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REVIEW

Visual agnosia☆

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KEYWORDS
Agnosia;
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Simultanagnosia

Abstract Visual agnosia is defined as an impairment of object recognition, in the absence of visual acuity or cognitive dysfunction that would explain this impairment. This condition is caused by lesions in the visual association cortex, sparing primary visual cortex. There are 2 main pathways that process visual information: the ventral stream, tasked with object recognition, and the dorsal stream, in charge of locating objects in space. Visual agnosia can therefore be divided into 2 major groups depending on which of the two streams is damaged. The aim of this article is to conduct a narrative review of the various visual agnosia syndromes, including recent developments in a number of these syndromes.

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Agnosias visuales

Resumen Las agnosias visuales se definen como una alteración en la capacidad de reconocer objetos con la vista, en ausencia de pérdida de agudeza visual o disfunción cognitiva que explique esta alteración. Están producidas por lesiones de la corteza visual asociativa, respetando la corteza visual primaria. Existen 2 vías principales de procesamiento de la información visual: la vía ventral, encargada del reconocimiento de objetos, y la vía dorsal, encargada de su localización en el espacio. Las agnosias visuales pueden, por tanto, dividirse en 2 grandes grupos dependiendo de cuál de las 2 vías esté lesionada. El objetivo de este artículo es realizar una revisión narrativa sobre los diferentes síndromes agnósicos visuales, incluyendo los últimos avances realizados en algunos de ellos.

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Background

Vision is the most developed sensory modality in humans and the one on which we are most dependent. The process starts with the coding of an image by photoreceptor cells in the retina, information which is then projected to the brain by means of the optical nerve, with an initial stop in the geniculate nucleus of the thalamus and from there to the primary visual cortex located around the calcarine fissure of the occipital lobe. Any lesion up to that point will cause a visual field disorder in image acuity or color, i.e., primary visual disorders. From there, the image formed in the primary visual cortex must be recognized and interpreted. To this end, a mental representation of the image is created that can be compared with images previously stored in memory, thereby acquiring sense to the individual. This process occurs in the associative visual cortex, located in the occipital, temporal and parietal lobes. Lesions in the associative visual cortex cause visual agnosia. This disorder is defined as an impairment in the ability to recognize objects visually, in the absence of a loss of visual acuity or cognitive dysfunction that could explain this impairment.

The information received in the primary visual cortex will follow 2 main processing pathways: the ventral stream or the ''What?'' and the dorsal stream or the ''Where?'' (Fig. 1). The ventral stream's function is perception, i.e., building a conscious representation of the world that surrounds us, allowing us to identify and recognize objects, assigning them meaning. The dorsal stream's function is to locate objects in space, determine their movement and trajectory and relate them spatially with the objects that surround them, allowing us to accurately guide our movements toward them.[1,2]

An example that shows how these 2 pathways work is the mailbox experiment. In this experiment, a patient with a bilateral ventral temporal–occipital lesion is asked if the opening of a mailbox is in the upper or lower part. The patient will not know how to answer the question; however, if they are given a letter, they will insert it into the opening correctly. The patient does not perceive the opening but can locate it and accurately guide their movements toward it.[3]

Depending on which pathway is damaged (ventral or dorsal), there will be 2 types of visual agnosia: the ones consisting of an erroneous perception of objects and the ones consisting of incorrectly locating these objects, which prevents accurate interaction with them.

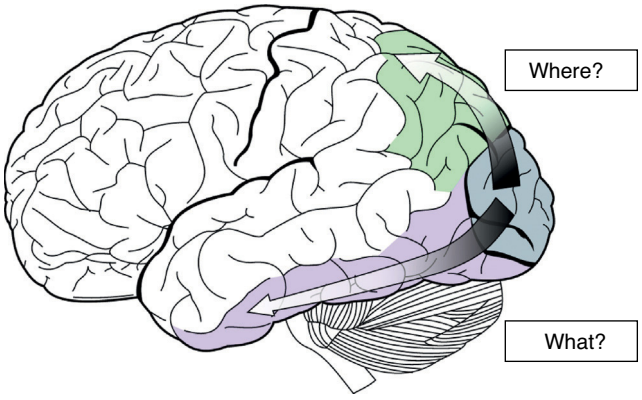

Figure 1 Schematic representation of the 2 visual association pathways.

Agnosia of the ventral visual pathway

General visual agnosia

Patients with this type of agnosia have difficulties recognizing objects in the absence of semantic recognition disorders. For example, when these patients are shown a hammer, they are unable to name it but, conversely, can name it if they touch it or are asked what object drive nails. This ability differentiates them from patients with aphasia.[4]

There are 2 types of sequential processes required when recognizing an object:

1. *Perception*. The process by which the form, size and volume of an object is identified, integrating it into a three-dimensional image. In patients with apperceptive agnosia, the degree of impairment varies significantly. Patients with a greater degree of impairment have an absolute inability to recognize the simplest forms, which impedes them from, for example, differentiating a straight line from a curve or determining the size of objects. In their daily life, these patients have practically the same degree of disability as a patient with total blindness, with the difference that the former are able of avoid obstacles but cannot recognize any of the objects that surround them. Paraphrasing Saramago, there are ''blind people who cannot see and blind people who seeing see not,'' the latter definition being the most appropriate for these patients. Patients with the less severe forms of this condition have difficulty integrating or grouping the various parts of an object in an item differentiated from the objects that surround them. These patients are unable to differentiate overlapping objects, something they achieve by separating them. Another type of perceptual visual agnosia is that in which the patients have difficulty in identifying objects presented from an atypical perspective (e.g., a painting with a figure lying in perspective). In general, this disorder is rarely limiting from the functional point of view. These disorders are caused by lesions of any type in the bilateral occipital–temporal cortex. These disorders have been reported most often after bilateral cerebral infarctions in the posterior cerebral artery territory, carbon monoxide poisoning and in the posterior variant of Alzheimer's disease,[4] characterized mainly by visuospatial disorders, object agnosia, difficulty with facial recognition, simultanagnosia and alexia.
2. *Association*. The process by which the generated mental image is compared with previously acquired images stored in memory, enabling us to recognize objects. Patients with associative visual agnosia can draw and copy objects, unlike patients with apperceptive agnosia in its complete form (Fig. 2). These patients are able to compare an object with another and say whether it is the same object or not. These patients can also describe the object. For example, when they are shown an orange, they are able to say that it is a small, round, rough, orange object but cannot recognize it further.[5]