

## ORIGINAL ARTICLE

**Sensitive skin: psychological effects and seasonal changes**

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**Introduction**

Sensitive skin has been described by Kligman<sup>1</sup> and Thiers.<sup>2</sup> However, its existence was debated, and sometimes still is. A near consensus now exists on a clear clinical definition. Sensitive skin types are defined<sup>3–6</sup> as the onset of prickling, burning or tingling sensation (possibly of pain or pruritus) due to various factors, which may be physical (ultraviolet radiation, heat, cold, wind), chemical (cosmetics, soap, water, pollution), psychological (stress) or hormonal (menstrual cycle). Erythema is frequently but not necessarily associated with sensitive skin. A few tests can aid in establishing the diagnosis and are useful exploratory methods: the stinging test, the thermal sensitivity test and

**Abstract**

**Introduction** Sensitive skin is a frequent disorder, but its effects and its variability are unknown.

**Objectives** To investigate the effects of sensitive skin first on quality of life and the psyche, and secondly, on seasonal changes.

**Methods** The French Opinion Poll Institute (IPSOS) conducted two opinion polls in March and July 2004. Samples included, respectively, 1006 and 1001 individuals, from a representative national sample of the French population aged 15 years or older. The polling subjects were interviewed by phone and selected by the quota method (gender, age, occupation of household head, type of geographical area and region). Questions about their perception of their sensitive skin and about potential aggravating factors were asked. Quality of life was assessed using the SF-12 questionnaire and depressive symptoms using the Hospital Anxiety and Depression (HAD) rating scale.

**Results** The characteristics of the two samples were strictly similar. Persons with sensitive skin and very sensitive skin were more numerous in summer than in winter. In both surveys, the degree of sensitivity was significantly higher in the female population. Quality of life was worse in people with sensitive or very sensitive skin, above all in its psychological component – the more sensitive the skin, the more the quality of life deteriorated. There was no significant relationship between depressive symptoms and skin sensitivity in the ‘very sensitive’ or ‘sensitive’ groups.

**Conclusion** Our study was the first to show seasonal changes in skin reactivity and to study the psychological impacts of sensitive skin.

the capsaicin test. Sensitive skin is also called reactive skin, hyper-reactive skin, intolerant skin or irritable skin.

The physiopathogenesis of sensitive skin is poorly understood. There is a decrease in the ‘tolerance threshold of skin.’ It is not an immune or allergic disorder. From a histological standpoint, vasodilation and an inflammatory infiltrate are infrequent findings. An impaired skin barrier function, with an increase in insensitizing water loss, which could increase exposure to irritants, is observed.<sup>7</sup> The presence of abnormal sensations and vasodilation demonstrates the involvement of the nervous system in the skin.<sup>8</sup> Neurogenic inflammation seems to result from neuro mediators such as substance P, CGRP and VIP, leading to vasodilation and mast cell degranulation. Non-specific

inflammation may also be associated with release of IL-1, IL-8, PgE2, PgF2 and TNF $\alpha$ .<sup>9</sup>

The prevalence of sensitive skin is surprisingly very high. Three epidemiological studies were conducted in the UK,<sup>5</sup> USA<sup>6</sup> and in France.<sup>10</sup> These studies showed that half of the population of these countries is affected (approximately 60% of women and 40% of men). In subjects with sensitive skin, quality of life is adversely affected, mainly through its mental component.<sup>10</sup> But two questions remain unresolved:

- 1 Could this deterioration in quality of life lead to depression?
- 2 Could exposure to ultra-violet radiation be a reactive skin aggravating factor and even could ultraviolet (UV) trigger reactive skin?

We tried to respond to this last question by determining if seasonal changes in reactive skin exist.

## Methods

An opinion poll was conducted by IPSOS-Santé in March and July 2004. This sample (1006 persons in March and 1001 in July) was drawn from a representative national sample of the French population aged 15 years or older. The polling subjects were interviewed by phone and selected according to the quota method (gender, age, occupation of household head, type of geographical area and region). A systematic check of the interviews was performed by calling back 20% of the interviewees. If this procedure had revealed an abnormal finding in a single questionnaire, all the interviews conducted by the interviewer concerned would have been checked. No such abnormal finding was observed.

Interviewees responded to an open question concerning the presence or not of sensitive skin, with no specific details about topography; they were then asked about the occurrence of burning, prickling or irritation in the presence of various factors: emotion, cold, heat, sun, cosmetics, dry air, air conditioning, water, pollution and temperature changes. They were also asked if they experienced frequent flushing for no apparent reason, if their facial skin was easily irritated, if they had consulted a dermatologist during the previous year and if they had a skin disorder.

Quality of life was evaluated using the Short-Form 12 (SF-12) scale.<sup>12</sup> The SF-12 is a short version of the SF-36, a generic measure making possible the assessment of health status in the general population. It is a self-questionnaire. Responses to questions are dichotomous (yes/no), ordinal (excellent to poor) or express a frequency (always to never). Two scores can be calculated from these 12 questions: a Physical Component Summary (PCS-12) and a Mental Component Summary (MCS-12). There is no overall score. Missing data are left as missing data. In case of

non-response to a question forming one of these subscales, the score cannot be calculated. Thus, a given subject can have a PCS-12 score but no MCS-12 score. After processing of abnormal responses and reversed items, each response was assigned a coefficient. PCS-12 and MCS-12 scores were obtained by summation. Lastly, they were transformed (mean 50 and standard deviation 10) for comparison with American 'standards', allowing a direct interpretation of scores compared to the general American population. Therefore, scores above or below 50 are above or below the mean of the general American population. The higher the score, the better the quality of life.

The Hospital Anxiety and Depression (HAD) scale<sup>13</sup> is a 14-item scale: seven items are intended to screen for anxiety and the other seven are for depression, thus giving two different scores. We only used the seven items on depression. The depression score can range between 0 and 21, allowing classification of subjects into three groups:

- absence of depressive symptoms (0–7);
- 'doubtful' depressive symptoms (8–10); and
- definite depressive symptoms (11–21).

This questionnaire was only proposed during the July poll.

In July, skin type was searched for (still by phone) according to the following criteria'

- I = 'Fair skin, freckles/moles, blond or red hair, does not tan or tans little and always burns'
- II = 'Fair skin, blond or chestnut brown hair, tans little and frequently burns'
- III = 'Olive-coloured skin, brown hair'
- IV = 'Tans well and rarely burns'

Quantitative variables were compared between groups using a Student's *t*-test (if two groups) or using an analysis of variance (ANOVA) design (if more than two groups). In the event that conditions required for these tests were not met, non-parametric tests were performed, in particular, the Wilcoxon and Kruskal–Wallis tests. Qualitative variables were compared using chi-squared tests or the Fisher's exact test if conditions for application were not met. Statistical analyses were performed using SAS software version 8.2 (SAS Institute, Cary, NC, USA).

## Results

Results from March 2004 have already been published.<sup>10</sup> Results for July 2004 and comparative data are first published in this article. Characteristics of the two populations were comparable for gender, age, head of household occupation, type of geographical area and region. All of these characteristics make the populations a representative sample of the French population over 15 years of age.

The number of subjects with reactive skin (sensitive skin or very sensitive skin) was significantly higher in July

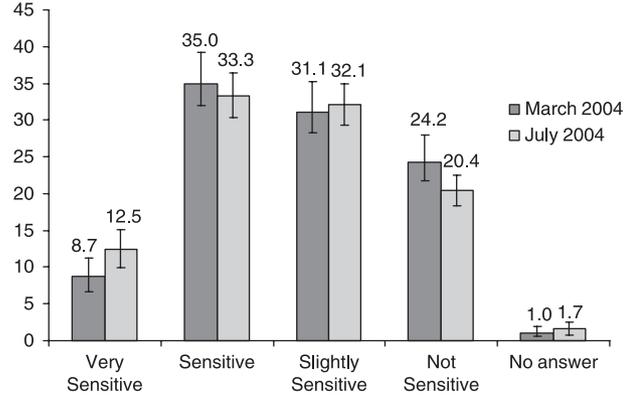
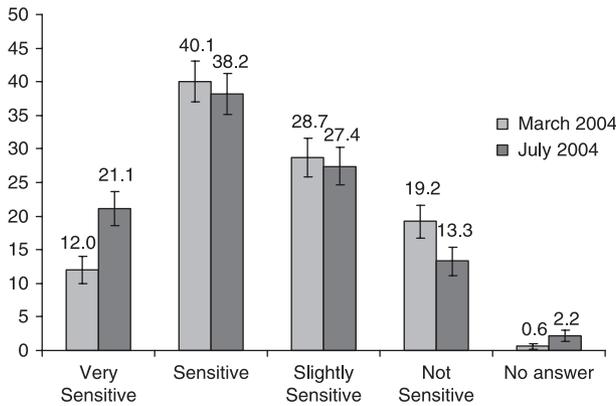
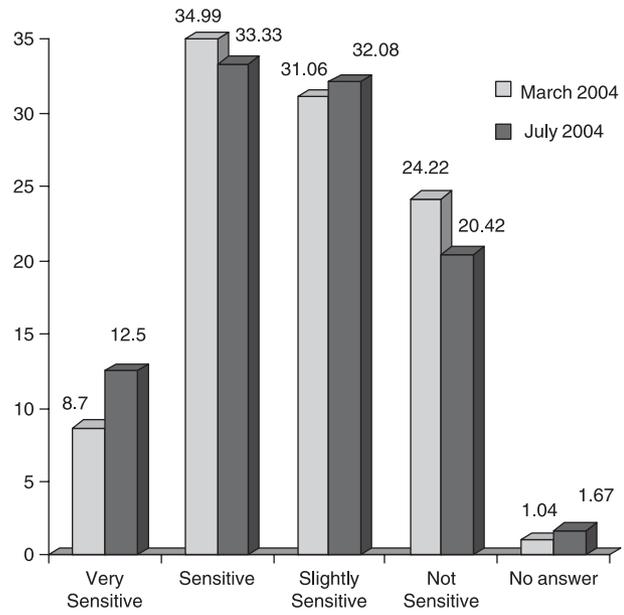
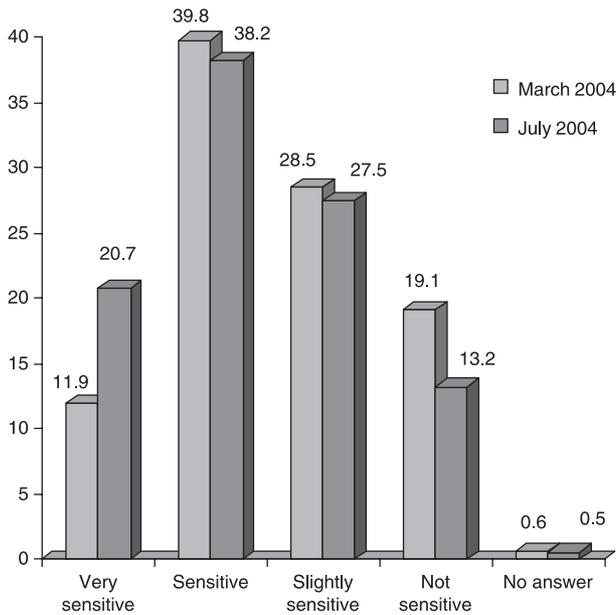


fig. 1 Skin sensitivity as a function of season (overall population).

fig. 2 Skin sensitivity in men as a function of season.

than in March so is the sex of patients: 59.4% vs. 52.1% ( $P_{\text{adjusted by gender}} = 0.008$ ) (fig. 1). In the two periods, women were more likely than men to have sensitive skin ( $P < 0.0001$ ). The seasonal difference observed was significant ( $P < 0.0001$ ) for women but not for men (figs 2 and 3). In women, the percentage with sensitive or very sensitive skin was 71.2% in July vs. 59.39% in March.

We studied the impact of factors that could explain a seasonal difference. In order to compel differences related to the sex, we carried out an analysis with adjustment on the sex (Table 1). Among factors triggering sensitive skin, dry air (41.13% vs. 35.01% for women and 23.31% vs. 21.55% for men,  $P_{\text{adjusted by gender}} < 0.05$ ), wind (48.93% vs. 42.47% for women and 30.48% vs. 22.96% for men,  $P_{\text{adjusted by gender}} = 0.001$ ) and cold (60.23% vs. 57.80% for women and 45.02% vs. 35.42% for men,  $P_{\text{adjusted by gender}} = 0.008$ ) were reported as playing a more important role

in March than in July. On the other hand, sun (54.6% vs. 47.66% for women and 40.8% vs. 36.7% for men,  $P_{\text{adjusted by gender}} = 0.013$ ), temperature changes (59.23% vs. 52.31% for women and 43.61% vs. 41.82% for men,  $P_{\text{adjusted by gender}} = 0.004$ ), air conditioning (46.34% vs. 37.32% for women and 38.43% vs. 32.75% for men,  $P_{\text{adjusted by gender}} < 0.001$ ), pollution (53.77% vs. 49.80% for women and 49.79% vs. 42.24% for men,  $P_{\text{adjusted by gender}} = 0.011$ ) and emotion (45.36% vs. 41.65% for women and 58.80% vs. 51.47% for men,  $P_{\text{adjusted by gender}} = 0.012$ ) were reported as playing a more important role in July than in March. Skin type had a significant influence on the perception of sensitivity, the fairer phototypes appearing more frequently reported when sensitive or very sensitive skin types were reported (Table 2). Persons feeling they had severe skin sensitivity were those who had fair skin (11.48% patients [8.80–14.15%] with very sensitive or sensitive skin had

**Table 1** Factors influencing the occurrence of skin reactivity in men and women

	Men				Women				$P_{\text{adjusted by gender value}}$
	March survey		July survey		March survey		July survey		
	N	%	N	%	N	%	N	%	
Dry air	110	23.31	103	21.55	211	41.13	181	35.01	0.049
Skin redness due to the sun	176	36.74	194	40.76	244	47.66	279	54.60	0.013
Skin redness due to emotion	197	41.65	215	45.36	262	51.47	304	58.80	0.012
Tingling due to cosmetic at least once	125	26.65	133	28.24	207	40.04	233	44.98	0.116
Irritations or burns due to cosmetic at least once	64	13.62	77	16.24	131	25.24	146	28.24	0.12
Changes in temperature	202	41.82	208	43.61	272	52.31	308	59.23	0.004
Pollution	196	42.24	237	49.79	247	49.80	278	53.77	0.011
Air conditioning	151	32.75	181	38.43	181	37.32	234	46.34	0.0009
Cold	217	45.02	170	35.42	312	60.23	300	57.80	0.008
Wind	146	30.48	110	22.96	252	48.93	220	42.47	0.001

	Men			Women		
	1st survey	2nd survey	P-value	1st survey	2nd survey	P-value
Changes in temperature	202 41.82%	208 43.61%	0.5764	272 52.31%	308 59.23%	0.0246
Pollution	196 42.24%	237 49.79%	0.0203	247 49.80%	278 53.77%	0.2058
Air conditioning	151 32.75%	181 38.43%	0.0705	181 37.32%	234 46.34%	0.0040
Cold	217 45.02%	170 35.42%	0.0024	312 60.23%	300 57.80%	0.4266
Wind	146 30.48%	110 22.96%	0.0086	252 48.93%	220 42.47%	0.0371

	Men			Women		
	1st survey	2nd survey	P-value	1st survey	2nd survey	P-value
Dry air	110 23.31%	103 21.55%	0.5162	211 41.13%	181 35.01%	0.0431
Skin redness due to the sun	176 36.74%	194 40.76%	0.2031	244 47.66%	279 54.60%	0.0263
Skin redness due to emotion	197 41.65%	215 45.36%	0.2496	262 51.47%	304 58.80%	0.0183
Tingling due to cosmetic at least once	125 26.65%	133 28.24%	0.5860	207 40.04%	233 44.98%	0.1078
Irritations or burns due to cosmetic at least once	64 13.62%	77 16.24%	0.2574	131 25.24%	146 28.24%	0.2755

the fairer phototypes vs. 4.27% patients [2.21–6.32%] with slightly sensitive or not sensitive skin had the fairer phototypes).

About a quarter of patients (i.e. 22.42%) (IC95% [19.83–25.01%]) had seen a dermatologist during the previous year in July, whereas only 20.70% (IC95% [18.15–23.25%]) of patients in March ( $P_{\text{adjusted by gender}} < 0.001$ ).

Concerning sex repartition, 18.37% (IC95% [14.89–21.85%]) of men and 26.15% (IC95% [22.37–29.94%]) of women had seen a dermatologist during the previous year in July, whereas these percentages were only 15.45% (IC95% [12.16–18.74%]) and 25.54% (IC95% [21.73–29.36%]), respectively, in March.

Some correlations were demonstrated between sensitive skin and concomitant dermatological disorder such as

contact dermatitis (18.3% [11.1–25.4%] in March and 40.2% [29.8–50.7%] in July ( $P_{\text{adjusted by gender}} < 0.05$ )), atopic dermatitis (4.4% [0.6–8.1%] in March and 16.1% [6.8–25.5%] in July ( $P_{\text{adjusted by gender}} < 0.05$ )), 'Rosacé' (2.6% [0.0–5.6%] in March and 10.3% [2.3–18.4%] in July ( $P_{\text{adjusted by gender}} < 0.05$ )), dermatite séborrique (2.6% [0.0–5.6%] in March and 14.8% [5.7–23.8%] in July ( $P_{\text{adjusted by gender}} < 0.05$ )).

The PCS-12 and MCS-12 scores were comparable in March and July. We combined the two populations for the study on quality of life. A difference between men and women was observed (fig. 4). In women (PCS = 49.38 [48.84–49.92] and MCS = 45.35 [44.73–45.97]), these scores were worse than in men (PCS = 50.40 [49.90–50.90] and MCS = 48.31 [47.73–48.90],  $P < 0.001$ ). For both men and women, a greater impact on quality of life

**Table 2** Phototype and severity of skin sensitivity

Severity of skin sensitivity												
Very sensitive or sensitive				Slightly or not sensitive				Total				
N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup	
Phototype												
I	63	11.48	8.80	14.15	16	4.27	2.21	6.32	79	8.55	6.74	10.36
II	238	43.35	39.20	47.51	105	28.00	23.44	32.56	343	37.12	34.00	40.24
III	248	45.17	41.00	49.35	254	67.73	62.99	72.48	502	54.33	51.11	57.55
Total	549	100.00	0	0	375	100.00	0	0	924	100.00	0	0

Severity of skin sensitivity																				
Very sensitive				Sensitive				Slightly sensitive				Not sensitive				Total				
N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup	
Phototype																				
I	31	16.32	11.03	21.60	32	8.91	5.96	11.87	8	3.23	1.02	5.44	8	6.30	2.03	10.57	79	8.55	6.74	10.36
II	83	43.68	36.59	50.78	155	43.18	38.03	48.32	84	33.87	27.95	39.79	21	16.54	10.01	23.06	343	37.12	34.00	40.24
III	76	40.00	32.99	47.01	172	47.91	42.73	53.10	156	62.90	56.86	68.94	98	77.17	69.79	84.54	502	54.33	51.11	57.55
Total	190	100.00			359	100.00			248	100.00			127	100.00			924	100.00		

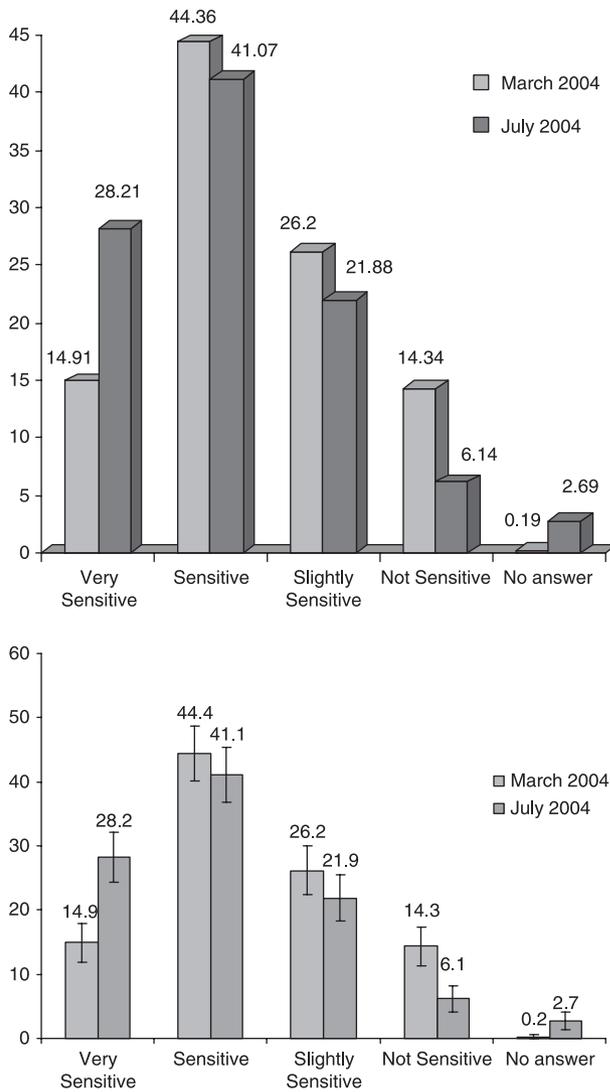


fig. 3 Skin sensitivity in women as a function of season.

was observed as a function of the severity of skin sensitivity (fig. 5). However, this result concerned only the psychological dimension of quality of life, as measured by the MCS-12 score ( $P < 0.005$ ).

We cross-matched the subpopulations according to skin sensitivity with the subpopulations according to depressive symptomatology (Table 3). There was no significant relationship between presence of depression and presence of sensitive or very sensitive skin.

Facial flushing triggered by emotions (erythrophobia) had no effect on PCS-12, but the MCS-12 score was 45.75 [45.12–46.37] in subjects with this condition and 47.78 [47.18–48.38] in other subjects ( $P_{\text{adjusted}} < 0.001$ ). On the other hand, subjects who suffered from facial flushing had higher depressive symptoms than other subjects (3.7% vs. 4.8%,  $P < 0.0001$ ).

Table 3 Depressive symptomatology and severity of skin sensitivity

Severity of skin sensitivity	Depressive symptomatology												P-value				
	No symptomatology				Doubtful symptomatology				Certain symptomatology					Total			
	N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup	N	%	IC 95% Borne Inf	IC 95% Borne Sup					
Sensitive or very sensitive	509	59.19	55.90	62.48	45	63.38	51.98	74.78	25	56.82	41.77	71.87	579	59.38	56.30	62.47	0.7393
Slightly or not sensitive	351	40.81	37.52	44.10	26	36.62	25.22	48.02	19	43.18	28.13	58.23	396	40.62	37.53	43.70	
Total	860	100.00	0	0	71	100.00	0	0	44	100.00	0	0	975	100.00	0	0	
Sensitive or very sensitive	509 87.9%				45 7.8%				25 4.3%				579 100%				0.7393
Slightly or not sensitive	351 88.6%				26 6.6%				19 4.8%				396 100%				
Total	860 88.2%				71 7.3%				44 4.5%				975 100%				

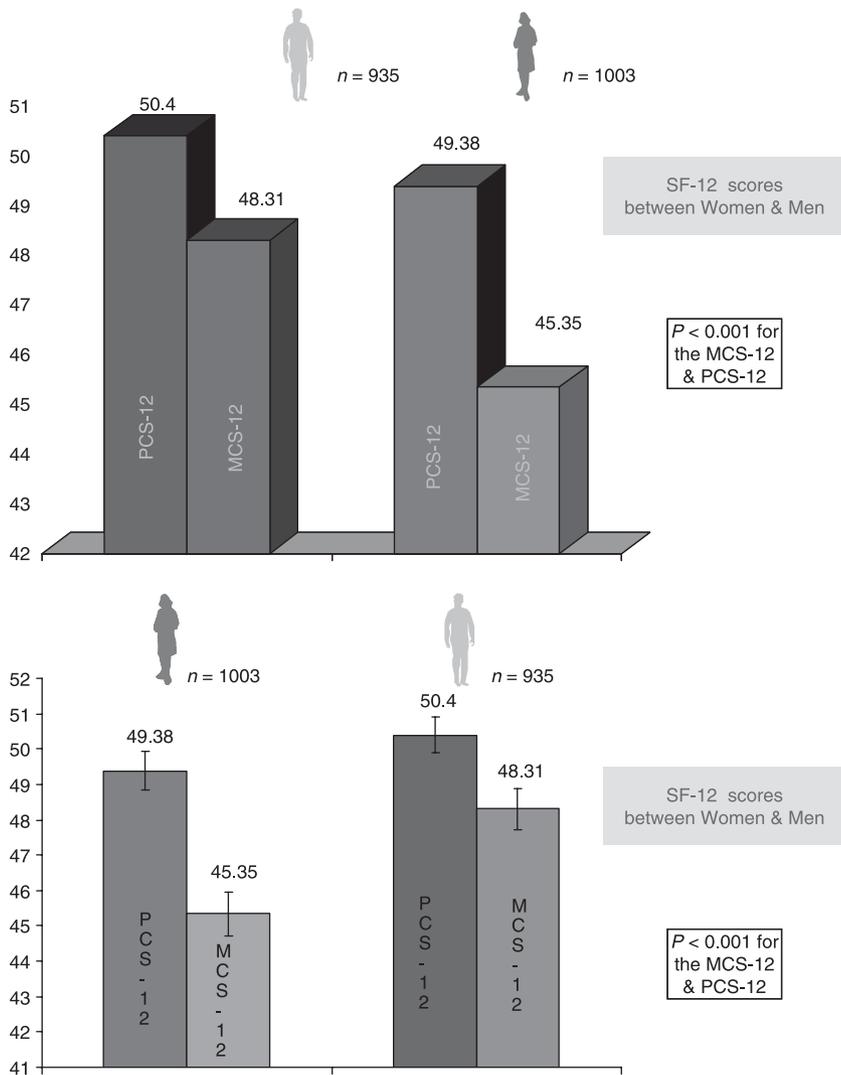


fig. 4 Assessment of quality of life in men and women.

### Discussion

To our knowledge, this study is the first study on seasonal changes and the psychological impact of sensitive skin. It was conducted on a representative sample of the French population by an institute recognized for its polling abilities. The non-response rate was negligible, which indicates that the term ‘sensitive skin’ has a meaning for the vast majority of French people. This meaning is appropriate as subjects who reported sensitive skin had in fact skin reactions triggered by one or, in general, several factors, thus meeting the definition of sensitive skin.<sup>3-6</sup> Surveys are therefore a suitable method for conducting an epidemiological study on sensitive skin. Moreover, it is the method that was used in the three studies.<sup>5,6,10</sup> Our study is the only one to involve a representative sample of a national population. It has confirmed the very high prevalence of sensitive skin.

General quality of life is little impaired in subjects with sensitive skin, except in its psychological component, as measured by the MCS-12 score: the more sensitive the skin is, the more this psychological component of QoL is impaired. Does this involve a predisposition for a ‘psychological sensitivity’ or is this a consequence of having sensitive skin? The number of depression cases was not higher in subjects who presented with sensitive skin or very sensitive skin. It might be interesting to supplement this study by evaluating depression severity, as well as by screening for anxiety or acute stress reactivity. Similarly, the use of Quality-of-Life scales more specific to dermatology might be interesting.

Our study is the first one to evaluate the effects of flushing triggered by emotions. There is a significant impact on the psychological component of quality of life. This impact is revealed by this study because persons with this condition present with marked depressive symptoms more

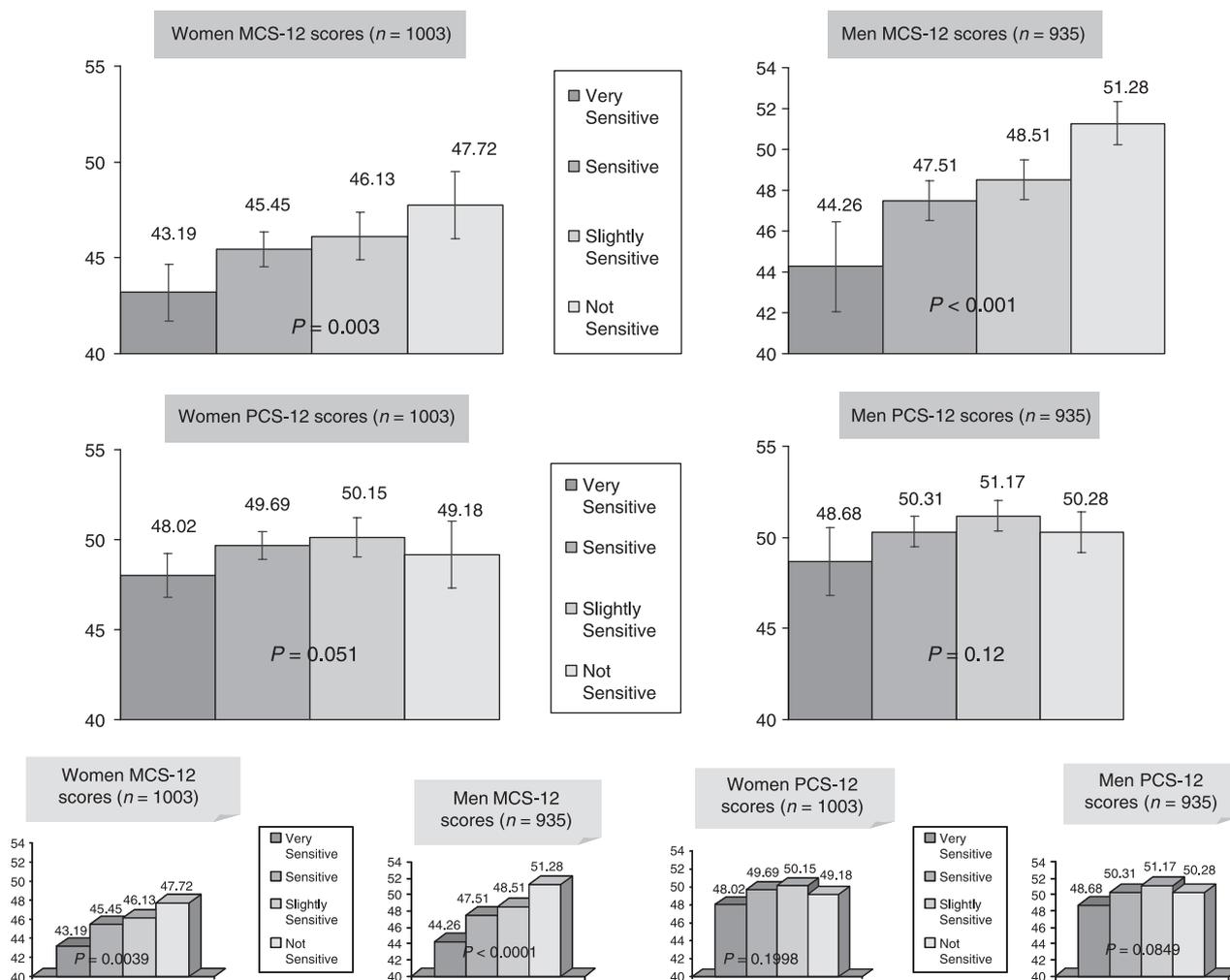


fig. 5 Assessment of quality of life according to skin sensitivity in men and women.

frequently than other subjects. To our knowledge, no study has involved psychiatric comorbidity in patients with erythrophobia. Autonomic hyperactivity has simply been observed in case of psychological stress.<sup>14</sup>

Sensitive skin clearly appears more frequently in summer than in winter, especially in women. Our results show that a fair skin type (phototype) is more commonly associated with sensitive or very sensitive skin. The American study<sup>6</sup> did not show any difference in prevalence among ethnic groups; however, it did show reactivity to different factors depending on ethnic groups. A German–Japanese study<sup>15</sup> showed that Japanese women had subjective feeling of skin irritation after application of sodium lauryl sulphate, more frequently than German women, although there was no difference in impairment of the skin barrier. Among factors triggering sensitive skin, climatic factors appear to play a role: there is more sun, temperature changes, air pollution and air conditioning in July.

Sensitivity to UVB (occurrence of an erythema) was higher in summer than in winter.<sup>11</sup> This is a paradoxical finding as natural protection by melanin is stronger in summer. Other factors could thus explain this result. Higher skin reactivity in summer allows one then to better understand why UVB would induce more erythema in summer. Consequently, a variability in skin reactivity could exist according to seasonal and chronobiological factors, which would depend more on neurogenic inflammation than on release of the free radicals.

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