Facial Photoprotection in Xeroderma Pigmentosum (XP) patients: validation of a new self-reported questionnaire of adherence

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<td>Canfield, Martha; King’s College London, Psychology Norton, Sam; King’s College London Walburn, Jessica; King’s College London Morrison, Natalie; King’s College London Sainsbury, Kirby; Newcastle University, Institute of Health and Society Araujo-Soares, Vera; Newcastle University Sarkany, Robert Weinman, John; King’s College London</td>
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Facial Photoprotection in Xeroderma Pigmentosum (XP) patients: validation of a new self-reported questionnaire of adherence

Running title: Self-reported adherence questionnaire in XP

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ABSTRACT

Background/Purpose: Adherence to photoprotection is the only way to prevent skin cancers and eye disease in Xeroderma Pigmentosum (XP). No validated self-report questionnaire exists for assessing adherence to photoprotection practices in individuals with XP. We sought to validate a self-reported measure of adherence to face photoprotection in this population. Methods: 66 XP patients recruited from the patient list of the XP specialist service in London, UK, completed a questionnaire of adherence to specific photoprotection behaviours. We measured objective Ultraviolet Radiation (UVR) exposure to the face continuously for 21 days with a wrist-worn UVR electronic dosimeter combined with a daily photoprotection diary. Reliability and convergent validity of the questionnaire were tested in relation to overall UVR exposure, UVR dose to the face, daily photoprotection activities, other self-reported photoprotection practices, and clinical ratings of patient’s protection.

Results: Internal consistency of the questionnaire was satisfactory. Questionnaire total scores were concordant with objective UVR exposure and UVR dose to the face. However, not all participants who reported good/excellent face photoprotection on the questionnaire recorded high levels of photoprotection in the daily diary. Correlations between the questionnaire and other practices and the clinical rating ranged from small to large in size. There was no correlation between the level of face photoprotection and self-reported avoidance of going outside. Conclusions: Our questionnaire was reliable and had good convergent validity with other indicators of photoprotection. This questionnaire could assist clinicians to detect low levels of adherence and the methodology used to develop validated questionnaires for other photosensitive conditions.

Key words: Xeroderma Pigmentosum, photoprotection, self-reported measure, validation
INTRODUCTION

Xeroderma Pigmentosum (XP) is a rare autosomal recessive genetic disorder affecting 1 in 250,000 people that results in defective repair of DNA damage caused by exposure to ultraviolet radiation (UVR). The main clinical manifestations of XP include skin cancers from childhood, corneal and conjunctival scarring inflammation and squamous cell carcinomas, and progressive neurological deterioration. Skin cancer is the major cause of premature death in people diagnosed with XP, with the median age life expectancy of 32 years old (1).

While there is no cure for XP, the adoption of rigorous photoprotection behaviours to minimize UVR exposure is the only way to improve the prognosis. This can be achieved by reducing time spent outside, particularly during the middle of the day when UVR levels are highest, and when outside by applying sunscreen and lip sunblock, wearing a UVR protective face visor and photoprotective clothing (e.g., long trousers, long sleeves, broad brimmed hat, and gloves). Prior to our recent programme of research (2), no studies have explored the use of photoprotection in this population, and little has been known about rates of adherence.

Research into photoprotection has been predominantly focused on healthy populations and individuals with, or at risk of developing, skin cancer (3-6). Photoprotection is complex and thus difficult to measure in a simple way since it relies on several separate behaviours. Often studies have used objective measures of UVR exposure (electronic or polysulfone film badge dosimetry), observation of protective behaviours, such as the application of sunscreen, and self-report diaries of protective behaviours (7-10). Although providing useful information, their intrusiveness and the burden on respondents to adhere to monitoring, which may itself influence the adoption of photoprotection, may make these techniques unreliable, impractical, and costly outside of research studies (11).

Several self-report questionnaires assessing specific aspects of photoprotection in different population groups are available. These include asking participants for estimates of
total sun exposure on an average weekday and weekend day (12), asking about consistency of use of sunscreen, sunglasses, and clothing (13,14), frequency of sunbathing(15,16) and how easily they burn (9,17). However, there have only been a few attempts to validate these self-report questionnaires of photoprotection against objective measures of UVR exposure (11,14,18,19). A key issue for the use of these questionnaires in populations that require rigorous photoprotection, such as XP, is that they are unlikely to be sensitive to the detection of small but important differences in photoprotection practices, particularly in clinically important areas such as the face (20,21). The only existing tool for use in XP patients is clinician-reported and has not been psychometrically validated (22). As such, there is a need to develop and validate a new self-report questionnaire for people with XP.

The aim of this study was to evaluate the validity of a new self-report questionnaire of adherence to photoprotection behaviours relevant to protecting the face in individuals diagnosed with XP. The focus on the face is due to the predominant occurrence of skin cancers in XP populations in this area (23). Convergent validity was explored in relation to electronic UVR dosimetry, a daily photoprotection diary, other photoprotection practices (e.g., avoidance of going outdoors) and clinicians rating of photoprotection.

METHODS

Participants and procedure

66 patients diagnosed with XP (approximately 65% of total XP population in the UK), were recruited from the national XP specialist service at Guy’s & St Thomas’ NHS Foundation Trust. All were recruited as part of a larger mixed-methods study of photoprotection in people with XP (2). Individuals of any age were eligible to participate if they had a confirmed diagnosis of XP. Thirty-nine (59%) participants were adults or older adolescents (aged 16 or above) who were responsible for their own photoprotection behaviour. The remaining 27 (41%) participants consisted of children, younger adolescents, and cognitively impaired
individuals where an adult was partly or entirely responsible for photoprotection for the individual. Although these individuals wore the UVR dosimeter, the daily diary and questionnaire were completed by the person responsible for photoprotection - typically a parent. This group are henceforth referred to as ‘cared-for’ sample and the respondents as ‘caregivers’.

The research nurse approached eligible individuals attending outpatient clinic appointments in a three-month period starting in late 2016. Prior to taking informed consent the research nurse verbally explained the study to patients and provided a study information sheet. For those who were not due to attend clinic within the recruitment period, an information pack containing a cover letter and study information sheet, was sent to their home address. Approval to conduct this study was granted by Camden and King's Cross Research Ethics Committee 15/LO/1395.

Measures

Adherence to face photoprotection: With input from the XP clinical team, a questionnaire was developed comprising of fourteen-items asking how often in the past seven-days participants wore/used each of the following seven forms of facial photoprotection: UVR protective visor, brimmed-hat, glasses with UVR protection, sunscreen applied to the face, lip sunblock, scarf or face buff covering the face, and a hooded jumper with the hood worn up. Each item was asked in reference to both cloudy and sunny days, as behaviour is likely to differ under these conditions. Each item was scored on a five-point ordinal scale from 1 (Never) to 5 (Always).

A sum-score across behaviours is not appropriate since there is potentially a negative association between behaviours. That is, using one form of protection (e.g., visor) makes doing another less likely (e.g., wearing a scarf underneath the visor is unnecessary). Therefore, an algorithm for scoring adherence to photoprotection behaviours was generated
based on the likely effectiveness of the photoprotection afforded by the different behaviours (see Appendix 1). Specifically, the seven individual behaviours were combined to form photoprotection scores based on five areas of the face (Figure 1): i) forehead, which is protected by the visor, hat, hoodie, and sunscreen; ii) lower face, which is protected by the visor, scarf, sunscreen, and lip sunblock; iii) nose, which are protected by the visor and sunscreen; iv) cheeks and side of face, which are protected by the visor and sunscreen; and v) eyes, which are protected by the visor and glasses.

Protection scores for each area are calculated based on the response to wearing a UVR protective visor, and then adjusted based on the responses to other behaviours relating to that region where the score for the visor was less than 5 (always). The visor is an adapted legionnaires hat, with transparent UVR protective film attached to the front protecting the face and neck from direct UVR exposure and UVR reflected from sand, snow and water. The logic for this is that wearing a UVR protective visor protects against virtually the entire solar UVA/UVB range, and is considered optimal clinically, therefore, where a visor is indicated to have always been worn, the score assigned is the maximum 5 for each region. Where a visor is indicated as being worn less often, the score for the visor can be adjusted upwards based on responses to other photoprotective behaviours. For example, where a visor is reported as never being worn but the respondent indicates they always wore a hat and/or hoodie (forehead), a scarf (lower face) and glasses (eyes) a score of five is given for each of these regions since close to 100% of UVR will be protected by these items. Since sunscreen and lip sunblock protects against ~70% of UVR (based on SPF50 worn at 50% recommended thickness (24)), where the score for the region is < 5 based on other behaviours, the maximum score is restricted to 4 even where sunscreen and lip sunblock are indicated as always being used.

The scores for each region are summed separately for cloudy and sunny days to give a scores for the entire face for each scenario ranging between 5 and 25, where higher scores indicate better photoprotection. The scores for cloudy and sunny days are averaged.
To give an overall photoprotection score: 5 indicates no use of photoprotection; 6 to 10 indicates very low use of photoprotection; 11 to 15 indicates low use of photoprotection; 16 to 20 indicates moderate use of photoprotection; 21 to 24 indicates good use of photoprotection; and 25 indicates excellent use of photoprotection. In the case of XP any score lower than 25 is considered suboptimal, with scores of 20 or lower being considered inadequate.

Adherence to body photoprotection: A ten-item questionnaire asking how often in the last seven-days participants used five photoprotective behaviours for other parts of the body on cloudy and sunny days was also developed. Each item was scored on a five-point ordinal scale from 1 (Never) to 5 (Always). Adherence to body photoprotection behaviours was defined by the sum of scores across two body's areas: arms and upper torso (long sleeved top, gloves and sunscreen applied to the arms and hands) and legs (long trousers/skirt and sunscreen applied to the legs). The score for each region was based on the response for wearing a long-sleeved top or long trousers/skirt and increased by the response to sunscreen use. As with the face, where the score for a region is less than 5 based on other behaviours, the maximum score is restricted to 4 even where sunscreen indicated as always being used. Scores for the two body areas for both cloudy and sunny days are summed and divided by two to create a total score. The mean across the sum-scores for cloudy and sunny days can be used as an overall body photoprotection score. Internal reliability for the body scale was high for cloudy and sunny days .88 and .84, respectively.

Avoidance of going outside and frequency of photoprotection whilst outside: Participants were asked single items to report how often they avoided going outside and how often they had protected themselves against UVR when outside in the last seven days. Responses were given separately for cloudy and sunny days on a five-point scale, ranging from 1 (never) to 5 (always).

Daily UVR protection diary: A daily UVR protection diary was used to collect information on time spent outside, specific photoprotection behaviours, and the type of outdoor activity that
participants were involved in. It is based on an adapted version of the UK Office of National Statistics Time Use Survey (25) and was completed daily for 50 days. For this study, only the 21 days matching the period where the UVR dosimeter was worn were used. Detailed information about the diary can be found elsewhere(2).

Objective UVR measure: The amount of UVR exposure was measured by a wristworn UVR electronic dosimeter (SunSaver 3, Bispebjerg Hospital, Copenhagen, Denmark). The dosimeters provide real time measurements of the UV level in the patients’ environment by measuring UVR exposure (standard erythemal dose, SED), movement (number of movements) and temperature (°C) every 5 seconds. Due to the memory capacity, the dosimeter was set to record the mean for each of these variables across intervals set at 5 minutes. Participants wore the dosimeter for the first 21 days of completing the daily UVR protection diary. For the purpose of this analysis, two outcome variables were tested: (1) the average day UVR exposure, and (2) average day UVR dose to the face per day after adjusting for photoprotection practices reported in the daily UVR protection diary. Further information about the dosimeter and the calculation of the adjusted dose to the face can be found in Walburn et al.(2).

Demographic and clinical variables: Self-reported information on participants’ age, gender, educational level and skin colour were collected. Participants were additionally asked to report age at the time of diagnosis, whether they ever had a skin cancer, experience of cognitive impairments (hearing, walking or speaking) caused by XP, and/or eye problems, and how easily they sunburn using a Likert Scale ranging from 0 (not easily) to 3 (extremely easy). A binary burning variable was created based how easily they sunburn (0 or 1 not easily and 2 or 3 easily). A clinical rating of overall UVR protection was also obtained from patient’s notes at the XP clinic database (22). This rating, on a 1 to 20 scale, where higher scores indicate photoprotection is made by a specialist nurse based on their judgment of a patients environmental, physical, and chemical UVR protection.
Statistical analyses

Internal-consistency of the sum-score of the five face region variables for cloudy and sunny days was assessed by examining the correlation between the score for each region and the total score, plus Cronbach’s alpha, inter-item and item-test correlations as an estimate of reliability. Responses for cloudy and sunny days were considered separately. Convergent validity between the sum-scores for face photoprotection on cloudy and sunny days was assessed by examining correlations with other indicators of photoprotection: mean daily UVR exposure (dosimetry), proportion of UVR protected against during the day (photoprotection diary), mean daily UVR dose to the face (combination of dosimetry and diary), clinical rating of overall UVR protection, and the self-reports for the frequency of avoidance of going outside and photoprotection whilst outside in the last 7 days. Pearson correlations were estimated where both variables were continuous and polyserial correlation estimated where one of the items was ordinal. Recruiting a sufficiently sized sample for analyses to have acceptable power is prohibitive given the rarity of XP, thus we focus interpretation on the magnitude of the correlations rather than significance tests. Specifically we use the following rules of thumb: ≥.10 for a small effect, ≥.30 for a medium effect, and ≥.50 for a large effect (26).

RESULTS

Table 1 presents the sample characteristics, which were typical of the wider XP population.

Table 2 shows means and standard deviations for each of the face photoprotection behaviours on cloudy and sunny days. Not unsurprisingly, most behaviours were undertaken more frequently on sunny rather than cloudy days. The rank ordering of behaviours remained stable across both cloudy and sunny days with the most frequently used photoprotective behaviour being the application of sunscreen, followed by wearing glasses and a hat.
**Internal reliability**

Internal consistency was satisfactory for adherence to face photoprotection for cloudy days ($\alpha = .87$), for sunny days ($\alpha = .81$) and for the average adherence on cloudy and sunny days ($\alpha = .82$). Inter-item and item-test correlations between the five areas were all greater than 0.50.

Figure 2 shows the proportion within each of the photoprotection categories for cloudy and sunny days. The sum-scores were left skewed with approximately one-third scoring at the maximum on both cloudy and sunny days. The scale was found to be able to reliably identify differences in photoprotection between cloudy and sunny days and between those where the responses were self-reported or reported by a carer (Appendix 2). Specifically, a mixed-effects model indicated a significant main effect for self- versus carer-report ($z=6.2$, $p<.001$), a significant main-effect for sunny versus cloudy days ($z=5.1$, $p<.001$), and a significant interaction ($z=2.33$, $p<.05$).

**Convergent validity**

- **Objective UVR exposure**

  Levels of agreement between adherence to face photoprotection categories on cloudy and sunny days with the daily diary and dosimetry are shown in Figure 3. The overall pattern is for mean daily face photoprotection to increase, and to some extent facial UVR exposure to decrease, with increasing categories of face photoprotection. However, while this association was negative as expected, the effect was relatively weak (Table 3). In addition, while participants reporting low or very low face photoprotection in the questionnaire were unlikely to have high levels of average daily protection in the diary, not all participants who reported having good or excellent face photoprotection were observed to have high levels of photoprotection in the daily diary. This suggests the questionnaire may be sensitive to detect low adherence to face photoprotection but not high adherence.

- **Other self-reported measures of photoprotection**
Face photoprotection was found to have good convergent validity in relation to other measures of photoprotection (Table 3). Very strong positive correlations were observed between face photoprotection on cloudy and sunny days with both self-reported frequency of photoprotection while outside in the past seven days and the clinician rating of overall photoprotection. Strong positive correlations were observed between face photoprotection and body photoprotection. Correlations between face photoprotection and the mean proportion of face photoprotection estimated from the daily diary were also strongly positive. However, there was no correlation observed between the level of face photoprotection with self-reported avoidance of going outside in the past seven days.

**DISCUSSION**

This study reports the initial evaluation of a self-report questionnaire for assessing face photoprotection in individuals diagnosed with XP. This brief self-report tool was shown to be reliable and have good convergent validity with other indicators of photoprotection. In particular, it corresponded well with a daily photoprotection diary and, therefore, may be useful in clinical practice where a daily diary is impractical, and the aim is to identify people with low adherence to photoprotection recommendations. However, given the potential low sensitivity to detect high levels of photoprotection and the low correlation with facial UVR exposure, we encourage future researchers to combine dosimetry with subjective reports of photoprotection practice where possible.

According to reviews, across different populations, use of self-report measures to assess adherence to photoprotection behaviours prevails, with an overreliance on non-validated measures (27,28). Few studies have reported comparisons between self-report measures of photoprotection and objective and clinical measures (11,19,29). Our study further demonstrates that self-report questionnaires can be used to assess UVR protective practices. Furthermore, given this tool is designed to assess full UVR coverage of the face, it
provides a promising self-reported outcome questionnaire for the photo-dermatological field. For instance, our tool could be used to facilitate clinicians’ discussions about the need to adopt preventive behaviours among those individuals who have poor adherence to UVR protection behaviours but are at high risk of skin cancers such as patients with a personal or family history of melanoma.

To date, it remains unclear how effective self-report questionnaires are in detecting whether the behaviour adopted does fully protect the target region. For example, participants are often asked to report the frequency of hat use without exploring whether they are concurrently protecting other areas of the face, or the type of hat used, which will impact the coverage achieved (e.g., a cap vs. a wide-brimmed hat). Reviews of the literature have recognised that UVR protection can occur in different forms and its efficacy usually depends on the adoption of more than one photoprotection behaviour (5,30,31). Evidence also suggests that clothing and seeking shade are more effective than sunscreen in protecting against UVR (32-34). Measures that account for the extent to which areas of the body are being simultaneously protected, and therefore, by extrapolation, the level of importance of the behaviours adopted, are important as this may provide a better understanding of adherence to photoprotection behaviours.

Overall, our measure demonstrated consistent patterns of relations between each of the five areas of the face. Moreover, we found some indication of differential adherence levels across weather condition (cloudy and sunny days) and across those where the responses were self-reported or reported by the caregivers. While it is difficult to draw robust inferences, it suggests that our measure could be used to make patients aware of how their protection differ according to weather conditions. This is particularly important as studies show that people tend to protect themselves less in cloudy days compared to sunny days (7,10,35,36).

A limitation with our questionnaire is the ceiling effect, with over one-third of respondents achieving the highest score — mainly due to reporting having ‘always’ worn a
UVR protective visor while outside. Comparison with the photoprotection diary indicated a discrepancy, with some participants self-reporting excellent face photoprotection, yet face photoprotection was likely to be as low as 50% in the diary data. This difference may be due to socially desirable responding, or alternatively may reflect differences in interpretation of the term ‘always’. For example, it is possible for someone to wear a face visor on every occasion they go outside but not necessarily wear it for the entire duration of the time outside on every occasion. This may be further explored using the think-aloud protocol (i.e verbalization of the first answer that comes into mind). Moreover, the fact that the amount of UVR exposure to the face was measured by a wrist-worn device may failed to register UVR levels to the face in some situations, for example, when the wrist was in the shadow but the face not. A further limitation is the relatively small size of the sample. However, XP is a rare disease and the sample recruited for this study represents over half of the known cases in the UK (approximately 100 diagnosed cases in the UK). Recruitment of sample sizes required for full psychometric assessment with typical levels of precision are simply not feasible. Although a larger sample size is not possible, we have adapted our analytical approach(21) to assess validity against a range of other tools, which provides confidence that the measure is valid and reliable.

Conclusion

The purpose of this study was to test the validity and reliability of a questionnaire of adherence to facial photoprotection in the XP population. Findings show that our questionnaire may provide a standardised and internally reliable self-report assessment of UVR protection. Given the brief and practical to complete, our questionnaire provides a useful way to clinical care professionals to assess patients’ photoprotection objectively. This questionnaire could be specifically useful for clinically detecting low adherence. The research implications of our measure are numerous. To date, the technical barriers in using objective measures (i.e., electronic dosimeter) has contributed to the lack of research into levels of photoprotection practices in patients with photosensitive skin diseases. Having a
single way of self-measuring UVR protection may promote future studies of photoprotection behaviours. However, because of the reported limitations, we encourage the combined use of objective measures in conjunction with our questionnaire to increase confidence in the accuracy of capturing this complex outcome. Our questionnaire would benefit from further exploration of construct validity and acceptability in future studies. The methodological approach adopted in our study may be of value to the development of validated photoprotection questionnaires in other photoprotective skin diseases.
REFERENCES


29. Glanz K, Mayer J. A. Reducing Ultraviolet Radiation Exposure to Prevent


Table 1. Sample characteristics (N=66)

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<tr>
<th>Characteristics</th>
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<tr>
<td>Male, n (%)</td>
<td>36 (54.55%)</td>
</tr>
<tr>
<td>Age, mean (S.D.)</td>
<td>30.83 (2.46)</td>
</tr>
<tr>
<td>White skin colour, n (%)</td>
<td>50 (73.6%)</td>
</tr>
<tr>
<td>Too young for having school qualifications, n (%)</td>
<td>19 (28.78)</td>
</tr>
<tr>
<td>Reported by the caregiver, n (%)</td>
<td>27 (40.01)</td>
</tr>
<tr>
<td>Worn dosimeter, n (%)</td>
<td>36 (54.55)</td>
</tr>
<tr>
<td>Age at the time of diagnose, mean (S.D.)</td>
<td>15.15 (2.11)</td>
</tr>
<tr>
<td>Burner n (%)</td>
<td>32 (48.48%)</td>
</tr>
<tr>
<td>Skin Cancer n (%)</td>
<td>28 (42.42%)</td>
</tr>
<tr>
<td>XP causing cognitive problems, n (%)</td>
<td>17 (25.76%)</td>
</tr>
<tr>
<td>Eyes problems, n (%)</td>
<td>43 (65.15%)</td>
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</table>
Table 2. Means (standard deviations) for the frequency of each face photoprotection behaviour (N=66)

<table>
<thead>
<tr>
<th>How often you do the different things on the days when it is cloudy and then on the days when it is sunny, throughout the year?</th>
<th>Cloudy days</th>
<th>Sunny days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you wear a UVR protective visor?</td>
<td>2.48 (1.85)</td>
<td>2.62 (1.92)</td>
</tr>
<tr>
<td>Do you wear a hat?</td>
<td>3.55 (1.60)</td>
<td>4.06 (1.39)</td>
</tr>
<tr>
<td>Do you wear glasses?</td>
<td>3.79 (1.47)</td>
<td>4.29 (1.26)</td>
</tr>
<tr>
<td>Do you wear a scarf or “face buff”?</td>
<td>2.17 (1.51)</td>
<td>2.17 (1.53)</td>
</tr>
<tr>
<td>Do you wear a hoodie (worn-up)?</td>
<td>2.28 (1.49)</td>
<td>2.35 (1.53)</td>
</tr>
<tr>
<td>Do you use sunscreen on your face?</td>
<td>4.26 (1.14)</td>
<td>4.61 (0.82)</td>
</tr>
<tr>
<td>Do you put on lip sunblock?</td>
<td>2.85 (1.66)</td>
<td>3.15 (1.64)</td>
</tr>
</tbody>
</table>

Note: the response scale ranges from 1 (never) to 5 (always)
Table 3. Correlation between face photoprotection with other indicators of photoprotection

<table>
<thead>
<tr>
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<th>N</th>
<th>Face photoprotection</th>
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<tr>
<td></td>
<td></td>
<td>Cloudy</td>
</tr>
<tr>
<td>Mean daily face photoprotection (0-100%)</td>
<td>36</td>
<td>0.66</td>
</tr>
<tr>
<td>Mean daily facial UVR exposure (SED)</td>
<td>36</td>
<td>-0.14</td>
</tr>
<tr>
<td>Frequency of photoprotection whilst outside (1-5)</td>
<td>66</td>
<td>0.72</td>
</tr>
<tr>
<td>Avoidance of going outside (1-5)</td>
<td>66</td>
<td>0.01</td>
</tr>
<tr>
<td>Body photoprotection</td>
<td>66</td>
<td>0.46</td>
</tr>
<tr>
<td>Clinical Rating of adherence (1-20)</td>
<td>47</td>
<td>0.76</td>
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Figure 1. Face regions scored
**Figure 2.** Distribution of categorised face photoprotection scores on cloudy and sunny days
Figure 3. Mean daily face photoprotection and facial UVR exposure by self-reported face photoprotection category
Appendix 1. Score algorithm for adherence to face photoprotection

<table>
<thead>
<tr>
<th>Face region</th>
<th>Wear/Use</th>
<th>Score algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>EYES</td>
<td>face visor, glasses</td>
<td>If wear a visor = 5 OR wear glasses = 5, eyes = 5. If wear a visor = 4 AND glasses = 4, eyes = 5. If wear a visor = 4 OR wear glasses = 4, eyes = 4. If wear a visor = 3 AND glasses = 3, eyes = 4. If wear a visor = 3 OR wear glasses = 3, eyes = 3. If wear a visor = 2 AND glasses = 2, eyes = 3. If wear a visor = 2 OR wear glasses = 2, eyes = 2. If wear a visor = 1 AND wear glasses, eyes = 1.</td>
</tr>
<tr>
<td>NOSE</td>
<td>face visor, face sunscreen</td>
<td>If wear a visor = 5 If wear a visor = 4 AND face sunscreen = 5, nose = 5. If wear a visor = 4 AND face sunscreen &lt; 5, nose = 4. If wear a visor = 3 AND face sunscreen = 4, nose = 4. If wear a visor = 3 AND face sunscreen &lt; 4, nose = 3. If wear a visor = 2 AND face sunscreen = 3, nose = 3. If wear a visor = 2 AND face sunscreen &lt; 3, nose = 2. If wear a visor = 1 AND face sunscreen = 2, nose = 2. If wear a visor = 1 AND face sunscreen = 1, nose = 1.</td>
</tr>
<tr>
<td>CHEEKS AND SIDES</td>
<td>face visor, face sunscreen</td>
<td>If wear a visor = 5 If wear a visor = 4 AND face sunscreen = 5, cheeks and sides = 5. If wear a visor = 4 AND face sunscreen &lt; 5, cheeks and sides = 4. If wear a visor = 3 AND face sunscreen = 4, cheeks and sides = 4. If wear a visor = 3 AND face sunscreen &lt; 4, cheeks and sides = 3. If wear a visor = 2 AND face sunscreen = 3, cheeks and sides = 3. If wear a visor = 2 AND face sunscreen &lt; 3, cheeks and sides = 2. If wear a visor = 1 AND face sunscreen = 2, cheeks and sides = 2. If wear a visor = 1 AND face sunscreen = 1, cheeks and sides = 1.</td>
</tr>
<tr>
<td>LOWER FACE</td>
<td>face visor, face sunscreen, lip sunblock and scarf/face buff</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1st Step: Use of sunscreen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If use face sunscreen = 5, lower face sunscreen = 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If use face sunscreen = 4, lower face sunscreen = 4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If use face sunscreen = 3 AND lips sunblock = 5, lower face sunscreen = 4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If use face sunscreen = 2 AND lips sunblock = 4, lower face sunscreen = 3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If use face sunscreen = 1 AND lips sunblock = 2, lower face sunscreen = 2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If use face sunscreen = 1 AND lips sunblock = 1, lower face sunscreen = 1.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2nd Step: Lower face score

- If wear a visor = 5 OR wear scarf/face buff = 5, lower face = 5.
- If wear a visor = 4 AND wear scarf/face buff = 4, lower face = 5.
- If wear a visor = 4 OR wear scarf/face buff = 4, lower face = 4.
- If wear a visor < 4 AND wear scarf/face buff = 4, lower face = 4.
- If wear a visor = 3 AND wear scarf/face buff = 3 AND lower face sunscreen = 5, lower face = 4.
- If wear a visor = 3 OR wear scarf/face buff = 3, lower face sunscreen = 3.
- If wear a visor < 3 AND wear scarf/face buff = 3, lower face sunscreen = 3.
- If wear a visor = 2 AND wear scarf/face buff = 2 AND lower face sunscreen = 4, lower face = 3.
- If wear a visor = 2 OR wear scarf/face buff = 2, lower face = 2.
- If wear a visor = 1 AND wear scarf/face buff, lower face = 1.
Appendix 2. Face photoprotection on cloudy and sunny days for self- and carer-reports