Photosensitivity and panic-agoraphobic spectrum: a pilot study

Fotosensibilità e spettro panico-agorafobico: studio pilota

LETIZIA BOSSINI[1], ELLEN FRANK[2], GIULIA CAMPINOTI[1], MARTA VALDAGNO[1],
CLAUDIA CATERINI[1], PAOLO CASTROGIOVANNI[1], ANDREA FAGIOLINI[1]
E-mail: bossini2@unisi.it

[1]Psychiatry Section, Department of Neuroscience, University of Siena, Italy
[2]School of Medicine, Western Psychiatric Institute and Clinic, University of Pittsburg, California, USA

SUMMARY. Background. The aims of this study were to assess photosensitivity (photophobia and photophilia) in panic disorder (PD) patients compared to healthy controls, and to evaluate the correlation between photosensitivity and panic-agoraphobic spectrum self-report (PAS-SR) scores. **Methods.** The PAS-SR and Photosensitivity Assessment Questionnaires were administered to 24 PD subjects and 33 healthy controls. **Results.** Compared to controls, PD patients showed significantly higher levels of photophobia and lower levels of photophilia items. The PAS-SR total score was positively correlated with the photophobia score. **Conclusions.** This study shows a strong correlation between PD and photophobia. However, whether photophobia develops before or after the onset of PD remains unclear. Further research is warranted to assess the potential role of light stimuli exposure in the onset, course and outcome of PD.

KEY WORDS: seasonality, anxiety, panic disorder.

RIASSUNTO. Introduzione. Lo scopo di questo studio è quello di valutare la dimensione fotosensibilità (fotofobia e fotofilia) nei pazienti con disturbo di panico (DP) rispetto ai controlli sani e di valutare l'esistenza o meno di una correlazione statisticamente significativa tra la dimensione fotosensibilità e lo score ottenuto al PAS-SR (questionario per la valutazione dello spettro panico-agorafobico, versione self-report). **Metodi.** Sono stati somministrati il PAS-SR e il questionario di valutazione della fotosensibilità a 24 soggetti con disturbo di panico e a 33 soggetti sani. **Risultati.** Rispetto ai controlli, i pazienti con DP hanno mostrato livelli significativamente più alti di fotofobia e livelli più bassi di fotofilia. Il PAS-SR (punteggio totale) è risultato correlato positivamente con il punteggio fotofobia. **Conclusioni.** Questo studio dimostra una forte correlazione tra DP e fotofobia. Tuttavia, non è chiaro se la fotofobia si sviluppi prima o dopo l'insorgenza del DP. Sono necessari ulteriori studi volti a valutare il possibile ruolo dell'esposizione a stimoli luminosi nell'insorgenza, decorso ed esito del DP.

PAROLE CHIAVE: stagionalità, ansia, disturbo di panico.

INTRODUCTION

There is general consensus in defining panic disorder (PD) as a chronic illness that alternates long periods of remission with intense symptom reexacerbation (1-4). Clinical observations have highlighted the presence of a strong seasonal component in PD, accompanied by high photosensitivity, and this seems to contribute to the etiopathogenesis of the disorder and also to affect the course and response to therapy (5). However, these aspects have been poorly investigated in the research literature so far. Patients report that the first panic attack usually occurs during the day between 6 a.m. and 6 p.m., and subsequent attacks are more commonly experienced in the morning rather than at night (6-8).

Moreover, fluorescent flashing light is able to induce panic attacks in PD patients (9-11), supporting the hypothesis of a biological substrate underlying the observations on onset time of attacks and suggesting a potential role of photosensitivity in the disorder's development.

Another feature presented by patients with PD is the tendency to often adopt photophobic behaviours and to protect themselves from light (for example by wearing sunglasses) (1,7,12,13). The importance of

light in the genesis of the disorder is also confirmed by the "chronobiology of PD" (7,13-16), described as a seasonal pattern where both onset and relapses tend to occur in spring and summer and even drug therapy seems to have less effect in this period of the year.

However, it remains unclear whether photosensitivity should be regarded as a *state* characteristic secondary to the active disease or as a *trait*, defined as an underlying condition potentially predisposing to the full-blown disorder, similar to other vulnerability factors included among the panic-agoraphobic spectrum dimensions.

The spectrum model in psychiatry intends to fill in the gap left by a categorical system, such as the DSM, between a full-blown disorder, only diagnosable in the presence of specific core symptoms, and many prodromal, residual, subclinical or atypical conditions, which form a *continuum* with the core pathological manifestations, despite the presence or absence of a diagnosed disorder. The spectrum model has been investigated in various psychiatric disorders and its application to PD has led to the formulation and description of a "panic-agoraphobic spectrum" and the consequent development of a structured clinical interview for its assessment (SCI-PAS) (17). The SCI-PAS questionnaire comprises among its various dimensions a number of so-called vulnerability factors that describe all those features, including trait characteristics, which seem to predispose to the full-blown disorder (anxiety sensitivity, hypersensitivity to CO_2, premorbid temperament, separation anxiety) (18-20). Previous uses of the SCI-PAS have revealed its validity at identifying subsyndromal conditions and subthreshold symptoms related to PD both in clinical samples and in healthy populations.

In a recent study, we found significantly higher photophobia in a sample of patients with PD compared to the general population (21), and a previous study had also shown that photophobia correlated with SCI-PAS scores in a sample taken from the general population (22). In order replicate and extend our previous results, the present study aims to compare sensitivity to light defined as photophobia and photophilia between a group of subjects with either subthreshold or fully syndromal PD and healthy controls and to assess the correlation between photosensitivity and the panic-agoraphobic spectrum.

The aims of this study were to assess photosensitivity (photophobia and photophilia) in PD patients compared to healthy controls and to evaluate the correlation between photosensitivity and scores on the Panic-Agoraphobic Spectrum Self-Report (PAS-SR).

METHODS

Our study sample was recruited from among all patients attending the outpatient services of the Psychiatry Clinic of the University of Siena from February 2007 to May 2009. A comparison group of healthy controls was recruited among friends and relatives of the Surgery Outpatients Clinic of Siena.

Participants signed a consent form before being enrolled in the study. Consent was obtained according to the Declaration of Helsinki guidelines, and the consent form and study procedures were approved by the Ethics Committee of the University Hospital of Siena.

Inclusion criteria for patients in the study were: age between 18 and 60 years; diagnosis of PD with or without agoraphobia according to DSM-IV-TR without any current or lifetime psychiatric comorbidity; absence of any ophthalmologic or general medical condition that could affect the retinal function (cardiac, renal, hepatic, respiratory, haematological, endocrine, etc.); absence of any current medication except for benzodiazepines as needed.

The control sample was recruited with the following criteria: absence of current or past history of psychiatric illness according to the Mini International Neuropsychiatric Interview (MINI) v.5 (23) and/or any other present relevant medical condition on the basis of a clinical examination; absence of any current pharmacological treatment.

The absence of diagnostic comorbidity in the patient group was assessed by a psychiatric interview and through the administration of the MINI structured clinical interview for psychiatric diagnosis according to DSM-IV (23). In the control group, the presence of current or past psychiatric disorders was ruled out using the Structured Clinical Interview for DSM-IV (SCID-NP) (24), and inclusion criteria were checked by conducting a full medical examination.

Both groups were administered the following psychometric tests: the PAS-SR questionnaire and the Photosensitivity Assessment Questionnaire (PAQ) (21). The PAQ, developed and validated in an Italian population (25), is a self-assessment tool, designed and subsequently validated at the Psychiatric Clinic of the University of Siena. It consists of 16 items investigating psychopathological traits and behavioural sensitivity to light (**Table 1**). The questions try to identify specifically both behaviours that actively avoid light, termed *photophobia* (items 2, 6, 7, 9, 10, 12, 13, 14) and that actively research light, described as *photophilia* (items 1, 3, 4, 5, 8, 11, 15, 16), which have been identified as relevant to the Mediterranean population in clinical practice. For each item the patient may respond in a dichotomous way (yes or no). Affirmative answers are rated as 1 and negative ones as 0, except for item 5 where the scores are reversed (yes=0, no=1). Two scores are obtained by the simple sum of each item divided by the number of items for each dimension (8 for photophobia and 8 for photophilia); therefore two scores ranging from 0 to 1 identify photophobic and photophilic behaviour respectively. In a previous study, designed and made at the Psychiatric Clin-

ic of the University of Siena, that evaluated abnormal light-related behaviour in patients with PD, we administered the PAQ questionnaire to 30 subjects with PD and 40 healthy subjects. Compared to healthy controls, PD subjects reported significantly higher scores on the photophobia and significantly lower scores on the photophilia questions. These findings confirmed the hypothesis that subjects with PD tolerate and seek light to a significantly lesser degree than normal controls (25).

Data were analysed by running the following statistical tests by means of the SPSS (Statistical Package for Social Science) software: *t*-test for unpaired and paired data; chi-square test; Spearman's rank correlation test; testing for partial correlation test. The data were considered statistically significant for p values <0.05.

Table 1. Photosensitivity Assessment Questionnaire (PAQ)

1.	I prefer summer to winter because winter dreariness makes me sad (Phi)
2.	If I could, I would be happier to go out after dusk rather than during the day (Pho)
3.	Often in winter I'd like to go to the other hemisphere where it is summer time (Phi)
4.	My ideal house has large windows (Phi)
5.	I like cloudy days (Phi)
6.	Sunlight is so annoying to me, that I have to wear sunglasses when I go out (Pho)
7.	I prefer to stay at home on sunny days, even if it is not warm (Pho)
8.	I feel reborn in spring when the days start to become longer (Phi)
9.	Usually strong sunlight annoys me (Pho)
10.	I prefer rooms that are in semi-darkness (Pho)
11.	I prefer sunlight to semi-darkness (Phi)
12.	Looking at a very bright view annoys me (Pho)
13.	I can't stand light reflecting off the snow (Pho)
14.	I think summer annoys me because it's too bright (Pho)
15.	Sunlight is like therapy for me (Phi)
16.	I prefer walking in the sunlight if the weather is cool (Phi)

Phi: photophilia; Pho: photophobia

RESULTS

Our sample consisted of 24 patients (14 female, 10 male, mean age 39.71±13.84 years) and 33 controls (20 female, 13 male, mean age 27.60±9.13 years) matched for gender. The patient group was divided into 12 subjects (50%) with a diagnosis of PD with agoraphobia and 12 (50%) with PD without agoraphobia according to the MINI criteria.

The course of disease was discontinuous – i.e. with periods when symptoms decrease significantly, but without reaching full recovery – in 54.2% of cases; continuous – without any breaks in symptom occurrence – in 29.2% of cases and episodic in just a minority of subjects (16.6%), who presented periods without any residual panic manifestation.

The average age of onset was 31.2±8.9 months (range 18-55), consistent with data reported by previous studies. Duration of the current episode at the time of assessment in the episodic cases was 60.0±105.1 months, compared to the usual 96.7±144 months reported on average by the literature. Positive family history for anxiety disorders was reported in 9 patients and overnight panic attacks were experienced by 10 subjects (41.7%). Overall the clinical and demographic characteristics of our sample were consistent with the literature.

Mean scores obtained from the sample on the PAS-SR and PAQ are reported in **Table 2**. As shown in **Table 2**, healthy controls had a tendency to be photophilic, while scoring very low on the photophobia scale. Conversely, the patient group showed medium to high scores of photophobia, supporting the hypothesis that photophobia is a characteristic feature of the panic-agoraphobic population. Comparing the scores on the subscales between the two groups (independent samples *t*-test), significant differences were observed in both the photophobic and photophilic scales. Patients revealed higher levels of photophobia (p<0.001) and lower levels of photophilia (p<0.017) than healthy controls (**Table 2**).

Not surprisingly, total scores on the PAS-SR were significantly higher among subjects with PD compared

Table 2. Mean values in the PAQ and the PAS-SR questionnaires: comparison between patients and controls

	Patients (n=24)	Controls (n=33)	p
Photophilia	0.50 ± 0.24	0.63 ± 0.25	0.017
Photophobia	0.34 ± 0.32	0.11 ± 0.13	<0.001
PAS-SR total score	48.00 ±18.92	16.12± 12.69	<0.001

PAQ: Photosensitivity Assessment Questionnaire; PAS-SR: Panic-Agoraphobic Spectrum Self-Report

to healthy controls (**Table 2**). In the whole sample (n=57), the PAS-SR total scores (Pas-tot) was significantly correlated with PAQ photophobia scores (r=0.58; p<0.001), while the correlation with the PAQ photophilia scores did not reach conventional levels of statistical significance (r=-0.10; p<0.43). This pattern of correlation was replicated when considering the PD sample separately: photophobia and Pas-tot (n=24; r=0.55; p<0.006); photophilia and Pas-tot (r=-0.17; p=0.43). Interestingly, photophobia also correlated significantly with Pas-tot in the control group taken separately (n=33; r=0.46; p<0.007), but again no significant correlation was observed for photophilia and Pas-tot (r=-0.07; p=0.67).

DISCUSSION

Our results show that healthy subjects have a tendency to be photophilic, but not photophobic: in fact, healthy controls had a tendency to be photophilic while scoring very low on the photophobia scale, suggesting that this feature could be scarcely represented in the general population. Conversely, the photophobia dimension reaches medium-high scores among patients, supporting the view of photosensitivity as a psychopathology-related measure with particular relevance for PD.

Comparing then the two dimensions (photophobia and photophilia) in the two groups, our data replicate results from previous work (21), confirming that PD patients have higher levels of photophobia and lower levels of photophilia than healthy controls (**Table 2**).

We also found that the PAS-SR score was significantly higher in subjects with a clinical diagnosis of panic as reported in the literature (17), despite it being a spectrum dimension measure that is not necessarily correlated with the presence of the related active disorder. However, this is not surprising given that the spectrum questionnaire also includes questions about having experienced full-blown panic state symptoms. Consequently, subjects with a diagnosis of PD respond positively to these items as well as to other characteristics of the panic-agoraphobic spectrum (such as temperament), therefore scoring higher than controls.

The correlation between Pas-tot and photosensitivity (Spearman's rank correlation test) also revealed interesting data. In fact, the correlation between photophobia and the panic-agoraphobic spectrum across the whole sample and in each group separately, reveals that this feature is not simply linked to the presence of a diagnosed PD: interestingly, photophobia correlated significantly with Pas-tot in healthy controls taken sep-

arately (n=33; r=0.46; p<0.007), supporting the relationship between photosensitivity and panic-agoraphobic spectrum, regardless of diagnosis. In fact, the data suggest that photosensitivity may be more closely related to the panic-agoraphobic spectrum than to the full-blown disorder. This finding confirms previous results obtained in the general population (22) and underscores the importance of investigating photosensitivity as a characteristic belonging to the core of PD, perhaps regardless of the presence of current active symptomatology. More precisely, it could be proposed that photophobia is integrated in the panic-agoraphobic spectrum, as it seems to run in parallel to other panic spectrum dimensions within both clinical and healthy populations.

Given these results, it could be then speculated that photosensitivity represents a trait characteristic in the panic-agoraphobic spectrum, more than a feature related to symptom manifestation and that, as such, it could play a role in the predisposition to PD or to episodes of panic within those already diagnosed.

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