

**Sensing Without Knowledge:**

Understanding Agnosia

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### **Abstract**

Agnosia is a perception disorder in which someone cannot understand what exactly it is they are hearing, physically feeling, or seeing (Kumar, Wroten, 2018), (Tiley, 2021). This disorder can affect people through any of the following senses: hearing, touch, and/or sight. The three types of agnosia as well as an example for each type will be introduced. The examples will provide a greater range of understanding than the definitions will be able to present. A glossary has still been included at the end of this paper, however, in the hopes that it provides a sense of organization in remembering the terms. Previous research has found that much is still to be discovered and researched on agnosia in general, although Prosopagnosia is currently the most researched subtype. A possible future study on Apperceptive Ventral Simultagnosia will be introduced. The goals of this study will be to increase awareness of the need for further, more up-to-date research across all subtypes, generally, and the aforementioned subtype, specifically.

**Keywords** - agnosia, neuropsychology, senses, imagination

## Introduction

With 15 different subsections split into three types, agnosia can affect people in many aspects of their life (Kumar, Wroten, 2018). Agnosia is a rare perceptual disorder in which someone cannot recognize people, objects, or sounds, even though their senses behave typically in all other ways. Looking at the "Rare Diseases" section of the National Center for Advancing Translational Sciences website, much is still unknown and to be discovered about agnosia in the present day, though there the study of the disorder has a long history (Genetic and Rare Diseases Information Center, 2021), (Gobbo, Calati, Silveri, Pini, Daini, 2022). Agnosia was first described by Carl Wernicke in 1874 in "*Der Aphasische Symptomencomplex*" (The Aphasiatic Syndrome) when he attempted to describe it in contrast to aphasia, a disorder that affects one's ability to understand and speak language (Moghadasi, 2014), (National Institute of Deafness and Other Communication Disorders, 2021). Interestingly, agnosia was also described in Avicenna (Ibn Sina)'s Canon of Medicine, a five-part encyclopedia of medicine written in 1025. He had similar ideas to those who came after him and they were most likely influenced by his work. The following is an in-depth description of each of the types and subtypes of agnosia.

### Auditory

Auditory agnosia is being unable to recognize sound despite having an intact auditory system. Sound can be used to describe all forms of auditory production, including the inability to recognize music (*amusia*), nonverbal sounds and noises (i.e. train horns, nonverbal auditory agnosia), spoken word (*verbal auditory agnosia*), and the voices of familiar people (*phonagnosia*).

Klarendic et al. found a woman who, at 66, was presented with signs of verbal auditory

agnosia, nonverbal auditory agnosia, and amusia (Klarendić, Gorišek, Granda, Avsenik, Zgonc, & Kojović, 2021). With this, she could not comprehend speech, other sounds, or music, and she also had trouble staying on topic when verbally asked a question. She was, however, still able to communicate through written word. She was also diagnosed with anosognosia, a condition in which someone is completely unaware of their ailment or condition. She did not seem to notice there was a problem with her understanding of sounds and thus, asked no questions about it and did not discuss it at all. Her case from these various forms of agnosia will be discussed further in the "Clinical Implications" section of this paper.

### Tactile

There are three subtypes of tactile agnosia: Ahylognosia (being unable to recognize an object's qualities, i.e. its texture) Amorphognosia (being unable to recognize an object's shape and physical size), and Tactile Asymbolia (being unable to recognize an object by ways not defined by Ahylognosia or Amorphognosia).

In 1890, Heinrich Lissauer, a neurologist, described "agnosia as an impairment of the imagination" (Ladewig, 2022). From this, Sigmund Freud's 1891 work on aphasia, and Ernst Weber's studies on tactile perception, Kurt Goldstein and Adhémar Gelb came up with the idea of mind-blindness. In 1918 and 1919, they ran a study on Johannes Schneider, a soldier, who had been struck above his left ear and in the back of his head with shrapnel. This led to his developing tactile agnosia, most likely Tactile Asymbolia. Goldstein and Gelb came to the conclusion that while Schneider was blindfolded and completely at rest, he was unable to determine what area of his body was being touched with various stimuli. He knew that pressure was being applied but not where it was. Goldstein and Gelb also found that after Schneider has

experienced a stimulant, his body went through a series of twitches in an attempt to figure out where the sensation was felt, even though Schneider believed he was remaining entirely still. Schneider was eventually able to determine where pressure was applied on his body, but only when he was allowed to move.

### Visual

Visual agnosia is the form with the most subtypes as it is the most common and the best understood. Sigmund Freud coined the term “visual agnosia” in 1891. It is categorized as not being able to recognize visual stimuli, despite having otherwise normal functioning in one’s vision. As stated by Heinrich Lissauer in 1890, visual agnosia can manifest because of being unable to draw meaning from what they are seeing with no failures in perceptual processing (associative) or failures in early perception and discriminative processing (apperceptive) (Ptak, Turri, & Doganci, 2022). Though both forms do offer some knowledge of an object, there are key differences between the two. Those with associative visual agnosia can, for the most part, draw but not identify something, while those with apperceptive visual agnosia cannot do either. Those with the associative form can comprehend what an object should look like, while those with the apperceptive form cannot. Associative is typically caused through damage to the bilateral inferior occipitotemporal cortex and apperceptive to the parietal occipital cortex.

From these forms come seven types of visual agnosia: agnostic alexia, akinetopsia, color agnosia, finger agnosia, prosopagnosia, simultagnosia (further split into dorsal and ventral simultagnosia), and topographical agnosia. These types will be discussed in more depth in the glossary section, but generally, these types can affect the way one sees objects, people, and their surroundings in addition to how much they see and understand at one time.

Agnosia can also manifest in extremely unexpected ways. Van Iterson, Vrij, Sie, Augustijn, Rooze, & Jansen (2021) studied a 7-year old boy who was found to have developed Visual Agnosia. This was found out through an Encephalography (EEG) in which it was discovered that he had increased level of brain activity in the left, backside of his head. Because of this, he had a newfound difficulty with identifying familiar people (Prosopagnosia) and naming pictures. The researchers found that in children with continuous spikes and waves during slow sleep, Visual Agnosia may occur. The researchers were able to provide treatment to the patient, but the boy did eventually have a relapse into his normal sleep patterns.

### **Clinical Implications**

Currently, brain imaging and scanning is the most popular form of collecting research for those with agnosia. Ptak et al. (2022) suggested doing a comparative study between the lesions on healthy and agnostic participants using a Functional Magnetic Resonance Imaging (fMRI) scan as a means of having a better understanding of the differences between these two populations' brain patterns. A similar idea was used in Mashima, Konishi, Tezuka, Ito, & Mimura (2021)'s study where they concluded a 77-year old woman had Auditory Agnosia through the use of a Positron Emission Tomography (PET) scan. Over the span of two years, she had an increasing amount of difficulty hearing and speaking. All other tests than ran with her came back completely normal. Furthermore, Klarendić et al. (2021) used a CT and Magnetic Resonance Imaging (MRI) scan in their study to determine that the 66 year-old woman had significant damage to the inferior frontal gyrus and insular cortex in her brain. Though the patient herself did not realize anything was wrong and would not have sought any sort of medical treatment, due to the Anosognosia, her daughter noticed small shifts in her mother's behavior. Interestingly, if patients do not report that any changes within themselves or misreport any

symptoms, their disorder could be classified as something else, in this case, Wernicke's Aphasia, a language disorder in which it becomes difficult for someone to understand speech and speak it themselves.

### **Discussion**

It is important for medical professionals to have a sense of what the different subtypes of agnosia are and how they manifest, so they are best able to assess if someone is suffering from it. There is a strong need to know the right questions to ask, in case there is a patient who does not believe anything is wrong or does not understand what exactly is happening to them and cannot put it into words.

The study in question will be on Apperceptive Visual Agnosia as it relates to Ventral Simultagnosia. As this is a rare disorder for people to have, it is unlikely any study will be able to recruit large and fully generalizable numbers. Because of this, case studies will most likely be the best way to research this topic. While both parts of the study will be able to be run independently, a two-part study would be the most informative and potentially helpful to those with the disorder. The main goals of the study will be as follows: (1) increasing the amount of information available, (2) highlighting the need for further research, and (3) providing potential treatment options to health professionals.

The first part would be a series of interviews in the form of qualitative research. As noted with the 66-year old woman case, agnosia of all forms can arise at any point in one's life (Klarendić, Gorišek, Granda, Avsenik, Zgonc, & Kojović, 2021). Participants should be limited to those who have had ventral simultagnosia for at least half of their life and are at least 30 years old. There should be a minimum of 15 and a maximum of 18 participants. Participants will also

need to include those who do realize there is a problem with their perception and are looking to lessen it. Recruitment options will mostly include reaching out to doctors, physicians, and other health experts in the United States of America who may have patients with this disorder. There are online forums and groups that may prove beneficial in contacting. While the study will focus only on the U.S., we do hope to see patients from all over the country. To increase the number of potential participants, all interviews will occur over Zoom. Interview questions will cover family history (both in general and with the disorder), personal history, past injuries (particularly to the brain), past treatments, how their symptoms developed, and interactions with doctors and their environment. There will be standardized questions throughout, but there may be new questions added as the study continues and participants potentially give similar answers. Each interview will have an audio-only recording. Transcripts will be needed for each interview, so the researchers can analyze similar words, sentiments, etc. All information taken (including recordings and transcripts) will be encrypted for security.

The second part will be a typical double-blind quantitative study that will take place over the course of six months. Through the interviews and further research, the researchers will find various treatment options. The two best of these options will be presented to the participants along with a placebo option. Each participant will be randomly assigned to one of the two actual treatment groups or a placebo group. It may prove difficult to clinically measure any changes in Ventral Simultagnosia, so all measurements will be self-reported. There will be a short standardized questionnaire given at the end of each week and a longer one given at the end of each month. Changes can be difficult to tell day-to-day, so these questionnaires will serve as a baseline and as a means of comparison at the end of the study. This will also shed light on which treatment option elicits the most change if any. All questionnaire answers will be available to the



participant it belongs to after the study, so they are able to see their progress as well.

### **Conclusion**

Agnosia (of all forms but especially in regard to Auditory and Tactile agnosia) is an under-researched topic, potentially leaving those with it under-served and without much knowledge on a disorder that affects their everyday life. Though certain aspects of agnosia are difficult to test, it is still imperative to consider those experiencing the world in an atypical way by increasing understanding and awareness. Past research indicates a general understanding of what agnosia is. However, current research would benefit from applying present-day knowledge and medicine to these topics.

Glossary

**Agnostic Alexia:** *visual*, inability to recognize written words. Does not affect spoken communication

**Ahylognosia:** *tactile*, inability to identify qualities, like texture and weight

**Akinetopsia:** *visual*, inability to recognize motion

**Amorphognosia:** *tactile*, inability to identify an object's size and shape

**Amusia:** *auditory*, inability to recognize music

**Anosognosia:** a condition in which someone is completely unaware of their ailment and does not believe anything is wrong

**Color Agnosia:** *visual*, inability to recognize colors. It is extremely difficult to diagnose this subtype. Damage has typically occurred to the left occipitotemporal cortex

**Finger Agnosia:** *visual*, inability to name and differentiate fingers on one's and others' hands. Damage has typically occurred to the left parietal lobe

**Nonverbal Auditory Agnosia:** *auditory*, inability to recognize nonverbal sounds, not including speech

**Phonagnosia:** *auditory*, inability to recognize familiar voices

**Prosopagnosia:** *visual*, inability to recognize familiar faces. Damage has typically occurred to the fusiform face area in the inferior temporal cortex

**Apperceptive Prosopagnosia:** inability to recognize facial expressions but can recognize

items outside the face, such as hair and clothing

**Associative Prosopagnosia:** in comparison to those with the above, they can make out some information from faces, such as age and gender

**Simultagnosia:** *visual*, inability to recognize and sort objects when they are together but can when they are separated

**Dorsal Simultagnosia:** inability to see more than one object at a time. People with this often have trouble reading as they have to see more than one word at a time. Damage has typically occurred to the bilateral occipitotemporal cortex

**Ventral Simultagnosia:** inability to recognize more than one object at a time. People with this can still see more than one object. Damage has typically occurred to the left inferior occipital area

**Tactile Asymbolia:** *tactile*, inability to not recognize something by touch if Amorphognosia and Ahylognosia are not present

**Topographical Agnosia:** *visual*, inability to interpret spatial surroundings. People with this have an understanding of areas they are familiar with in their heads but cannot apply that knowledge to the real world. Damage has typically occurred to the right posterior cingulate area of the brain

**Verbal Auditory Agnosia:** *auditory*, inability to recognize spoken words. Does not affect written communication

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