



## Face Blindness - Prosopagnosia

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**Abstract:** Faces are of utmost importance for human social life. They provide valuable information about the identity, expression, gaze, health and age of a person. Recent face processing models assume highly interconnected neural structures between different temporal, occipital, and frontal brain areas with several feedback loops. A selective deficit in the visual learning and recognition of faces is known as prosopagnosia, which can be found both in acquired and congenital form. Any neural tissue damage in the face recognition network of the brain can cause a prosopagnosia, a condition which can best be defined as a selective impairment of the visual learning and recognition of faces. Recently, a hereditary sub-type of congenital prosopagnosia with a very high prevalence rate of 2.5% has been identified.

**Keywords:** Prosopagnosia, *Prosophenosia*, Faceblindness.

### 1. Introduction

Prosopagnosia, a loss in the ability to recognize faces, is easy to diagnose but difficult to explain. Faces not only tell us the identity of other people, but they also inform us about their mood, age, health, and their gender. They are a major factor of sexual attractiveness. From the eyes, we can judge the direction of gaze with remarkable accuracy and the observation of lip movements helps to understand speech. Prosopagnosia, sometimes known as face blindness (*Prosopon*, Greek for “face,” and “Agnosia,” which is the scientific word for “recognition impairment”) is a disorder of face perception where the ability to recognize faces is impaired, while the ability to recognize other objects may be relatively intact. The term originally referred to a condition following acute brain damage, but recently a congenital form of the disorder has been proposed, which may be inherited by about 2.5% of the population [1]. The specific brain area usually

associated with prosopagnosia is the fusiform gyrus [2]. The face seems to function as an important identifying feature in memory, it can also be difficult for people with this condition to keep track of information about people and socialize normally with others. Some also use the term *prosophenosia*, which refers to the inability to recognize faces following extensive damage of both occipital and temporal lobes [3].

#### 1.1 Symptoms of Prosopagnosia

Most people occasionally forget a name but usually recall a face. A person with face blindness forgets to make common acquaintances even after several encounters. In extreme cases, a person may not even recognize immediate family members [3]. It is also difficult for them to imagine images of people in their minds. Another symptom of the disorder is depending on non-facial clues, such as a person’s hairstyle and voice tone for distinguishing people [4].

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## 1.2 Causes of Prosopagnosia

Brain, that is responsible for facial recognition also allows us to differentiate between people. Face blindness often occurs following damage to the brain, including head trauma, stroke and degenerative diseases. Recent evidence suggests, however, that a congenital form of face blindness exists. Cases of face blindness can sometimes be traced through families. Any neural tissue damage in the face recognition network of the brain can cause a prosopagnosia, a condition which can best be defined as a selective impairment of the visual learning and recognition of faces. As of yet, there is no generally accepted classification. A prosopagnosia caused by an accident or stroke in adulthood is mostly called 'acquired' prosopagnosia or simply 'prosopagnosia'. Prosopagnosia can be inherited or acquired by early brain tissue damage. The term 'developmental prosopagnosia' has been used for both conditions in the past [3]. It is somewhat doubtful if discrimination between prosopagnosia acquired before or after adulthood makes sense. There is another type of prosopagnosia which has no defined onset and is not accompanied by any visible brain damage [4]. This type has also been called 'developmental', while we would prefer the attribute 'congenital' to show that it was not acquired at some defined point in life [5]. Hereditary prosopagnosia is a type of congenital prosopagnosia which runs in families [6].

## 2. Subtypes

### 2.1 Apperceptive prosopagnosia

*Apperceptive prosopagnosia* is thought to be a disorder of some of the earliest processes in the face perception system. People with this disorder cannot make any sense of faces and are unable to make judgments when they are presented with pictures of same and different faces. They may also be unable to work out attributes such as age or gender from a face. However, they may be able to recognize people based on non-face clues such as their clothing, hairstyle and voice [7].

### 2.2 Associative prosopagnosia

*Associative prosopagnosia* is thought to be impaired to the links between early face perception processes and the semantic information we hold about people in our memories. People with this form of the disorder may be able to say whether photos of people's faces are the same or different and derive the age and gender from a face but may not be able to subsequently identify the person or provide any information about them such as their name, occupation or when they were last encountered [7]. They may be able to recognize and produce such information based on non-face information such as voice, hair or even particularly

distinctive facial features that do not require the structure of the face to be understood. Typically such people do not report that 'faces make no sense' but simply that they do not look distinctive in any way.

### 2.3 Developmental prosopagnosia

*Developmental prosopagnosia* (DP) is a face recognition deficit that is lifelong, manifests itself in early childhood and that cannot be attributed to acquired brain damage. However, a number of studies have found functional deficits in DP both on the basis of EEG measures and fMRI. It has been suggested that a genetic factor is responsible for the condition [8]. There seem to be two categories of DP patients: patients who are impaired in basic face processing (age estimation, judgment of facial affect) and also show deficits on other forms of visual processing; and patients with pure face recognition impairments in the presence of intact basic visual processing. However, these types of disorders are very complicated, so arbitrary assumptions should be avoided [9].

## 3. Conclusion

Face processing plays a decisive role in effective social interactions. As it has not been designed or engineered, it is highly efficient, but not necessarily structured in a simple or logical way. Current research results show that a complex interplay between different highly face-responsive brain areas are involved in encoding, integration, and interpretation of the huge amount of different information [6]. Tissue damage in these regions leads to a lasting face-processing deficit called (acquired) prosopagnosia. In contrast, many other visual abilities, the brain's functional plasticity cannot compensate for this deficit. While the acquired type is rarely observed, the congenital type without any gross brain abnormalities is quite frequent. Hereditary prosopagnosia is highly prevalent (2.5%) [5]. The condition is characterized by a great homogeneity of clinical symptoms, including deficits in learning and recognition of faces, while other facial information is processed normally [10, 11]. Face recognition is a complex and highly integrated task employing large parts of the brain. Hereditary type of prosopagnosia opens a big window of opportunity to improve our knowledge about face processing and its genetic base.

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