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## Abstract

**Background:** Attention is the process which enables to preferentially select salient or relevant stimuli and to attenuate the response to irrelevant incoming stimuli. Migraine is characterized by both attentional alterations and an abnormal sensory processing to external stimulations. The aim of the study was to investigate potential interactions between self-perceived attentional difficulties and sensory hypersensitivity in migraine patients.

**Methods:** Forty-six episodic migraineurs without aura and 46 healthy controls filled out questionnaires on self-perceived attention difficulties and self-reported sensitivity to visual, auditory and olfactory stimulations.

**Results:** Compared to controls, migraineurs reported significantly higher levels of attention difficulty and sensory sensitivity. Sensory hypersensitivity correlated significantly with self-perceived attentional difficulties in migraineurs ( $p=0.002$ ), but not with migraine disability or levels of anxiety or depression. Ictal and interictal sensory sensitivity were significantly correlated in migraineurs within visual ( $p<.001$ ), auditory ( $p<.001$ ) and olfactory ( $p=.001$ ) modalities.

**Conclusion:** This study shows for the first time an association between self-reported attentional difficulties and multimodal sensory hypersensitivity. Studies combining behavioral and physiological measures of sensory processing and attention processes are necessary to further understand the peculiar vulnerability of migraineurs to sensory stimuli.

**Key-words :** Photophobia – Phonophobia – Osmophobia – Attention – Questionnaire - Headache

# **Self-perceived attention difficulties are associated with sensory hypersensitivity in migraine**

## **1. Introduction**

Migraine is characterized by an abnormal sensory processing [1][2]. Enhanced sensitivity to uni- or multimodal stimuli such as an exacerbation of headache or discomfort is a striking feature of migraine which varies over the migraine cycle [3] [4]. Neurophysiological and neuroimaging studies also suggest that the migraine brain is hyperresponsive to sensory stimuli as evidenced by impaired habituation to stimuli and increased BOLD fMRI responses to photic stimuli [5].

In parallel, recent research has pinpointed attentional alterations in interictal migraineurs. Attention is the process which enables to preferentially select salient or relevant stimuli and to attenuate the response to irrelevant incoming stimuli. Neurophysiological and neuroimaging studies suggest an altered top-down attentional control of visual cortex [6] and an enhanced orienting response towards acoustic stimuli [7][8] in migraineurs. Behavioral and neuropsychological studies also report attentional impairments in migraineur children and adults (for a review, see [9]). However, distinction between executive functions and attention, or hyperactivity symptoms and attention, is not always possible given the tests employed [10][11] and results are not always consistent overall. For instance, Gil-Gouveia et al. [12] and Lo Buono et al. [13] found no difference between migraineurs' and controls' performance in the Trail Making Test-A and -B. The study of Han et al. suggested that some components of attention may be impaired in migraineurs without aura, whilst other components are intact [14].

To our knowledge, no study has investigated the potential link between migraine enhanced sensory sensitivity and attentional alterations. Both point to abnormal sensory processing in migraine patients. The aim of our study was to investigate the interactions between sensitivity to light, sound, odor, and self-perceived attentional difficulties by means of questionnaires, in episodic migraineurs without aura and control participants.

## 2. Methods

### 2.1 Participants

Forty-six migraine patients without aura and forty-six healthy control participants matched for sex, age, education and music training participated in this study (Table 1). All migraine patients fulfilled the criteria of episodic migraine according to the International Headache Society [15], were aged 18 to 75 years and suffered from at least 1 attack per month. Exclusion criteria were migraine with aura, chronic migraine (>15 days of headache per month), other neurological or psychiatric disease, and use of preventive medication. Attack frequency was  $3.8 \pm 1.9$  per month. Twenty-three migraineurs and eleven control subjects were concomitantly participants to a magnetoencephalography (MEG) study investigating auditory attention [16]. Participants gave their written informed consent, according to the Declaration of Helsinki.

		Patients	Controls	Group comparison	
		(n=46)	(n=46)	Statistics	p-value
Sex (n)	Male	10	13	$\chi^2(1) = 0.52$	0.471
	Female	36	33		
Age (years)	Mean (SD)	29.4 (9.4)	27.4 (11.2)	$t(90) = 0.93$	0.355
Education (years)	Mean (SD)	15.5 (2.4)	15 (1.7)	$t(90) = 1.18$	0.240
Music training (years)	Mean (SD)	3.4 (4.9)	3.4 (4.2)	$t(90) = 0.50$	0.964

**Table 1: Demographic characteristics of the participants**

### 2.2 Material

We created one questionnaire assessing self-perceived attentional difficulties in daily life. This questionnaire was inspired from the Attention self-assessment questionnaire [17] and the Wender Utah Rating Scale [18]. For each item, the participants rated on a 4-point scale the frequency with which they encounter difficulties in a particular situation. We also created three questionnaires to assess visual, auditory, and olfactory hypersensitivity. Each item presented a behavioral or emotional response to a sensory stimulation and a 4-point scale from 1 “Rarely” to 4 “Very often”. These questionnaires were divided into two sections: “between attacks” and “during an attack” (see Appendix for the full version, with an English translation). The “between attacks” auditory questions were selected from the auditory sensitivity questionnaire of Khalfa (1999, French clinical test, published in English under the name HQ – Hyperacusis Questionnaire- [19]). The visual questions were adapted from Choi et al. [20]. The olfactory questions were inspired from the Glasgow Sensory Questionnaire [21][22].

Finally, migraineurs were requested to fill the HIT (Headache Impact Test, [23]) and the MIDAS scale (Migraine Disability Assessment, [24]) as a measure of migraine general severity, functional impact of migraines and migraine frequency. The 34 participants who underwent an additional MEG experiment also completed the HAD (Hospital Anxiety and Depression Scale [25]) to assess anxiety and depression levels.

### **2.3 Procedure**

Participants (n=92) completed the attention and hypersensitivity questionnaires. For the hypersensitivity questionnaires, controls were asked to answer only the “between attacks” sections. The migraine patients also completed the HIT and the MIDAS (n=46). The HAD was completed only by the subjects participating to the MEG study (n=23 migraineurs).

### **2.4 Statistical analysis**

Responses “rarely” were recoded as “1”, “sometimes” as “2”, “often” as “3” and “very often” as 4. Missing data in questionnaires were replaced by the group average score to the item. By averaging item scores, we got a total score for each questionnaire. Separate scores were computed for the sections “between attacks” and “during an attack” for the hypersensitivity questionnaires. Internal coherence of each questionnaire was assessed using Cronbach’s alpha.

Group differences in the scores to the self-perceived attentional difficulties and the visual, auditory and olfactory interictal hypersensitivity questionnaires were assessed using independent t-tests. Pearson correlations between ictal and interictal scores and between modalities were then conducted on migraine patient data. Finally, a multiple linear regression assessed the relationship between interictal sensory hyperactivity with self-perceived attention difficulties, including age, sex, education level, MIDAS and HIT scores as covariates to control for confounding effects. Modeling assumptions were verified using the *glm* R-package [26]: data fulfilled the statistical assumptions of independence, normality and homogeneity of variances ( $p > .05$ ). The multicollinearity was not excessive with a Variance Inflation Factor (VIF) always inferior to 0.69, under the commonly accepted cutoff value of 5 or 10 [27].

Causality questions (“Is your headache worsened by...?” and “Is your headache triggered by...?”) were analyzed separately, with the aim to examine the link between the perception of a stimulation as a trigger and interictal hypersensitivity in migraineurs.

All the computed p-values were two-tailed and the cut-off for statistical significance was of 0.5.

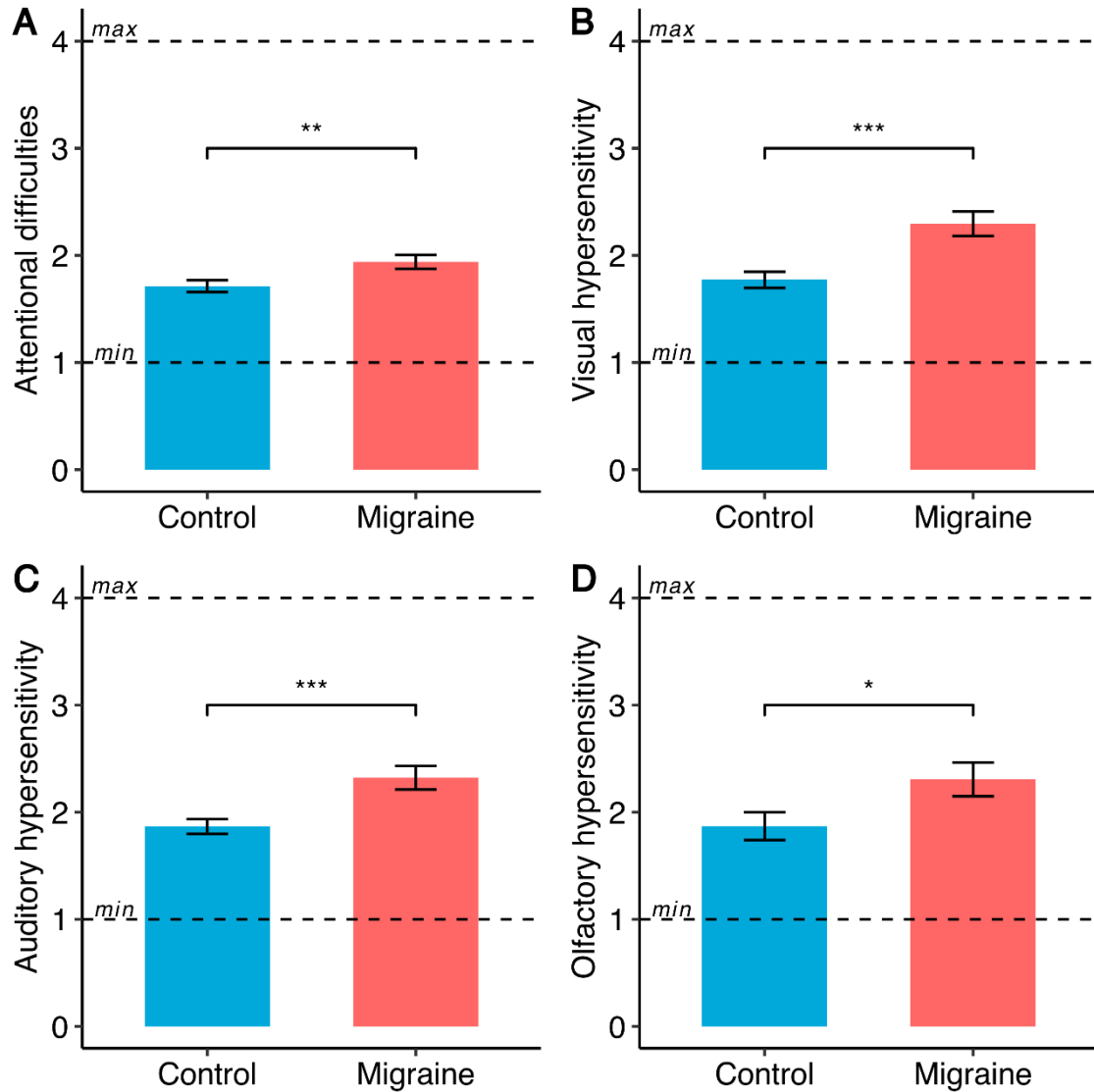
## **3. Results**

There was no missing data across the questionnaires for the control group. In the migraine group, the rate of unanswered items was <2% for all questionnaires. Internal coherence was high within each questionnaire (interictal part), as measured by the Cronbach’s Alpha computed on the 92 participants: 0.73 for the attention questionnaire, 0.85 for the visual questionnaire, 0.84 for the auditory questionnaire. Olfactory questionnaire comprised only one question in the interictal part. Three migraineurs out of 23 tested showed an anxiety score superior to the

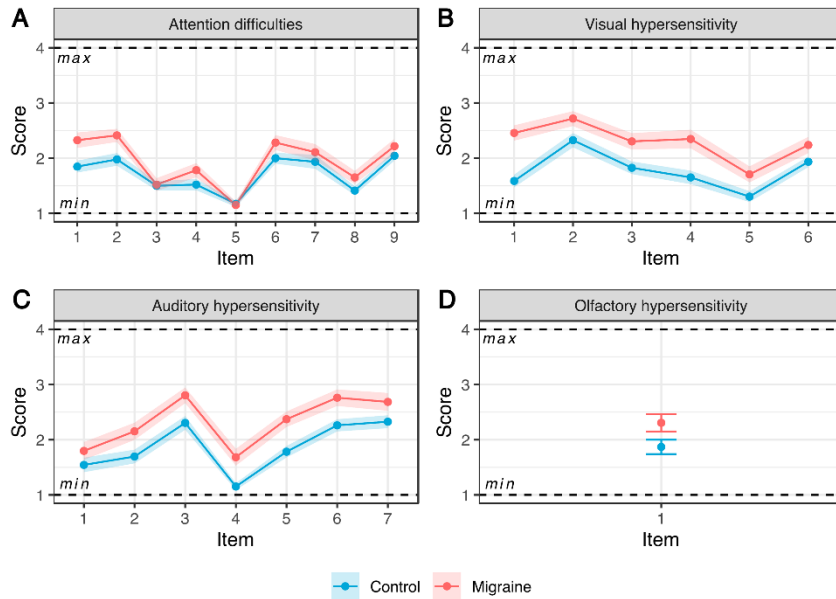
pathological cut-off according to the HAD norms, but the depression score was not pathological and their data were retained for the main analyses.

### 3.1 Group comparisons

Migraineurs showed significantly higher scores of self-perceived attention difficulties than control participants ( $t(90)=2.64$ ,  $p=.010$ ,  $d=.53$ ), as illustrated on Figure 1A.



**Figure 1:** Average score to the attention questionnaire (panel A) and the sensory hypersensitivity questionnaires (“between attacks” questions) in control and migraine participants (panels B, C, D). \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$



**Figure 2:** Profile of average rating (shaded area represents the standard-error) by item and group for the attention questionnaire (panel A) and the sensory hypersensitivity questionnaires (“between attacks” questions) in control and migraine participants (panels B, C, D).

Between attacks, migraineurs showed significantly higher scores of sensory hypersensitivity than controls in the visual ( $t(90)=3.84$ ,  $p<.001$ ,  $d=.75$ ), auditory ( $t(90)=3.22$ ,  $p=.002$ ,  $d=.64$ ), and olfactory modalities ( $t(90)=2.18$ ,  $p=.032$ ,  $d=.45$ ), as illustrated on Figure 1 (panels B, C, and D).

Ratings by items are illustrated on Figure 2.

### 3.2 Correlations in migraineurs

Visual and auditory hypersensitivity were correlated in migraineurs, slightly in interictal periods ( $r(44)=.30$ ,  $p=.043$ )<sup>1</sup>, more strongly in ictal period ( $r(44)=.432$ ,  $p=.003$ ). Olfactory hypersensitivity did not correlate with the other modalities in interictal period ( $r(44)<.22$ ,  $p>.141$ ). In ictal period, the correlation of olfactory hypersensitivity with auditory hypersensitivity was significant ( $r(44)=.315$ ,  $p=.033$ ), but the correlation with visual hypersensitivity failed to show significance ( $r(44)=.24$ ,  $p=.102$ ). Note however that the olfactory questionnaire was shorter and hence likely to be less robust than the auditory and visual questionnaires.

In the analyses that follow, we used a composite score of interictal sensory hypersensitivity across visual and auditory modalities by averaging visual and auditory scores for each migraineur participant.

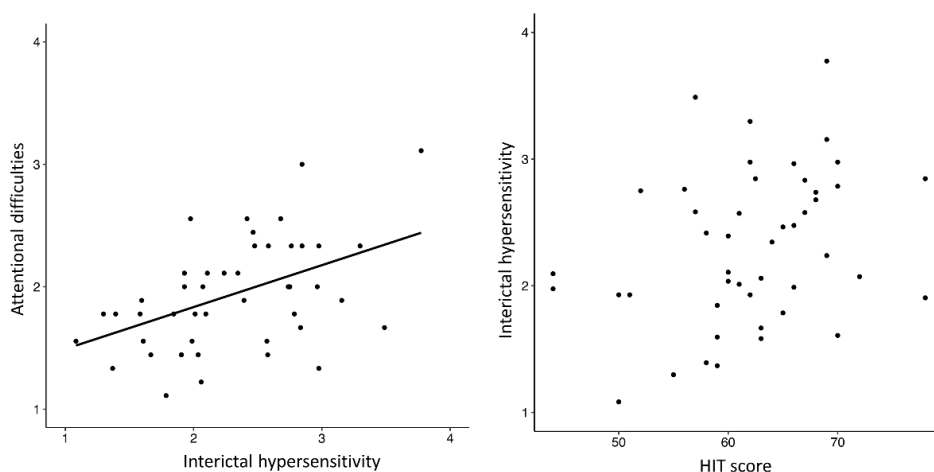
<sup>1</sup> While visual and auditory sensitivity did not correlate in control participants:  $r(44)=.08$ ;  $p=.61$



The multiple linear regression revealed a significant correlation between interictal sensory hypersensitivity and self-perceived attention difficulties ( $t=3.47$ ,  $p=.001$ ) with no significant contribution of the covariates (see Table 2). The model had a multiple  $R^2$  of .38 and an adjusted  $R^2$  of .28 ( $F(6,39)=3.95$ ,  $p=.003$ ). The relationship between sensory hypersensitivity and attention is illustrated in Figure 3.

	Estimate	Standard error	t-value	$p$
(Intercept)	0.854875	1.070402	0.799	0.42933
<b>Attention</b>	<b>0.610242</b>	<b>0.175795</b>	<b>3.471</b>	<b>0.00128</b>
Age	-0.003425	0.008243	-0.415	0.68006
Sex	-0.196746	0.175242	-1.123	0.26842
Education	-0.041456	0.032653	-1.270	0.21175
HIT	0.016227	0.011846	1.370	0.17858
MIDAS	0.005301	0.007090	0.748	0.45915

**Table 2: Results of the multiple linear regression in migraineurs data (n=46) with the interictal audiovisual hypersensitivity as the dependent variable. Self-perceived attention difficulties are significantly linked to hypersensitivity, while the demographic and migraine variables are not.**



**Figure 3: Interictal sensory hypersensitivity correlates significantly with self-perceived attentional difficulties in migraineurs (left) but not with migraine disability (HIT score, right)**

Tested in a separate analysis because of a sample of lower size (n=23), the correlation between the anxiety and depression score (HAD total score) and self-perceived attentional difficulties revealed a significant association between both variables ( $r(21)=.45$ ,  $p=.033$ ). However, the anxiety and depression score was not significantly correlated to interictal sensory hypersensitivity ( $r(21)=.09$ ,  $p=.674$ ).

### **3.3 Attack-related questions in migraineurs**

Sensory hypersensitivity was strongly enhanced during ictal periods compared to interictal periods (During attack composite score:  $2.8\pm 0.6$ ; Between-attack composite score:  $2.30\pm 0.6$ ;  $t(45)=-7.8$ ,  $p<.001$ ). Ictal and interictal scores were also significantly correlated within each modality (visual:  $r(44)=.57$ ,  $p<.001$ ; auditory:  $r(44)=.72$ ,  $p<.001$ ; olfactory:  $r(44)=.47$ ,  $p=.001$ ).

To the question “Is your headache worsened by...?” (see Appendix), 70% of migraineur participants answered “often” or “very often” for lights, 65% for sounds, 43% for odors. To the question “Is your headache triggered by...?”, 15% of migraineur participants answered “often” or “very often” for lights, 11% for sounds, 22% for odors. Scores to the question “Is your headache triggered by...?” were significantly correlated to interictal sensory hypersensitivity for visual and auditory modalities (visual:  $r(44)=.43$ ;  $p=.003$ ; auditory:  $r(44)=.38$ ;  $p<.010$ ), and marginally for olfactory modality ( $r(44)=.26$ ;  $p=.077$ ).

## **4. Discussion**

Compared with controls, migraine patients reported significantly higher levels of sensory sensitivity and attention difficulties. Both variables were positively correlated among migraineurs, after controlling for background variables (age, sex, education, HIT and MIDAS scores). Ictal and interictal sensory sensitivity were significantly correlated in migraineurs within visual, auditory and olfactory modalities. The correlation between visual and auditory hypersensitivity was slight in interictal period in migraineurs, and reinforced in ictal periods.

### **4.1 Multimodality of sensory hypersensitivity**

In this study, migraine patients reported a higher self-reported sensitivity to light, sound and odor between and during migraine attacks. A recent study showed that patients with ictal photophobia were more likely to complain from interictal photosensitivity as well as visual stimuli as triggers than headache patients without ictal photophobia or controls [28]. Our results corroborate this finding within the visual modality and show that these correlations between ictal and interictal states are also observed within auditory and olfactory modalities. A limit of the current study is that ictal and interictal allodynia was not evaluated.

Migraineurs reporting interictal hypersensitivity to a given modality also complained that these stimulations could trigger migraine attacks. This link is however difficult to draw up since answers to the hypersensitivity questionnaires may reflect preventive behaviors set up by patients toward a supposed trigger. Moreover, attribution of a causal role to certain sensory stimulations may be misinterpretation by patients of a simple co-occurrence of hypersensitivity

and migraine attacks. Indeed, patients pay an exacerbated attention to certain stimuli in the premonitory phase of the attack [29].

Correlation between self-reported visual and auditory sensitivity in migraineurs are in line with a set of data linking sensitivities across modalities. For instance, lower sound aversion thresholds were observed in patients with allodynia compared with non-allodynic patients [30] and patients with olfactory hypersensitivity were more likely to complain of photophobia [31]. This multimodal sensitivity would reflect the hypothesis that migraine is “*a paroxysmal disorder of pan-sensory gain*” [2].

#### **4.2 Self- reported attentional difficulties in migraine**

The present findings of self-reported attentional difficulties in migraineurs complement a set of studies objectivating complex attentional alterations between attacks [16] for electrophysiology; and more contrasting results for behavioral performances [32][14]. Our results suggest that attentional difficulties are not only detected by fine electrophysiology measures in experimental sets-up, but are consciously experienced by migraineurs in daily life, even in patients with episodic migraine. Recently, a cross-sectional study among university students showed an association between self-perceived attention difficulties and hyperactivity symptoms levels in students suffering from migraine [11]. Attention deficit is also reported in both children and adult patients with migraine (see [9] for a review). A comorbidity between migraine and Attention Deficit and Hyperactivity Disorder (ADHD) has been described, possibly because the same neurotransmitters might be involved in both conditions (see [33] for a review and meta-analysis; in particular migraine with aura [34]; see also [35]). However, the item in our attention questionnaire which could be considered as typical of ADHD (distraction at school during childhood), did not yield a difference in rating by migraineurs and controls (questionnaire in annex and figure 2). Items revealing the greatest group differences concern the sensitivity to exogenous and endogenous distractors, fatigability in sustained attention tasks and attention to detail. Migraineurs do not report making more errors than do controls when divided attention or sustained attention is required. Migraineurs might pay a superior cost in attention to reach the same performance, leading to fatigue. More detailed explorations of the different components of attention are needed to better understand this attentional profile.

#### **4.3 Correlations between self- reported attentional difficulties and sensory sensitivity in migraine**

The pathophysiological mechanism of ictal and interictal non-painful symptoms in migraine is still poorly understood. Three hypotheses may be proposed as possible explanations for the association we found between self-perceived attentional difficulties and sensory hypersensitivity.

First, attentional difficulties may be caused by an increased sensitivity to environmental stimuli. Migraine is characterized by a sensory amplification that occurs both during and between attacks and that implies multimodal sensory systems (see above). External stimuli may engage attention in an exacerbated manner in migraineurs [7], yielding distraction, and thus attentional

difficulties in daily life. According to this hypothesis, migraine would generate sensory hypersensitivity, which, as a consequence, would disturb attentional processes.

Second, hypersensitivity could be caused by attentional difficulties linked to migraine. An altered bottom-up (involuntary capture of attention by an unexpected salient stimulus) and/or top-down (voluntary attention to sensory stimuli) processes could lead to an abnormal sensory modulation management. For instance, an association between attentional deficit and abnormal sensitivity to sensory stimuli has been reported in patients with ADHD [36][37]. According to this hypothesis, migraine generates attentional imbalances, which expose patients to multimodal sensory hypersensitivity. However, migraine disease is not primarily an attention deficit disorder.

Third, both self-reported attentional difficulties and enhanced sensory responsiveness could originate from individual predisposition to develop migraine. Neurochemical imbalances (noradrenaline, dopamine) could underlie the attentional difficulties as well as the ictal and interictal pathophysiology of the migraineur brain (e.g [38]). This hypothesis could explain that both sensory and attentional anomalies have been reported in adults but also in children with migraine (see above): they would not be consequences of several years of migraine damaging the cognitive functions, but reflects of a source dysfunction. Longitudinal studies are required to enlighten causal relationships and disentangle anomalies which are at the core of migraine disease, and anomalies secondary to the source dysfunctions. One could for instance investigate engagement of attention in external stimuli processing in children, and how predictive it is for later migraine disease.

Importantly, the association we found here between self-perceived attentional difficulties and sensory hypersensitivity cannot be explained by anxiety and depression nor by the severity of migraine, as both variables were not correlated to sensory hypersensitivity. A personality factor as neuroticism [39] could underlie a higher level of complaint in migraineurs than controls and association between both complaints (hypersensitivity and attention difficulties). However, in that case, we would probably have observed a level of complaint across all scales (including HAD score) proportional to the migraine severity (HIT score), which is not the case. In line with these observations, interictal photosensitivity has been found to be unrelated to duration of migraine, frequency of attacks and mood disorder [40][41].

#### **4.4 Conclusion**

This study highlights the association between multimodal hypersensitivity and self-perceived attentional difficulties in migraine patients. Studies combining behavioral and physiological measures of sensory processing and attention processes are necessary to further understand the peculiar vulnerability of migraineurs to sensory stimuli.

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**Conflict of Interest:** The Authors declare no conflict of interest.

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## Annex

### QUESTIONNAIRES

The French version was used in the present study. The English translation is provided between brackets for the readership of this article. The scale is the same across the questionnaires: “rarely”, “sometimes”, “often” or “very often”.

#### Echelle d’attention

[Attention scale]

	Très rarement	Parfois	Souvent	Très souvent
1. Au cours de mes activités (lecture, télévision, conversation,...), je perds le fil parce que je suis distrait(e) par les bruits extérieurs et/ou le va-et-vient autour de moi. [During/throughout my activities (reading, television, conversation,...), I lose the thread because I am distracted by external noises and/or coming and going around me.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Au cours de mes activités (lecture, télévision, conversation,...), je perds le fil parce que mon esprit vagabonde et que je ne peux pas m’empêcher de penser à autre chose. [During/throughout my activities (reading, television, conversation,...), I lose the thread because my mind wanders and I cannot keep from thinking to something else.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Quand je mène une activité simple, répétitive et monotone de longue durée, je commets beaucoup d’erreurs. [When I am carrying on a simple, repetitive, monotonous activity on a long time, I commit a lot of mistakes.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Quand je mène une activité et que je suis interrompu(e) par quelque chose d’imprévu, j’oublie d’y revenir pour la terminer. [When I am carrying on an activity and I am interrupted by something unexpected, I forget to come back and finish it.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Quand je mène une activité qui comporte plusieurs étapes (comme faire du café), j’en omets une. [When I am carrying on an activity that include several steps (like making coffee), I omit one.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Je me fatigue lors d’un effort soutenu d’attention. [I get tired when making a sustained attention effort.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. A l’école j’avais tendance à rêvasser plutôt qu’à suivre les cours [At school, I had the tendency to daydream rather than attend the courses.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Je ne prête pas attention aux détails. [I don’t pay attention to details.]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Quand je mène une activité, je commets des erreurs si on me parle en même temps.

[When I am carrying on an activity, I make mistakes if one talks to me at the same time.]

### Questionnaire de gêne au bruit

[Phonophobia questionnaire]

Si vous présentez des migraines, répondez aux questions suivantes en vous basant sur votre vécu en dehors des crises :  
[If you have migraines, answer the following questions based on your experience between attacks:]

Très rarement  
Parfois  
Souvent  
Très souvent

1. Vous arrive-t-il d'utiliser des bouchons (boules Quiès) pour limiter votre perception du bruit ?

[Do you ever use earplugs to reduce your noise perception?]

2. Avez-vous des difficultés à ne plus faire attention aux sons qui vous entourent dans les situations de la vie quotidienne ?

[Do you find it hard to not pay attention anymore to sounds around you in everyday situations?]

3. Etes-vous gêné(e) pour vous concentrer dans un environnement bruyant ?

[Do you have trouble concentrating in noisy surroundings?]

4. Si l'on vous propose une activité (sortie, cinéma, concert), pensez-vous tout de suite au bruit que vous aurez à supporter ?

[When someone suggests doing something (going out, to the cinema, to a concert), do you immediately think about the noise you are going to have to put up with?]

5. Est-ce que le bruit vous fatigue ?

[Does noise make you tired?]

6. Trouvez-vous certains bruits ou sons agaçants, irritants ?

[Do you find certain sounds or noises irritating?]

7. Est-ce que les bruits forts vous dérangent ?

[Do loud noises bother you?]

Ne répondez aux questions suivantes que si vous présentez des migraines :

[Answer the following questions only if you have migraines:]

8. Lorsque vous avez la migraine, vous arrive-t-il d'utiliser des bouchons (boules Quiès) pour limiter votre perception du bruit ?

*[During your headache, do you ever use earplugs to reduce your noise perception?]*

9. Lorsque vous avez la migraine, avez-vous des difficultés à ne plus faire attention aux sons qui vous entourent dans les situations de la vie quotidienne ?

*[During your headache, do you find it hard to not pay attention anymore to sounds around you in everyday situations?]*

10. Lorsque vous avez la migraine, est-ce que les bruits forts vous dérangent ?

*[During your headache, do loud noises bother you?]*

11. Lorsque vous avez la migraine, trouvez-vous certains bruits ou sons agaçants, irritants ?

*[During your headache, do you find certain sounds or noises irritating?]*

12. Votre migraine empire-t-elle quand il y a du bruit ou certains sons ?

*[Is your headache worsened by noise or certain sounds?]*

13. Votre migraine est-elle déclenchée par le bruit ou certains sons ?

*[Is your headache triggered by noise or certain sounds?]*

**Questionnaire de gêne à la lumière**

*[Photophobia questionnaire]*

*Si vous présentez des migraines, répondez aux questions suivantes en vous basant sur votre vécu en dehors des crises :*

*[If you use to have migraines, answer the following questions based on your experience between attacks:]*

1. Est-ce que la lumière vous fatigue ?

*[Does light make you tired?]*

2. Quand la lumière est vive, vous sentez-vous ébloui(e) ou aveuglé(e) ?

*[Do you have a sense of glare or dazzle in your eyes by bright light?]*

3. Etes-vous dérangé(e) par des lumières vacillantes ou éblouissantes, certaines couleurs, ou des rayures très contrastées ?

*[Do flickering lights, glare, specific colours or high contrast striped patterns bother you?]*

Très rarement  
Parfois  
Souvent  
Très souvent

4. Vous arrive-t-il d'éteindre des lumières ou de tirer des rideaux pour éviter une trop grande luminosité ?      
*[Do you ever turn off the lights or draw a curtain to avoid bright conditions?]*
5. Portez-vous des lunettes de soleil même lorsque les conditions lumineuses sont normales ?      
*[Do you wear sunglasses even in normal daylight?]*
6. Avez-vous mal aux yeux lorsque la lumière est vive ?      
*[Do bright lights hurt your eyes?]*
- Ne répondez aux questions suivantes que si vous présentez des migraines :*  
*[Answer the following questions only if you have migraines:]*
7. Lorsque vous avez la migraine, vous sentez-vous plus ébloui(e) ou aveuglé(e) que d'habitude par les lumières vives ?      
*[During your headache, do you feel a greater sense of glare or dazzle in your eyes than usual by bright light?]*
8. Lorsque vous avez la migraine, êtes-vous dérangé(e) par des lumières vacillantes ou éblouissantes, certaines couleurs, ou des rayures très contrastées ?      
*[During your headache, do flickering lights, glare, specific colours or high contrast striped patterns bother you?]*
9. Lorsque vous avez la migraine, vous arrive-t-il d'éteindre des lumières ou de tirer des rideaux pour éviter une trop grande luminosité ?      
*[During your headache, do you ever turn off the lights or draw a curtain to avoid bright conditions?]*
10. Lorsque vous avez la migraine, portez-vous des lunettes de soleil même lorsque les conditions lumineuses sont normales ?      
*[During your headache, do you wear sunglasses even in normal daylight?]*
11. Lorsque vous avez la migraine, avez-vous mal aux yeux lorsque la lumière est vive ?      
*[During your headache, do bright lights hurt your eyes?]*
12. Votre migraine empire-t-elle quand la lumière est vive ?      
*[Is your headache worsened by bright lights?]*
13. Votre migraine est-elle déclenchée par une lumière vive ?      
*[Is your headache triggered by bright lights?]*

**Questionnaire de gêne aux odeurs**  
*[Osmophobia questionnaire]*

*Si vous présentez des migraines, répondez à la question suivante en vous basant sur votre vécu en dehors des crises :*

*[If you use to have migraines, answer the following questions based on your experience between attacks:]*

1. Cherchez-vous à éviter les lieux avec des odeurs fortes ? (odeurs de cuisine, de friture, de parfum, d'essence).

*[Do you seek to avoid places with strong odors? (kitchen, frying, perfume, petrol smells)]*

Très rarement  
Parfois  
Souvent  
Très souvent

*Ne répondez aux questions suivantes que si vous présentez des migraines :*

*[Answer the following questions only if you have migraines:]*

2. Pendant votre migraine, les odeurs fortes (odeurs de cuisine, de friture, de parfum, d'essence) vous dérangent-elles ?

3. Votre migraine empire-t-elle en présence d'odeurs fortes ?

*[Is your headache worsened by strong odors?]*

4. Votre migraine est-elle déclenchée par une odeur forte ?

*[Is your headache triggered by strong odors?]*