SHORT REPORT

UV light set-ups for vitiligo photography, a comparative study on image quality and ease of use

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Abstract

Background Ultraviolet (UV) light is an essential tool to assess the extent, spreading and staging of vitiligo. Different UV light set-ups are used for vitiligo photography, including the following: (i) hand-held Wood's lamps; (ii) soft boxes with UV lamps; (iii) UV flash attached to the camera; and (iv) high output UV flash.

Objective Our objective was to compare UV light set-ups for vitiligo photography regarding image quality and ease of use.

Methods Patients with vitiligo lesions with unclear borders were included. Two images were made with all four UV set-ups per patient, for a large and a small area. Image quality was scored separately by three blinded vitiligo experts on five criteria: overall quality, clearness of borders, contrast and sharpness and for larger areas the shadows. The two professional medical photographers were asked to score the ease of use for each set-up.

Results A total of 88 photos were assessed from 11 patients. For larger areas, the frequency of a 'good' or 'very good' overall quality rating was 12.1% (Wood's), 6.1% (soft boxes), 15.2% (camera flash) and 78.8% (high output flash). For smaller areas, the score 'good' or 'very good' was given to 54.5%, 3%, 66.6% and 84.8% in the same order. For the shadow criteria, each set-up scored below 40% on a 'good' or 'very good' score. The high output flash was scored as most easy to use by the photographers.

Conclusion When comparing four different UV light set-ups for vitiligo photography, we concluded that the UV set-ups strongly influenced the quality scores of the obtained images. The high output flash scored best for both small and large areas and for ease of use. For small areas, Wood's lamp and camera flash were acceptable. All set-ups scored badly for shadows, and more research is needed to find the optimal exposure to avoid shadows.

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Conflicts of interest

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Introduction

Vitiligo is a skin disorder characterized by patchy leukoderma that can have a significant negative effect on the quality of life.[1,2] For evaluation of different therapies and for research on vitiligo, photographs are made. When borders of lesions are not clear, it is common to use Wood's lamp emitting UV light to increase the contrast. Moreover, Wood's lamp is recommended to assess the extent, spreading and staging of vitiligo in selected areas.[3] Different methods to create UV exposure are used for vitiligo photography; however, there is no consensus.

Four methods for UV exposure in vitiligo photography are as follows: (i) hand-held Wood's lamps (Wood's lamps), these are the most commonly known in the field of dermatology and vitiligo,[3,4] (ii) soft boxes with UV lamps without the translucent cloths (soft boxes), by reflecting the light towards the patient these can potentially reduce shadow forming, (iii) UV flash attached to the camera (camera flash), this device is potentially easy to use, and (iv) separate high output UV flash (high output flash), described in a previous study by van Geel et al.[5] All four methods are shown in Fig. 1.

These set-ups have specific advantages and disadvantages. Wood's lamps and soft boxes give continuous UV exposure, allowing the photographer to optimize the angle and distance between the UV source and skin. On the other hand, the intensity of the light for both set-ups is low, leading to lack of resolution and/or focus hampering large area photography. Another

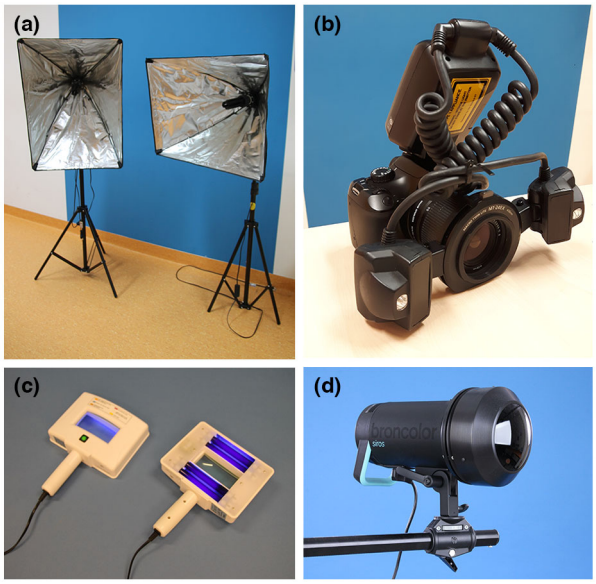

Figure 1 The UV light set-ups: (a) soft boxes; (b) camera flash; (c) Wood's lamps; (d) high output flash.

disadvantage of Wood's lamps is that an assistant is needed to hold the lamps. A benefit of the camera flash is the autofocus assist light. But a disadvantage is its design to fit only one specific camera. The high output flash has the benefit that normal background light does not need to be switched off, due to the high UV exposure.

Expenses differ between set-ups. While for Wood's lamps and soft boxes costs are quite low (estimate below €200), a camera flash or high output flash are more expensive (estimate around €1000–€2000).

In clinical research, the extent of the vitiligo is often measured with clinical scoring systems (e.g. vitiligo extent score; the vitiligo area scoring index[6,7]) based on (un)blinded evaluation of images.[8–10] These scoring systems could benefit from large area photography. The UV set-up may influence the outcomes of research urging efforts for optimization and standardization.[5] The objective of our study was to compare UV light set-ups for vitiligo photography regarding image quality and ease of use.

Materials and methods

This study was performed at the Netherlands Institute for Pigment Disorders in Amsterdam. Inclusion criteria for patients were as follows: (i) diagnosis of vitiligo; (ii) age 18 or older; (iii) vitiligo lesions with (partially) unclear borders on the arms, hands, legs and/or trunk.

All eligible patients visiting the Netherlands Institute for Pigment Disorders in the Amsterdam University Medical Centers in Amsterdam that were sent to the medical photographer were consecutively asked to enter the study. If informed consent was given, patients were included. This study was not subject to the WMO (Medical Research Involving Human Subjects Act), and approval was granted by the local Medical Ethical Committee.

We compared four UV set-ups that are commonly used to administer UV light for vitiligo photography:

1 Two hand-held Wood's lamps (1004 Wood's lamp, 22W) placed on both sides of the patient as close as possible without entering the frame of the image (Wood's lamps).
2 Two soft boxes with UV light bulbs (Omnilux, 25W) without the translucent cloths placed on both sides of the patient as close as possible without entering the frame of the image (soft boxes).
3 A UV flash device with two lamps that can be attached to the camera (Canon MT-24EX Macro Twin Lite Flash; camera flash).
4 A separate high output UV flash device (Broncolor, Siros 800 S Wi-Fi RFS 2.1 with UV attachment; high output flash).

All four UV set-ups are shown in Fig. 1. Per patient five photographs were taken for both a larger (e.g. the whole limb or trunk) and for a smaller (the lesional) area; one with each UV set-up and a reference photo. Two professional medical photographers took the photographs using a Nikon D750 camera with a 60 mm macro lens. Images were assessed separately by three blinded physicians, not knowing which UV set-up was used for which image. They were asked to score each image on five different criteria: (i) overall quality (ii) the clearness of the lesional borders, (iii) the contrast between lesional and non-lesional skin, (iv) the sharpness of the image and (v) in the case of a larger area for shadows. The five criteria were rated on a 5-point scale: very poor; poor; average; good or very good.

Additionally, the photographers were asked separately to score the ease of use, the time needed and the need of assistance on a 5-point Likert scale ranging from − − (very negative) to ++ (very positive) for each technique.

Scores were collected, and frequency of the scores for each criterion was assessed by descriptive statistics. Furthermore, for each criteria Pearson's chi-squared tests were performed to assess the differences in quality scores between the UV set-ups. The tests were two-sided, and after the Bonferroni correction for the nine different correlations, the statistical level of significance was set at $P < 0.0056$.

Results

A total of 88 images were assessed from eleven patients with non-segmental vitiligo (five females). The median age was 47 years (range 31–68). An example of all photographs taken of one patient is shown in Fig. 2.

The scores for overall quality of the UV set-ups from the blinded physicians are shown in Fig. 3. The frequency of a 'good' or 'very good' overall quality rating was 12.1% (Wood's lamps), 6.1% (soft boxes), 15.2% (camera flash) and 78.8%

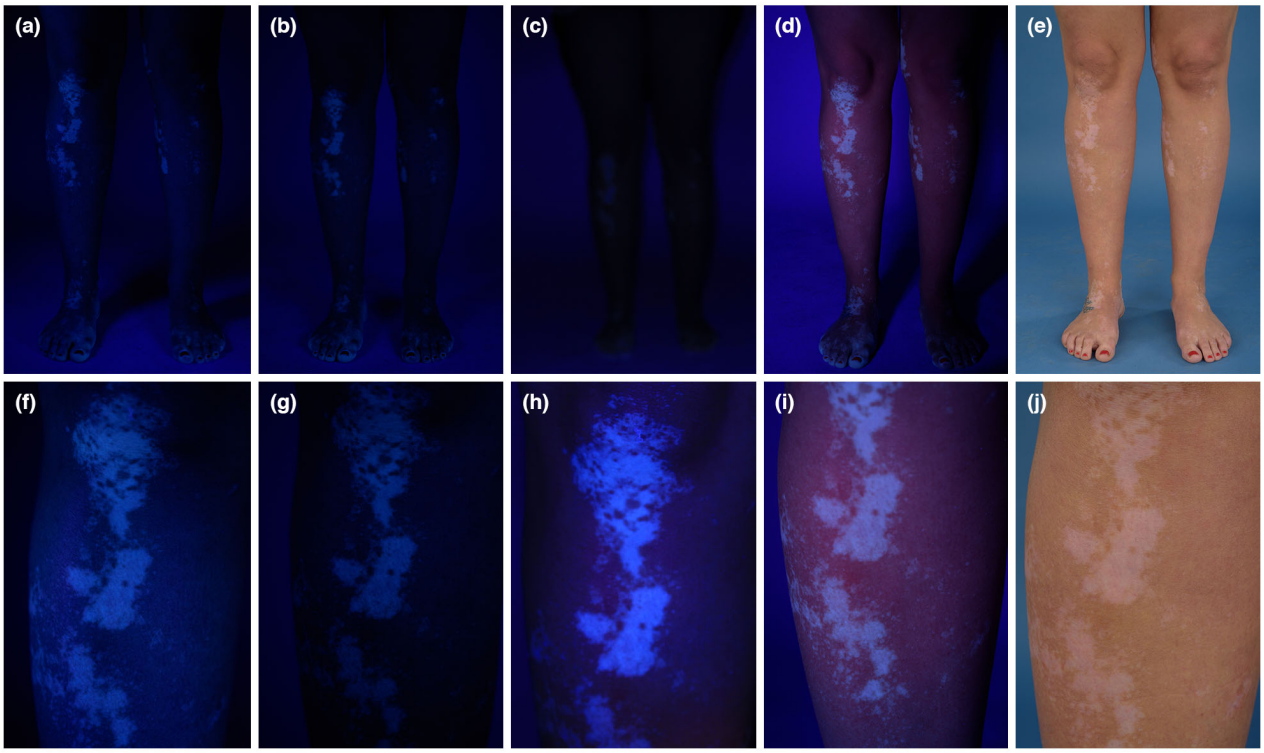

Figure 2 Images of a large area and a smaller area with the different UV light set-ups. Large area: (a) Wood's lamps; (b) soft boxes; (c) camera flash; (d) high output flash; (e) normal light. Smaller area: (f) Wood's lamps; (g) soft boxes; (h) camera flash; (i) high output flash; (j) normal light.

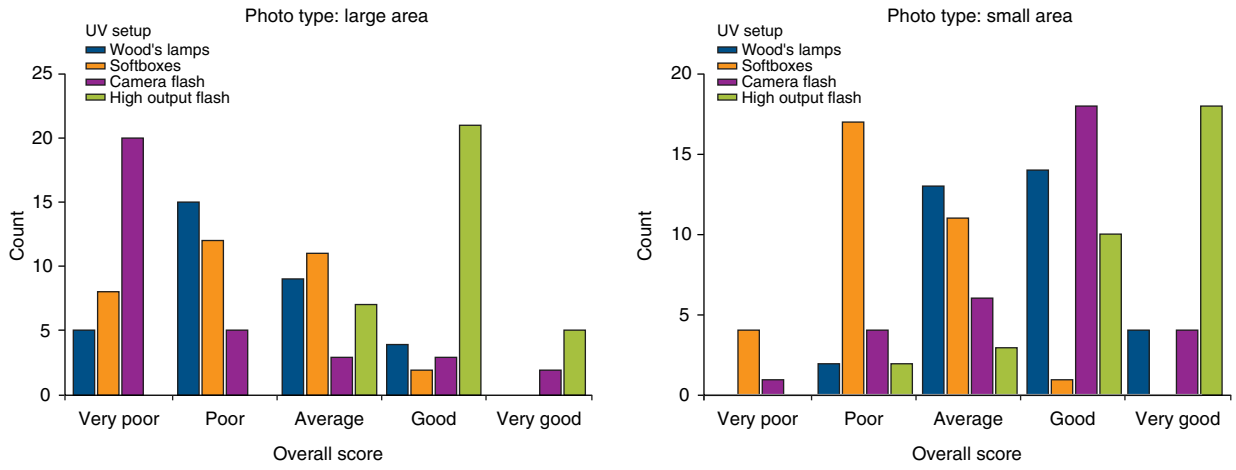

Figure 3 Overall image quality score per UV light set-up.

(high output flash). For smaller areas, the score 'good' or 'very good' for overall quality was 54.5% (Wood's lamps), 3% (soft boxes), 66.6% (camera flash) and 84.8% (high output flash).

For larger areas, the amount of shadows were scored; the better the quality the fewer shadows. The frequency of a 'good' or 'very good' quality score for this item was lower than 40% for all set-ups. Table 1 shows the frequency of a 'good' or 'very good' quality rating per criterion for each UV set-up. For each criterion, the differences between the UV light set-ups were significant with P values below 0.0001.

Table 1 Score 'good' or 'very good' quality by blinded physicians for each UV light set-up

	Wood's lamps (%)	Soft boxes (%)	Camera flash (%)	High output flash (%)	*P*
Larger area					
Overall quality	12.1	6.1	15.2	78.8	<0.001*
Clearness of the lesional borders	9.1	3	15.1	87.9	<0.001*
Contrast†	12.1	9.1	18.2	90.9	<0.001*
Sharpness	60.1	12.1	9.1	97	<0.001*
Shadows‡	15.2	21.3	9.1	39.4	<0.001*
Smaller area					
Overall quality	54.5	3	66.6	84.8	<0.001*
Clearness of the lesional borders	54.6	3	57.6	84.8	<0.001*
Contrast*	60.6	3	63.6	87.9	<0.001*
Sharpness	48.5	3	57.6	81.8	<0.001*

Percentages are the frequency that the UV set-up quality was scored 'good' or 'very good' for that criterion.
P-value of two-sided chi-squared test.
*Significant.
†Contrast between lesional and non-lesional skin.
‡Shadows were scored 'very good' if the UV set-up did not create shadow in the image.

Table 2 Ease of use scored by two photographers

	Wood's lamps	Soft boxes	Camera flash	High output flash
Ease of use				
Photographer 1	−−	+	−	+
Photographer 2	−	−	+	+
Time needed				
Photographer 1	−−	+/−	+	++
Photographer 2	+/−	+	++	
Need of assistance				
Photographer 1	−−	+	+	++
Photographer 2	−−	+	++	++

− − very negative; − negative; +/− average; + positive; ++ very positive.

The scores of both photographers working with the different UV light set-ups for the study are shown in Table 2.

Discussion

We found that the quality scores of the images varied largely between the UV set-ups. The high output flash scored highest for both small and large areas on all criteria. Furthermore, this device scored best for ease of use. For small areas, Wood's lamp and camera flash had average scores, while the soft boxes scored low on quality for both small and larger areas. The frequency of a 'good' or 'very good' score for the criteria shadows was lower than 40% for each UV set-up.

While the soft boxes were scored more easy to use than Wood's lamps and do not require assistance, the sharpness of the images was scored better for Wood's lamps. This is probably due to the fact that these lamps can be held very close to the lesional skin. The camera flash seems quite easy to use, but the quality scores for large areas were very poor. The quality of the camera flash for smaller areas was scored generally as good, so this set-up could be useful for the photographic assessment of target lesions in vitiligo. The high output flash showed good quality for all criteria except shadows. To create optimal illumination without shadows, possibly two high output flashlight could be used, but our estimate is that this would increase the costs to more than a 10-fold of the costs for Wood's lamps.

Strengths of this study include the consecutive inclusion of patients and the blinded assessment by three different vitiligo experts. On the other hand, limitations are the small sample size, the fact that outcomes may depend on specific devices and other brands could differ in UV intensity or technical details.

Comparing four different UV light set-ups for vitiligo photography, we concluded that the UV set-ups strongly influenced the quality scores of the obtained images. The high output flash scored best for both small and large areas and for ease of use. For small areas, Wood's lamp and camera flash were acceptable. All set-ups scored badly for shadows. Possibly, multiple flash devices could reduce shadows. More research is needed to find the optimal exposure to avoid shadows.

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References

1 Ezzedine K, Sheth V, Rodrigues M *et al*. Vitiligo is not a cosmetic disease. *J Am Acad Dermatol* 2015; **73**: 883–885.
2 Linthorst Homan MW, Spuls PI, de Korte J, Bos JD, Sprangers MA, van der Veen JPW. The burden of vitiligo: patient characteristics associated with quality of life. *J Am Acad Dermatol* 2009; **61**: 411–420.
3 Taieb A, Picardo M. The definition and assessment of vitiligo: a consensus report of the Vitiligo European Task Force. *Pigment cell Res* 2007; **20**: 27–35.

4 Asawanonda P, Taylor CR. Wood's light in dermatology. *Int J Dermatol* 1999; **38**: 801–807.
5 van Geel N, Vandendriessche D, Vandersichel E *et al*. Reference method for digital surface measurement of target lesions in vitiligo: a comparative analysis. *Br J Dermatol* 2018; 1–8.
6 van Geel N, Lommerts J, Bekkenk M *et al*. Development and validation of the vitiligo extent score (VES): an international collaborative initiative. *J Invest Dermatol* 2016; **136**: 978–984.
7 Hamzavi I, Jain H, McLean D, Shapiro J, Zeng H, Lui H. Parametric modeling of narrowband UV-B phototherapy for vitiligo using a novel quantitative tool. *Arch Dermatol* 2004; **140**: 677–683.
8 Nguyen S, Chuah SY, Fontas E *et al*. Atorvastatin in combination with narrowband UV-B in adult patients with active vitiligo: a randomized clinical trial. *JAMA Dermatol* 2018; **154**: 725–726.
9 Muhammed RT, Kumar R, Rani S, Kumaran SM, Tanwar S, Parsad D. Combination of follicular and epidermal cell suspension as a novel surgical approach in difficult-to-treat vitiligo a randomized clinical trial. *JAMA Dermatol* 2018; **154**: 301–308.
10 van Geel N, Wolkerstorfer A, Lommerts JE *et al*. Validation study of the vitiligo extent score-plus. *J Am Acad Dermatol* 2018; **78**: 1013–1015.