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Clinical assessment of skin phototypes: the importance of wording

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Short title: Assessing phototype for sun sensitivity

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Abstract

Background: Fitzpatrick skin phototype classification is widely used to assess risk factors for skin cancers. This skin type evaluation is easy to use in clinical practice but is not always applied as initially described, nor practiced in a standardised way. This can have implications on the results of relevant dermato-epidemiological studies.

Objectives: To demonstrate, in a large multinational setting, that the phrasing of questions on sun sensitivity can have a strong impact on the perception and reporting of skin phototype, as well as the importance of a standardised procedure for phototype assessment.

Material & methods: Using data collected from 48,258 screenees of the Euromelanoma campaign in six European countries from 2009 to 2011, we analysed the impact of change in the question phrasing on phototype classification in each country.

Results: Changing the wording of a question to assess the phototype of a person also significantly influenced the classification of phototypes in different countries ($p < 0.001$ for each country). The difference essentially corresponded to a shift towards a less sun-sensitive skin type when a shorter question that did not include skin colour description was used. The only exception was Portugal where phototype was not patient-assessed and classification shifted towards a more sun-sensitive phototype. Results were statistically significant and highly consistent, irrespective of gender.

Conclusions: The phrasing of questions on skin type is important and substantially influences reporting. A standardized procedure to classify phototypes should be used in order to obtain comparable data between studies.

Key words: Fitzpatrick skin phototype classification, question, phrasing, sun

sensitivity, wording, country, standardised procedure

Skin cancer is increasing worldwide in fair-skinned people [1], therefore the need to be able to judge an individual's sensitivity to solar ultraviolet radiation (UVR) and thus one's susceptibility to develop skin cancer is of paramount importance. The most commonly used clinical classification of skin tolerance to sun exposure is the Fitzpatrick skin typing system.

The concept of skin phototypes was introduced in 1975 by Fitzpatrick to classify Caucasian patients in order to select the appropriate doses of ultraviolet A to treat psoriasis with PUVA therapy [2, 3]. He suggested that a brief personal interview regarding sunburn history and ability to tan of individuals could help estimate their skin tolerance to UVR exposure [2].

Fitzpatrick classified patients according to what they reported as their skin response to an initial sun exposure, *i.e.* three minimum erythema doses (MEDs) or about 45 to 60 minutes of noon exposure in northern (20 to 45) latitudes in the early summer, equivalent to $90\text{mJ}/\text{cm}^2$. Two questions were used to investigate the tendency to burn ("How painful is your sunburn after 24 hours?", *i.e.* intensity of erythema, oedema, and discomfort) and the ability to tan ("How much tan will you develop in a week?"). Combining the answers to these questions placed individuals into four possible categories: Type I (always burns, never tans), Type II (usually burns, tans less than average with difficulty), Type III (sometimes mild burns, tans about average), and Type IV (rarely burns, tans more than average and with ease). Two categories were subsequently added for dark-skinned people, such as people with a Latin American, Asian, or African origin [3].

Although widely used to assess cutaneous sensitivity to UVR in dermato-

epidemiological studies [4], Fitzpatrick phototypes have also been widely criticised mainly because of the lack of an objective measurement of skin sun sensitivity and weak correlation with the MED [5-10]. Indeed, for the sake of practicality and expediency, numerous variations of “Fitzpatrick” phototype evaluation are practiced worldwide, making comparisons difficult between studies. Who assesses the phototype of an individual (patient or physician), what process is used to obtain information on sun sensitivity (patient self-report or interview), and even the phrasing of the question(s) used to define skin type can lead to different answers for the same person.

Euromelanoma is a pan-European skin cancer public awareness and prevention campaign offering skin examinations to a large audience in order to enhance early detection of skin cancer [11]. During the examination, a questionnaire, common to all European countries, is systematically completed by participants and collected to compare relevant epidemiological data on people attending these screenings. One of the questions addresses skin sensitivity to sun exposure and its formulation was changed in 2010. While the initial question (≤ 2010) included both skin colour and reaction to UVR to describe one’s skin photosensitivity, the new question (≥ 2010) focused only on skin reaction to sun exposure.

We analysed the impact this change in wording had on the answers from screenees in geographically spread and socio-culturally diverse areas of Europe. The purpose of our work was to demonstrate, in a large multinational setting, that the phrasing of a question on sun sensitivity can have a strong impact on the reporting of skin phototype. As such, this observational study was not designed to assess the Fitzpatrick classification. A substantial impact on the classification of skin phototype associated with this change would support the importance of a standardised

methodology when using subjective measurements and highlight the need to develop an objective approach for clinical assessment of skin phototype.

Materials and methods

We used data collected on phototype during the spring Euromelanoma campaigns of 2009, 2010 and 2011, based on a standardised European questionnaire previously described [11, 12]. Euromelanoma member countries were chosen to represent geographically spread and socio-culturally diverse regions of Europe (Greece, Lithuania, Portugal, Serbia, Sweden, and Switzerland) for which the number of annual screenees exceeded one thousand.

During the campaign examination and following a media-promoted campaign announcement, screenee volunteers were asked to complete a one-page anonymous questionnaire that included questions on age, gender, degree of education, reasons for visit, risk factors for skin cancer, sun-related habits, skin characteristics, and relevant medical history. The question about phototype was altered in 2010 (*see subscript of table 1 for exact phrasing of the questions*). In 2009, the question (phrase A) concerned a description of skin colour and its reaction to summer sun exposure (tendency to burn and ability to tan), whereas in 2010, the question focused specifically on skin reaction to the summer sun (phrase B). For the 2011 (and subsequent) campaigns, the phototype question remained the same as in the 2010 questionnaire. The only exception to this procedure was Greece where the questionnaire was changed one year later, in 2011, such that the initial phrasing of the phototype question was used in 2009 and 2010 (*table 1*).

The phototype was self-assessed by each screenee in all countries, except Portugal where a dermatologist or a nurse specialized in dermatology asked the question to the patients. Guidelines to check the phototype were provided to specialist nurses. Evaluation of skin phototype was consistent over the three-year period studied in each country.

Screenees with unspecified skin phototype were discarded from all analyses ($n=1,054$; 2.1% of all cases). Statistical comparisons of phototype classification across years, countries, and with regards to gender were assessed by the Wilcoxon rank-sum test [13]. The null hypothesis of similar classification was rejected at the 5% significance level. All analyses were performed with Stata 13 (StataCorp LP, College Station, Texas, USA). The study was exempt of ethical approval due to the use of anonymous records.

Results

The phototype classification of 48,258 Euromelanoma screenees is presented by country and campaign year in *table 1*. No clear gradient of change in phototype classification was observed with regards to latitude for any of the phototype descriptions. In all countries, skin type classification differed statistically ($p<0.001$ for each country) when results were compared using the old versus new phototype description (phrase A vs B, respectively).

Overall, a shift was observed towards a less sun-sensitive phototype without indication of skin colour. In Lithuania and Greece, for instance, the proportion of people self-reported as phototype II dropped by about 20% (50% in relative terms) with phrase B, with a concomitant corresponding increase in those self-reported as

phototype IV (*table 1*). The change affected the proportion of people the least with phototype I (absolute difference: 0.1%, $p=0.55$, as compared to larger and significant differences [$p<0.05$] for phototypes II, III and IV). Portugal, with health professional-determined phototype, was the exception, with a shift occurring towards lighter phototypes. The proportion of phototype IV was substantially lower when skin colour was not described (5.9% and 4.5% in 2010 and 2011, respectively, compared with 17.4% in 2009), while the proportions of phototype II and, to a lesser extent, of phototype I increased upon this change (*table 1*). Results were consistent irrespective of gender for each country and campaign year (*data not shown*).

Of note, annual classification of phototypes did not differ significantly within countries when the same phrasing was used, independent of whether the phototype was self-reported (Greece, Lithuania, Serbia, Sweden, and Switzerland) or assessed by a dermatologist or a specialized nurse (Portugal). A change in phototype classification was observed one year later in Greece coinciding with the modification in phototype description.

Discussion

In this large multinational study of nearly 50,000 Europeans living at different latitudes, we demonstrated that the phrasing of a skin sensitivity question impacted substantially on the answers and therefore on the overall classification of phototypes. Including the term “skin colour” in the question on sun sensitivity altered both patients’ and specialists’ perception of skin phototype.

The wording of questions and response options in a questionnaire is paramount [14]. Asking a question with the slightest difference in wording could result in a different

answer or cause the respondent to misinterpret the question; the precise choice of words may influence the respondents' answer [14]. For the description of skin colour, there may be particular associations with words, such as "light" rather than "fair," "tanned" rather than "olive," "brown" and "dark" rather than "dark" and "black" [15]. Strong overestimation of skin pigmentation, skin colour, and, potentially, UV radiation tolerance have been reported in a New Zealand study, ranging from 36% in a self-identified fair skin group to 77% in a medium skin colour group [15]. An Australian study showed poor agreement between perceived and measured skin colour among Caucasians, with many over-estimating their skin pigmentation [16]. In our study, the description of skin colour in the same question as that of burning/tanning reactions of the skin seemed to guide people towards a choice of a lighter phototype rather than a darker one. When the skin colour was omitted from the question and answer options, leaving only the question and answers on skin reactions to sun exposure, we observed a shift in the phototype classification in all countries towards a darker phototype (IV). This shift might be due to underestimation of skin vulnerability. When the choice of skin reaction was paired with a specific colour of skin, the response might be "guided" by the category of reactions associated with the skin colour of the patient.

The Portuguese results suggest that a mention of skin colour also substantially influenced phototype assessment by dermatologists and specialist nurses. However, in contrast to countries where the phototype was patient-assessed, classification shifted towards a more sun-sensitive phototype. A mention of colour may influence physicians to estimate a darker phototype, reflecting the darker skin colour of the patient. When colour was omitted, the dermatologist or the specialized nurse could focus on the skin reaction and thus better assess the sensitivity of the skin. Other

potential explanations for our results include different perceptions of vulnerability to sun exposure with regards to skin colour and cultural habits, different attitudes towards sun exposure across countries, different self-selection of screened populations, or a translation bias regarding the question or multiple choice answers.

Accurately studying dermatological disease on national and worldwide levels is challenging because there is still imprecision around definitions of race, ethnicity, skin type, and pigmentation, combined with a lack of easily quantifiable tests and measures [17]. Recent evidence indicates that a phototype represents a biochemical basis for individual sun sensitivity in which constitutive skin colour is one of several factors [18]. People will tend to compare themselves with their immediate environment, thus a fair person in the south of Europe might be considered a dark person in the North. Indeed, it has been shown that determining skin type does not provide consistent results and does not correlate well with sun reactivity in ethnically diverse populations with different tanning abilities, such as lightly pigmented Scandinavians versus more pigmented Mediterranean, or Asian, Arab, and African American populations [7, 19]. Also, those with brown skin probably do not label their sun reactivity with terms such as “tanning” or “sunburn”, and are unlikely to describe themselves as tanned even when they are [5]. Instead, they may label their reactivity in terms of their skin becoming darker, itching, flaking, and becoming irritated, thereby resulting in a poor relationship between skin type categories and sun reactivity [19]. The Fitzpatrick skin type determined by a dermatologist allows for a better distinction of phototype with a clarification of responses through questions directed towards the ability to sunburn and tan, as these terms have various meanings to persons from different cultural or ethnic backgrounds.

Our study has limitations. Firstly, the two versions of the questionnaire were applied to similar populations but not to the same subjects. However, our highly consistent results irrespective of gender, country, and year in large sample sizes makes it unlikely that annual fluctuations in the screened populations differ substantially according to skin type. Secondly, our observations should not be considered as an evaluation of the Fitzpatrick phototype classification, since the wording we used was not exactly the same in order to ensure that questions were concise. Instead, we combined all three elements suggested by Fitzpatrick (constitutive and facultative skin colour and tanning ability) in one question (phrase A; *table 1*). Thirdly, the translation of the questionnaire in various languages might have led to slight discrepancies in the description of phototype categories. Finally, as an objective assessment of phototype was not our aim, both phrases were not formally evaluated. From our results, however, the classification of phototypes could be adjusted to compare between settings where the estimation was made with and without a skin colour description.

Our study results further highlight the difficulty of using the Fitzpatrick phototype scale in comparative studies. The cross-cultural sensitivity and utility of skin type assessments might be improved by substituting the words “suntan” and “sunburn” with culturally neutral descriptions. Moreover, we showed that the phrasing of the questions used to determine the skin type modifies its perception and reporting, regardless of the population studied and source of assessment used. The precise way the phototype is evaluated, who determines it, and which questions are used should be explicitly reported in research articles. Practical tips for dermatologists assessing the phototype are provided (*table 2*). Images to aid objective collection of phototypes in daily practice, by screening examination or questionnaire, should improve

reproducibility [20]. A standardised procedure for estimating phototypes should be established to warrant reliable comparisons of results across studies.

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Table 1. Effect of question phrasing on the classification of skin type among 48,258 Euromelanoma screenees in six selected countries, 2009-2011.

Country*	Year-phrase**	N/year	Skin type (%)				p value	
			I	II	III	IV	Same phrase	Phrase A vs B
<i>Phototype assessed by patient</i>								
Greece	2009-A	3922	5.7	41.5	33.2	19.6	0.648	<0.001
	2010-A	3628	4.8	42.6	34.6	18.0		
	2011-B	5065	4.7	21.1	34.6	39.6		
Lithuania	2009-A	1071	8.4	38.7	43.1	9.8	0.569	<0.001
	2010-B	1045	7.1	12.1	50.5	30.3		
	2011-B	1044	6.5	19.1	40.9	33.5		
Serbia	2009-A	1544	4.1	30.8	51.8	13.2	0.437	<0.001
	2010-B	1509	6.5	20.3	44.4	28.8		
	2011-B	1528	6.5	21.3	44.6	27.6		
Sweden	2009-A	2913	3.2	30.2	58.6	8.0	0.112	<0.001
	2010-B	2523	2.4	15.7	51.0	31.0		
	2011-B	2971	2.9	14.6	54.6	27.9		
Switzerland	2009-A	4506	6.2	29.9	46.8	17.0	0.665	<0.001
	2010-B	4385	5.6	22.0	44.8	27.5		
	2011-B	6922	4.9	22.2	45.3	27.5		
<i>Phototype assessed by specialist in dermatology</i>								
Portugal	2009-A	1236	3.3	28.7	50.6	17.4	0.957	<0.001
	2010-B	1257	7.9	37.2	49.1	5.9		
	2011-B	1189	5.8	39.5	50.2	4.5		

*The source of information on skin type was constant over the study period in each country.

Phrase A: **Describe the colour of your skin and how it reacts during sun exposure in the summer? Type I (very fair skin, always burns, never tans); Type II (fair skin, always burns, tans minimally or with difficulty); Type III (darker skin, initially burns and then tans); Type IV (brown skin, burns minimally, tans readily).
 Phrase B: **How does your skin react to the summer sun?** My skin always burns, never tans; My skin always burns, tans minimally or with difficulty; My skin initially burns and then tans; My skin burns minimally, tans readily.

Table 2. Practical tips for clinicians assessing skin phototype.

- Check your patient's constitutive skin colour (buttocks or other unexposed skin area).
- **Use a visual aid** that helps grade skin colour instead of written descriptions (such as dark, tanned, light, olive, *etc.*) that might be misinterpreted. Use a scale (*examples: Skin Colour Palette used in the 2010 Americas Barometer, von Luschans scale, etc.*)
- **Discuss** with your patient but let him/her decide on how sun sensitive his/her skin is after clarifying the terms "sunburn" and "suntan".
- Clarify that you are asking for a description of a tendency to develop a sunburn (erythema, oedema, pain, *etc.*) **24 hours after first exposure** to the sun (*in late spring or early summer for 30-60 min, depending on latitude*).
- Clarify that you are asking him/her how tanned he/she will become **in a week after this first exposure** and use your visual scale to help your patient show the intensity of the tan, instead of describing it with words.
- **REMEMBER:**

Take your time when doing this assessment and be sure you have all the information. Use **separate** questions for each of the three elements that need to be reported:

- **Constitutive skin colour (example: Is your skin in unexposed areas much lighter?**

What does your skin look like when not exposed to the sun?)

- **24-hour sun reaction after first exposure (example: What does your skin look like after your first exposure to the sun the next day?)**

- **Facultative skin colour seven days after first exposure (example: What does your skin look like one week after a first exposure to the sun?)**