

Migraine aura as an artistic resource

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ABSTRACT

Introduction. Art is a human creation that arises thanks to the brain; therefore, both creation and perception depend on the functioning of the brain. Recent research in the fields of neurology and the arts has studied the potential link between the work of artists from different historical contexts and artistic movements who are thought to have had migraine with aura. The existence of this link has been deduced through the analysis of certain shared characteristics of their work, which it seems cannot be attributed either to the historical context or to the movements to which these artists belonged; therefore, they may have been inspired by migraine with aura.

Methods. To establish this link, the comparative method was used to determine pictorial connections with the work of artists retrospectively diagnosed with migraine with aura. We also analyse the historical context and artistic movement of each painter using a logico-historical approach.

Results. Artists with migraine with aura present characteristic painting styles that differentiate them from their contemporaries. In some cases, this neurological condition led to unique styles, such as the metaphysical painting of Giorgio de Chirico. However, in other cases it is more difficult to discern whether the distinctive features of these artists' works are due to visual symptoms of migraine, other diseases, or the brilliance of the artist.

Discussion. This focus on the relationship with migraine with aura is a relevant approach when reviewing paintings; a more exhaustive review should go beyond purely pictorial analysis of artistic creation.

KEYWORDS

Aura, artistic inspiration, migraine, visual symptoms

Introduction

Art is a human creation arising as a product of brain activity; therefore, artistic creation is closely linked to the functioning of the brain. In this regard, Semir Zeki coined the term “neuroaesthetics” in 1999, arguing that understanding of the structure and functioning of the brain would help to deduce how different regions of the brain are involved in tasks related to the creation and

appreciation of artistic and aesthetic objects.¹ Perceptual alterations caused by migraine aura are particularly interesting, given the involvement in this symptom of the occipital cortex, where image processing occurs.²

Visual alterations are the most frequent manifestation of migraine aura. Recent studies have identified up to 25 distinct visual manifestations, with marked variability between patients. Furthermore, it has been shown that symptoms can change between episodes in a given

individual, undermining the idea that visual aura follows a fixed, predictable pattern.³ Visual auras may also present sequentially, with initially simple shapes (dots, lines, stars, etc), followed by partial vision loss (scotoma), and culminating with complex perceptual alterations (macropsia, metamorphopsia, cinematographic vision, etc).^{4,5}

Numerous well-documented cases suggest a relationship between artistic creation and altered perceptual experiences during migraine episodes. One of the most emblematic examples is Lewis Carroll (Charles Dodgson), the author of *Alice in Wonderland*, whose work may have been inspired by visual symptoms associated with migraine, including such phenomena as body dysmorphia and micropsia/macropsia.⁶ Similarly, we might note the case of the contemporary artist Bethany Noël Murray, whose work is based on the auras she experiences during migraine attacks.⁷

This evidence has led some authors to suggest that artists with perceptual (and especially visual) alterations may have depicted these symptoms in their work. The different forms of visual aura are so diverse and so peculiar (zigzags of light, small bright spots, the sensation of looking through clouded glass, etc)^{3,8} that each of them would lead to different artistic results.

However, it is important to note that understanding a process of artistic creation requires analysis of contextual, historical, generational, formative, and cultural factors, and that these factors reveal fundamental premises and conditions in the development of the artistic process. Similarly, this analysis seeks to discover the underlying reasons for certain artistic manifestations through the application of present-day scientific knowledge; therefore, the results may be affected by the form of perceiving a given work of art, whose meanings may change over time.⁹

The purpose of this study is to examine the works of artists who have been retrospectively diagnosed with migraine in order to identify similarities in their work that may visually depict migraine auras. Our secondary objective is to identify any artists whose work transcends the artistic movement or context in which it was produced, with disease representing a factor that may influence the patient's artistic output.

Material and methods

As this is a transversal study, we studied sources of information related to both art and neurology. The following books and scientific publications were consulted to better understand the relationship between migraine aura and the artistic depiction of this phenomenon: *Migraine*,⁵ "Migraine as a source of artistic inspiration,"¹⁰ "Visual art and the brain,"¹¹ "The painful muse: migrainous artistic archetypes from visual cortex,"¹² "El aura de la creación" (The aura of creation),¹³ and "Otra percepción" (Another perception).¹⁴ This review analyses how migraine, particularly when accompanied by visual aura, has influenced artistic creation throughout history, with the perceptual changes associated with the disease enabling artists to reinterpret reality and express this in their work.

For the analysis of the lives and work of the selected artists, as well as the artistic movements to which they belonged, we consulted the following books and scientific publications: *Vida y visiones de Hildegard von Bingen* (Life and visions of Hildegard von Bingen),¹⁵ *Van Gogh*,¹⁶ "Seurat's dots: a shot heard 'round the art world - fired by an artist, inspired by a scientist,"¹⁷ *Cubism*,¹⁸ "El arte de vanguardias: (re)descubriendo a Giorgio de Chirico y la pintura metafísica" (Modern art: (re)discovering Giorgio de Chirico and metaphysical painting),¹⁹ *De Chirico*,²⁰ and *Surrealism*.²¹ These works explore the careers of the artists studied, alluding to aspects of both their personal and creative lives.

To understand how disease, in this case migraine, influenced these artists' work, we studied the following articles: "Migraine and aura in the genesis of mystical visions and artistic creation: the case of Hildegard von Bingen,"²² "Vincent van Gogh and the elusive diagnosis of vestibular migraine,"²³ "Coining the Pablo Picasso syndrome,"²⁴ and "The illness of Giorgio de Chirico – migraine or epilepsy?"²⁵ These articles analyse artistic depictions of certain perceptual alterations associated with migraine aura and interpret them from a medical perspective.

For scientific studies of medical concepts, we consulted the following works: "Multisensory hallucinations and other unusual sensory experiences in the context of migraine: a systematic review,"² "Visual migraine aura iconography: a multicentre, cross-sectional study

of individuals with migraine with aura,”³ “Migraña” (Migraine),⁴ and “Are these visual symptoms due to migraine? A guide for general practice.”⁸ This analysis aimed to obtain a general overview of migraine and its visual symptoms from a neurological perspective. In this regard, the study is also based on the art and neurology publications mentioned above, which define the specific visual auras of interest.

The data obtained were studied through a combination of the logico-historical and comparative methods. Using a logico-historical approach, we searched for relevant Western painters in a historical period from the 11th to the 20th century. Within this framework, we selected those artists in whom the potential presence of visual symptoms in their work has received the greatest research interest in the field of neurology.

Through the comparative method, we sought to establish whether shared experience of a single neurological disease might result in common characteristics in these artists’ work. This approach includes analysis of figures, light, and colour, with a view to identifying the presence of photopsia, as well as shapes suggesting the influence of such phenomena as micropsia/macropsia, metamorphopsia, or scintillating scotoma. We also studied brushstrokes to search for evidence of any depiction of mosaic vision. This method was based on clinical descriptions of the different types of visual aura, enabling a relationship to be established between pictorial characteristics and the associated neurological symptoms.

A total of six painters were selected for this analysis. The criterion used to select artists for inclusion in the study was based on a literature review focusing on artists who have been studied from a neurological perspective due to the presence in their work of features resembling the visual phenomena associated with migraine aura^{10,12}: Hildegard von Bingen (1098-1179),^{22,26} Vincent van Gogh (1853-1890),^{23,27} Georges Seurat (1859-1891),¹³ Pablo Picasso (1881-1973),²⁴ Giorgio de Chirico (1888-1978),^{10,25} and Salvador Dalí (1904-1989).^{10,12} Selection was based on the results of analysis of these artists’ work, suggesting that they may have had migraine with aura.

Within the oeuvre of each artist, we selected paintings whose analysis, compared with the symptoms of aura described in the medical literature,³ suggests that migraine with aura may have been a source of inspiration: *The*

fall,¹⁵ *The universe*,¹⁵ *The bedroom*,¹⁶ *Starry night*,¹⁶ *The church at Auvers*,¹⁶ *Study for the channel of Gravelines*,²⁸ *The weeping woman*,²⁹ *The return of Ulysses*,²⁰ *Return to the castle*,²⁰ and *The persistence of memory*.³⁰

Each artist is linked to a different Western artistic movement, with representatives of Romanesque art, post-impressionism, neo-impressionism, cubism, metaphysical painting, and surrealism. However, it should be noted that modern movements have been defined artificially by the formalist historiography of the late 19th and early 20th centuries, with a key role played by “Modernist painting” and other essays by Clement Greenberg,³¹ on which this classification is based. In the present study, this classification is used for didactic purposes; however, it should be noted that it is largely rejected today as it reduces the complex activity of these modern artists to a simplistic formal analysis. This complexity is demonstrated in the famous diagram by Alfred H. Barr,³² which represents the relationships and mutual influences between different modern art movements.

The study was limited to modern art for two main reasons. Firstly, the core concept in these movements is art as a means of revealing, discovering, and accessing hidden dimensions that we do not perceive in our usual form of observing reality.³³ In this context, artists with perceptual alterations were able to access different ways of seeing, which may have influenced their painting style. Secondly, as suggested by Alexander Nagel,³⁴ there is a trans-historic connection between medieval and contemporary art. In the Middle Ages, art was closely linked to social and religious institutions, and artists did not see themselves as creative individuals; therefore, personal expression was not seen as legitimate. This tendency persisted until the 17th century.³¹ Given this lack of creative freedom that limited the independence of artists, our study is restricted to modern artists and Hildegard von Bingen. The latter broke away from the established boundaries, basing all her works on her mystical experiences,^{15,22} interpreted today as probable episodes of migraine with aura,²⁶ thus becoming one of the most influential figures of her day. For this reason, the work of Hildegard von Bingen is closely associated with the principles of modern art, where artists are free to independently interpret the visual world.³³



Figure 1. A) *The fall*, by Hildegard von Bingen. B) *Starry night*, by Vincent van Gogh. Both works display pictorial devices that suggest the influence of the phenomenon of photopsia or phosphenes. Sources: A) Cirlot V, ed., transl. *Vida y visiones de Hildegard von Bingen*. 4th ed. Madrid: Siruela; 2023. Miniature 3, *La caída del hombre* (1,2); p. 195. B) Van Gogh V. *Starry night* [painting]. 1889. New York: Museum of Modern Art.

Results

Photopsia in the work of Hildegard von Bingen and Vincent van Gogh

Hildegard von Bingen (1098, Bermersheim vor der Höhe, Holy Roman Empire - 1179, Bingen, Holy Roman Empire) was a multifaceted woman who was far ahead of her time, distinguishing herself as a composer, writer, philosopher, scientist, naturalist, physician, mystic, monastic leader, and prophetess, which made her one of the most influential figures of the Middle Ages. Despite her very delicate health from a young age, it was not until the age of 42 years that she presented an episode that would mark her spiritual experience: “at that time in this vision I was pressured by severe pains to reveal

what I had seen and heard.”^{15,A} From the time of that episode, which she interpreted as a divine revelation, Von Bingen began to document these visions, giving rise to a prolific body of prophetic work. Among her works, *Scivias* (“Know the ways”) stands out for the miniature illustrations and detailed descriptions of her visions, which probably reflect migraine attacks accompanied by visual aura.

Vincent van Gogh (1853, Zundert, Netherlands – 1890, Auvers-sur-Oise, France) was a post-impressionist painter whose historical relevance owes both to his

^ATranslator’s note: this fragment is taken from Godefridus, Theodricus. *The life of the Holy Hildegard*. Palmquist M, transl. Collegeville, MN: Liturgical Press; 1995.

paintings and to the multiple diseases diagnosed based on his paintings and the correspondence he exchanged with his brother Theo. These letters reflect unstable moods, an unusual character, and numerous psychotic episodes.¹⁶ It has also been suggested that he may have presented migraine.^{23,27}

The works of Hildegard von Bingen and Vincent van Gogh are separated by eight centuries; nonetheless, similarities can be identified between *The fall*¹⁵ and *Starry night*¹⁶ (Figure 1). Both paintings present common pictorial elements that suggest the presence of photopsia or phosphenes, one of the most frequent forms of migraine aura. This type of aura manifests in the form of stars, sparks, glittering, or white geometric shapes across the entirety of the visual field.⁵

Hildegard von Bingen may have presented geometric hallucinosis, colloquially known as “seeing stars”⁵ due to its structured appearance. In the painting by Van Gogh, the stars are depicted as points of diffuse light. Both works are dominated by bright colours, tones that have classically been associated with photopsias,⁵ with yellow in particular being considered to evoke luminosity. Von Bingen also describes this phenomenon in *Scivias* as “a very great multitude looking as if they were living torches. They were very bright, so that those who reflected the burning brightness took on a most serene brilliance.”^{15,B} This description suggests a visual experience that may be comparable to the stars in *Starry night*, which is frequently cited as an example of an image suggestive of this type of visual aura.³⁵

Scintillating scotoma in the work of Hildegard von Bingen and Giorgio de Chirico

Giorgio de Chirico (1888, Volos, Greece - 1978, Rome, Italy) is the founder and greatest representative of an artistic style that was given the name metaphysical painting by the art critic Guillaume Apollinaire. This style originates in Giorgio de Chirico's passion for philosophy, and particularly for the works of Nietzsche and Otto Weininger.¹⁹ He was also influenced by an episode of reduplicative paramnesia or *jamais vu*, a symptom associated with migraine⁴ that he captured in his first

metaphysical painting, *The enigma of an autumn afternoon*, and in autobiographical texts.³⁶ Giorgio de Chirico presented migraine with aura (distortions, metamorphopsia, and scotomas) and associated abdominal symptoms.^{10,25}

However, De Chirico rejected the idea that these symptoms were the manifestation of some disease, ascribing them a very strong spiritual quality; in fact, he called these visions “spiritual fevers.”¹⁴ Similarly, Hildegard von Bingen interpreted her visions as divine manifestations. Although both artists conferred divine qualities to their symptoms, the similarities between *The universe*¹⁵ and *Return to the castle*²⁰ (Figure 2) go beyond this interpretation. The form and use of colour in both works seem to suggest scintillating scotoma as a potential source of inspiration. Scintillating scotoma is a type of visual aura in which a blind spot is perceived in the patient's visual field (negative scotoma), surrounded by a structured border resembling a castle wall (fortification spectrum or teichopsia), which may be perceived as dazzling light. Negative scotoma may appear before or after scintillating scotoma, or even replace it.⁵

In both works, the central element of the composition is a figure with a dentate border. In the case of *The universe*,¹⁵ the border of the scintillating scotoma is depicted in a yellow that evokes flames, a recurrent motif in the works of Von Bingen, suggesting the characteristic brightness of this visual aura. The blind spot is depicted in dark blue, making up the centre of the oval; the presence of stars may indicate the perception of phosphenes, as noted above in reference to *The fall*¹⁵ (Figure 1A). On the other hand, De Chirico's scotoma is characterised by a blind spot occupying part of the visual field (negative form) and a concrete shape (positive form),¹⁴ which in this painting takes the form of a knight.

Macropsia in the work of Vincent van Gogh and Giorgio de Chirico

Due to the wide range of neurological and psychological diseases diagnosed in Vincent van Gogh, it is difficult to attribute a particular visual symptom to any specific disorder. The neurological diseases that may have influenced his work include epilepsy, in which phosphenes, macropsia, illusory perception of movement, temporary blindness, and photophobia have also been described.^{37,38} He may also have presented episodes of

^BTranslator's note: this fragment is taken from Hozewski B, ed., transl. Hildegard von Bingen's mystical visions: translated from Hildegard's *Scivias*. Santa Fe (NM): Bear and Company; 1986.



Figure 2. A) *The universe*, by Hildegard von Bingen. B) *Return to the castle*, by Giorgio de Chirico. Artistic depiction of scintillating scotoma. Sources: A) Cirlot V, ed., transl. *Vida y visiones de Hildegard von Bingen*. 4th ed. Madrid: Siruela; 2023. Miniature 4, El macrocosmos (I,3); p. 195. B) De Chirico G. *Return to the castle* [painting]. 1969. Rome: Fondazione Giorgio e Isa de Chirico.

acute psychosis, similar to those experienced by Louis Wain, an artist affected by this condition, which would cause perceptual alterations, as we may deduce from the strange cats he drew (Figure 3).⁵ However, this was not the case for Giorgio de Chirico, whose diagnosis of migraine with aura (scotoma) and associated visual symptoms (distortions and metamorphopsia) is extensively documented.^{10,25}

In addition to the visual symptoms of migraine with aura described in *Starry night*¹⁶ (photopsia), in the case

of Van Gogh, and *Return to the castle*²⁰ (scintillating scotoma), in the case of Giorgio de Chirico (Figures 1B and 2B), both painters seem to have presented some more complex visual distortion, macropsia, in which objects appear larger than their true size.⁶ Although macropsia is more commonly associated with Alice in Wonderland syndrome, it also presents, though less frequently, in simpler visual aura phenomena.^{6,36}

Comparative analysis of the size of shapes in Van Gogh's *The bedroom*¹⁶ and De Chirico's *The return of*

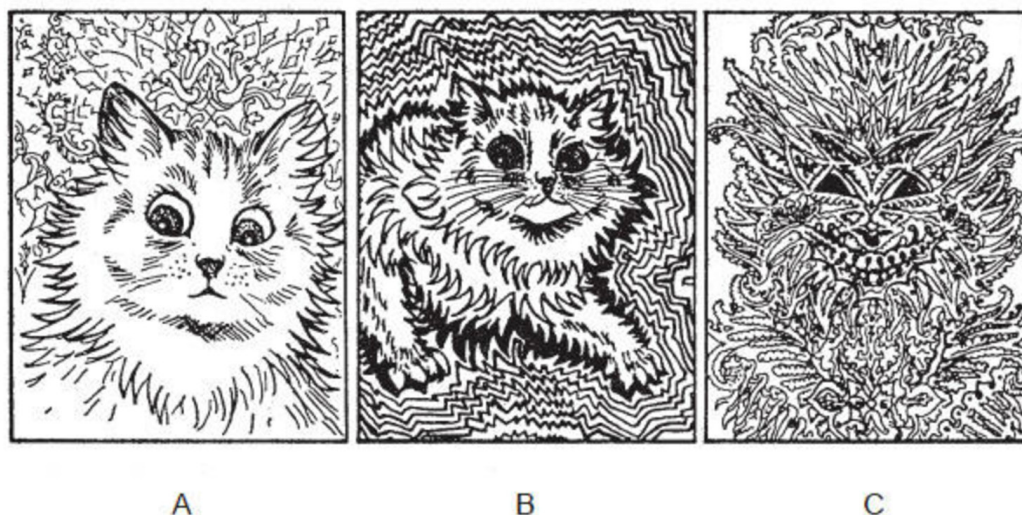


Figure 3. Cats drawn by Louis Wain during an episode of acute psychosis. Source: Sacks O. *Migraña*. 4th ed. Barcelona: Anagrama; 2018. Figure 5. Algunas alucinaciones visuales en la psicosis aguda; p. 106.

*Ulysses*²⁰ (Figure 4) suggests that macropsia may have had a significant influence on both paintings. In both cases, the furniture is proportionally larger than the remaining elements of the composition. Furthermore, in *The bedroom*, the bed appears to be projected towards the viewer, an effect that is compounded by the chosen perspective, in which the horizon is somewhat higher than in classical compositions. This contributes to the impression that the depth of the room is stretched, intensifying the sensation that the bed is larger than the remaining elements.

Metamorphopsia in the work of Vincent van Gogh and Salvador Dalí

Salvador Dalí (1904, Figueres, Spain - 1989, Figueres, Spain) is one of the greatest representatives of surrealism in Spain. He is frequently characterised as a multifaceted genius, who not only dedicated himself to painting, but also explored other artistic disciplines including cinema, photography, sculpture, engraving, and writing. However, his eccentricities are thought to have

been the result of some mental disease, as he displayed psychotic traits and paranoid tendencies, narcissism (for instance, his famous phrase “I am surrealism!”), megalomania (delusions of grandeur), and crematomania (obsession with money), as well as episodes of migraine with visual aura.^{10,12} Very possibly inspired by these symptoms, Dalí developed a peculiar method known as the paranoiac-critical method. This approach is described in his article “The rotting donkey,” in which he formulated a strategy to exploit the creative potential of his mental condition for artistic creation. This method consisted in reflecting his paranoid delusions through the elements depicted in his works, imbuing the everyday with a dimension of mystery.²¹

Analysis of Van Gogh’s *The church at Auvers*¹⁶ and Dalí’s *The persistence of memory*³⁰ (Figure 5) revealed that in both cases, the main source of inspiration may have been metamorphopsia, a type of visual alteration characterised by straight lines appearing to be wavy. Like macropsia, this distortion is more characteristic of Alice in Wonderland syndrome, although cases have also been described in migraine with aura.³⁸



Figure 4. A) *The bedroom*, by Vincent van Gogh. B) *The return of Ulysses*, by Giorgio de Chirico. Macropsia is depicted in the size of the furniture. Sources: A) Van Gogh V. *The bedroom* [painting]. 1888. Amsterdam: Van Gogh Museum. B) De Chirico G. *The return of Ulysses* [painting]. 1968. Rome: Fondazione Giorgio e Isa de Chirico.

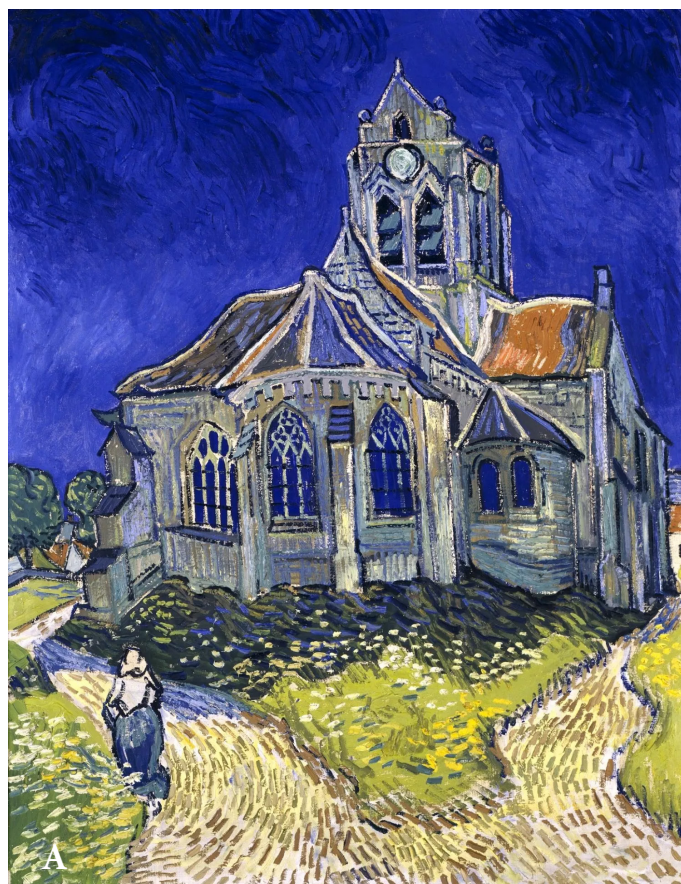


Figure 5. A) *The church at Auvers-sur-Oise*, by Vincent van Gogh. B) *The persistence of memory*, by Salvador Dalí. Elements with wavy shapes, presumably inspired by metamorphopsia. Sources: A) Van Gogh V. *The church at Auvers-sur-Oise* [painting]. 1890. Paris: Musée d'Orsay. B) Dalí S. *The persistence of memory* [painting]. 1931. St. Petersburg (FL): Salvador Dalí Museum.

Metamorphopsia is observed in the church in the painting by Van Gogh and in the soft watches in Dalí's work. In the case of Van Gogh, the depiction of church of Notre-Dame-de-l'Assomption in Auvers-sur-Oise is strikingly faithful to the Gothic architecture of the real building. However, the structure appears to be "melting," its shapes distorted, giving the building a sense of instability, as though it were a living organism. Similarly, the soft watches in Dalí's work also have a liquid appearance, suggesting metamorphopsia as an explanation for these unusual shapes. In *The secret life of Salvador Dalí*, the painter speaks extensively about this symptom, supporting the hypothesis of migraine aura as a source of inspiration:

After a dinner concluded with a very soft Camembert he remained alone at the table contemplating the cheese and pondering the philosophical problem of "supersoftness." [...] He then went to his studio to take a final look at the painting on which he was working at the time. [...] He knew that the atmospheric landscape he had managed to create would serve as background for an amazing picture, but he had not the slightest idea what it would be. As he went to turn off the light he suddenly "saw" the solution: three soft watches, one of them, hanging pitifully from the branch of the olive tree. Although suffering from a splitting headache, he eagerly prepared his palette and set to work.²¹

Mosaic vision in the work of Georges Seurat and Pablo Picasso

Georges Seurat (1859, Paris, France - 1891, Paris, France) was a French painter and one of the greatest exponents of neo-impressionism. Despite his great talent, his paintings were not well-received in his day, as was also the case with Van Gogh. As a result, Seurat tried to forge his own path, developing a novel form of painting using dots: pointillism. This technique, which contrasted greatly with the broad brushstrokes that painters had used for centuries,¹⁷ has been a subject of interest in neurological research, as pointillist works resemble a type of visual aura known as the Seurat effect.²¹³

In turn, Pablo Picasso (1881, Malaga, Spain - 1973, Mougins, France), alongside Georges Braque, was the creator and one of the key representatives of the cubist movement. If any concept defines this new trend in

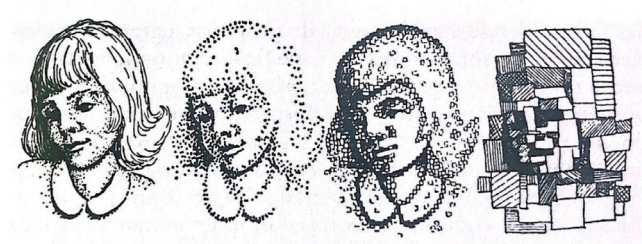
the early 20th century it is the decomposition and fragmentation of forms; thus, through cubism, artists were able to create a two-dimensional pictorial universe that depicted a single figure from multiple perspectives.¹⁸ This definition coincides with the visual symptoms described by some patients with migraine with aura, who report that bodies and faces appear distorted.³⁹ In fact, a study published in 2020 proposed the term "Pablo Picasso syndrome" to classify this type of aura.²⁴

Although pointillism and cubism are two different artistic movements, with the former based on dots and the latter using faceting,¹⁷ from a neurological perspective they may be considered to represent the same form of perceptual alteration, mosaic vision. This term refers to a type of aura in which images are fragmented into irregular facets, creating an optical illusion resembling the effect of looking through cut glass. A peculiar characteristic of this type of migraine aura is that it progresses from smaller facets (dots) to larger ones reminiscent of the faceting technique used by cubist painters (Figure 6A).⁵

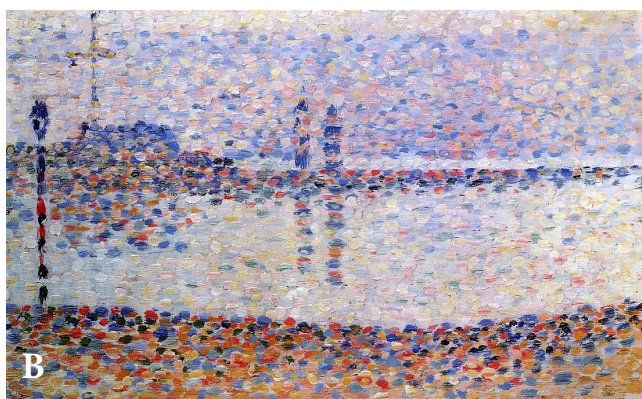
Georges Seurat and Pablo Picasso are two names irrevocably associated with migraine. The pictorial result of the brushstrokes that Seurat uses in *Gravelines* (Figure 6B) is a clear example of the sight of a person with earlier stages of mosaic vision. Picasso's work *The weeping woman*, in which the elements of the woman's face are divided into facets (Figure 6C), serves as an example of the more complex form of this visual phenomenon. This association between the two artists' work is not a coincidence: for years, researchers have speculated that both Seurat and Picasso presented migraine with visual aura.^{13,24,39} While sufficient evidence of this has not been provided in either case, their paintings perfectly depict many of the phenomena described during migraine aura.

Discussion

Our results show that artists sharing the experience of migraine with aura have a particular style that differentiates them from their contemporaries, possibly because these visual phenomena serve as a source of artistic inspiration. However, the logico-historical method, which was applied in this study to analyse both their works and their biographies, reveals that this assertion does not apply to all the artists considered. In some



A



B



C

cases, though it has been speculated that the peculiarities of their oeuvre may be attributed to migraine with aura, insufficient evidence has been found to support this claim.

In the Middle Ages, humans inhabited a world awash with divine manifestations, which were present in everyday things. For instance, allegorical meanings were attributed to flora and fauna: the lion represented Christ, and certain trees stood for life or knowledge. Geometric compositions, in turn, were used to organise space in a manner that reflected spiritual relationships and hierarchies, and were also considered an expression of divine harmony.⁴⁰ Although the miniature illustrations of Hildegard von Bingen incorporate these common symbols in medieval art, alongside such others as the bestiary and lack of perspective, they stand out for their novelty. In these drawings, Hildegard adopts a more symbolic, abstract vision, which represents the fruits of her visionary capacity. According to the beliefs of the day, visions that appeared before the inner eye may resemble earthly forms, but they were never the same, as they originated in a “visionary world,” and therefore were considered to be symbols. For this reason, the work of Von Bingen has been compared to that of the surrealist Max Ernst.⁴¹ Another distinctive trait of her work is the self-portraits she included in many of the miniatures, which was unusual in the Middle Ages. At the time, according to scholastic doctrine, the objectivist conception of art precluded the expression of the artist’s personality in their works.⁴⁰ However, Hildegard often placed herself at the centre of her compositions, seeking to construct an image of herself as a prophet or a saint.

With regard to Van Gogh, the vast range of neurological and psychiatric disorders he is thought to have presented, as well as the secondary effects of medications

Figure 6. A) Phases of mosaic vision, as experienced during migraine aura. B) *Gravelines*, by Georges Seurat. C) *The weeping woman*, by Pablo Picasso. Artistic depiction of the different phases of mosaic vision. Sources: A) Sacks O. *Migraña*. 4th ed. Barcelona: Anagrama; 2018. Figure 4. Fases de visión en mosaico tal y como se experimenta durante el aura de migraña; p. 106. B) Seurat G. *Study for the Channel of Gravelines* [painting]. 1890. Saint-Tropez (FR): Musée de l’Annonciade. C) Picasso P. *The weeping woman* [painting]. 1937. London: Tate Modern.

he took to treat them,⁴² makes it difficult to attribute the uniqueness of many of his paintings to the manifestation of any specific disease. Therefore, more thorough analysis is needed to determine the origin of the distinctive traits of his work. The same is true of Dalí. Given that the main characteristic of the surrealist movement is the representation on the canvas of the artist's unconscious, we will inevitably encounter differentiating traits when we draw comparisons between artists; therefore, not all of the characteristic features of Salvador Dalí's work may be attributed to a potential diagnosis of migraine with aura, despite the fact that his diaries include references to headache.

In the case of Giorgio de Chirico, his unique style makes it more challenging to establish links between his works and those of his contemporaries. Furthermore, metaphysical painting arose out of opposition to such other avant-garde movements as futurism (see De Chirico's 1919 manifesto "We, metaphysicists," published in response to Marinetti's "We, futurists" manifesto). However, it influenced later movements, such as surrealism,¹⁹ and it is therefore not uncommon to observe characteristic elements of the Italian painter's work in the works of such surrealist painters as Magritte. For instance, in his 1928 painting *Attempting the impossible*, the human figures resemble the articulated mannequins that are so characteristic of De Chirico.

The origins of the cubist movement are a controversial subject. At the Salon d'Automne in 1908, Matisse used the term cubist in reference to a work presented by Braque. On the other hand, the above-mentioned art critic Guillaume Apollinaire cited Picasso as the founder of cubism in October 1911.¹⁸ Although some studies have related the fragmentation and decomposition of Picasso's cubist works to migraine aura, the fact that the technique was first used by Braque, in whom this diagnosis is not suggested by any evidence, means that we are unable to definitively conclude that the technique is directly related to migraine aura.

Finally, the term neo-impressionism was coined by the French art critic Félix Fénéon to describe the paintings of Seurat and Signac. Seurat sought to unite science and art through the study of colour, applying his own theoretical principles and Chevreul's treatises on optics.¹³ Though he used the same pointillist technique due to the influence of Seurat, Signac used looser brushstrokes

and his use of colour bore a greater resemblance to that of the fauvist movement. Van Gogh also used the technique in such works as *Self-portrait*, which may indicate either the presence of a neurological condition similar to Seurat's, or a possible stylistic influence of Seurat over Van Gogh in the adoption of pointillism. However, as the available literature does not support a conclusive retrospective diagnosis of migraine in Seurat, the hypothesis of an artistic influence seems more plausible.

In conclusion, in the cases of Hildegard von Bingen and Giorgio de Chirico, there is no room for doubt that they presented migraine with aura and that this influenced their work. In *Scivias*, Von Bingen gathers illustrations and descriptions that coincide with what we now know to be episodes of migraine with aura; Giorgio de Chirico declared on numerous occasions that his work had been directly influenced by his visions,⁹ which even led him to create a unique artistic style, metaphysical painting. However, in the cases of Vincent van Gogh, Pablo Picasso, and Salvador Dalí, more thorough analysis is needed to establish the origin of the distinctive traits of their work, if the explanation is any other than the very brilliance of these artists.

In this sense, the comparative method is not appropriate for determining whether the similarities between paintings are due to presence of a single neurological disease in these artists, as such associations may be biased by the past experiences of the person studying the work. For the same reason, it is no coincidence that the paintings of Van Gogh, Picasso, and Dalí draw the attention of neurologists as depictions suggestive of visual aura due to their great resemblance to some patients' descriptions of their own aura. Therefore, it is interesting to use these works to explain these visual phenomena both to patients and to physicians.

The review of paintings with this focus on the relationship with migraine with aura opens new lines of research in art history and health, suggesting a need for deeper exploration of how medical conditions may have influenced the work of different artists throughout history. By better understanding their context, we are able to appreciate more fully the wealth and depth of their creation, beyond the purely pictorial component.

Conflicts of interest and funding

This study has received no funding from any public, private, or other organisation. The authors declare that the content of this manuscript has not previously been published in any journal. This study was presented orally at the 76th Annual Meeting of the Spanish Society of Neurology.

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