Perceptual Disorders

Agnosias
Disorders of Object Recognition

AGNOSIA: a general term for a loss of ability to recognize objects, people, sounds, shapes, or smells.

Agnosias result from damage to cortical areas of the visual system (retina and optic nerve are not impaired, nor is visual acuity, color, motion or depth perception impaired).
DSM does not officially categorize agnosia however, they are commonly divided into two categories: Apperceive Agnosia and Associative Agnosia.
Apperceptive Agnosias (Difficulty with perceptual processes)
Have trouble recognizing, copying, or discriminating between different visual stimuli. Ex. may not be able to distinguish a poker chip from a scrabble tile despite there clear difference in shape and surface features.
Simultanagnosia refers to an inability to recognize two or more things at the same time.
Simultanagnosia: lose the ability to see "global" objects, and can only very narrowly focus their visual attention. For example, in this image: they can see "T"s but not the "H".

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T T T  T T T
T T T  T T T
T T T  T T T
T T T T T T T T
T T T T T T T T
T T T T T T T T
T T T  T T T
T T T  T T T
T T T  T T T
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- may have difficulty reading and counting because these activities involve viewing more than one thing at a time.
- may seem to be "blind" since they bump into objects that are close together. Motion may further impair their ability to perceive objects.
When patients are able to identify objects, they do so based on inferences using color, size, texture and memory to piece it together.

**Video**  (begin @ .33)
**Associative agnosias** - perceptual processes are intact but patient is unable to recognize visually presented objects - may be able to replicate a drawing of the object but still fail to recognize it.
Shape Processing

Integrating or Combing features

Object Recognition

Apperceptive Agnosia

Associative Agnosia
Auditory Agnosia: - inability to recognize or differentiate between sounds.

- Verbal auditory agnosia (aka: pure word deafness) refers to deficits specific to speech processing,
- Environmental sound agnosia refers to difficulties confined to non-speech environmental sounds.
- Amusia refers to deficits confined to music.
- These deficits can be apperceptive, affecting basic perceptual processes, or associative, affecting the relation of a perceived auditory object to its meaning.
Prosopagnosia: Face blindness

• Prosopagnosia is a selective and often severe deficit in the ability to recognize others’ faces. People suffering from the disorder are often unable to recognize their friends and family members by face alone, instead relying on vocal cues for proper identification. They cannot name images of celebrities, even if they can describe who the celebrity is.

• They often describe faces as nearly indistinguishable; one patient characterized faces as “strangely flat, white with emphatic dark eyes, as if made from a flat surface, like white, oval plates, all alike.” However, their general visual ability and recognition of non-face objects often remains intact.

Source
Oliver Sacks on Agnosia and Face blindness
**Video** described a woman who could not recognize her family’s faces or her own. She could recognize people through voices, hair color, eye color...
Face Recognition

Is it different than Object recognition? Yes.

More Holistic - altering the appearance of one facial region can strikingly affect the percept of other regions and of the whole face (Part-whole illusion).
Part-whole illusion.

Part-whole illusion. The only difference between the two images is the mouth. Altering the mouth creates illusions of alteration in regions of the rest of the face (e.g., makes the nose appear shorter on left and longer on right, makes the eyes appear more interested on left and less interested on right). In the inverted version, the difference in the mouth shape can be easily seen but the illusory changes in the rest of the face are not apparent.
Composite Face Illusion

Aligned Faces (Composite Illusion)    Misaligned Faces (No Composite Illusion)
Composite Face Illusion Explanation

Composite stimuli are whole faces comprised of two halves taken from different individuals. When asked to decide if two identical top halves are the ‘same’, subjects are more accurate (or faster to respond) in misaligned trials, than in aligned trials. This performance advantage for misaligned trials is referred to as the composite face effect (CFE). The proposed explanation is that aligned features are automatically fused together and form a global identity that interferes with the recognition of smaller components (the composite face illusion, CFI). However, when composite faces are misaligned, it appears to be much easier to ignore the identity of the whole face and process individual features.

http://dx.doi.org/10.1016/j.visres.2009.04.025
Fusiform Face Area of temporal Lobe.

Region of the brain used in identifying faces

Experiments have shown that when people look at faces, areas in a region of the brain called the fusiform gyrus are activated. A new study by a Stanford neurologist investigated what happens when that section of the brain is overstimulated by an electrical charge.

Source: National Institutes of Health

Todd Trumbull / The Chronicle
When doctors stimulated two spots in his fusiform gyrus, Blackwell, who does not ordinarily suffer from face blindness, could still remember his doctor's name, and he could read words and identify objects in his hospital room. But a video taken of the test shows Blackwell telling Parvizi, "Your nose got saggy, went to the left. You almost looked like somebody I'd seen before, somebody different."

A few minutes later, Parvizi stimulated the same bundles of nerves and asked Blackwell to look at a different doctor in the room. "The bottom of her face sort of metamorphosed up," Blackwell said. "It kind of stretched up to give her a different look. Um, it wasn't pretty."
Bruce and Young (1986) model of face recognition.

(1) Face detection followed by
(2) processing of the face’s structure which is then matched to a memory representation (face memory).
(3) The perceptual representation of the face can also be used for recognition of facial expression and gender discrimination.
Evidence of separate processes

• Edward: impaired face recognition but normal face detection.

• Some Prosopagnosia patients cannot recognize faces but can recognize emotions.

• Alexithymia - Emotion blindness
Individual differences in Face Recognition Ability

Developmental vs. Acquired Prosopagnosia

Criminal Justice Application