in Psoriasis and Atopic Dermatitis Healthcare” in the *European Journal of Dermatology* [57].

2.2.3 Paper III: Differentiating happiness and depression

Prior research on the mental burden of skin diseases has mostly taken a pathogenic perspective, assessing mental comorbidities such as depression, anxiety or addiction as indicators of mental health. Especially for psoriasis, a large number of studies have demonstrated a higher risk of mental comorbidities [9, 10, 46, 48]. These findings are one of the reasons why psoriasis was defined as a “serious non-communicable disease” by the World Health Assembly in 2014 [58].

However, bearing the WHO’s definition of health in mind [18], assessing mental comorbidities only measures one side of the mental burden of skin diseases. In order to achieve a more holistic understanding, researchers and the WHO alike are demanding for a more holistic evaluation of the mental burden of psoriasis, which incorporates measures of well-being [7, 59, 60]. However, in psychological research there is still an ongoing debate whether depression and happiness are indeed two different constructs [61, 62]. This debate is especially relevant as depression, amongst other symptoms, is characterized by the inability to feel happy [63]. This raises the question whether assessing happiness in patients with skin diseases does actually provide new insights of the mental burden of skin diseases, or whether it just reflects the findings of a high risk for depression in this population. Therefore, the aim of this study was to simultaneously assess and compare happiness and depression in a large and diverse sample of patients with psoriasis and to explore determinants of both constructs.

For this project, a cross-sectional online survey was conducted from March to June 2019. The link to an online questionnaire was shared on Germany’s largest patients’ information website about psoriasis (www.psoriasis-netz.de) as well as on the Facebook pages of several psoriasis associated organizations or campaigns (e.g. Farbenhaut, “bitte berühren” of the Professional Association of German Dermatologists). The questionnaires contained validated scales measuring subjective well-being (SPANE, SWLS) [37, 38], as well as a validated screening questionnaire for depression (WHO-5 Well-being index) [64]. Additionally, current and general disease severity were assessed using self-evaluation (mild, moderate, severe) and data on treatment status and years since the first diagnosis were collected.

In total, the data of 722 participants with psoriasis were analyzed. Controlling for sex and age, we found that the participants reported lower PA ($p = .003$) and lower SWL ($p < .001$;

except participants aged 65+ years) than German reference populations (norm data or in case of PA and NA, data of the German validation sample), but not more NA ($p = .767$). 40.3% of participants were screened positive for depression. Using exploratory factor analysis, PA, NA, SWL and depression were confirmed as four distinct constructs. General disease severity was identified as main risk factor for low happiness and depression. In contrast, participants who were currently in a phase of improvement of skin condition reported higher happiness and less depressive tendencies. Similarly, the longer the participants had been living with their diagnosis the more happy and less depressed they were.

As a conclusion, the results of this study not only confirmed the findings of low PA in patients with psoriasis (as presented in Paper I of this PhD project) in a large and diverse sample of patients with psoriasis. They also supported the methodological approach of differentiating happiness in depression in patients with psoriasis.

The results of this project are published under the title “Happiness and depression in psoriasis: a cross-sectional study in Germany” in the Journal *Quality of Life Research* [57].

2.3 Conclusion

As a conclusion, this PhD thesis showed that assessing happiness contributes to a more holistic evaluation of the mental burden of skin diseases which goes beyond mental comorbidities and QoL. The results indicate that patients with skin diseases, and especially with psoriasis and atopic dermatitis, seem to experience less PA than healthy individuals, but not necessarily more NA. As PA has only rarely been studied in patients with skin diseases so far, this part of the mental burden of skin diseases has been overlooked so far. The finding of low PA is especially interesting as PA has been shown to directly and indirectly affect physical health by influencing our endocrine system, our immune responses, and our health behavior [65, 66]. Future research as well as clinical practice should start to incorporate measures of well-being such as happiness in order to better understand the patients’ needs and to provide personalized medical care. Additionally, future research should explore ways of increasing PA in patients with skin diseases, as this could not only lower the mental burden of skin diseases, but potentially contribute to better physical health and maybe even improvement of skin condition.

3. Paper I

Happiness in Dermatology: a Holistic Evaluation of the Mental Burden of Skin Diseases

Schuster B, Ziehfreund S, Albrecht H, Spinner CD, Biedermann T, Peifer C*, Zink A*

**contributed equally*

Journal of the European Academy of Dermatology and Venereology

Impact Factor: 6.17

Ranking: 7/68 (Dermatology- SCIE)

Source: ISI Journal Citation Reports 2020

DOI: 10.1111/jdv.16146 JEADV

ORIGINAL ARTICLE

Happiness in dermatology: a holistic evaluation of the mental burden of skin diseases

B. Schuster,[1,2,*] S. Ziehfreund,[1,2] H. Albrecht,[3] C.D. Spinner,[4] T. Biedermann,[1] C. Peifer,[5,†] A. Zink[1,†]

[1]Department of Dermatology and Allergy, School of Medicine, Technical University of Munich, Munich, Germany
[2]Institute for Medical Information Processing, Biometry, and Epidemiology (IBE), Pettenkofer School of Public Health, LMU Munich, Munich, Germany
[3]Department of Internal Medicine II, Hospital Neumarkt i.d.Opf., Neumarkt in der Oberpfalz, Germany
[4]Department of Medicine II, School of Medicine, Technical University of Munich, Munich, Germany
[5]Unit Applied Psychology in Work, Health, and Development, Faculty of Psychology, Ruhr University Bochum, Bochum, Germany
*Correspondence: B. Schuster. E-mail: barbara.schuster@tum.de

Abstract

Background According to the World Health Organization, mental health is a state of well-being and not merely the absence of disease. However, studies exploring subjective well-being in patients with skin diseases are very rare.

Objectives To assess subjective well-being, i.e. 'happiness', in patients with different skin diseases and to compare them to other patient groups and healthy controls.

Methods A cross-sectional study was conducted from 12/2017 to 04/2019. Patients receiving in- or outpatient care for psoriasis, atopic eczema, nummular eczema, mastocytosis, skin cancer (malignant melanoma and keratinocyte carcinoma), human immunodeficiency virus (HIV) or chronic inflammatory bowel diseases (Crohn's disease and ulcerative colitis) were recruited at two hospitals in Bavaria, Germany. Healthy individuals living in or near Munich served as a control group. All participants filled in a questionnaire assessing happiness, measured as positive affect (PA), negative affect and satisfaction with life (SWL; together representing subjective well-being) and a heuristic evaluation of one's own happiness.

Results Data from 229 dermatologic patients (53.3 ± 18.5 years, 48% women), 49 patients with inflammatory bowel diseases (48.9 ± 18.7 years, 43% women), 49 patients with HIV (46 ± 10.1 years, 10% women) and 106 healthy controls (38.4 ± 13.4 years, 49% women) were analysed. Compared to the controls, dermatologic patients reported lower heuristic happiness ($P = 0.023$) and PA ($P = 0.001$) but higher SWL ($P = 0.043$). Patients with psoriasis and atopic eczema reported the lowest happiness, as they reported significantly lower PA ($P = 0.032$ and $P < 0.001$) and heuristic happiness ($P = 0.002$ and $P = 0.015$) than the control group. Patients with skin cancer reported higher SWL than the control group ($P = 0.003$). Dermatologic patients reported lower happiness than patients with HIV but reported greater happiness than patients with IBD.

Conclusions Dermatologic patients experience lower levels of happiness, especially PA, compared to healthy controls. As PA is linked to desirable health outcomes, targeting PA could be a promising holistic approach for the treatment of skin diseases.

Received: 16 July 2019; Accepted: 20 November 2019

Conflict of interest

The authors declare no conflict of interest.

Funding source

This study was funded by the Department of Dermatology and Allergy, Technical University of Munich, School of Medicine.

Introduction

Patients with skin diseases have a higher risk for mental comorbidities such as depression, anxiety and addiction.[1–4] While there is a growing body of research on this topic, it is striking that almost all studies exploring the mental burden of skin diseases focused on assessing mental disorders.[2,5–7] However, considering the World Health Organization's (WHO) definition of health as a 'state of well-being and not merely the absence of disease',[8]

†Contributed equally.

such studies are only able to provide a partial assessment of the full mental burden of skin diseases. Studies measuring mental health in terms of subjective well-being are almost absent in dermatologic research so far.

While there are different definitions, happiness is often defined as subjective well-being,[9] which represents 'a person's cognitive and affective evaluations of his or her life as a whole'.[10] Following this definition, subjective well-being is considered high if one experiences plenty of positive emotions, few negative emotions and is generally satisfied with one's life.[10,11]

Integrating well-being seems a promising approach, especially in dermatology, as studies have found significant relationships between psychosocial factors, mostly stress-related, on the occurrence, severity and progression of skin diseases and that psychological factors can play a role in the treatment of the diseases.[12–14] For example, a prospective study among 62 psoriasis patients over the course of 6 months showed that stressful periods were related to higher disease severity 4 weeks later, but only in patients who tend to worry or scratch.[15] Similarly, other studies showed that psoriasis patients who worry a lot are less responsive to psoralen and ultraviolet A (PUVA) therapy[16] and that listening to meditation audiotapes during phototherapy (UVB and PUVA) leads to better treatment results in patients with psoriasis.[17] In addition, positive affect (PA) has been shown to be associated with several desirable health outcomes, ranging from improved health behaviour and better cardiovascular health to better immune responses, quicker wound healing and reduced pain.[18–20] Apart from these beneficial outcomes, the well-being of patients is a valuable aim in itself. Thus, exploring well-being among affected patients utilizing diverse measures could greatly contribute to a better understanding and treatment of skin diseases.

However, in dermatologic research, happiness and subjective well-being have been widely neglected as outcome variables with only very few exceptions. Only one study measured PA in patients with psoriasis,[21] while three studies looked at negative affect (NA) and life satisfaction as components of well-being.[22–24] While these studies underline the importance of happiness as a patient-reported outcome, their informative value is limited as they measured only components of happiness, were restricted to only one patient group, lacked a control group and used self-reported scores of disease severity.

To gain a more balanced and valid view on the mental burden of skin diseases, this explorative study sought to assess happiness and subjective well-being holistically, using PA, NA, satisfaction with life (SWL) and a heuristic measure of happiness. We assessed patients with different skin diseases and compared them to patients with chronic non-dermatologic diseases as well as healthy controls. In addition, disease severity was documented by the attending physician using validated indices.

Materials and methods

This cross-sectional study was conducted from December 2017 to April 2019. The dermatologic diagnoses examined were psoriasis, atopic eczema, nummular eczema, mastocytosis and skin cancer (malignant melanoma and keratinocyte carcinoma). For comparison purposes, patients with chronic inflammatory bowel diseases (IBD: ulcerative colitis and Crohn's disease), which can be very physically demanding due to strong pain during flares,[25] patients with infection with human immunodeficiency virus (HIV) who due to antiretroviral therapy are mainly physically unimpaired[26] but may have been experiencing stigmatization[27,28] and a healthy control group were included.

Patients with skin diseases were recruited from the Department of Dermatology and Allergy and patients with HIV from the interdisciplinary HIV centre at University hospital of the Technical University of Munich, while patients with IBD were recruited from the Department of Internal Medicine II, Hospital Neumarkt in der Oberpfalz. Only patients aged 18 years or older, suffering from one of the examined diagnoses, receiving in- or outpatient medical care at the respective clinics were eligible to participate in this study. Patients meeting these criteria were asked by the attending physician or assistant to fill in a paper-based questionnaire. Patients unable to fill in the German paper-based questionnaire were excluded. Written informed consent was obtained from all patients prior to study inclusion.

Healthy individuals, who served as a control group, were recruited with the help of a recruitment service (TestingTime, Zurich, Switzerland). Only individuals aged 18 years or older living in the greater Munich area and not suffering from one of the examined diseases were eligible to participate. Participants in the control group filled in an online version of the paper-based questionnaire used for the patient groups. The TestingTime recruiting team was responsible for the recruitment and the financial compensation of the participants (3€ per person) but was not involved in the data collection. Only the participants of the control group (as recruited by TestingTime) received a financial compensation.

This 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 subjective well-being. For the patients, the attending physician additionally documented diagnoses and, when clinical scores were available, disease severity based on the following scores: Psoriasis Area and Severity Index for psoriasis, Scoring Atopic Dermatitis for atopic dermatitis, Mayo score & Crohn's disease activity index for IBD and Centers of Disease Control and Prevention (CDC) stage for HIV. The respondents were further asked to report any comorbidities in the questionnaire.

Positive affect and NA were measured using the German version of the Positive and Negative Affect Schedule (PANAS),[29,30] which consists of 20 adjectives (10 representing PA, e.g. 'excited' and 'enthusiastic', and 10 representing NA, e.g. 'distressed' and 'upset'), each rated on a 5-point scale ranging from 1 ('very slightly or not at all') to 5 ('extremely'). The PANAS is the most commonly used instrument for measuring affect.[31,32] The two distinct subscales, PA and NA, showed good reliability in this sample with Cronbach's alphas of 0.92 and 0.86, respectively. As the PANAS measures rather specific emotions,[9] we additionally used the German version of the Scale of Positive and Negative Experience (SPANE), which measures PA and NA in a more comprehensive way using 12 more general items (e.g., 'pleasant' and 'unpleasant').[32] Both subscales of SPANE showed good reliability in this sample with Cronbach's alphas of 0.94 for PA and 0.88 for NA. For both the PANAS and SPANE, the items of each subscale were averaged to form an index if at least 80% of items were answered validly.

Satisfaction with life was measured using the SWL Scale (SWLS),[33] which consists of five items (e.g. 'in most ways my life is close to my ideal'), each rated on a seven-point scale ranging from 1 ('strongly disagree') to 7 ('strongly agree'). The scale showed good reliability in this sample ($\alpha = 0.88$), and the items were averaged to form an index if at least 80% of items were answered validly.

In addition to this theory-based operationalization of happiness, we included a measure of *heuristic happiness* in the form of a single question derived from the European Social Survey[34]: 'Taking all things together, how happy would you say you are?' Respondents could give their answer on an 11-point scale ranging from 0 ('extremely unhappy') to 10 ('extremely happy').

Statistics

In order to identify and eliminate potential errors in manual data digitalization, data collected via paper-based questionnaires were digitalized twice using Epi Info™ (CDC, Atlanta, GA, USA) and any discrepancies between the resulting datasets were sorted out. Patients suffering from more than one of the examined diseases were excluded from all further analyses to avoid ambiguous results. Differences in age and gender between the groups were analysed using a Student's *t*-test and a chi-squared test. For the analysis of PA and NA, we focused on the PANAS, because it is the most commonly used tool for measuring affect.[31,32] In case of divergent results, we also reported the results obtained with SPANE for a more comprehensive evaluation of subjective well-being (see also Table S1, Supporting Information for the detailed results of the SPANE). Analyses of Covariance (ANCOVAS) were used to compare the groups of participants while controlling for gender and age. Age- and gender-adjusted means (m_a) and partial eta squared (η^2) are reported. Planned contrasts were calculated to reveal differences between the groups. To increase comparability, z-standardized data are presented when appropriate. To analyse the relationship between disease severity and happiness, z-standardized clinical scores were entered into linear regression models, with the different happiness measures as outcomes and age and gender as covariates. Standardized regression coefficients (β) are reported.

A main symptom of clinical depression is the inability to feel happy.[35] To rule out potential confounding, we conducted a sensitivity analysis and excluded all participants suffering from depression (four in total: one psoriasis, one atopic eczema, one mastocytosis and one ulcerative colitis) as assessed using the provided information on comorbidities in the questionnaire. As the exclusion did not have significant influence on the results, we reported the final results including the depressed participants.

The level of significance was set at $\alpha = 0.05$ for all analyses. All statistical analyses were conducted using IBM SPSS Statistics Version 24 (IBM Corporation, Armonk, NY, USA).

Results

In total, 335 patients and 106 controls were recruited. Of those, eight patients affected by more than one of the examined diseases were excluded. Of the remaining 327 patients, 229 were dermatologic patients (52 psoriasis, 50 atopic eczema, 24 nummular eczema, 53 mastocytosis and 50 skin cancer), 49 patients had been diagnosed with IBD (28 Crohn's disease and 21 ulcerative colitis) and 49 patients with HIV. The examined groups differed significantly in terms of gender ($P < 0.001$) and age ($P < 0.001$; Tables 1 and 2).

Unadjusted means, medians, quartiles, minima and maxima of the examined happiness variables are displayed in Fig. 1.

Comparing dermatologic patients to patients with HIV, IBD and healthy controls

Taking all dermatologic diseases together, we found significant effects of group membership (patient groups and controls) on heuristic happiness ($\eta^2 = 0.028$, $P = 0.009$) and PA ($\eta^2 = 0.051$, $P < 0.001$), but not on NA ($\eta^2 = 0.004$, $P = 0.612$) and SWL ($\eta^2 = 0.010$, $P = 0.223$). Compared to the control group, dermatologic patients reported lower heuristic happiness ($P = 0.023$) and PA ($P = 0.001$) but higher SWL ($P = 0.043$; Table 3 and Fig. 2). No significant difference was found for NA ($P = 0.418$). Compared to the other patient groups, dermatologic patients reported significantly lower PA than patients with HIV ($P = 0.016$) and higher PA than patients with IBD, but this difference was not significant ($P = 0.08$). Dermatologic patients did not significantly differ from HIV and IBD patients regarding NA, SWL and heuristic happiness.

Comparing patients with different dermatologic diseases to healthy controls

When looking separately at the different dermatologic diseases compared to controls, we found effects of group membership on heuristic happiness ($\eta^2 = 0.050$, $P = 0.006$) and

Table 1 Participants' characteristics

	Dermatology total *n* = 229†	Inflammatory bowel diseases *n* = 49‡	HIV *n* = 49§	Control group *n* = 106
Age				
Mean + SD	53.3 ± 18.4	48.9 ± 18.7	46 ± 10.1	38.4 ± 13.4
18–29 years	29 (13%)	9 (18%)	2 (4%)	32 (30%)
30–44 years	43 (19%)	12 (25%)	20 (41%)	40 (38%)
45–64 years	80 (35%)	19 (39%)	25 (51%)	30 (28%)
65+ years	75 (33%)	9 (18%)	2 (4%)	4 (4%)
Gender				
Men	119 (52%)	27 (57%)	44 (90%)	54 (51%)
Women	109 (48%)	20 (43%)	5 (10%)	52 (49%)
Disease severity¶				
Mean + SD/%	PASI: 12.7 ± 9.6	CDAI: 102.7 ± 108.3	CDC stage A: 19 (46%)	–
	SCORAD: 42.3 ± 19.9	Mayo: 4.5 ± 3.5	CDC stage B: 7 (17%)	
			CDC stage C: 15 (37%)	

†Two missing cases for age, one missing case for gender, ‡Two missing cases for gender, §Eight missing cases for CDC stage, ¶Data on disease severity are only available for patients with psoriasis (Psoriasis Area and Severity Index, PASI; score ranging from 0 to 72; $n = 48$), atopic eczema (Scoring Atopic Dermatitis, SCORAD; score ranging from 0 to 103; $n = 45$), Crohn's disease (Crohn's Disease Activity Index, CDAI; score ranging from 0 to _600; $n = 28$), ulcerative colitis (Mayo score; score ranging from 0 to 12; $n = 19$) and human immunodeficiency virus (HIV; Centers for Disease Control and Prevention CDC stages; $n = 41$).

PA ($\eta^2 = 0.045$, $P = 0.011$), but not on NA ($\eta^2 = 0.025$, $P = 0.160$) and SWL ($\eta^2 = 0.032$, $P = 0.063$). Specifically, we found significantly lower heuristic happiness and PA in patients with psoriasis and atopic eczema compared to the control group (happiness: $P = 0.002$ and $P = 0.015$; PA: $P = 0.032$ and $P < 0.000$; Table 3 and Fig. 2). Patients with mastocytosis and nummular eczema reported lower PA compared to the controls, but the differences did not reach significance ($P = 0.050$ and $P = 0.081$). Patients with skin cancer reported significantly higher SWL than the control group ($P = 0.003$). Regarding patients with mastocytosis, elevated SWL did not reach significance in comparison with the controls ($P = 0.074$). For NA, there were no differences between patients with skin diseases and the control group.

The role of disease severity

Taking all diagnoses with clinical scores for disease severity available together (psoriasis, atopic dermatitis, HIV and IBD), we found that higher disease severity was associated with lower PA ($\beta = -0.20$, $P = 0.007$). When differentiating between the diseases, we found a similar association with disease severity for patients with psoriasis ($\beta = -0.33$, $P = 0.041$) and IBD ($\beta = -0.49$, $P = 0.002$), but not for patients with atopic eczema ($\beta = 0.71$, $P = 0.694$) and HIV ($\beta = -0.36$, $P = 0.723$). Disease

Table 2 Patient characteristics of dermatologic patients

	Psoriasis *n* = 52†	Atopic eczema *n* = 50	Nummular eczema *n* = 24	Mastocytosis *n* = 53‡	Skin cancer *n* = 50
Age					
Mean + SD	48.7 ± 16.8	46 ± 21.2	60.8 ± 13.3	47.1 ± 13.7	68 ± 13.1
18–29 years	10 (20%)	14 (28%)	0	5 (10%)	0
30–44 years	9 (18%)	12 (24%)	4 (17%)	17 (33%)	1 (2%)
45–64 years	21 (41%)	12 (24%)	5 (21%)	21 (40%)	21 (42%)
65+ years	11 (22%)	12 (24%)	15 (63%)	9 (17%)	28 (56%)
Gender					
Men	31 (62%)	26 (52%)	14 (58%)	15 (29%)	32 (64%)
Women	20 (39%)	24 (48%)	10 (42%)	37 (71%)	18 (36%)
Disease severity§					
Mean + SD	12.7 ± 9.6	42.3 ± 19.9	–	–	–

†One missing case for age, ‡One missing case for age and gender, §Data on disease severity are only available for patients with psoriasis (Psoriasis Area and Severity Index, PASI; score ranging from 0 to 72; $n = 48$) and atopic eczema (Scoring Atopic Dermatitis, SCORAD; score ranging from 0 to 103; $n = 45$).

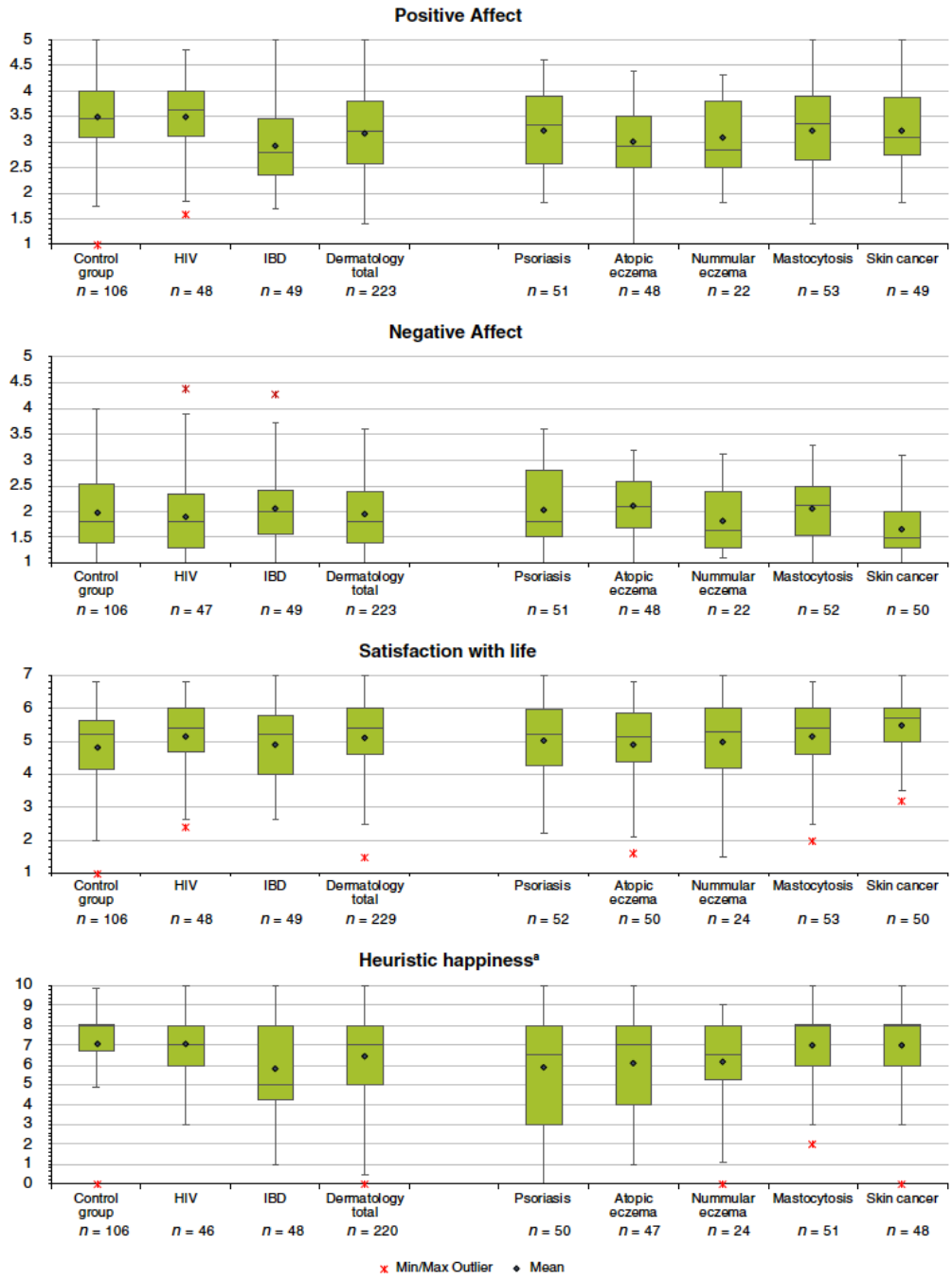


Figure 1 Unadjusted means, medians, quartiles and minima/maxima of positive affect, negative affect, life satisfaction and heuristic happiness. [a]Heuristic evaluation of own happiness on a scale ranging from 0 to 10.

Table 3 Descriptive statistics for the happiness measures (patient groups and healthy controls)

	Positive affect		Negative affect		Satisfaction with life		Heuristic happiness†	
	n, *m* ± SD	m_a	*n*, *m* ± SD	m_a	*n*, *m* ± SD	m_a	*n*, *m* ± SD	m_a
All diseases								
Dermatology total	223, 3.17 ± 0.76	3.18	223, 1.96 ± 0.66	1.99	229, 5.12 ± 1.17	5.13	220, 6.48 ± 2.34	6.47
Inflammatory bowel diseases	49, 2.95 ± 0.76	2.97	49, 2.08 ± 0.67	2.08	49, 4.93 ± 1.16	4.99	48, 5.81 ± 2.21	5.89
Human immunodeficiency virus	48, 3.51 ± 0.71	3.48	47, 1.91 ± 0.72	1.95	48, 5.14 ± 1.10	5.11	46, 7.09 ± 1.64	6.98
Healthy controls	106, 3.51 ± 0.71	3.49‡	106, 2.00 ± 0.71	1.93‡	106, 4.82 ± 1.26	4.83‡	106, 7.08 ± 2.06	7.11‡
Dermatologic diseases								
Psoriasis	51, 3.22 ± 0.79	3.20	51, 2.05 ± 0.77	2.08	52, 5.02 ± 1.14	5.02	50, 5.92 ± 2.81	5.85
Atopic eczema	48, 3.02 ± 0.66	3.01	48, 2.11 ± 0.60	2.09	50, 4.90 ± 1.35	4.89	47, 6.11 ± 2.35	6.09
Nummular eczema	22, 3.11 ± 0.73	3.16	22, 1.83 ± 0.63	1.89	24, 4.98 ± 1.45	4.99	24, 6.21 ± 2.40	6.20
Mastocytosis	53, 3.24 ± 0.84	3.22	52, 2.07 ± 0.60	2.06	53, 5.15 ± 1.10	5.18	51, 7.00 ± 1.80	7.07
Skin cancer	49, 3.24 ± 0.75	3.30	50, 1.66 ± 0.56	1.76	50, 5.50 ± 0.87	5.53	48, 7.02 ± 2.13	7.00
Healthy controls	106, 3.51 ± 0.71	3.48‡	106, 2.00 ± 0.71	1.96‡	106, 4.82 ± 1.26	4.81‡	106, 7.08 ± 2.06	7.07‡

†Evaluation of one's own happiness on a scale ranging from 0 to 10, ‡Due to the adjustment procedure, m_a of healthy controls differs depending on which groups they were compared to (all diseases or dermatologic diseases only).
Unadjusted means, standard deviation and age- and gender-adjusted means of the different happiness measures in the patient groups and the healthy controls. *m*, mean, m_a, age- and gender-adjusted means; SD, standard deviation.

severity was not associated with any of the other happiness measures.

Alternative measurement of affect with SPANE

When measuring PA and NA with SPANE (Table S1, Supporting Information), some results differed from those obtained with the PANAS. In contrast to the findings reported above, the difference between dermatologic patients ($m_a^{SPANE} = 3.57$) and healthy controls ($m_a^{SPANE} = 3.76$) regarding PA^{SPANE} did not reach significance ($P = 0.063$). Similarly, only patients with atopic eczema ($m_a^{SPANE} = 3.28$) reported significantly lower PA^{SPANE} than the healthy controls ($m_a^{SPANE} = 3.74$, $P = 0.001$), but not patients with psoriasis ($m_a^{SPANE} = 3.53$, $P = 0.16$). Regarding NA^{SPANE}, patients with atopic eczema ($m_a^{SPANE} = 2.55$) reported significantly higher values than the control group ($m_a^{SPANE} = 2.21$, $P = 0.019$), which was not observed when measuring NA with PANAS.

Discussion

This study sought to extend previous research on the mental burden of skin diseases, which so far has almost exclusively focused on mental comorbidities related to skin diseases, by taking a holistic approach and measuring well-being and happiness. We found that dermatologic patients reported lower levels of happiness than participants of a control group both when using a heuristic and a theoretical operationalization of happiness. This finding is in accordance with previous studies that also reported reduced subjective well-being in patients with chronic diseases.[36,37] Dermatologic patients further reported lower levels of happiness than patients with HIV but scored higher than patients with chronic inflammatory bowel diseases.

Positive and negative affect

Patients with skin diseases reported lower PA as measured by the PANAS, but no differences emerged regarding NA compared to healthy controls. This finding is especially interesting, as PA has been shown to be associated with several desirable health outcomes, such as improved health behaviour, quicker wound healing, better cardiovascular health and better immune responses.[18–20] Thus, increasing PA in patients with skin diseases could not only improve well-being, but might even lead to a better prognosis.[38]

There is large evidence on interventions to promote PA.[39,40] Interventions that have been found to be highly effective are, for example, a gratitude journal or interventions focusing on meaning or strength use in daily life.[39] While these and further interventions have been positively evaluated, they are yet to be adapted to dermatologic patients.

It has to be added that the scale used to measure PA in this study (PANAS) focused on high-arousal positive emotions (e.g., 'excited' and 'enthusiastic').[31] When measuring affect with more general items (e.g. 'positive and 'pleasant'), the differences regarding PA between dermatologic patients and healthy controls were less pronounced and not significant ($P = 0.063$). Thus, the effect of skin diseases on PA might at least to some degree be moderated by arousal.

Comparing dermatologic diseases

Taking all findings together, patients with psoriasis and atopic eczema seemed to have the lowest levels of happiness, as they reported lower PA and lower overall happiness compared to participants of the control group. This corroborates previous research that has shown that psoriasis and atopic eczema are associated with several mental disorders, such as depression,

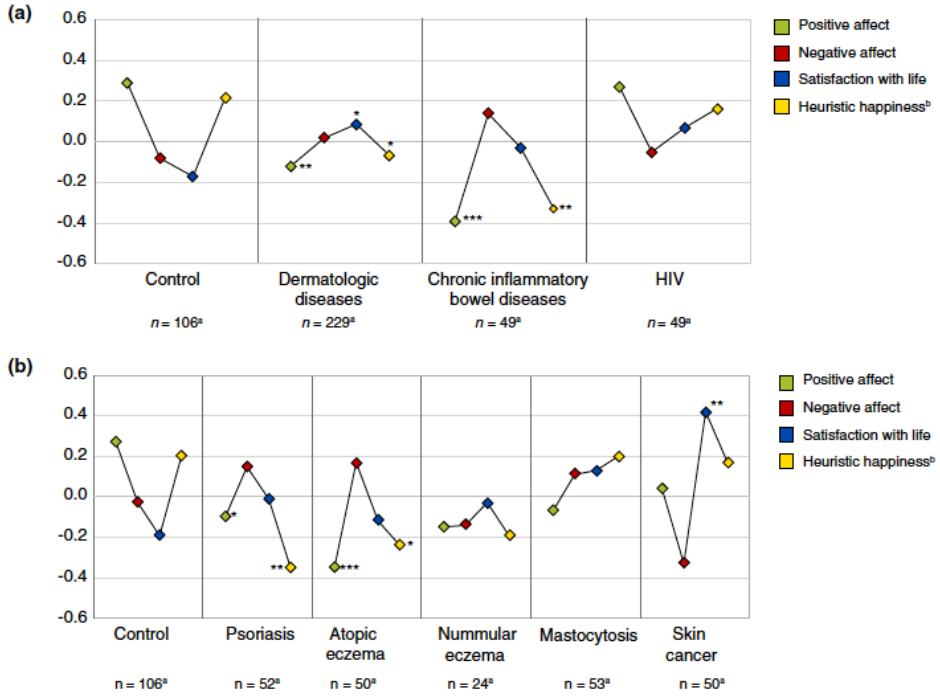


Figure 2 Patterns of well-being in (a) all participants (b) dermatologic patients. Z-standardized, and age- and gender-adjusted means are shown. Asterisks indicate significant differences compared to the control group: $*P < 0.05$, $**P < 0.01$, $***P < 0.001$ [a]Case numbers for different variables slightly vary due to missing data and [b]heuristic evaluation of own happiness on a scale ranging from 0 to 10.

addiction and even suicidal ideation.[4,5,7] In contrast, patients with skin cancer seemed to be the least unhappy in this sample; this finding is in accordance with a study conducted by Wikman and colleagues who found that patients with diabetes and cancer had higher levels of happiness than patients with other diseases including stroke and lung diseases.[37]

Elevated satisfaction with life in patients with skin cancer

Surprisingly, skin cancer patients reported significantly higher levels of SWL than all other groups. Even though skin cancer is a potentially fatal diagnosis, the prognosis is usually favourable if tumours are detected early, especially, but not only, in cases of keratinocyte carcinoma.[41–43] Accordingly, patients might be relieved after treatment and, consequently, feel more satisfied with their lives. Another explanation for their high levels of life satisfaction could be that the emotionally charged diagnosis of cancer may trigger re-evaluation processes in the affected patients. This has been observed for patients diagnosed with other types of cancer such as breast and colorectal cancer.[44] However, re-evaluation processes in patients diagnosed with skin cancer, which has a very low mortality rate compared to breast and colorectal cancer, might imply different kinds of emotions and cognitions which remain to be tested.

The group of skin cancer patients examined in this study was quite heterogeneous and patients with melanoma and keratinocyte carcinoma (including its different types) and different tumour stages were not differentiated due to sample size restrictions. As both types of skin cancer and tumour stage greatly impact treatment and prognosis,[42,43] it seems probable that these variables might influence emotional reactions and well-being as well. For verification, more detailed studies with larger sample sizes allowing a closer differentiation between melanoma and keratinocyte carcinoma and different tumour stages are necessary.

The role of dermatologic disease severity

Higher disease severity was associated with less PA in patients with psoriasis but not in patients with atopic eczema. Thus, patients with more severe forms of psoriasis tend to experience less PA than those with milder forms, whereas patients with atopic eczema are affected in the same way regardless of disease severity. On the one hand, this could be due to differences in the symptoms caused by psoriasis and atopic eczema. For example, Evers and colleagues found that patients with atopic eczema

reported higher levels of itch than patients with psoriasis.[45] However, they also found that itch hardly contributed to levels of distress in both patient groups. In contrast, they identified fatigue as an important factor causing psychological distress, which was more pronounced in patients with atopic eczema than psoriasis. This might explain why milder forms of atopic eczema might be more mentally straining than milder forms of psoriasis. On the other hand, Bahmer and colleagues found that patients with psoriasis and atopic eczema differed regarding personality and character traits, with patients with psoriasis being less ambitious and narcissistic and patients with atopic eczema being less self-critical than the population average.[22] In addition, psoriasis has been linked to alexithymia,[46,47] which involves difficulties in recognizing and describing emotions. Such psychometric differences might lead to different ways of perceiving and coping with the respective skin disease,[48] which could explain the different effects of disease severity on PA. Finally, Schut and colleagues[49] found that in patients with atopic eczema, illness perception was significantly associated with self-assessed, but not physician-assessed physical health. Thus, the perception of disease severity of AD seems to differ between patients and physicians, which could explain why we did not find an association between objectively assessed disease severity and PA in those patients.

Strengths and limitations

This study is one of the very few studies[21–24] to examine happiness and subjective well-being in the context of dermatology. As there is no uniform operationalization of happiness, this study used a theory-based and a heuristic approach as well as two different instruments for measuring affect to increase validity. Furthermore, due to the recruitment of a control group living in the same area as the dermatologic patients and age- and gender-adjusted analyses, a valid comparison with healthy controls was possible that did not rely on unadjusted norm data as was the case in other studies.[23] A comparison with two different patient groups further enhanced the informative value of the results obtained in this study. In addition, a sensitivity analysis was conducted in order to rule out depression as a potential confounder.

Still, this study is subject to several limitations. First, only dermatologic patients receiving in- or outpatient care at a university hospital were included. As a result, severe cases might have been over-represented in this sample. While patients with HIV were recruited from the same hospital, IBD patients were recruited from a municipal hospital located in a more rural area. Thus, regional differences could have confounded the results of the comparison with this patient group. Furthermore, patients with mastocytosis were contacted by mail. Again, this might have affected the results for this group. Participants of the control group filled in an online version of the paper-based questionnaire used in the patient groups. These different modalities of data collection could also have influenced the results in this study. Furthermore, depression was assessed using a question asking for current comorbidities, which implies that the respective diseases, in this case depression, have actually been diagnosed by a physician. Depressive symptoms or depressive tendencies were not assessed. Together with the fact that patients with acute clinical depression are less likely to seek medical help for non-mental health reasons than non-depressed individuals (even in case of severe diseases such as advanced cancer[50]), this probably explains the low prevalence of depression in this sample. Moreover, due to the cross-sectional nature of this study, we could not determine causality but only associations. Consequently, we could not ascertain whether skin diseases cause subjective well-being to decrease or whether individuals with low subjective well-being are more prone to developing skin diseases, e.g. due to psychoneuroimmunologic processes.[51] Finally, further variables influencing happiness, such as personality traits, which could potentially moderate the association between happiness and skin diseases,[31] had not been taken into account in this analysis. More detailed studies are needed to achieve a better understanding of their potential interaction with happiness in dermatologic patients.

Conclusion

The results of this study show that dermatologic patients tend to experience lower levels of happiness and especially PA compared to a healthy control group. As PA has been related to several desirable health outcomes, targeting PA in addition to the treatment of somatic symptoms is a promising approach for a holistic treatment of skin diseases.

References

1 Zink A, Herrmann M, Fischer T *et al.* Addiction: an underestimated problem in psoriasis health care. *J Eur Acad Dermatol Venereol* 2017; **31**: 1308–1315.

2 Leisner MZ, Riis JL, Schwartz S, Iversen L, Ostergaard SD, Olsen MS. Psoriasis and risk of mental disorders in Denmark. *JAMA Dermatol* 2019; **155**: 745–747.

3 Cohen BE, Martires KJ, Ho RS. Psoriasis and the risk of depression in the US population: National Health and Nutrition Examination Survey 2009-2012. *JAMA Dermatol* 2016; **152**: 73–79.

4 Kurd SK, Troxel AB, Crits-Christoph P, Gelfand JM. The risk of depression, anxiety, and suicidality in patients with psoriasis: a population-based cohort study. *Arch Dermatol* 2010; **146**: 891–895.

5 Dalgard FJ, Gieler U, Tomas-Aragones L *et al.* The psychological burden of skin diseases: a cross-sectional multicenter study among dermatological out-patients in 13 European countries. *J Invest Dermatol* 2015; **135**: 984–991.

6 Marron SE, Tomas-Aragones L, Navarro-Lopez J *et al.* The psychosocial burden of hand eczema: data from a European dermatological multicentre study. *Contact Dermatitis* 2018; **78**: 406–412.

7 Sandhu JK, Wu KK, Bui T-L, Armstrong AW. Association between atopic dermatitis and suicidality. *JAMA Dermatol* 2019; **155**: 178–187.

8 World Health Organization. Constitution of the World Health Organization. World Health Organization, Geneva, 1948.

9 Veenhoven R. Notions of the good life. In: David SA, Boniwell I, Conley Ayers A, eds. The Oxford Handbook of Happiness. Oxford University Press, Oxford, 2013: 161–173.
10 Diener E, Oishi S, Lucas RE. Subjective well-being: the science of happiness and life satisfaction. In: Lopez SJ, Synder CR, eds. The Oxford Handbook of Positive Psychology, 2nd edn. Oxford University Press, Oxford, 2009: 187–194.
11 Diener E. Subjective well-being. *Psychol Bull* 1984; **95**: 542–575.
12 DeWeerdt S. Psychodermatology: an emotional response. *Nature* 2012; **492**: S62.
13 Jafferany M, Franca K. Psychodermatology: basics concepts. *Acta Derm Venereol* 2016; **96**: 35–37.
14 Harth W. Psychosomatic dermatology (psychodermatology). *J Dtsch Dermatol Ges* 2008; **6**: 67–76.
15 Verhoeven EW, Kraaimaat FW, de Jong EM, Schalkwijk J, van de Kerkhof PC, Evers AW. Individual differences in the effect of daily stressors on psoriasis: a prospective study. *Br J Dermatol* 2009; **161**: 295–299.
16 Fortune DG, Richards HL, Kirby B *et al.* Psychological distress impairs clearance of psoriasis in patients treated with photochemotherapy. *Arch Dermatol* 2003; **139**: 752–756.
17 Kabat-Zinn J, Wheeler E, Light T *et al.* Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosom Med* 1998; **60**: 625–632.
18 Steptoe A, Dockray S, Wardle J. Positive affect and psychobiological processes relevant to health. *J Pers* 2009; **77**: 1747–1776.
19 Diener E, Pressman SD, Hunter J, Delgadillo-Chase D. If, why, and when subjective well-being influences health, and future needed research. *Appl Psychol Health Well Being* 2017; **9**: 133–167.
20 Broadbent E, Koschwanez HE. The psychology of wound healing. *Curr Opin Psychiatry* 2012; **25**: 135–140.
21 Martin-Brufau R, Romero-Brufau S, Martin-Gorgojo A, Brufau Redondo C, Corbalan J, Ulnik J. Psoriasis lesions are associated with specific types of emotions. Emotional profile in psoriasis. *Eur J Dermatol* 2015; **25**: 329–334.
22 Bahmer JA, Kuhl J, Bahmer FA. How do personality systems interact in patients with psoriasis, atopic dermatitis and urticaria? *Acta Derm Venereol* 2007; **87**: 317–324.
23 Reimus JL, Vingerhoets AJ, Soons PH, Korstanje MJ. Suffering in psoriasis patients: its relation with illness severity and subjective well-being. *Int J Dermatol* 2007; **46**: 1042–1045.
24 Jankowiak B, Sekmistrz S, Kowalewska B, Niczyporuk W, Krajewska-Kulak E. Satisfaction with life in a group of psoriasis patients. *Postepy Dermatol Alergol* 2013; **30**: 85–90.
25 Bielefeldt K, Davis B, Binion DG. Pain and inflammatory bowel disease. *Inflamm Bowel Dis* 2009; **15**: 778–788.
26 Gunthard HF, Saag MS, Benson CA *et al.* Antiretroviral drugs for treatment and prevention of HIV infection in adults: 2016 recommendations of the international antiviral society-USA panel. *JAMA* 2016; **316**: 191–210.
27 Rueda S, Mitra S, Chen S *et al.* Examining the associations between HIV-related stigma and health outcomes in people living with HIV/AIDS: a series of meta-analyses. *BMJ Open* 2016; **6**: e011453.
28 Logie C, Gadalla TM. Meta-analysis of health and demographic correlates of stigma towards people living with HIV. *AIDS Care* 2009; **21**: 742–753.
29 Krohne HW, Egloff B, Kohlmann C-W, Tausch A. [Investigations with a German version of the positive and negative affect schedule (PANAS)]. *Diagnostica* 1996; **42**: 139–156.
30 Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS Scales. *J Pers Soc Psychol* 1988; **54**: 1063–1070.
31 Miao FF, Koo M, Oishi S. Subjective well-being. In: David SA, Boniwell I, Conley Ayers A, eds. The Oxford Handbook of Happiness. Oxford University Press, Oxford, 2013: 174–186.
32 Diener E, Wirtz D, Tov W *et al.* New measures of well-being: flourishing and positive and negative feelings. *Soc Indic Res* 2009; **39**: 247–266.
33 Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. *J Pers Assess* 1985; **49**: 71–75.
34 European Social Survey. ESS Round 8 Source Questionnaire. ESS ERIC Headquarters c/o City University London, London, 2016.
35 World Health Organization. ICD-10: International Statistical Classification of Diseases and Related Health Problems: 10th Revision, 5th edn. Word Health Organization, Geneva, 2016.
36 Bennett PN, Weinberg MK, Bridgman T, Cummins RA. The happiness and subjective well-being of people on haemodialysis. *J Ren Care* 2015; **41**: 156–161.
37 Wikman A, Wardle J, Steptoe A. Quality of life and affective well-being in middle-aged and older people with chronic medical illnesses: a cross-sectional population based study. *PLoS ONE* 2011; **6**: e18952.
38 Robles TF, Brooks KP, Pressman SD. Trait positive affect buffers the effects of acute stress on skin barrier recovery. *Health Psychol* 2009; **28**: 373–378.
39 Parks A, Titova M. Positive psychological interventions: an overview. In: Wood AM, Johnson JA, eds. The Wiley Handbook of Positive Clinical Psychology. Wiley-Blackwell, Hoboken, NJ, 2016: 305–320.
40 Seligman MEP, Rashid T, Parks AC. Positive psychotherapy. *Am Psychol* 2006; **61**: 774–788.
41 Zink A. Trends in the treatment and prevention of keratinocyte carcinoma (non-melanoma skin cancer). *Curr Opin Pharmacol* 2019; **46**: 19–23.
42 Nehal KS, Bichakjian CK. Update on keratinocyte carcinomas. *N Engl J Med* 2018; **379**: 363–374.
43 Corrie P, Hategan M, Fife K, Parkinson C. Management of melanoma. *Br Med Bull* 2014; **111**: 149–162.
44 Peh CX, Liu J, Bishop GD *et al.* Emotion regulation and emotional distress: the mediating role of hope on reappraisal and anxiety/depression in newly diagnosed cancer patients. *Psychooncology* 2017; **26**: 1191–1197.
45 Evers AW, Lu Y, Duller P, van der Valk PG, Kraaimaat FW, van de Kerkhof PC. Common burden of chronic skin diseases? Contributors to psychological distress in adults with psoriasis and atopic dermatitis. *Br J Dermatol* 2005; **152**: 1275–1281.
46 Sampogna F, Puig L, Spuls P *et al.* Reversibility of alexithymia with effective treatment of moderate-to-severe psoriasis: longitudinal data from EPIDEPSO. *Br J Dermatol* 2019; **180**: 397–403.
47 Talamonti M, Galluzzo M, Servoli S, D'Adamio S, Bianchi L. Alexithymia and plaque psoriasis: preliminary investigation in a clinical sample of 250 patients. *Dermatology* 2016; **232**: 648–654.
48 Larsen MH, Krogstad AL, Wahl AK. Alexithymia, illness perception and self-management competency in psoriasis. *Acta Derm Venereol* 2017; **97**: 934–940.
49 Schut C, Felsch A, Zick C, Hinsch KD, Gieler U, Kupfer J. Role of illness representations and coping in patients with atopic dermatitis: a cross-sectional study. *J Eur Acad Dermatol Venereol* 2014; **28**: 1566–1571.
50 Lo C, Calzavara A, Kurdyak P *et al.* Depression and use of health care services in patients with advanced cancer. *Cam Fam Physician* 2013; **59**: e168–e174.
51 Suarez AL, Feramisco JD, Koo J, Steinhoff M. Psychoneuroimmunology of psychological stress and atopic dermatitis: pathophysiologic and therapeutic updates. *Acta Derm Venereol* 2012; **92**: 7–15.

Supporting information

Additional Supporting Information may be found in the online version of this article:

Table S1. Descriptive statistics for positive and negative affect using an alternative measuring tool (SPANE).

4. Paper II

Adding happiness to complement the Dermatology Quality of Life Index in Psoriasis and Atopic Dermatitis Healthcare

Schuster B, Ziehfreund S, Schielein MC, Tizek L, Biedermann T, Peifer C*, Zink A*

**contributed equally*

European Journal of Dermatology

Impact Factor: 3.33

Ranking: 28/68 (Dermatology- SCIE)

Source: ISI Journal Citation Reports 2020

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

Short title: Adding happiness to complement the DLQI

Authors: Barbara Schuster, M.Sc.[1,2], Stefanie Ziehfreund, M.Sc.[1], Maximilian C. Schielein, PhD[1,3], Linda Tizek PhD[1], Prof. Tilo Biedermann[1], Prof. Corinna Peifer [4*], Alexander Zink, MD[1,3*]

[1] Technical University of Munich, School of Medicine, Department of Dermatology and Allergy, Biedersteiner Str. 29, 80802 Munich, Germany

[2] Institute for Medical Information Processing, Biometry, and Epidemiology (IBE), Pettenkofer School of Public Health, LMU Munich, Marchioninistr. 15, 81377 Munich, Germany

[3] Division of Dermatology and Venereology, Department of Medicine Solna, Karolinska Institutet, Karolinska Universitetssjukhuset, 17176 Stockholm, Sweden

[4] Department of Psychology, University of Lübeck, Ratzeburger Allee 160, 23562 Lübeck, Germany

Corresponding Author: Barbara Schuster
Department of Dermatology and Allergy
School of Medicine, Technical University of Munich
Biedersteiner Str. 29, 80802 Munich, Germany
Email: barbara.schuster@tum.de

Word count text: 2554

Word count abstract: 147

Tables: 2
Figures: 3

ABSTRACT

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.

Material & 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 but not psychological quality of life nor 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.

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

INTRODUCTION

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 researching 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 endeavor 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 if 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 a) explore the association between the DLQI and happiness in patients with chronic inflammatory skin diseases and b) to put the results into perspective by making comparisons to 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 out-patients 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 Supplement 1). 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 (6 representing PA, e.g. "pleasant", and 6 representing NA, e.g. "unpleasant"), each rated on a 5-point Likert scale ranging from 1 ("very rarely or never") to 5 ("very often or always"). The two distinct subscales measuring PA and NA showed good reliability with Cronbach's alphas of .94 and .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 score consisting of 5 items (e.g. "in most ways my life is close to my ideals"), 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 .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

142 gender between the patients and the controls were analyzed using Student's t-test and chi-
143 squared test. As the groups differed in terms of age, age was initially controlled for in all
144 analyses. However, as age did not show to influence the results, it was omitted as a covariate
145 to keep the models as simple as possible.

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

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

163 The level of significance was set at α=.05 for all analyses. All statistical analyses were
164 conducted using IBM SPSS Statistics Version 26 (IBM Corporation, Armonk, NY, USA).

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 analyzed. 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=.187). Almost half of all patients received a systemic treatment for their skin condition (46.4%, 4 cases with missing information). Patients with psoriasis and AD did not differ in terms of age or gender distribution (p=.493 and p=.331, respectively). Participants of the control group were significantly younger than patients (m=38.4, SD=13.4 p<.001) but showed a comparable gender distribution (49.1% women, p=.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) nor happiness (PA: m=3.5 vs. m=3.3, p=.14; NA: m=2.3 vs. m=2.6, p=.17; SWL: m=5 vs. m=4.9, p=.62). In terms of QoL, patients with psoriasis reported better physical QoL than patients with AD (m=68.7 vs. 60.8, p=.03), but no difference was observed for the other QoL domains (mental: m=67.1 vs. 62.3, p=.15; social: m=69 vs. 71.3, p=.6; environmental: m=75.6 vs. 74, p=.54).

In the overall 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 nor 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=.02), but they did not significantly differ in terms of happiness nor QoL as measured with the WHOQOL-BREF.

The association between DLQI, QoL, and happiness

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

Linear regression furthermore revealed a significant association between overall QoL and DLQI (β=-.52, p<.001; Figure 1). More precisely, the DLQI significantly correlated only with the physical (β=-.42, p=.002) domain and not the psychological, social, and environmental domains of QoL. The DLQI furthermore negatively predicted overall happiness (β=-.49, p<.001; Figure 1). More precisely, an association between the DLQI with NA (β=.39, p<.001) and not with PA (β =-0.20, p=.173) nor with SWL (β=0.03, p=.793) was observed.

Happiness significantly predicted overall QoL in the patient group (β=0.84, p<.001) and control group (β=0.86, p<.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: β=0.47, p<.001; control: β=0.40, p<.001, Table 2).

Figures 2 and 3 summarize the associations between DLQI, overall QoL, and happiness in the patient group. The DLQI alone (β=-0.52, p<.001) accounted for 26% of variance in overall QoL. Adding happiness to the model significantly increased the model's goodness of fit (p<.001), with both happiness (β=0.77, p<.001) and DLQI (β=-0.13, p=.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 emotions 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 showed 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 outcomes such as better immune responses, improved health behavior, 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 life 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 dermatologic 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 theses 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 dermatologic 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.

ACKNOWLEDGEMENTS

We thank Alphina Kain for editing and reviewing this manuscript for English language.

280 Financial support: None.

281 Conflict of interest: The authors declare no conflict of interest.

282 IRB approval status: Reviewed and approved by the local ethics committee of the
283 Technical University of Munich (reference number 424/17S).

REFERENCES

1. Wood-Dauphinee S. Assessing Quality of Life in Clinical Research. Journal of Clinical Epidemiology. 1999;52(4):355-63.
2. World Health Organization. Constitution of the World Health Organization. Geneva: World Health Organization; 1948.
3. Chernyshov PV. The Evolution of Quality of Life Assessment and Use in Dermatology. Dermatology. 2019;235(3):167-74.
4. Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI)--a simple practical measure for routine clinical use. Clin Exp Dermatol. 1994;19(3):210-6.
5. Lopez SJ, Gallagher MW. A Case for Positive Psychology. In: Lopez SJ, Synder CR, editors. The Oxford Handbook of Positive Psychology (2nd edn). Oxford: Oxford University Press Inc; 2009.
6. Diener E. Subjective Well-Being. Psychol Bull. 1984;95(3):542-75.
7. Diener E, Oishi S, Lucas RE. Subjective Well-Being: The Science of Happiness and Life Satisfaction. In: Lopez SJ, Synder CR, editors. The Oxford Handbook of Positive Psychology (2nd ed). Oxford: Oxford University Press; 2009.
8. Schuster B, Peifer C, Ziehfreund S, Biedermann T, Zink A, Schielein M. Happiness and depression in psoriasis: a cross-sectional study in Germany. Qual Life Res. accepted.
9. Schuster B, Ziehfreund S, Albrecht H, Spinner CD, Biedermann T, Peifer C, et al. Happiness in dermatology: a holistic evaluation of the mental burden of skin diseases. J Eur Acad Dermatol Venereol. 2020;34(6):1331-9.
10. Birdi G, Cooke R, Knibb RC. Impact of atopic dermatitis on quality of life in adults: a systematic review and meta-analysis. Int J Dermatol. 2020;59(4):e75-e91.
11. de Korte J, Sprangers MA, Mombers FM, Bos JD. Quality of life in patients with psoriasis: a systematic literature review. J Investig Dermatol Symp Proc. 2004;9(2):140-7.
12. Schielein MC, Tizek L, Schuster B, Ziehfreund S, Liebram C, Eyerich K, et al. Always Online? Internet Addiction and Social Impairment in Psoriasis across Germany. J Clin Med. 2020;9(6).
13. Ring J, Zink A, Arents BWM, Seitz IA, Mensing U, Schielein MC, et al. Atopic eczema: burden of disease and individual suffering - results from a large EU study in adults. J Eur Acad Dermatol Venereol. 2019;33(7):1331-40.
14. Schielein MC, Tizek L, Schuster B, Ziehfreund S, Biedermann T, Zink A. Genital Psoriasis and Associated Factors of Sexual Avoidance - A People-centered Cross-sectional Study in Germany. Acta Derm Venereol. 2020;100(10):adv00151.
15. Skevington SM, Lotfy M, O'Connell KA, Group W. The World Health Organization's WHOQOL-BREF quality of life assessment: psychometric properties and results of the international field trial. A report from the WHOQOL group. Qual Life Res. 2004;13(2):299-310.
16. European Task Force on Atopic Dermatitis. Severity scoring of atopic dermatitis: the SCORAD Index (consensus report of the European Task Force on Atopic Dermatitis). Dermatology. 1993;186:23-31.
17. Nast A, Boehncke W-H, Mrowietz U, Ockenfels H-M, Philipp S, Reich K, et al. S3 - Guidelines on the treatment of psoriasis vulgaris Update 2011. JDDG: Journal der Deutschen Dermatologischen Gesellschaft. 2011;9:S1-S95.
18. Wollenberg A, Barbarot S, Bieber T, Christen-Zaech S, Deleuran M, Fink-Wagner A, et al. Consensus-based European guidelines for treatment of atopic eczema (atopic dermatitis) in adults and children: part I. J Eur Acad Dermatol Venereol. 2018;32(5):657-82.
19. Diener E, Wirtz D, Tov W, Kim-Prieto C, Choi D, Oishi S, et al. New measures of well-being: Flourishing and positive and negative feelings. Soc Indic Res. 2010;39(2):143.
20. Rahm T, Heise E, Schuldt M. Measuring the frequency of emotions-validation of the Scale of Positive and Negative Experience (SPANE) in Germany. PLoS One. 2017;12(2):e0171288.
21. Diener E, Emmons RA, Larsen RJ, Griffin S. The Satisfaction with Life Scale. J Pers Assess. 1985;49:71-5.

334 22. Glaesmer H, Grande G, Braehler E, Roth M. The German Version of the Satisfaction With Life
335 Scale (SWLS). European Journal of Psychological Assessment. 2011;27(2):127-32.
336 23. Angermeyer MC, Kilian R, Matschinger H. WHOQOL-100 und WHOQOL-Bref. Göttingen:
337 Hogrefe-Verlag; 2000.
338 24. Medvedev ON, Landhuis CE. Exploring constructs of well-being, happiness and quality of life.
339 PeerJ. 2018;6:e4903.
340 25. Paudyal P, Apfelbacher C, Jones C, Siddiqui S, El-Turki A, DeGiovanni C, et al. "DLQI Seems to
341 be 'Action', and Skindex-29 Seems to be 'Emotion'": Qualitative Study of the Perceptions of Patients
342 with Psoriasis or Eczema on Two Common Dermatology-specific Quality of Life Measures. Acta Derm
343 Venereol. 2020;100(8):adv00105.
344 26. Mattei PL, Corey KC, Kimball AB. Psoriasis Area Severity Index (PASI) and the Dermatology
345 Life Quality Index (DLQI): the correlation between disease severity and psychological burden in
346 patients treated with biological therapies. J Eur Acad Dermatol Venereol. 2014;28(3):333-7.
347 27. Puig L, Thom H, Mollon P, Tian H, Ramakrishna GS. Clear or almost clear skin improves the
348 quality of life in patients with moderate-to-severe psoriasis: a systematic review and meta-analysis. J
349 Eur Acad Dermatol Venereol. 2017;31(2):213-20.
350 28. Golbari NM, van der Walt JM, Blauvelt A, Ryan C, van de Kerkhof P, Kimball AB. Psoriasis
351 severity: commonly used clinical thresholds may not adequately convey patient impact. J Eur Acad
352 Dermatol Venereol. 2021;35(2):417-21.
353 29. Steptoe A, Dockray S, Wardle J. Positive affect and psychobiological processes relevant to
354 health. J Pers. 2009;77(6):1747-76.
355 30. Diener E, Pressman SD, Hunter J, Delgadillo-Chase D. If, Why, and When Subjective Well-
356 Being Influences Health, and Future Needed Research. Appl Psychol Health Well Being.
357 2017;9(2):133-67.
358 31. Broadbent E, Koschwanez HE. The psychology of wound healing. Curr Opin Psychiatry.
359 2012;25(2):135-40.
360 32. Basra MK, Fenech R, Gatt RM, Salek MS, Finlay AY. The Dermatology Life Quality Index 1994-
361 2007: a comprehensive review of validation data and clinical results. Br J Dermatol. 2008;159(5):997-
362 1035.
363 33. Badia X, Mascaro JM, Lozano R. Measuring health-related quality of life in patients with mild
364 to moderate eczema and psoriasis: clinical validity, reliability and sensitivity to change of the DLQI.
365 The Cavide Research Group. Br J Dermatol. 1999;141(4):698-702.
366 34. Shikiar R, Willian MK, Okun MM, Thompson CS, Revicki DA. The validity and responsiveness
367 of three quality of life measures in the assessment of psoriasis patients: results of a phase II study.
368 Health Qual Life Outcomes. 2006;4:71.
369 35. Veenhoven R. Notions of the Good Life. In: David SA, Boniwell I, Conley Ayers A, editors. The
370 Oxford Handbook of Happiness. Oxford: Oxford University Press; 2013.

371

372

373 **Figure Legends**

374

375 Figure 1: Associations between the Dermatology Quality of Life Index (DLQI) and a) happiness and b)
376 World Health Organization Quality of Life (WHOQOL)-BREF.

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

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

386

387 **Table Legends**

388

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

391 Table 2: Associations between World Health Organization Quality of Life (WHOQOL)-BREF, the
392 Dermatology Quality of Life Index (DLQI), and happiness: results of linear regression models in
393 patients with psoriasis and atopic dermatitis and healthy controls.

Tables

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	<.001
Gender (women)	43.1%	-	49.1%	-	3.92
Disease severity - mild - moderate to severe	 33.3% 66.7%	 - -	 - -	 - -	 - -
Systemic treatment	46.4%	-	-	-	-
DLQI[b]	13	8.6	-	-	
QoL[c]. physical	64.8	18.7	77.8	16.2	<.001
QoL[c]: psychological	64.7	16.9	68.9	15.9	.004
QoL[c]: social	70.1	21.1	68.6	22	.482
QoL[c]: environmental	74.8	13.7	74.6	15.8	.932
Overall QoL[c]	68.6	14.5	72.5	14.8	.057
Satisfaction with life[d]	5	1.2	4.8	1.3	.519
Positive affect[e]	3.4	0.9	3.8	0.8	.005
Negative affect[e]	2.4	0.9	2.3	0.8	.057
Overall happiness[f]	-0.1	0.9	0.1	0.9	.136

m=mean; SD=standard deviation; [a] Student's t-tests (for gender: Chi-Square test); [b] DLQI=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, overall QoL indicates average of all four domains. [d] measured using the Satisfaction with Life Scale, possible range 1-7; [e] measured using the Scale of Positive and Negative Experience, possible range 1-5; [f] satisfaction with life, positive and negative affect variables were z-standardized and averaged into an index, range in this sample: -3.03–1.47.

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

Predictors Model Summary	Patients N=102		Controls N=106	
DV: Overall Happiness				
QoL: physical (β, p)	0.08	.283	0.09	.224
QoL: psychological (β, p)	0.70	<.001	0.56	<.001
QoL: social (β, p)	0.11	.066	0.22	.001
QoL: environmental (β, p)	0.07	.250	0.13	.060
Model Summary (cR^2)	0.77	<.001	0.77	<.001
DV: Overall QoL				
Overall happiness (β, p)	0.84	<.001	0.86	<.001
Model summary (cR^2)	0.70	<.001	0.74	<.001
Satisfaction with life (β, p)	0.47	<.001	0.40	<.001
Positive affect (β, p)	0.27	.002	0.33	<.001
Negative affect (β, p)	-0.26	.001	-0.22	.006
Model summary (cR^2)	0.71	<.001	0.74	<.001
DLQI (β, p)	-0.52	<.001	-	-
Model summary (cR^2)	0.26	<.001	-	-
DLQI (β, p)	-0.13	.031	-	-
Overall happiness (β, p)	0.77	<.001	-	-
Model summary (cR^2)	0.73	<.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.

Figures:

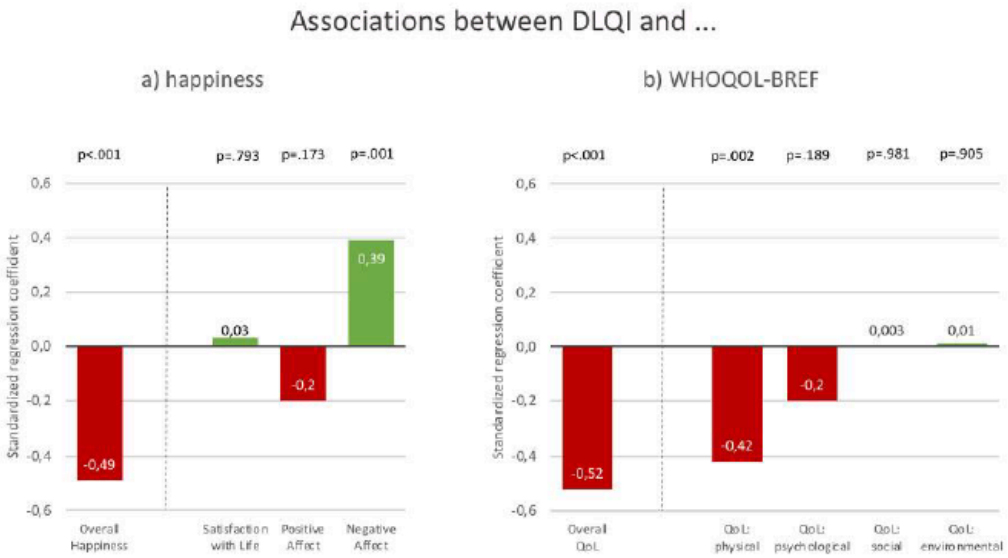


Figure 1: Associations between Dermatology Quality of Life Index (DLQI) and a) happiness and b) World Health Organization Quality of Life (WHOQOL)-BREF.

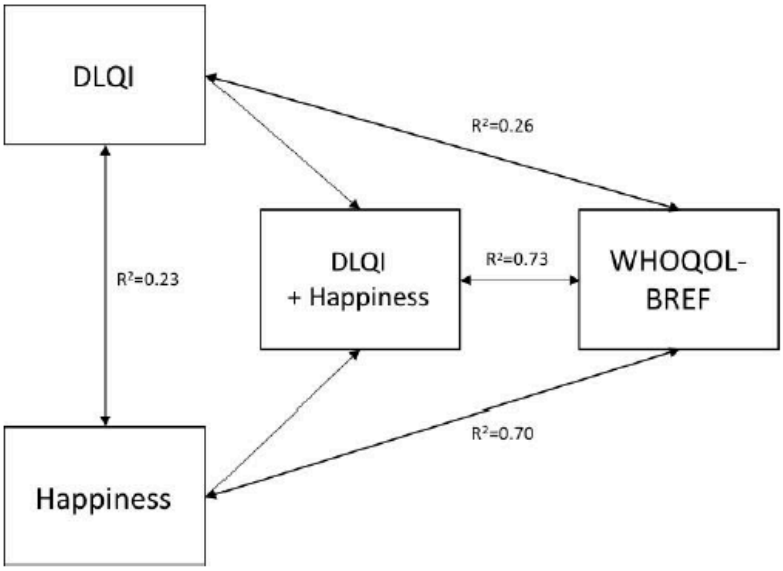
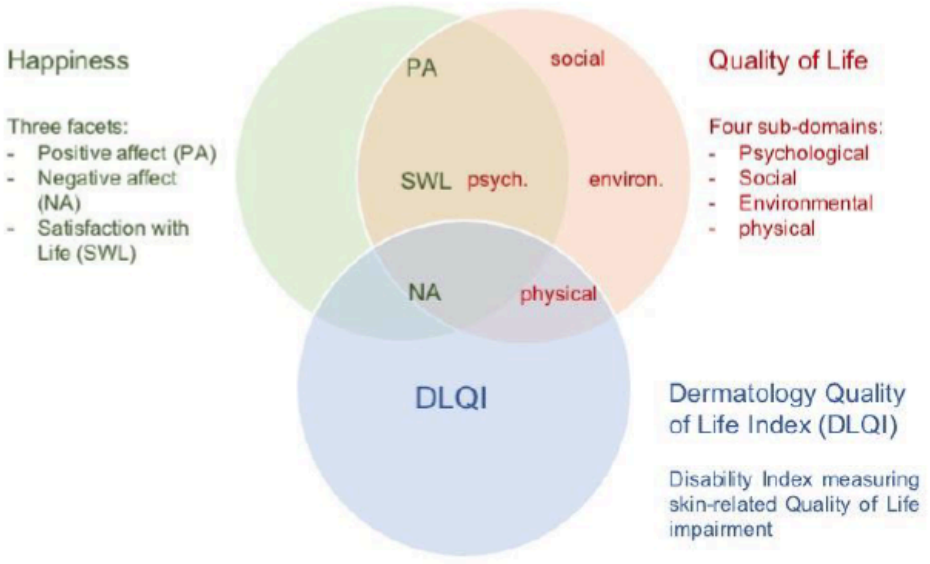


Figure 2: Correlations between happiness, the Dermatology Quality of Life Index (DLQI) and World Health Organization Quality of Life (WHOQOL)-BREF in patients with psoriasis and atopic dermatitis. R^2 indicates the percentage of explained variance in the respective models (corrected R^2).



435

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

442

John Libbey Eurotext [ejd210830] - Decision about your manuscript

delphos@fontismedia.com

Sa 20.11.2021 19:36

An:schuster, Barbara <barbara.schuster@tum.de>;

Dear Mrs Barbara Schuster

We are delighted to inform you that your article ejd210830 "Adding happiness to complement the Dermatology Quality of Life Index in psoriasis and atopic dermatitis healthcare: a cross-sectional study" has been accepted for publication in The European Journal of Dermatology.

The manuscript will now be sent to the publishers, John Libbey Eurotext, in order to generate the proofs. You will then be sent the proofs in PDF format which may have been modified for grammar/spelling and language editing. At the same time, you will also be sent the copyright transfer form and payments details, as required. Once the proofs have been checked/returned and the completed copyright transfer form and payment have been received, the manuscript will be available on the journal web site and Pubmed ahead of print.

Regarding payment, authors are asked to pay 200 euros for the publication of an article (there is no charge for colour illustrations) at: https://www.jle.com/en/revues/ejd/page_charges.phtml

Authors of invited articles or articles of the Residents' Corner are exempt from payment. Please note that you should expect to receive the proofs, copyright transfer form, and payment details within 4-5 months.

Open access is available for all articles published in The European Journal of Dermatology at an extra charge of 900 euros.

Please notice that:
-no article will be published until page charges (200 euros) have been paid,
-no open access will be set up until page charges and the open access charge (900 + 200 : 1100 euros) have been paid.

Please contact The Editorial Office (ejd.lyon@gmail.com) for further information.

Thank you for submitting your manuscript to The European Journal of Dermatology.

Yours sincerely,

Pr Ana Gimenez Arnau
Co-Editor
The European Journal of Dermatology

Conditions of publication:
The author possesses sole copyright and alone is legally entitled to submit the manuscript for publication. The author vouches that the work has not been published elsewhere either completely or in part, or in another form, and furthermore, that the manuscript has not been submitted to another journal and will not be published elsewhere after its publication in this journal. Manuscripts, original illustrations, and proofs are kept by the editor and/or publisher for a period of two months after publication of an article, during which time they will be returned to the author only upon written request. After this period, unrequested material will be disposed of. With the acceptance of the manuscript, John Libbey Eurotext acquires all

publishing rights including those of reprinting, translation, and other forms of reproduction (e.g. photocopies, microfilm, etc.) of the article according to the provision of the copyright laws in force.

5. Paper III

Happiness and depression in psoriasis: a cross-sectional study in Germany.

Schuster B, Peifer C, Ziehfreund S, Tizek L, Biedermann T, Zink A, Schielein MC

Quality of Life Research

Impact Factor: 4.15

Ranking: 24/108 (Health Care Sciences & Services - SCIE)
49/203 (Public, Environmental & Occupational Health- SCIE)

Source: ISI Journal Citation Reports 2020

Quality of Life Research
https://doi.org/10.1007/s11136-021-02991-2

Happiness and depression in psoriasis: a cross-sectional study in Germany

Barbara Schuster[1,2] · Corinna Peifer[3] · Stefanie Ziehfreund[1] · Linda Tizek[1,2] · Tilo Biedermann[1] · Alexander Zink[1,4] · Maximilian C. Schielein[1,2,4]

Accepted: 31 August 2021

Abstract

Purpose Prior research on the psychological consequences of skin diseases has focused on assessing mental comorbidities. The aim of this study was to investigate subjective well-being in a large sample of individuals affected by psoriasis, a chronic inflammatory skin disease, and to explore the associations with depression and disease-related parameters such as disease severity.

Methods A cross-sectional online survey was conducted from March to June 2019. The link to the questionnaire was shared on websites and Facebook pages of psoriasis patient organizations and campaigns. Participants filled in validated scales measuring subjective well-being—operationalized as positive affect (PA), negative affect (NA) and satisfaction with life (SWL); and depression.

Results The data of 722 participants were analyzed. Exploratory factor analysis supported the differentiation of PA, NA, SWL, and depression as four different constructs. The respondents reported lower levels of PA than healthy individuals and judged themselves to be less happy and were less satisfied with their lives than the general population (except age group 65 + years). 40.3% of respondents were screened positive for depression. More severe psoriasis was associated with lower affective well-being and a higher risk for depression.

Conclusion The results of this study empirically supported the differentiation of subjective well-being and depression as different constructs in individuals with psoriasis, and underline the large mental burden of the disease which goes beyond a higher risk for depression. Measures of well-being should thus be incorporated in both research and clinical practice in patients with psoriasis in order to achieve a more comprehensive picture of the mental burden of this disease.

Keywords Psoriasis · Happiness · Subjective well-being · Depression · Mental health · Dermatology

Plain English summary

Chronic skin diseases such as psoriasis can be a large mental burden for the affected individuals. Previous research has focused on assessing mental comorbidities such as depression in order to determine mental health in patients with skin diseases. However, according to the World Health Organization, there is more to being well than just not being ill. Thus, in order to fully capture the mental burden of skin diseases, both mental comorbidities and well-being need to be considered. Therefore, the aim of this study was to assess the mental burden of patients with psoriasis by not only measuring depression, but also happiness. We found that patients with psoriasis are less happy and have a higher risk for depression than healthy individuals. Treating skin symptoms can help the patients to be happier and less depressed.

Alexander Zink and Maximilian C. Schielein have contributed equally to this work.

✉ Barbara Schuster
barbara.schuster@tum.de

1 Department of Dermatology and Allergy, School of Medicine, Technical University of Munich, Munich, Germany

2 Institute for Medical Information Processing, Biometry, and Epidemiology (IBE), Pettenkofer School of Public Health, LMU Munich, Munich, Germany

3 Department of Psychology, University of Lübeck, Lübeck, Germany

4 Division of Dermatology and Venereology, Department of Medicine, Karolinska Institutet, Stockholm, Sweden

Published online: 16 September 2021

However, additional psychological care should be provided to patients with severe psoriasis in order to improve the patients' well-being.

Introduction

Psoriasis is a common chronic inflammatory skin disease with an estimated prevalence of 1.2–3% in Germany [1, 2]. It is characterized by sharply demarcated red patches covered in typical whitish-silver scales, typically, but not only, located on knees and elbows as well as the scalp [3]. A large number of patients suffer from severe itch, and some of them, even pain [4, 5]. In addition, psoriasis is associated with a large number of comorbidities, ranging from arthritis and metabolic syndrome to depression [3, 6, 7]. As psoriatic lesions are often considered disfiguring by their social environments, many affected patients experience body image issues [8] and suffer from stigmatization and social exclusion [9, 10], resulting in a large psychological disease burden [7, 11, 12]. As a consequence, psoriasis has been recognized as a serious noncommunicable disease by the World Health Assembly in 2014 [13].

Assessing the mental burden of psoriasis

Prior research on the psychological consequences of skin diseases has predominantly taken a pathogenic perspective, with most studies exploring mental comorbidities as markers of mental health. The results in general indicated a higher risk of depression, anxiety, and addiction for patients with psoriasis [6, 14–16]. However, in line with the World Health Organization (WHO) defining health as "a state of […] well-being and not merely the absence of disease" [17], salutogenic approaches for measuring mental health in patients with skin diseases are necessary in order to achieve a holistic understanding of the mental burden [12, 18, 19]. Accordingly, over the last years, studies exploring well-being in individuals with psoriasis have emerged [20–24]. In general, most studies comparing individuals with psoriasis to healthy controls found that well-being was impaired in this patient group, underlining the large mental burden of psoriasis [20, 21, 25]. However, there is increasing evidence pointing toward a more complex relationship between psoriasis and well-being, which seems to be mediated by the subjective perception of the symptoms rather than the objective course of the disease [21, 26, 27].

Subjective well-being and depression in psoriasis

Recently, happiness has been discussed as a patient reported outcome with high subjective relevance for patients with chronic skin diseases [20]. Although different definitions exist [28], happiness is often conceptualized as subjective well-being [29]. According to Diener et al. [25], subjective well-being comprises an individual's "cognitive and affective evaluation of life as a whole". Following this approach, subjective well-being is high if one experiences frequent positive affect (PA), infrequent negative affect (NA) and a general satisfaction with life (SWL) [25, 30]. So far, only a few studies exploring subjective well-being in patients with psoriasis exist [23, 24, 31, 32], with only one study comprehensively assessing all three facets of subjective well-being in a comparably small group of 52 patients with psoriasis [20]. The results of the existing studies suggest that psoriasis patients are impaired in terms of PA but not SWL compared to healthy individuals [20, 23, 24]. For NA, results are inconsistent [20, 23, 31].

Depression, in contrast, is a well-researched and generally accepted comorbidity of psoriasis which has been studied in several systematic reviews and meta-analyses [33, 34]. As depression is characterized by the reduced capability to experience positive emotions [35], the finding of low PA in patients with psoriasis could be explained by the higher prevalence of depressive symptoms in this patient group, which raises the question whether exploring affective well-being independently of depression does in fact provide new insights on the mental burden of psoriasis. Studies exploring both subjective well-being and depression in individuals with psoriasis are needed in order to be able to distinguish these two constructs in this patient group.

Aim of the study

The aim of this study was thus to assess both depression and subjective well-being (operationalized as PA, NA, and SWL) in a large and diverse sample of individuals affected by psoriasis, and to explore associations between depression, subjective well-being, and patient characteristics in this group.

Materials and methods

Study population and recruitment

For this cross-sectional study, an online survey among individuals affected by psoriasis in Germany was conducted from March to June 2019. The link to the online questionnaire was shared on Germany's largest patients' organization webpage for psoriasis ("Psoriasis Netz", www.psoriasis-netz.de) and in the corresponding email newsletter and forum. In addition, the link was shared on other psoriasis-related Facebook pages ("Farbenhaut", Technical University of Munich's University Hospital and the de-stigmatization campaign "Bitte berühren" by the Professional Association of the German Dermatologists). Only individuals affected

by psoriasis were eligible to participate, which was clearly stated on the first page of the online questionnaire and which had to be confirmed by the participants in the first question before they were able to continue with the rest of the questionnaire. Informed consent was obtained from all participants prior to inclusion. This study was conducted in accordance with the Declaration of Helsinki and was reviewed and approved by the local ethics committee of Technical University of Munich (reference 25/19 S).

Study variables

The study questionnaire was developed by a multidisciplinary team including a dermatologist, a psychologist and two epidemiologists. It consisted of validated scales measuring subjective well-being and depression and additional questions on happiness in general and the evaluated impact of psoriasis. The survey was pre-tested by three psoriasis patients and, based on the resulting feedback, slightly modified. For the scales used in this study, internal consistency was considered "excellent" for Cronbach's alpha values > 0.9 and "good" for Cronbach's alpha values > 0.8 [36].

Subjective well-being

Following Diener et al. [25], subjective well-being was operationalized as *PA*, *NA* and *SWL*. PA and NA were measured using the validated German version of the Scale of Positive and Negative Experience (SPANE) [37, 38]. We chose the SPANE over the more frequently used Positive and Negative Affect Schedule (PANAS) [39], as it assesses a wider range of positive and negative emotions than the PANAS, which focusses on high arousal emotions, and as it is coherent with Diener and colleagues conceptualization of subjective well-being [37]. The SPANE consists of two subscales measuring PA and NA, respectively. Each subscale consists of six adjectives, e.g., "pleasant" and "positive" for PA and "unpleasant" and "negative" for NA). The respondents were asked to indicate how often they had felt the respective feelings over the past two weeks on a 5-point scale from 1 ("very rarely or never") to 5 ("very often or always"). The two distinct subscales, showed excellent and good reliability in this study with Cronbach's alphas of 0.93 and 0.86 for PA and NA, respectively. For each subscale, the items were averaged to form an index. *SWL* was measured using the German version of the Satisfaction With Life Scale (SWLS) [40, 41]. The scale consists of five items (e.g., "in most ways my life is close to my ideal"), each rated on a 7-point scale from 1 ("strongly disagree") to 7 ("strongly agree"). The scale showed excellent reliability in this study with a Cronbach's alpha of 0.91 and the items were averaged to form an index. As some researchers argue that happiness is not in fact a multidimensional but a unidimensional construct [29], we decided to also include a *heuristic measure of happiness*, meaning a single question asking participants for their overall happiness [20]. In order to achieve comparability with the general population, a single question from the European Social Survey was used: "Taking all things together, how happy would you say you are?" [42]. Respondents could give their answer on a 11-point scale from 0 ("extremely unhappy") to 10 ("extremely happy").

As an additional question on happiness in the context of psoriasis, the participants were asked for a *subjective evaluation of the impact of psoriasis on their own happiness* ("Do you think that your psoriasis has a negative impact on how happy you are?"—"No", "Yes, a little", "Yes, moderately", "Yes, very much").

Depression

The WHO-5 Well-Being Index [WHO-5, 43] is a validated screening questionnaire for *depression*. It consists of five statements (e.g., "My daily life has been filled with things that interest me"), which respondents rate on a 6-point scale from 0 ("at no time") to 5 ("all of the time"). The items showed good reliability in this study with a Cronbach's alpha of 0.87. Following the instructions, the values of the items were added, resulting in an overall score ranging from 0 to 25, with lower scores indicating a higher risk for depression. Using a cut-off of ≤ 7, the WHO-5 has shown good properties for the screening of major depression with a sensitivity of 94% and specificity of 78% [44]. Consequently, a score of ≤ 7 was considered a positive screening result for depression in this study.

Participants' characteristics

As possible parameters associated with happiness, data on *age* (in years), *gender*, *years since first diagnosis*, and *current treatment status* (currently receiving treatment vs. not receiving treatment) were collected. Subjective *general disease severity* was measured as "mild", "moderate", "severe". In addition, data on current disease severity were collected using the same given options ("mild", "moderate", "severe"). Based on general and current disease severity, new dichotomous variables indicating current phases of *relative improvement* or *relative deterioration* compared to general disease severity were derived.

Analysis

Prior to the analysis, data were checked for completeness (at least 80% of questions on happiness answered) and plausibility (e.g., data were considered implausible if the participants indicated a higher number of years since first diagnosis than age). As only very few participants did not meet our criteria

for completeness and plausibility ($n = 8$), these cases were excluded from all further analysis rather than using imputation in order to keep the analysis as simple as possible. The remaining data were analyzed descriptively. Pearson's correlations were calculated in order to explore associations between the examined variables. Correlations were considered moderate for $r > 0.5$ and strong for $r > 0.7$ [45]. To further differentiate the four constructs PA, NA, SWL, and depression, exploratory factor analysis using Promin Rotation, an oblique rotation method appropriate for correlated variables, was conducted after checking the respective requirements were fulfilled. As all variables were measured on at least 5-step scales (with equal distances between the answer options and numbers suggesting equal steps between the categories), variables were treated as quasi-metric and Pearson's correlations were used for factor analysis. Following Guadagnoli and Velicer [46], factor loadings of 0.4 and higher were considered stable, which is why all smaller coefficients were suppressed. Factor retention was determined using parallel analysis [47]. However, as the retention of three factors, which was the number of factors suggested by parallel analysis, did not result in stable factor loadings for all examined items, we additionally conducted the analysis retaining one more factor, which was in line with the theoretical assumption of four differing constructs of PA, NA, SWL, and depression.

Means of PA, NA, heuristic happiness, SWL and WHO-5 were compared to norm data [41, 48, 49] or, in case of PA and NA, to data of a validation study [38] as norm data were not available. For both SWL and WHO-5, norm data had been collected in representative samples of the German general population (with the assistance of a demographic consulting company (SWL: mean age 48.9 ± 18.3 years, 52.2% women; WHO-5: mean age 48.3 years, SD not indicated for the overall sample, 52.7% women) [41, 48]. For heuristic happiness, norm data for the German general population were collected within the European Social Survey (mean age 48.2 ± 18.1 years, 49.9% women) [49]. For PA and NA, the data of the German validation study among a total of 498 participants recruited in university lectures ($n = 264$) and via mailing lists/social media ($n = 234$) were used as reference data (mean age not indicated, 18.5% < 20 years, 47.8% 20–29 years, 16.3% 30–39 years, 7.7% 40–49 years, 5.3% 50–59 years, 4.5% > 59 years, 75.1% women) [38]. As for PA, NA, and heuristic happiness the datasets of the reference samples were accessible, the group comparisons for these variables were conducted using ANCOVA and planned contrasts while controlling for sex and age. Adjusted means (m^a) are reported. For SWL and WHO-5, the datasets of the reference populations could not be retrieved, which is why analyses were conducted stratified for age and sex, using Student's *t*-tests. The age groups for these analyses were chosen to match the age groups reported in the respective reference samples. As Student's *t*-tests and ANCOVA have been shown to provide robust results even when normality and equal variance assumptions are violated [50–52], the analyses were conducted without prior verification of these assumptions.

Parameters associated with subjective well-being and a positive screening for depression were identified using multiple linear regression models and binary logistic regression, respectively. In all regression models, age, gender, years since first diagnosis, general subjective disease severity, improvement or deterioration of skin condition and current treatment status were entered as independent variables. As a result, adjusted raw (B) and standardized regression coefficients (β) and Odds Ratios (OR) as well as corresponding 95%-confidence intervals (CIs) and the percentage of variance explained by each model (adjusted R^2) are reported. As depression is characterized by the inability to feel happy [35], we conducted additional sub-group analyses in participants who did not receive a positive screening result for depression in order to explore differential findings for affective well-being which are not explained by the presence of depression.

The level of significance was set at $\alpha = 0.05$ for all analyses. All statistical analyses except exploratory factor analysis were conducted using IBM SPSS Statistics Version 24 (IBM Corporation, Armonk, NY, USA). Exploratory factor analysis was conducted using FACTOR software [53].

Results

In total, 730 participants completed the survey, with most users having participated via "Psoriasis Netz" (95%). Of those, eight were excluded prior to analysis due to insufficient ($n = 3$) or implausible data (e.g., higher number of years since first diagnosis than age; $n = 5$). Consequently, the data of 722 participants were analyzed. The mean age was 45.8 years with a standard deviation (SD) of 13.4 years and a range of 12–85 years (Table 1). 62.7% of participants were women. Almost all participants (98.6%) reported having been diagnosed with psoriasis by a medical doctor, and only ten participants (1.4%) had been given the diagnosis by an alternative practitioner or had self-diagnosed psoriasis. On average, the participants had been living with psoriasis for 20.6 years (SD = 14.5 years, range < 1–68). The majority of participants (55.7%) judged their psoriasis to be generally moderate, 34.3% severe, and only 10% mild. When asking for current disease severity, 24% of participants indicated mild, 52.8% moderate, and 23.3% severe. Comparing self-reported general and current disease severity, 31.7% of participants were in a phase of relative improvement, and 14.4%

Table 1 Baseline patients' characteristics

Patients' characteristics	$N=722$
Age in years (mean ± SD, range)	48.8 ± 13.4, 12–85
Gender	
- Male	269 (37.3%)
- Female	453 (62.7%)
Diagnosis	
- By medical doctor	712 (98.6%)
- By alternative practitioner or self-diagnosis	10 (1.4%)
Years since first diagnosis (mean ± SD, range)	20.6 ± 14.5, 0–68
General disease severity	
- Mild	72 (10%)
- Moderate	402 (55.7%)
- Severe	248 (23.3%)
Current disease severity	
- Mild	173 (24%)
- Moderate	381 (52.8%)
- Severe	168 (23.3%)
Phase of relative improvement of skin condition	229 (31.7%)
Phase of relative deterioration of skin condition	104 (14.4%)
Current treatment[a]	
- Dermatologist	446 (61.8%)
- Rheumatologist	127 (17.6%)
- General practitioner	117 (16.2%)
- Alternative care	23 (3.2%)
- No current treatment	179 (24.8%)

[a]Multiple answers were possible

of relative deterioration. One out of four participants (24.8%) was not currently receiving medical treatment for psoriasis. Of those who were receiving treatment, the majority (82.1%) were treated by a dermatologist, 23.3% by a rheumatologist, 21.5% by a general physician, and 3.2% received alternative care (e.g., by an alternative practitioner).

Subjective well-being and depression

The variables intercorrelated moderately to strongly, with the strongest correlation observed for PA and heuristic happiness ($r=0.73$, $p<0.001$; Table 2) and the weakest correlation observed for SWL and NA ($r=-0.56$, $p<0.001$). 40.3% of participants had a positive screening result for depression (41.9% of women and 37.5% of men). Nine out of ten participants (90.3%) stated that psoriasis had a negative impact on how happy they were (28.8% a little, 29% moderately, and 32.9% very much), and only 9.3% of participants stated that their psoriasis did not affect their happiness at all (Fig. 1).

Using exploratory factor analysis and parallel analysis for factor retention, three factors were identified (Fig. 2a). The first factor corresponded to the PA items of the SPANE, the second corresponded to the items of the SWLS, and the third factor corresponded to the NA items of the SPANE, with one item of the WHO-5 loading on the same factor. The remaining items of the WHO-5 did not show stable factor loadings on any of the three factors. When adding one more factor to be extracted, all items of SPANE, SWLS, and WHO-5 loaded on four separate factors corresponding to the four constructs PA, NA, SWL and depression (Fig. 2b).

Descriptive statistics of PA, NA, SWL, heuristic happiness, and WHO-5 are displayed in Table 3.

Comparison with reference populations

Controlling for age and sex, participants in this study reported significantly less PA than the German validation sample ($m^a=2.98$ vs. 3.10, $p=0.003$) [38], but did not differ from them in terms of NA ($m^a=2.87$ vs. 2.88, $p=0.767$; Table 3). Furthermore, controlling for age and sex, participants in this study judged themselves less happy than the general population ($m^a=6.34$ vs. 7.26, $p<0.0001$). Stratifying for age and sex, participants of this study over all age groups and both men and women scored significantly lower on the WHO-5 than the general population (all $p<0.001$).

Table 2 Correlation matrix

	PA	NA	SWL	Heuristic happiness	WHO-5 well-being index
PA	1				
NA	− 0.669***	1			
SWL	0.652***	− 0.564***	1		
Heuristic happiness	0.728***	− 0.588***	0.629***	1	
WHO-5 well-being index	0.687***	− 0.651***	0.630***	0.591***	1

Pearson's correlation coefficients are displayed

Asterisks indicate significant correlations; *$p<0.05$, **$p<0.01$, ***$p<0.001$

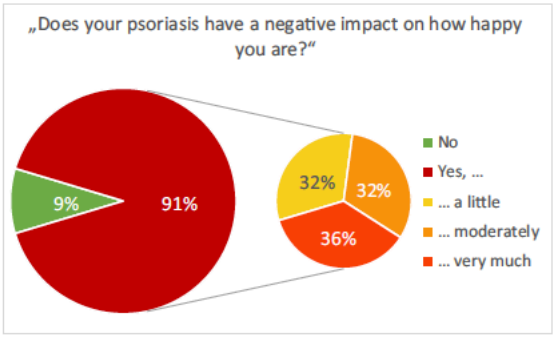


Fig. 1 Subjective evaluation of the impact of psoriasis on patients' happiness. $N=721$, one missing case

Furthermore, stratified analyses showed that participants under 65 years in this sample were less satisfied with their lives than the general population under 65 years (all $p<0.001$), while participants of 65 years and older did not differ from their peers in terms of SWL ($p>0.05$). Taking all age groups together, both men and women in this study reported lower SWL than men and women of the general population (both $p<0.0001$).

Factors associated with subjective well-being and depression

PA

Higher age [B = − 0.01, CI (− 0.12; − 0.002); β = − 0.10, CI (− 0.18; − 0.03)], moderate [B = − 0.33, CI (− 0.55; − 0.11); β = − 0.18, CI (− 0.31; − 0.06)] and severe [B = − 0.85, CI (− 1.11; − 0.59); β = − 0.45, CI (− 0.59; − 0.31)] general disease severity as compared to mild disease severity and deterioration of skin condition [B = − 0.32, CI (− 0.53; − 0.13); β = − 0.13, CI (− 0.2; − 0.05)] were associated with lower levels of PA (Fig. 3). In contrast, a higher number of years since the first diagnosis [B = 0.11, CI (0.01; 0.02); β = 0.18, CI (0.10; 0.25)] and improvement of skin condition [B = 0.36, CI (0.21; 0.52); β = 0.06, CI (0.11; 0.27)] were associated with higher PA. The full model explained 10.7% of variance in PA ($p<0.001$). When including only patients without depression, the same parameters were associated with PA, but the model explained only 7.5% of variance ($p<0.001$).

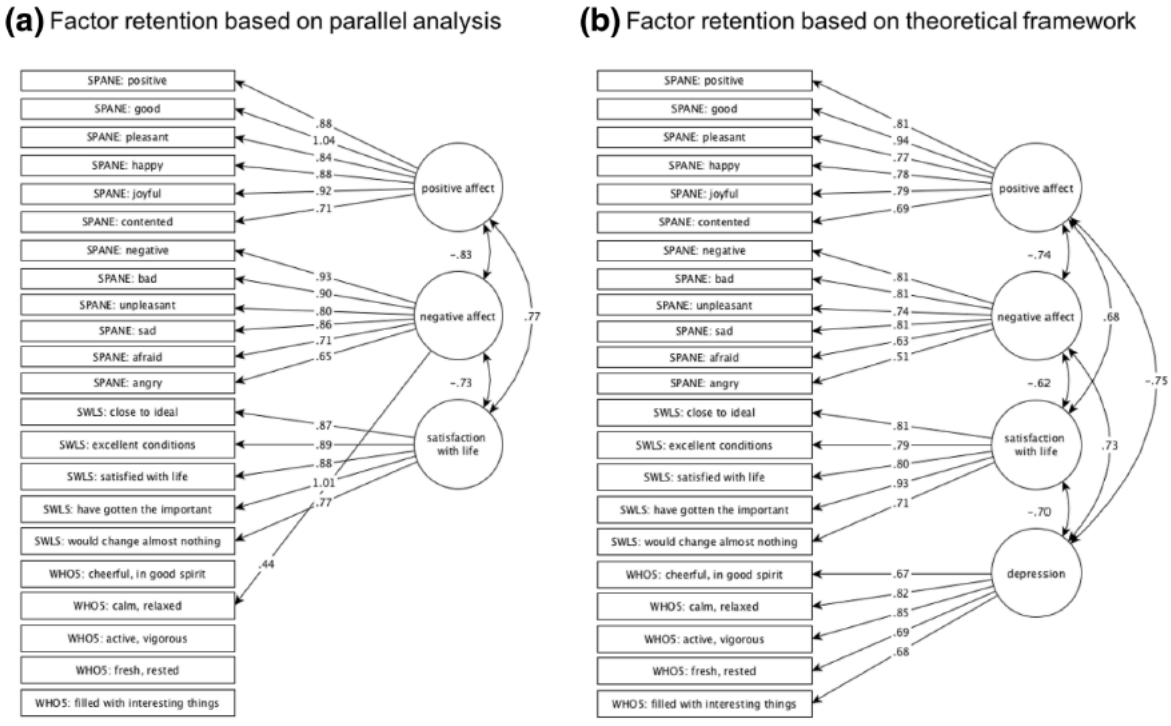


Fig. 2 Factor loadings of the examined variables of the SPANE, the SWLS, and the WHO-5 **a** on the three factors retained based on parallel analysis **b** on four factors corresponding to the four constructs PA, NA, SWL, and depression. Arrows between factors show inter-factor correlations

Table 3 Descriptive statistics of the examined variables in the study sample and the respective reference samples

	Mean ± SD	Adjusted mean/means per group ± SD	Adjusted mean/means per group ± SD (reference)	Significance[a]
PA	2.96 ± 0.89	2.98	3.10	0.003
NA	2.83 ± 0.89	2.87	2.88	0.767
Heuristic happiness	5.32 ± 2.37	6.34	7.26	< 0.001
SWL	4.27 ± 1.43			
- 14–24 years		19.63[b] ± 6.24	24.77[c] ± 6.11	< 0.001
- 15–34 years		21.87[b] ± 7.47	25.89[c] ± 6.34	< 0.001
- 35–44 years		20.77[b] ± 7.66	25.01[c] ± 6.37	< 0.001
- 45–54 years		20.80[b] ± 6.79	24.43[c] ± 6.81	< 0.001
- 55–64 years		21.28[b] ± 7.28	24.15[c] ± 6.32	< 0.001
- 65–74 years		23.73[b] ± 6.13	25.30[c] ± 5.52	0.059
- > 74 years		24.56[b] ± 3.78	25.06[c] ± 5.93	0.802
- Men		20.86[b] ± 7.40	25.12 ± 6.32	< 0.001
- Women		21.62[b] ± 7.05	24.67 ± 6.20	< 0.001
WHO-5 well-being index	9.86 ± 5.27			
- < 41 years		9.73 ± 4.96	18.36 ± 4.80	< 0.001
- 41–60 years		9.41 ± 5.30	17.49 ± 4.88	< 0.001
- > 60 years		11.9 ± 5.65	16.70 ± 5.13	< 0.001
- Men		10.34 ± 5.61	18.15 ± 4.90	< 0.001
- Women		9.58 ± 5.05	17.07 ± 4.98	< 0.001

[a]ANCOVA and Student's *t*-tests, respectively

[b]For stratified analysis items were summed up (instead of averaged) in order to allow for comparison with reference data

[c]Calculated based on weighted means for men and women

NA

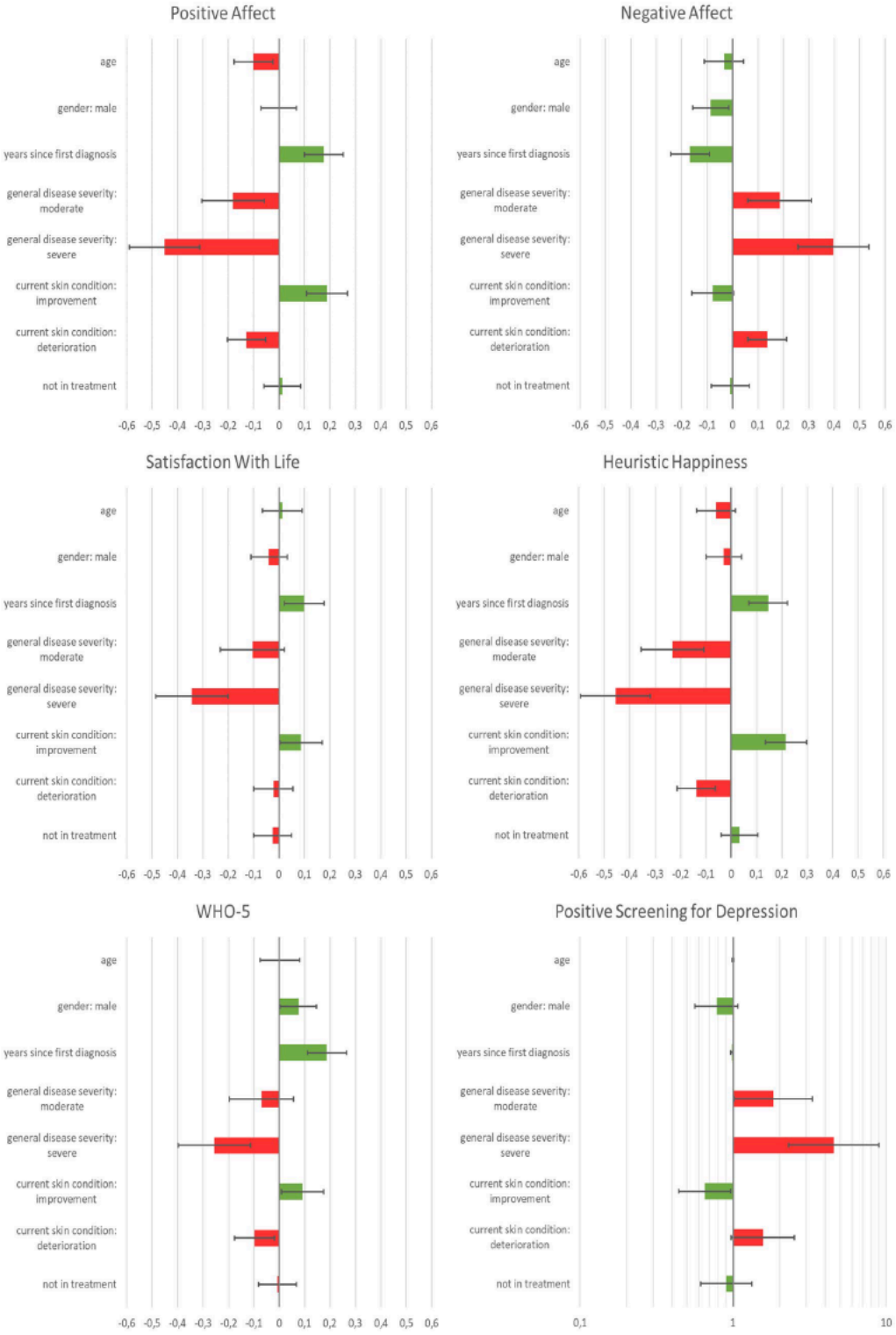
NA was higher in participants with moderate [B = 0.33, CI (0.11; 0.55); β = 0.19, CI (0.06; 0.31)] and severe [B = 0.74, CI (0.48; 1); β = 0.40, CI (0.26; 0.54)] general disease severity and those who were currently in a phase of deterioration of the skin condition [B = 0.34, CI (0.15; 0.54); β = 0.14, CI (0.06; 0.21); Fig. 3]. In contrast, being male [B = − 0.16, CI (− 0.29; − 0.03); β = − 0.09, CI (− 0.16; − 0.02)] and living with psoriasis for a longer time [B = − 0.01, CI (− 0.02; − 0.006); β = − 0.17, CI (− 0.24; − 0.09)] were associated with less NA. The full model explained 9.1% of variance in NA (p < 0.001). When including only patients without depression, the association remained significant for moderate and severe general disease severity and years since the diagnosis of psoriasis (p = 0.008; p = 0.001; p < 0.001, respectively), but the associations with gender and deterioration of the skin did not reach significance anymore (p = 0.071 and p = 0.085, respectively). Similar to PA, the model explained slightly less variance (7.6%, p < 0.001) in participants without depression compared to the whole sample.

SWL

Severe general disease severity was associated with lower levels of SWL [B = − 1.04, CI (− 1.47; − 0.61); β = − 0.34, CI (− 0.49; − 0.20); Fig. 3]. More years passed since the first diagnosis [B = 0.01, CI 0.002; 0.02); β = 0.10, CI (0.02; 0.18)] and current improvement of skin condition [B = 0.27, CI (0.01; 0.52); β = 0.09, CI (0.00; 0.17)] were associated with higher SWL. The full model explained 5.5% of variance (p < 0.001) in SWL. When excluding participants with depression, only female gender was significantly associated with SWL (p = 0.049). Overall, the model did not show a good fit for this sub-sample (adjusted R^2 = 0.013, p = 0.099).

Heuristic happiness

Patients who were in general moderately [B = − 1.11, CI (− 0.1.7; − 0.51); β = − 0.24, CI (− 0.36; − 0.11)] or severely [B = − 2.28; CI (− 2.97; − 1.59); β = − 0.46, CI (− 0.60; − 0.32)] affected or who were currently in a phase of deterioration [B = 1.1, CI (0.69; 1.51); β = − 0.14, CI (− 0.22; − 0.07)] judged themselves to be less happy


Positive Affect
Negative Affect
Satisfaction With Life
Heuristic Happiness
WHO-5
Positive Screening for Depression
age
gender: male
years since first diagnosis
general disease severity: moderate
general disease severity: severe
current skin condition: improvement
current skin condition: deterioration
not in treatment
-0,6 -0,5 -0,4 -0,3 -0,2 -0,1 0 0,1 0,2 0,3 0,4 0,5 0,6
0,1
1
10

◂**Fig. 3** Determinants of happiness and depression in 722 individuals with psoriasis. Adjusted standardized regression coefficients (for positive screening of depression: OR on log scale) with corresponding confidence intervals are given. Factors associated with higher well-being are displayed in green and those associated with lower well-being are displayed in red. Happiness was operationalized as subjective well-being, consisting of PA, NA, and SWL, and as a heuristic evaluation of happiness. A screening result for depression was considered positive if a participant scored ≤7 in the WHO-5. Asterisks indicate significant correlations. *$p<0.05$, **$p<0.01$, ***$p<0.001$. (Color figure online)

(Fig. 3). In contrast, those who had been living with psoriasis for more years [B = 0.02, CI (0.01; 0.04]; $\beta = 0.14$, CI (0.07; 0.22)] or who were in a current phase of improvement of skin condition [B = 1.1, CI (0.69; 1.51); $\beta = 0.22$, CI (0.14; 0.30)] judged themselves to be happier. The full model explained 10.2% of variance in heuristic happiness. All parameters associated with heuristic happiness remained significant when excluding patients with depression, and the model explained 6.9% of variance in heuristic happiness ($p<0.001$).

Depression

Participants with severe psoriasis [B = − 2.84, CI (− 4.41; − 1.27); $\beta = -0.26$, CI (− 0.40; − 0.11)] and currently going through a phase of deterioration [B = − 1.46, CI (− 2.62; − 0.3); $\beta = -0.10$, CI (− 0.18; − 0.02)] scored lower in the WHO-5 questionnaire, which indicates higher levels of depressive tendencies (Fig. 3). In contrast, men [B = 0.82, CI (0.04; 1.6); $\beta = 0.08$, CI (0.01; 0.15)], participants living with psoriasis for a longer time [B = 0.07, CI (0.04; 0.1); $\beta = 0.19$, CI (0.11; 0.27)] and those currently experiencing improvement of skin condition [B = 1.04, CI (0.11; 1.98); $\beta = 0.09$, CI (0.01; 0.18)] scored higher in the WHO-5. The full model explained 6.6% of variance in the WHO-5 score ($p<0.001$). Moderately affected participants had a 1.8-fold [CI (1.02; 3.32)] and severely affected participants even had a 4.6-fold [CI (2.31; 9.03)] chance of being screened positive for depression compared to mildly affected participants (Fig. 3). Living with psoriasis for a year longer [OR 0.98, CI (0.97; 0.99)] and current improvement of skin condition [OR 0.65, CI (0.44; 0.97)] were both associated with a decreased chance of a positive screening for depression. The full model explained 8.6% of variance in screening results ($p<0.001$).

Discussion

This study examined both subjective well-being and depression in patients with psoriasis, following the WHO's demand for a holistic approach of measuring mental health in this patient group [12]. In a nationwide sample of 722 individuals affected by psoriasis in Germany, subjective well-being and more precisely PA and SWL were low compared to the general population or healthy reference populations, and 40% of participants were screened positive for depression. The main risk factor for low subjective well-being and depression was general disease severity, but also deterioration of the skin was negatively associated with the affective component of subjective well-being, while phases of improvement of skin condition were associated with more PA and higher SWL. Additionally, the longer participants had been living with psoriasis, the higher was their subjective well-being and the less depressed they were.

Differentiating depression and well-being

Due to the simultaneous assessment of depression and subjective well-being, this study allowed to examine the association between these constructs in individuals affected with psoriasis. As depression, among other symptoms, is characterized by the absence of PA [35], the constructs of depression and subjective well-being/positive affect are bound to overlap per definition, which is reflected by overlapping items of the respective measurement tools (especially question 1 of the WHO-5 and the PA items of the SPANE) [54]. However, depression is also characterized by other symptoms such as lack of energy and decreased activity which are not covered by PA/subjective well-being. Accordingly, exploratory factor analysis revealed that all items of SPANE, SWLS and WHO-5 loaded on four different factors corresponding to PA, NA, SWL and depression, supporting the methodological approach of differentiating depression and subjective well-being. This is especially interesting as the empirical differentiation of subjective well-being and depression, which has been successfully shown in some studies [55], has proven difficult in others [56]. The results of this study are in line with the postulate of the WHO that well-being is more than the absence of illbeing (see also Lukat et al. [57]). Thereby, they underline the WHO's demand to including measures of well-being in clinical research and practice in individuals with psoriasis in order to achieve a more comprehensive understanding of the mental burden of this disease [12].

Subjective and objective disease severity

Subjective general disease severity was associated with all facets of subjective well-being in this study. In contrast, two previous studies have only found associations between disease severity and single facets of subjective well-being (NA: Martin-Brufau et al. [23]; PA: Schuster et al. [20], respectively). These inconsistencies in the findings might be owed to the different modalities of assessing disease severity employed in the different studies: Previous studies

have shown that the subjective perception of the symptoms might be more important for individual well-being than the objective course of the disease [21, 26, 27]. While the two mentioned studies used either physician assessed disease severity [20] or a validated self-assessment tool for disease severity [23], a very subjective approach was used in the present study, with participants rating their disease severity as "mild", "moderate" or "severe", This approach might explain why the associations between well-being and disease severity were especially pronounced in this study. More research is needed in order to shed light on the (different?) roles of subjective and objective disease severity for well-being and mental health. An alternative explanation could be that the small sample size of 52 patients in the study of Schuster et al. [20] prevented the detection of associations between disease severity and NA and SWL observed in this study.

General and current disease severity

Interestingly, high general disease severity remained strongly associated with low subjective well-being and depression even when current skin condition was taken into account. While improvement of the skin was associated with higher well-being, the negative association between general severe disease severity and well-being was more pronounced. These findings implicate that by relieving skin symptoms, physicians might be able to help patients feel happier and, as reported before [15, 16], reduce the risk for depression. However, especially in more severe forms of psoriasis, well-being might remain low even if the symptoms improve. This supports the idea that documenting the PeakPASI, meaning the highest PASI ever recorded per patient, might provide additional information about the mental burden of psoriasis compared to just referring to the "snapshot" PASI at a single visit [58].

The role of online recruitment

The participants in this sample scored lower than the German norm in SWL and reported less PA than a healthy reference sample. While the findings of impaired PA, but not increased NA, is in line with previous findings [20], the reported values for PA, NA and SWL were even more unfavorable than in a previous study among patients with psoriasis [20]. Also, we found a high rate of positive screening for depression of 40%. An explanation for these findings could be that the recruitment strategy might have led to a sample which was especially impaired in terms of well-being and depression. This would suggest that especially unhappy individuals turn to (online offers of) self-help organizations like the one used for recruitment in this study, which would underline the great importance these entities have for the comprehensive treatment of individuals with psoriasis. In contrast, however, it is also possible that, due to the anonymity, the participants in this online survey were more honest and open about their well-being than in previous studies, which have mostly taken place in medical settings [20, 24, 32]. Thus, social desirability might have led to an underestimation of happiness and well-being in previous studies.

Limitations

The results of this study are subject to several limitations. First, as the survey was conducted online, selection bias must be considered, which was already discussed in the above paragraph. Second, while all participants had to actively indicate that they were indeed affected by psoriasis prior to taking part in the survey, the online setting did not allow to confirm the diagnosis. Third, due to time limitations in the survey, which was designed to take only a few minutes to complete in order to achieve a high number of participants, disease severity was not assessed using validated scales or clinical scores but as "mild", "moderate" and "severe". Future studies should explore whether the findings of this study can be replicated when using validated scores for the assessment of subjective or even objective disease severity like PASI. Also, as this is a cross-sectional study, we could not determine causality but only association. Finally, future studies should explore the role of personality traits and other possible moderator variables such as marital status for the examined associations, as they have not been considered in this study.

Strengths

This study followed a holistic approach of assessing mental health in individuals with psoriasis by measuring not only depression, but also subjective well-being in a large sample of affected individuals. Thus, the study does not only contribute to the growing body of research exploring well-being in psoriasis healthcare, it furthermore adds empirical evidence supporting the differentiation of depression and well-being as two related constructs. Furthermore, the study was designed in a way to not only include patients in the medical setting, but also affected individuals who were not currently part of the health care system, which is in line with the WHO's demand for "people centered care" instead of "patient centered care" [59]. Thus, by looking at people with psoriasis in general instead of focusing on patients only (=people who are currently receiving medical care), the study provides a more comprehensive picture of mental health in individuals with psoriasis regardless of treatment status than prior studies which were mostly conducted in medical settings. Finally, the online setting of this study allowed the participants to fill in the questionnaire in an

anonymous setting, which might help to reduce social desirability bias as compared to paper-based questionnaires at doctors' offices or clinics which are frequently employed in epidemiological research.

Future research

Interventions targeting NA (especially stress) have been successfully conducted in patients with psoriasis [60, 61]. As this and previous studies have shown that PA seems to be especially impaired in patients with psoriasis [20], and as PA has been linked to several desirable health outcomes like better immune reactions, faster skin barrier recovery, and better cardiovascular health [62, 63], future research should evaluate whether interventions targeting PA could be also or maybe even more beneficial for improving the patients' well-being beyond the treatment of skin symptoms. Furthermore, future research should explore the mechanisms behind the presumably beneficial effect of skin treatment on well-being, as it could be moderated and potentially improved by additional factors such as time to treatment response [26].

Conclusion

In this large sample of 722 patients with psoriasis, participants reported lower subjective well-being than the German general population or healthy reference populations. General disease severity was associated with both low subjective well-being and depression, even in phases of improvement of the skin condition. While improvement of skin condition, which can be achieved by an effective treatment of skin symptoms, was associated with higher well-being and less depression, the negative associations between severe general disease severity and well-being and depression, respectively, were even more pronounced. As subjective well-being and depression have been identified as two differential constructs in this study, measures of well-being should be increasingly incorporated in psoriasis health care.

Acknowledgements We thank all participants for taking part in this study. We further thank Claudia Liebram and Rolf Blaga of "Psoriasis Netz" (www.psoriasis-netz.de) for the valuable support during the development of the study questionnaire and the set-up of the study and the recruitment of participants. Finally, we want to thank Dr. Bernd Neidl from "Farbenhaut" (www.farbenhaut.de) and the "Bitte berühren" team of the Professional Association of the German Dermatologists (BVDD) for sharing the link to the study questionnaire on their respective Facebook pages.

Author contributions BS, LT, SZ, MCS: Conceptualization; BS, CP, MCS, AZ: methodology; BS: software; LT, SZ, MCS, AZ: validation; BS: formal analysis; TB, AZ: resources; BS: writing—original draft preparation; CP, LT, SZ, MCS, AZ: writing—review and editing; TB, AZ: supervision; MCS: project administration. All authors have read and agreed to the published version of the manuscript.

Funding Open Access funding enabled and organized by Projekt DEAL. The research was funded by the Department of Dermatology and Allergy, Technical University of Munich.

Data availability Data are available at http://dx.doi.org/10.23668/psycharchives.4451.

Code availability Code is available upon request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This study was reviewed and approved by the local ethics committee of Technical University of Munich (reference 25/19 S).

Consent to participate All participants provided informed consent prior to participation.

References

1. Michalek, I. M., Loring, B., & John, S. M. (2017). A systematic review of worldwide epidemiology of psoriasis. *Journal of the European Academy of Dermatology and Venereology, 31*(2), 205–212. https://doi.org/10.1111/jdv.13854
2. Tizek, L., Schielein, M. C., Seifert, F., Biedermann, T., Bohner, A., & Zink, A. (2019). Skin diseases are more common than we think: Screening results of an unreferred population at the Munich Oktoberfest. *Journal of the European Academy of Dermatology and Venereology, 33*(7), 1421–1428. https://doi.org/10.1111/jdv.15494
3. Boehncke, W.-H., & Schön, M. P. (2015). Psoriasis. *The Lancet, 386*(9997), 983–994. https://doi.org/10.1016/s0140-6736(14)61909-7
4. Damiani, G., Cazzaniga, S., Conic, R. R., & Naldi, L. (2019). Pruritus characteristics in a large Italian cohort of psoriatic patients. *Journal of the European Academy of Dermatology and Venereology, 33*(7), 1316–1324. https://doi.org/10.1111/jdv.15539
5. Pithadia, D. J., Reynolds, K. A., Lee, E. B., & Wu, J. J. (2019). Psoriasis-associated cutaneous pain: Etiology, assessment, impact, and management. *The Journal of Dermatological Treatment, 30*(5), 435–440. https://doi.org/10.1080/09546634.2018.1528330

6. Zink, A., Herrmann, M., Fischer, T., Lauffer, F., Garzorz-Stark, N., Bohner, A., et al. (2017). Addiction: An underestimated problem in psoriasis health care. *Journal of the European Academy of Dermatology and Venereology, 31*(8), 1308–1315. https://doi.org/10.1111/jdv.14204
7. Dalgard, F. J., Gieler, U., Tomas-Aragones, L., Lien, L., Poot, F., Jemec, G. B. E., et al. (2015). The psychological burden of skin diseases: A cross-sectional multicenter study among dermatological out-patients in 13 European countries. *The Journal of Investigative Dermatology, 135*(4), 984–991. https://doi.org/10.1038/jid.2014.530
8. Tomas-Aragones, L., & Marron, S. E. (2016). Body image and body dysmorphic concerns. *Acta Dermato Venereologica, 96*(217), 47–50. https://doi.org/10.2340/00015555-2368
9. Dimitrov, D., & Szepietowski, J. C. (2017). Stigmatization in dermatology with a special focus on psoriatic patients. *Postępy Higieny i Medycyny Doświadczalnej (Online), 71*, 1115–1122. https://doi.org/10.5604/01.3001.0010.6879
10. Hrehorow, E., Salomon, J., Matusiak, L., Reich, A., & Szepietowski, J. C. (2012). Patients with psoriasis feel stigmatized. *Acta Dermato Venereologica, 92*(1), 67–72. https://doi.org/10.2340/00015555-1193
11. Leisner, M. Z., Riis, J. L., Schwartz, S., Iversen, L., Ostergaard, S. D., & Olsen, M. S. (2019). Psoriasis and risk of mental disorders in Denmark. *JAMA Dermatology, 155*(6), 745–747. https://doi.org/10.1001/jamadermatol.2019.0039
12. World Health Organization. (2016). Global report on psoriasis. Retrieved July 2, 2018, from http://www.who.int/iris/handle/10665/204417
13. World Health Organization. (2014). Sixty-seventh world health assembly: Solutions and decisions. Retrieved August 3, 2020, from https://apps.who.int/gb/ebwha/pdf_files/WHA67-REC1/A67_2014_REC1-en.pdf?ua=1#page=25
14. Schielein, M. C., Tizek, L., Knobloch, L., Maaßen, D., Biedermann, T., & Zink, A. (under review). Psoriasis and addiction: Assessing mental health with a focus on depression and anxiety in patients with psoriasis across Germany.
15. Strober, B., Gooderham, M., de Jong, E. M. G. J., Kimball, A. B., Langley, R. G., Lakdawala, N., Goyal, K., Lawson, F., Langholff, W., Hopkins, L., Fakharzadeh, S., Srivastava, B., & Menter, A. (2018). Depressive symptoms, depression, and the effect of biologic therapy among patients in psoriasis longitudinal assessment and registry (PSOLAR). *Journal of American Academy of Dermatology, 78*(1), 70–80. https://doi.org/10.1016/j.jaad.2017.08.051
16. Tee, S. I., Lim, Z. V., Theng, C. T., Chan, K. L., & Giam, Y. C. (2016). A prospective cross-sectional study of anxiety and depression in patients with psoriasis in Singapore. *Journal of the European Academy of Dermatology and Venereology, 30*(7), 1159–1164. https://doi.org/10.1111/jdv.13615
17. World Health Organization. (1948). *Constitution of the world health organization*. World Health Organization.
18. Picardi, A., Pasquini, P., Abeni, D., Fassone, G., Mazzotti, E., & Fava, G. A. (2005). Psychosomatic assessment of skin diseases in clinical practice. *Psychotherapy and Psychosomatics, 74*(5), 315–322. https://doi.org/10.1159/000086323
19. Offidani, E., Del Basso, D., Prignago, F., & Tomba, E. (2016). Discriminating the presence of psychological distress in patients suffering from psoriasis: An application of the clinimetric approach in dermatology. *Acta Dermato Venereologica, 96*(217), 69–73. https://doi.org/10.2340/00015555-2369
20. Schuster, B., Ziehfreund, S., Albrecht, H., Spinner, C. D., Biedermann, T., Peifer, C., et al. (2020). Happiness in dermatology: A holistic evaluation of the mental burden of skin diseases. *Journal of the European Academy of Dermatology and Venereology, 34*(6), 1331–1339. https://doi.org/10.1111/jdv.16146
21. Solovan, C., Marcu, M., & Chiticariu, E. (2014). Life satisfaction and beliefs about self and the world in patients with psoriasis: A brief assessment. *European Journal of Dermatology, 24*(2), 242–247. https://doi.org/10.1684/ejd.2014.2295
22. Rzeszutek, M., Podkowa, K., Pieta, M., Pankowski, D., & Cyran-Stemplewska, S. (2021). Comparative study of life satisfaction among patients with psoriasis versus healthy comparison group: The explanatory role of body image and resource profiles. *Quality of Life Research, 30*(1), 181–191. https://doi.org/10.1007/s11136-020-02621-3
23. Martin-Brufau, R., Romero-Brufau, S., Martin-Gorgojo, A., Brufau Redondo, C., Corbalan, J., & Ulnik, J. (2015). Psoriasis lesions are associated with specific types of emotions. Emotional profile in psoriasis. *European Journal of Dermatology, 25*(4), 329–334. https://doi.org/10.1684/ejd.2015.2577
24. Reimus, J. L., Vingerhoets, A. J., Soons, P. H., & Korstanje, M. J. (2007). Suffering in psoriasis patients: Its relation with illness severity and subjective well-being. *International Journal of Dermatology, 46*(10), 1042–1045. https://doi.org/10.1111/j.1365-4632.2007.03191.x
25. Diener, E., Oishi, S., & Lucas, R. E. (2009). Subjective well-being: The science of happiness and life satisfaction. In S. J. Lopez & C. R. Synder (Eds.), *The Oxford handbook of positive psychology* (2nd ed.). Oxford University Press.
26. Zidane, M., Dressler, C., Gaskins, M., & Nast, A. (2019). Decision-analytic modeling for time-effectiveness of the sequence of induction treatments for moderate to severe plaque psoriasis. *JAMA Dermatology*. https://doi.org/10.1001/jamadermatol.2019.2941
27. Pereira, M. G., Brito, L., & Smith, T. (2012). Dyadic adjustment, family coping, body image, quality of life and psychological morbidity in patients with psoriasis and their partners. *International Journal of Behavioral Medicine, 19*(3), 260–269. https://doi.org/10.1007/s12529-011-9174-5
28. Cummins, R. A. (2013). Measuring happiness and subjective well-being. In S. A. David, I. Boniwell, & A. Conley Ayers (Eds.), *The Oxford handbook of happiness*. Oxford University Press.
29. Veenhoven, R. (2013). Notions of the good life. In S. A. David, I. Boniwell, & A. Conley Ayers (Eds.), *The Oxford handbook of happiness*. Oxford University Press.
30. Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*(3), 542–575.
31. Bahmer, J. A., Kuhl, J., & Bahmer, F. A. (2007). How do personality systems interact in patients with psoriasis, atopic dermatitis and urticaria? *Acta Dermato Venereologica, 87*(4), 317–324. https://doi.org/10.2340/00015555-0246
32. Jankowiak, B., Sekmistrz, S., Kowalewska, B., Niczyporuk, W., & Krajewska-Kulak, E. (2013). Satisfaction with life in a group of psoriasis patients. *Postepy Dermatol Alergol, 30*(2), 85–90. https://doi.org/10.5114/pdia.2013.34156
33. Dowlatshahi, E. A., Wakkee, M., Arends, L. R., & Nijsten, T. (2014). The prevalence and odds of depressive symptoms and clinical depression in psoriasis patients: A systematic review and meta-analysis. *The Journal of Investigative Dermatology, 134*(6), 1542–1551. https://doi.org/10.1038/jid.2013.508
34. Lukmanji, A., Basmadjian, R. B., Vallerand, I. A., Patten, S. B., & Tang, K. L. (2020). Risk of depression in patients with psoriatic disease: A systematic review and meta-analysis. *Journal of Cutaneous Medicine and Surgery*. https://doi.org/10.1177/1203475420977477
35. World Health Organization. (2016). *ICD-10: International statistical classification of diseases and related health problems: 10th revision* (5th ed.). Word Health Organization.

36. George, D., & Mallery, P. (2003). *SPSS for windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Allyn & Bacon.
37. Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D., Oishi, S., & Biswas-Diener, R. (2010). New measures of well-being: Flourishing and positive and negative feelings. *Social Indicators Research, 39*(2), 143.
38. Rahm, T., Heise, E., & Schuldt, M. (2017). Measuring the frequency of emotions-validation of the scale of positive and negative experience (SPANE) in Germany. *PLoS ONE, 12*(2), e0171288. https://doi.org/10.1371/journal.pone.0171288
39. Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070.
40. Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*, 71–75.
41. Glaesmer, H., Grande, G., Braehler, E., & Roth, M. (2011). The German version of the satisfaction with life scale (SWLS). *European Journal of Psychological Assessment, 27*(2), 127–132. https://doi.org/10.1027/1015-5759/a000058
42. European Social Survey. (2016). *ESS round 8 source questionnaire*. ESS ERIC Headquarters c/o City University London.
43. World Health Organization. (1998). Use of well-being measures in primary health care—The DepCare Projects.
44. Lowe, B., Spitzer, R. L., Grafe, K., Kroenke, K., Quenter, A., Zipfel, S., et al. (2004). Comparative validity of three screening questionnaires for DSM-IV depressive disorders and physicians? Diagnoses. *Journal of Affective Disorders, 78*(2), 131–140. https://doi.org/10.1016/s0165-0327(02)00237-9
45. Hinkle, D., Wiersma, W., & Jurs, S. (2003). *Applied statistics for the behavioral sciences* (5th ed.). Houghton Mifflin Company.
46. Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin, 103*(2), 265–275.
47. Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika, 30*, 179–185. https://doi.org/10.1007/BF02289447
48. Brähler, E., Mühlan, H., Albani, C., & Schmidt, S. (2007). Teststatistische Prüfung und Normierung der deutschen Versionen des EUROHIS-QOL Lebensqualität-Index und des WHO-5 Wohlbefindens-Index. *Diagnostica, 53*(2), 83–96. https://doi.org/10.1026/0012-1924.53.2.83
49. Schnaudt, C. (2016). Country-specific, cumulative ESS data set for Germany 2002–2004 (ESSDE1-7e01). Retrieved from https://www.europeansocialsurvey.org/about/country/germany/german_data.html
50. Knief, U., & Forstmeier, W. (2020). Violating the normality assumption may be the lesser of two evils. *bioRxiv*. https://doi.org/10.1101/498931
51. Shields, J. L. (1978). *An Empirical Investigation of the Effect of Heteroscedasticity and Heterogeneity of Variance on the Analysis of Covariance and the Johnson-Neyman Technique*. Army research inst. for the behavioral and social sciences. Retrieved from https://apps.dtic.mil/dtic/tr/fulltext/u2/a058205.pdf
52. Rasch, D., & Guiard, V. (2004). The robustness of parametric statistical methods. *Psychology Science, 46*(2), 175–208.
53. Lorenzo-Seva, U., & Ferrando, P. J. (2006). FACTOR: A computer program to fit the exploratory factor analysis model. *Behavior Research Methods, 38*(1), 88–91. https://doi.org/10.3758/bf03192753
54. Hays, R. D., & Fayers, P. M. (2021). Overlap of depressive symptoms with health-related quality-of-life measures. *PharmacoEconomics, 39*(6), 627–630. https://doi.org/10.1007/s40273-020-00972-w
55. Westerhof, G. J., & Keyes, C. L. (2010). Mental illness and mental health: The two continua model across the lifespan. *Journal of Adult Development, 17*(2), 110–119. https://doi.org/10.1007/s10804-009-9082-y
56. Gargiulo, R. A., & Stokes, M. A. (2008). Subjective well-being as an indicator for clinical depression. *Social Indicators Research, 92*(3), 517–527. https://doi.org/10.1007/s11205-008-9301-0
57. Lukat, J., Margraf, J., Lutz, R., van der Veld, W. M., & Becker, E. S. (2016). Psychometric properties of the positive mental health scale (PMH-scale). *BMC Psychology, 4*(1), 8. https://doi.org/10.1186/s40359-016-0111-x
58. Tizek, L., Schielein, M. C., & Zink, A. (2020). PeakPASI: A new measurement tool in psoriasis care. *Journal of the American Academy of Dermatology*. https://doi.org/10.1016/j.jaad.2020.08.096
59. World Health Organization. (2010). *People-centred care in low- and middle-income countries*. WHO Press.
60. Fortune, D. G., Richards, H. L., Kirby, B., Bowcock, S., Main, C. J., & Griffiths, C. E. (2002). A cognitive-behavioural symptom management programme as an adjunct in psoriasis therapy. *British Journal of Dermatology, 146*(3), 458–465. https://doi.org/10.1046/j.1365-2133.2002.04622.x
61. Rousset, L., & Halioua, B. (2018). Stress and psoriasis. *International Journal of Dermatology, 57*(10), 1165–1172. https://doi.org/10.1111/ijd.14032
62. Robles, T. F., Brooks, K. P., & Pressman, S. D. (2009). Trait positive affect buffers the effects of acute stress on skin barrier recovery. *Health Psychology, 28*(3), 373–378. https://doi.org/10.1037/a0014662
63. Steptoe, A., Dockray, S., & Wardle, J. (2009). Positive affect and psychobiological processes relevant to health. *Journal of Personality, 77*(6), 1747–1776. https://doi.org/10.1111/j.1467-6494.2009.00599.x

References

1. White JML, Lui H, Chute CG, Jakob R, Chalmers RJG. The WHO ICD-11 Classification of Dermatological Diseases: a new comprehensive online skin disease taxonomy designed by and for dermatologists. Br J Dermatol. 2021.

2. Kurzban R, Leary MR. Evolutionary origins of stigmatization: the functions of social exclusion. Psychol Bull. 2001;127(2):187-208.

3. Solovan C, Marcu M, Chiticariu E. Life satisfaction and beliefs about self and the world in patients with psoriasis: a brief assessment. Eur J Dermatol. 2014;24(2):242-7.

4. Jafferany M, Franca K. Psychodermatology: Basics Concepts. Acta Derm Venereol. 2016;96(217):35-7.

5. Aydin E, Atis G, Bolu A, Aydin C, Karabacak E, Dogan B, et al. Identification of anger and self-esteem in psoriasis patients in a consultation-liaison psychiatry setting: a case control study. Psychiatry and Clinical Psychopharmacology. 2017;27(3):216-20.

6. Rzeszutek M, Podkowa K, Pieta M, Pankowski D, Cyran-Stemplewska S. Comparative study of life satisfaction among patients with psoriasis versus healthy comparison group: the explanatory role of body image and resource profiles. Qual Life Res. 2021;30(1):181-91.

7. Picardi A, Pasquini P, Abeni D, Fassone G, Mazzotti E, Fava GA. Psychosomatic assessment of skin diseases in clinical practice. Psychother Psychosom. 2005;74(5):315-22.

8. Harth W, Gieler U. Psychosomatische Dermatologie. Heidelberg: Springer; 2005.

9. Dalgard FJ, Gieler U, Tomas-Aragones L, Lien L, Poot F, Jemec GBE, et al. The psychological burden of skin diseases: a cross-sectional multicenter study among dermatological out-patients in 13 European countries. J Invest Dermatol. 2015;135(4):984-91.

10. Zink A, Herrmann M, Fischer T, Lauffer F, Garzorz-Stark N, Bohner A, et al. Addiction: an underestimated problem in psoriasis health care. J Eur Acad Dermatol Venereol. 2017;31(8):1308-15.

11. Germain N, Augustin M, Francois C, Legau K, Bogoeva N, Desroches M, et al. Stigma in visible skin diseases - a literature review and development of a conceptual model. J Eur Acad Dermatol Venereol. 2021;35(7):1493-504.

12. Layton AM, Thiboutot D, Tan J. Reviewing the global burden of acne: how could we improve care to reduce the burden? Br J Dermatol. 2021;184(2):219-25.

13. Dalgard FJ, Svensson A, Halvorsen JA, Gieler U, Schut C, Tomas-Aragones L, et al. Itch and Mental Health in Dermatological Patients across Europe: A Cross-Sectional Study in 13 Countries. J Invest Dermatol. 2020;140(3):568-73.

14. Silverberg JI, Gelfand JM, Margolis DJ, Boguniewicz M, Fonacier L, Grayson MH, et al. Patient burden and quality of life in atopic dermatitis in US adults: A population-based cross-sectional study. Ann Allergy Asthma Immunol. 2018;121(3):340-7.

15. Wu JJ, Feldman SR, Koo J, Marangell LB. Epidemiology of mental health comorbidity in psoriasis. J Dermatolog Treat. 2018;29(5):487-95.

16. Pompili M, Innamorati M, Forte A, Erbuto D, Lamis DA, Narcisi A, et al. Psychiatric comorbidity and suicidal ideation in psoriasis, melanoma and allergic disorders. Int J Psychiatry Clin Pract. 2017;21(3):209-14.

17. Yaghmaie P, Koudelka CW, Simpson EL. Mental health comorbidity in patients with atopic dermatitis. J Allergy Clin Immunol. 2013;131(2):428-33.

18. World Health Organization. Constitution of the World Health Organization. Geneva: World Health Organization; 1948.

19. Ryff CD, Singer B. The Contours of Positive Human Health. Psychological Inquiry. 1998;9(1):1-28.

20. Wood-Dauphinee S. Assessing Quality of Life in Clinical Research. Journal of Clinical Epidemiology. 1999;52(4):355-63.

21. Sfeatcu R, Cernuşcă-Miţariu M, Ionescu C, Roman M, Cernuşcă-Miţariu S, Coldea L, et al. The Concept of Wellbeing in Relation to Health and Quality of Life. European Journal of Science and Theology. 2014;10(123-128).

22. Gable SL, Haidt J. What (and Why) is Positive Psychology? Review of General Psychology. 2005;9(2):103-10.

23. Deci EL, Ryan RM. Hedonia, eudaimonia, and well-being: an introduction. Journal of Happiness Studies. 2006;9(1):1-11.

24. Gallagher MW, Lopez SJ, Preacher KJ. The hierarchical structure of well-being. J Pers. 2009;77(4):1025-50.

25. Cummins RA. Measuring Happiness and Subjective Well-Being. In: David SA, Boniwell I, Conley Ayers A, editors. The Oxford Handbook of Happiness. Oxford: Oxford University Press; 2013.

26. Veenhoven R. Notions of the Good Life. In: David SA, Boniwell I, Conley Ayers A, editors. The Oxford Handbook of Happiness. Oxford: Oxford University Press; 2013.

27. Diener E, Oishi S, Lucas RE. Subjective Well-Being: The Science of Happiness and Life Satisfaction. In: Lopez SJ, Synder CR, editors. The Oxford Handbook of Positive Psychology (2nd ed). Oxford: Oxford University Press; 2009.

28. Diener E. Subjective Well-Being. Psychol Bull. 1984;95(3):542-75.

29. Bennett PN, Weinberg MK, Bridgman T, Cummins RA. The Happiness and Subjective Well-Being of People on Haemodialysis. J Ren Care. 2015;41(3):156-61.

30. Furrer A, Michel G, Terrill AL, Jensen MP, Muller R. Modeling subjective well-being in individuals with chronic pain and a physical disability: the role of pain control and pain catastrophizing. Disabil Rehabil. 2017:1-10.

31. Wikman A, Wardle J, Steptoe A. Quality of life and affective well-being in middle-aged and older people with chronic medical illnesses: a cross-sectional population based study. PLoS One. 2011;6(4):e18952.

32. Martin-Brufau R, Romero-Brufau S, Martin-Gorgojo A, Brufau Redondo C, Corbalan J, Ulnik J. Psoriasis lesions are associated with specific types of emotions. Emotional profile in psoriasis. Eur J Dermatol. 2015;25(4):329-34.

33. Bahmer JA, Kuhl J, Bahmer FA. How do personality systems interact in patients with psoriasis, atopic dermatitis and urticaria? Acta Derm Venereol. 2007;87(4):317-24.

34. Reimus JL, Vingerhoets AJ, Soons PH, Korstanje MJ. Suffering in psoriasis patients: its relation with illness severity and subjective well-being. Int J Dermatol. 2007;46(10):1042-5.

35. Jankowiak B, Sekmistrz S, Kowalewska B, Niczyporuk W, Krajewska-Kulak E. Satisfaction with life in a group of psoriasis patients. Postepy Dermatol Alergol. 2013;30(2):85-90.

36. Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: The PANAS Scales. Journal of Personality and Social Psychology. 1988; 54(6):1063-70.

37. Diener E, Wirtz D, Tov W, Kim-Prieto C, Choi D, Oishi S, et al. New measures of well-being: Flourishing and positive and negative feelings. Soc Indic Res. 2010;39(2):143.

38. Diener E, Emmons RA, Larsen RJ, Griffin S. The Satisfaction with Life Scale. J Pers Assess. 1985;49:71-5.

39. Gunthard HF, Saag MS, Benson CA, del Rio C, Eron JJ, Gallant JE, et al. Antiretroviral Drugs for Treatment and Prevention of HIV Infection in Adults: 2016 Recommendations of the International Antiviral Society-USA Panel. JAMA. 2016;316(2):191-210.

40. Logie C, Gadalla TM. Meta-analysis of health and demographic correlates of stigma towards people living with HIV. AIDS Care. 2009;21(6):742-53.

41. Rueda S, Mitra S, Chen S, Gogolishvili D, Globerman J, Chambers L, et al. Examining the associations between HIV-related stigma and health outcomes in people living with HIV/AIDS: a series of meta-analyses. BMJ Open. 2016;6(7):e011453.

42. Bielefeldt K, Davis B, Binion DG. Pain and inflammatory bowel disease. Inflamm Bowel Dis. 2009;15(5):778-88.

43. Steptoe A, Dockray S, Wardle J. Positive affect and psychobiological processes relevant to health. J Pers. 2009;77(6):1747-76.

44. Diener E, Pressman SD, Hunter J, Delgadillo-Chase D. If, Why, and When Subjective Well-Being Influences Health, and Future Needed Research. Appl Psychol Health Well Being. 2017;9(2):133-67.

45. Broadbent E, Koschwanez HE. The psychology of wound healing. Curr Opin Psychiatry. 2012;25(2):135-40.

46. Kurd SK, Troxel AB, Crits-Christoph P, Gelfand JM. The risk of depression, anxiety, and suicidality in patients with psoriasis: a population-based cohort study. Arch Dermatol. 2010;146(8):891-5.

47. Lukmanji A, Basmadjian RB, Vallerand IA, Patten SB, Tang KL. Risk of Depression in Patients With Psoriatic Disease: A Systematic Review and Meta-Analysis. J Cutan Med Surg. 2020:1203475420977477.

48. Dommasch ED, Li T, Okereke OI, Li Y, Qureshi AA, Cho E. Risk of depression in women with psoriasis: a cohort study. Br J Dermatol. 2015;173(4):975-80.

49. Ring J, Zink A, Arents BWM, Seitz IA, Mensing U, Schielein MC, et al. Atopic eczema: burden of disease and individual suffering - results from a large EU study in adults. J Eur Acad Dermatol Venereol. 2019;33(7):1331-40.

50. Peh CX, Liu J, Bishop GD, Chan HY, Chua SM, Kua EH, et al. Emotion regulation and emotional distress: The mediating role of hope on reappraisal and anxiety/depression in newly diagnosed cancer patients. Psychooncology. 2017;26(8):1191-7.

51. Schuster B, Ziehfreund S, Albrecht H, Spinner CD, Biedermann T, Peifer C, et al. Happiness in dermatology: a holistic evaluation of the mental burden of skin diseases. J Eur Acad Dermatol Venereol. 2020;34(6):1331-9.

52. Muller K, Karrer S, Apfelbacher C, Blome C, Berneburg M, Koller M. [Quality of life in dermatology. From measurement to practical implementation]. Hautarzt. 2015;66(4):287-96; quiz 97-8.

53. Bottomley A, Jones D, Claassens L. Patient-reported outcomes: assessment and current perspectives of the guidelines of the Food and Drug Administration and the reflection paper of the European Medicines Agency. Eur J Cancer. 2009;45(3):347-53.

54. Chernyshov PV. The Evolution of Quality of Life Assessment and Use in Dermatology. Dermatology. 2019;235(3):167-74.

55. Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI)--a simple practical measure for routine clinical use. Clin Exp Dermatol. 1994;19(3):210-6.

56. Angermeyer MC, Kilian R, Matschinger H. WHOQOL-100 und WHOQOL-Bref. Göttingen: Hogrefe-Verlag; 2000.

57. Schuster B, Peifer C, Ziehfreund S, Tizek L, Biedermann T, Zink A, et al. Happiness and depression in psoriasis: a cross-sectional study in Germany. Qual Life Res. 2021.

58. World Health Organization. Sixty-seventh World Health Assembly: solutions and decisions 2014 [Available from: https://apps.who.int/gb/ebwha/pdf_files/WHA67-REC1/A67_2014_REC1-en.pdf?ua=1#page=25.

59. World Health Organization. Global report on psoriasis Geneva: World Health Organization; 2016 [2 July 2018]. Available from: http://www.who.int/iris/handle/10665/204417.

60. Offidani E, Del Basso D, Prignago F, Tomba E. Discriminating the Presence of Psychological Distress in Patients Suffering from Psoriasis: An Application of the Clinimetric Approach in Dermatology. Acta Derm Venereol. 2016;96(217):69-73.

61. Westerhof GJ, Keyes CL. Mental Illness and Mental Health: The Two Continua Model Across the Lifespan. J Adult Dev. 2010;17(2):110-9.

62. Gargiulo RA, Stokes MA. Subjective Well-Being as an Indicator for Clinical Depression. Social Indicators Research. 2008;92(3):517-27.

63. World Health Organization. ICD-10: international statistical classification of diseases and related health problems: 10th revision, 5th ed. Geneva: Word Health Organization; 2016.

64. World Health Organization. Use of Well-Being Measures in Primary Health Care - The DepCare Projects1998. Available from: http://www.euro.who.int/__data/assets/pdf_file/0016/130750/E60246.pdf.

65. Pressman SD, Cohen S. Does positive affect influence health? Psychol Bull. 2005;131(6):925-71.

66. Pressman SD, Jenkins BN, Moskowitz JT. Positive Affect and Health: What Do We Know and Where Next Should We Go? Annual Review of Psychology. 2019;70(1):627-50.

Acknowledgements

My PhD studies have been full of happiness, and I have a number of people to thank for this:

First and foremost, I want to thank my amazing supervisor PD Dr. Dr. Alexander Zink. Your support and your trust have been the foundation of my academic career and have allowed me to grow both professionally and personally. Your curiosity, your positive mindset and your drive are a true source of inspiration, and I am more than grateful to have you as a mentor and friend. Thank you for everything!

Moreover, I want to thank my second supervisor, PD Dr. Heike Künzel, as well as PD Dr. Caroline Jung-Sievers and Dr. Cornelia Oberhauser, who have supported me as my Thesis Advisory Committee, and who have been very encouraging, supportive and open-minded since the very beginning.

Furthermore, I want to thank Prof. Dr. Ulrich Mansmann for giving me the possibility to be a part of this PhD program, and Dr. Annette Hartmann and Monika Darchinger for their competent and reliable support.

Moreover, I want to thank Prof. Corinna Peifer, who has supported me with her expertise in the field of positive psychology. Her invaluable scientific input has made it possible for me to research one of the most beautiful aspects of human life: happiness.

Further, I want to thank my incredible team, with whom I did not only research but also live happiness. Steffi, Linda, Max, you were the most supportive team I could ever have hoped for, and I am beyond grateful for the many happy memories we made.

I further want to thank the whole Biederstein team as well as my co-authors for supporting me and my research.

Last but not least, I want to thank my family, my friends, and most of all my amazing husband, who are my personal source of happiness.