Author's response to reviews

Title: Assessment of a new questionnaire for self-reported sun sensitivity in an occupational skin cancer screening program

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Author's response to reviews: see over
Dear BMC Editors,

Thank you for your response regarding our manuscript entitled “Assessment of a new questionnaire for self-reported sun sensitivity in an occupational skin cancer screening program”. A statement of ethics was included in the methods section. We are grateful for the constructive comments given by the reviewers. The issues of the reviewers have been carefully addressed and we now submit a revised manuscript.

Point-by-point response to reviewers’ comments:

Point 1, reviewers 1 and 2: The presented questionnaire is only another tool to measure sun sensitivity without any additional benefit or improvement.

There is no gold standard in the assessment of sun sensitivity (table 1). The Fitzpatrick (FP) classification, the prevailing standard, was demonstrated to be an insufficient indicator of sun sensitivity. In recent studies sun sensitivity was therefore measured by using various self-constructed scores. We are currently in a situation where the former standard is no longer considered valid and new tools have not been evaluated. Additionally, there is no international consensus about what sun sensitivity is and which indicators it should comprise. In our study we did not construct our own score, but used a recommended tool for the assessment of sun sensitivity based on a consensus by the German Federal Office for Radiation Protection. We are aware of published studies analyzing objectivity, reliability and validity for tools referring to the former FP standard, but we are not aware of such studies concerning the recently applied tools. We used a new standardized questionnaire for the self-assessment of sun sensitivity and performed evaluations on reliability (internal consistency). We compared the RTS-score with other methods (convergent validity). Compared to methods used in studies without known reliability and validity our approach is sound. The questionnaire presented has a sufficient
internal consistency and the analysis showed a good convergent validity between the RTS-score and the FP classification. We demonstrated that the RTS questionnaire is a valid and reliable tool avoiding shortcomings of the prevailing standard (low objectivity, selection bias). This is an improvement. Obviously, we did not address this improvement appropriately in our manuscript and therefore made changes in following sections: abstract, introduction, methods, and discussion (details of changes attached).

Point 2, reviewer 2: Freckles are an independent indicator for skin cancer.

We agree that the inclusion of phenotypic indicators in a sun sensitivity score may be a problem when modelling risk factors for skin cancer. This is a shortcoming of the questionnaire. Freckles are an independent indicator for skin cancer. Freckles are also considered as an indicator for sun sensitivity. The studies mentioned in table 1 show that freckles are sometimes used as an indicator for sun sensitivity in epidemiologic studies. In other studies they are not considered at all. The shortcoming of the questionnaire therefore depends strongly on the chosen model of causal factors for skin cancer. This has been added to the Discussion.

Point 3, reviewer 2: Problems with self-reported sun sensitivity apply to FP and RTS

We agree that all known problems with self-reported sun sensitivity do also apply to the presented questionnaire. Self-perception of sun sensitivity is known to be a flaw of self-reported questionnaires. We have addressed this issue in the Discussion. We do not agree that self-reported sun sensitivity is the “biggest problem” with FP classes. The problem of FP classes is objectivity. In published studies up to 40% of participants could not be assigned to a FP class at all or they could not objectively be assigned to a FP class. We consider selection bias and lack of objectivity as major problems of the FP classification. The presented questionnaire is standardized and is not flawed by selecting participants due to classification problems.

Point 4, reviewer 2: Categorization of RTS-score

Categories of the RTS-score are used to compare ordinal data (e.g. FP-class) with data used as continuous data (RTS score). The RTS-score, categorized in four classes, does correctly agree with the corresponding FP-class in 75%. This is a clear result of the analysis. Dermatologists will get a clearer sense of the quality of the RTS-score using this measure for comparison. A comparison of continuous data with other methods, using the information of the continuous scale, is presented in figures 1a to 1d. We therefore use the information of the continuous data. Medical scores on a continuous scale are often re-categorized in clinical routine as well as in studies to identify risk groups or to identify groups for various diagnostic or therapeutic procedures (e.g. PASI, SCORAD).

Point 5, reviewer 2: Reference to questionnaire for HRQoL

We agree that health-related quality of life questionnaires have a higher quality compared to the presented questionnaire since the scientific community has reached an agreement on this construct and the scientific criteria to assess the quality of these questionnaires have been repeatedly tested. But the basic methodology and construction of the questionnaires can be compared. The assessment of HRQoL is based on standardized self-completed questionnaires with many items on different subscales. The answers are rated on an ordinal Likert scale. The reference to the publication of Walters et al. is not given to imply an equally high quality of the presented questionnaire, but to demonstrate that our analysis is based on a sound scientific methodology. The reference was made to show the limitations that the use of ordinal data as continuous data presents.
**Point 6, reviewer 2: Gender difference**

The obtained gender difference is comprehensively analyzed and discussed in our manuscript. The interpretations of the extent of the mean absolute difference of 1.2 points on a scale comprising 31 points are obviously divergent. In contrast to the reviewer we think there is no clinical relevance in the difference. As outlined in the Discussion we agree that the gender difference may be due to self-perception of sun sensitivity.

**Point 7, reviewer 2: Table 4**

We have considered removing table 4. However, the main purpose of the study was to assess the quality of the questionnaire. Table 4 shows the core results of the analysis. The internal correlation structure gives important information about the association between each item and the RTS-score. The internal consistency, a summary measure of the inter-item correlation, shows only one part of the correlation structure. The correlation between RTS-score and different methods for the assessment of sun sensitivity is the main result of the convergent validity analysis. Categorization is discussed above (see Point 4).

**Point 8, reviewer 2: Uter-classification**

The Uter-classification was developed in a large study on the basis of a sound statistical analysis. The fact that the Uter-classification has not been applied in other studies is not necessarily a judgment about the quality of the tool. The items of the Uter classification are objectively derived from a statistical analysis and neither based on a self-constructed score nor based on a consensus based score. We therefore included this tool.

**Point 9, reviewer 2: Young people**

In the Discussion we mentioned that a valid and accepted tool for the assessment of sun sensitivity would be especially beneficial for young people. Background is the hypothesis that the individual knowledge of sun sensitivity in risk groups may lead to behavioural changes of sun exposure. Studies showed that nearly 80% of the lifetime UV exposure takes place in young years. The IARC-study showed a significantly higher risk of melanoma in people that have used sunbeds under the age of 35. The results of that study and other studies suggest that UV exposure “in childhood is an important contributing factor for melanoma in adults” (IARC 2006, Autier P et al. 1998, Whiteman DC et al. 2001). A reference has been added.

**Point 10, reviewer 2: Measure for the risk of skin cancer would be better**

We agree that depending on the purpose of a study it might be better to use a measure for the risk assessment of skin cancer. Risk assessment tools for melanoma have been developed and assessed elsewhere. In our study we assessed a questionnaire for self-reported sun sensitivity.

Thank you for considering publishing this revised version of our manuscript in BMC Dermatology.

Sincerely,

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Dermatologist
Details of changes:

Page 2 Abstract:
Line 9 added: “self-reported”;  
Line 14 deleted: “one-dimensional”  
Line 18 added: “(convergent validity)”  
Lines 23/24 modified: “showed a reliability coefficient of”

Page 3 Abstract:  
Lines 5-10 modified: “The RTS questionnaire showed a sufficient internal consistency. There is a good convergent validity between the RTS-score and the Fitzpatrick classification avoiding shortcomings of the prevailing standard. The questionnaire represents a simple, reliable and valid instrument for the assessment of sun sensitivity. It can be used in epidemiological studies as well as in skin cancer prevention programs.”

Page 4 Introduction  
Lines 21/22: modified: “The purpose of the study is to assess a new questionnaire for self-reported sun sensitivity by determining internal consistency and convergent validity in an occupational skin cancer screening program.”

Page 5: Methods  
Line 11/12 added: “the study is compliance with the Helsinki Declaration.”

Page 6: Methods  
Line 5 added: “(Likert scale)”

Page 8: Methods  
Lines 16-20 modified and added: “The reliability of the questionnaire was evaluated by calculating the internal consistency (Cronbach’s alpha). Convergent validity was assessed by comparing the RTS-score to other methods (Fitzpatrick classification, Uter classification, SSSE-score).”

Page 16: Discussion  
Lines 7-12 added: “While the inclusion of several indicators is recommended to describe sun sensitivity (4), it may raise a problem when modelling causal factors for skin cancer in epidemiologic studies. If a model is chosen, which considers phenotypic independent variables such as freckles as an independent risk factor for skin cancer, the presented sun sensitivity questionnaire cannot be used, since it already contains freckles as an indicator for sun sensitivity.”  
Line 20 deleted: “phenotypic”