

Higher Visual Cortices and Agnosias

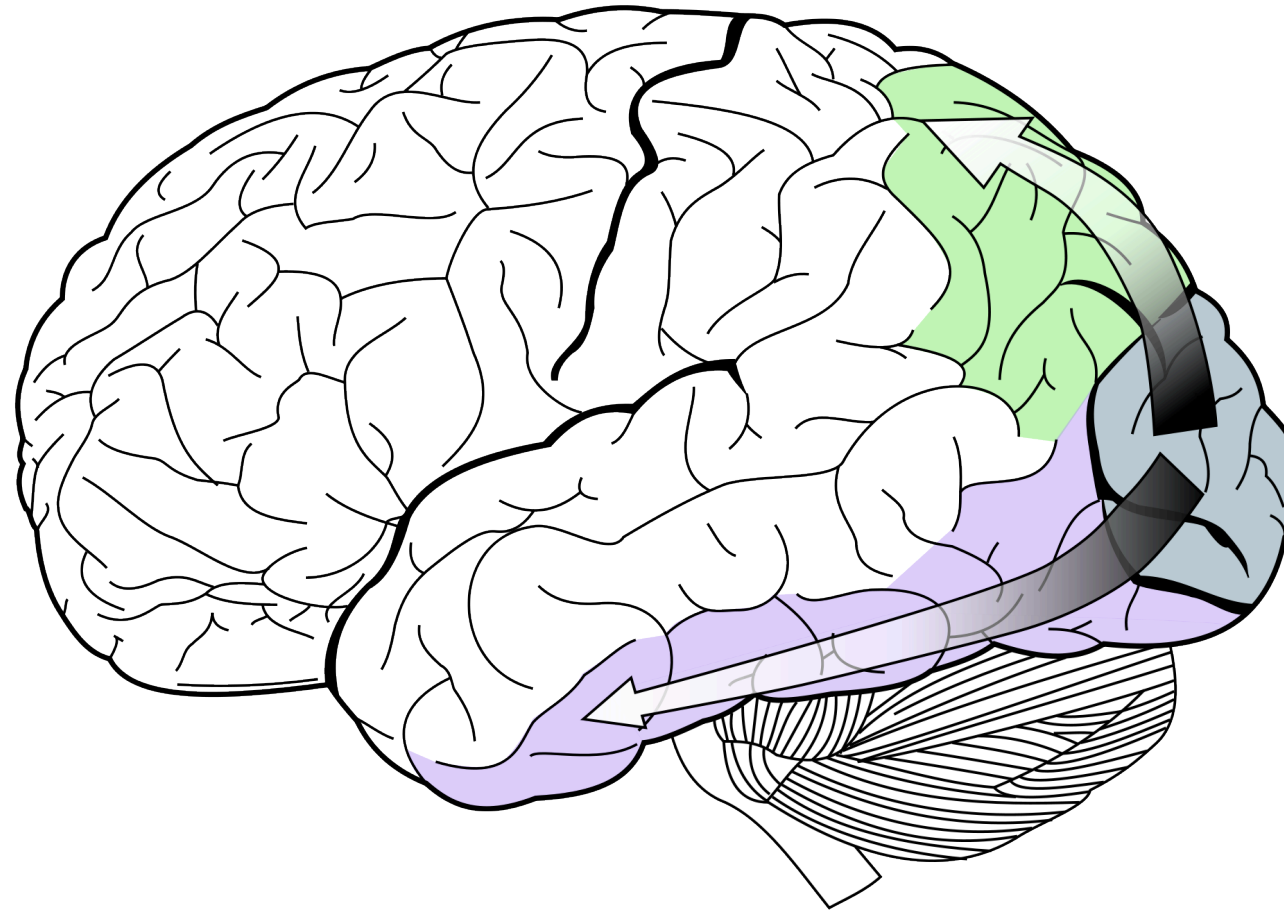


- Know the difference between primary visual cortex, secondary visual cortex, and association cortex.
- Know the various theories of the functions of the dorsal vs. ventral visual streams.
- Understand the difference between apperceptive and associative agnosias.

Learning Goals

In addition to V1, visual cortex also includes:

1. **Secondary visual cortices** (~24): Receive much of their input from V1. Most are located in the prestriate and the inferotemporal cortex.
2. **Visual association cortices** (~7): Receive input from visual cortex and from the cortices of one or more other sensory systems.

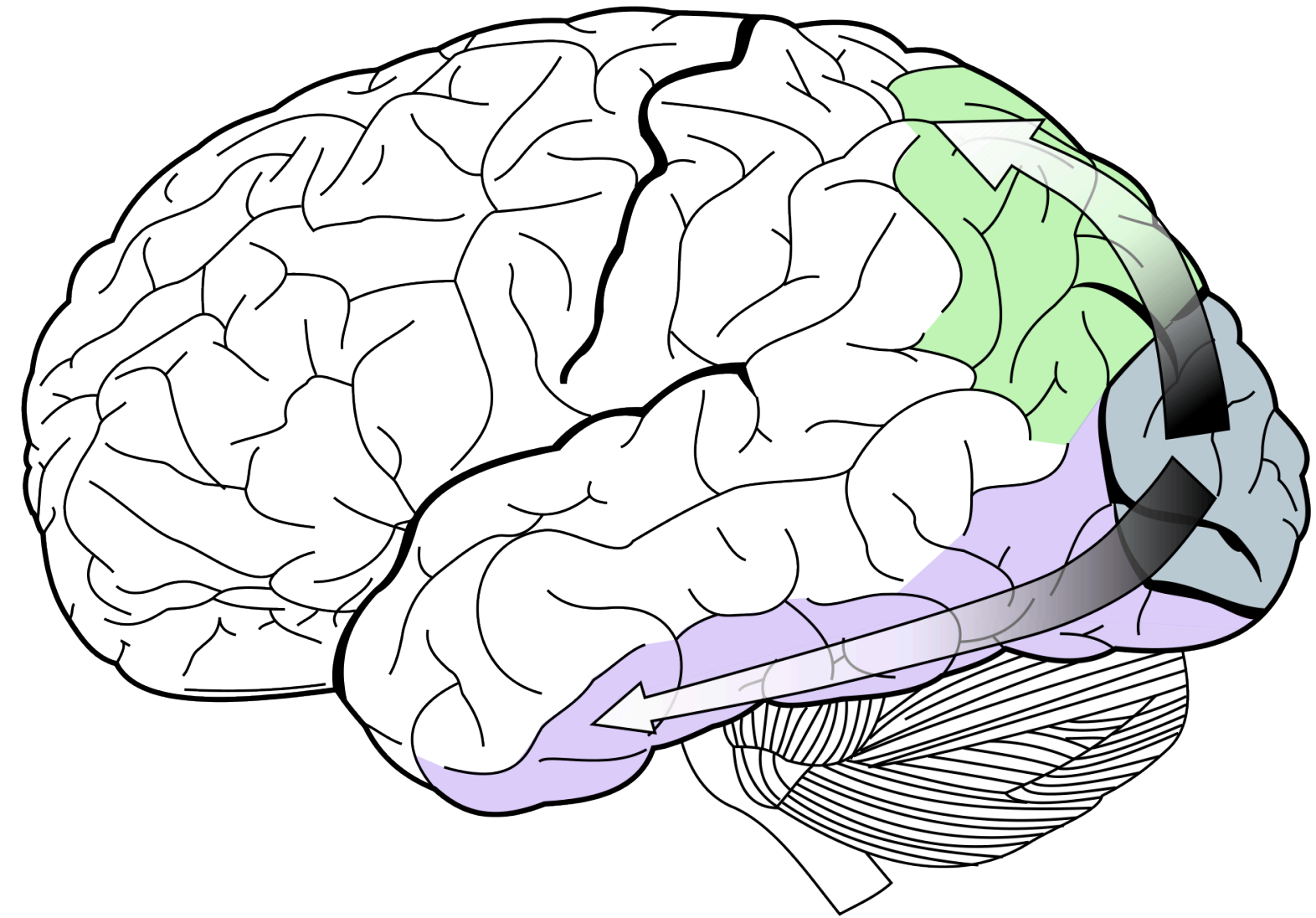


Higher Visual Cortices

Visual information is transmitted from the primary visual cortex to visual association cortex via two streams:

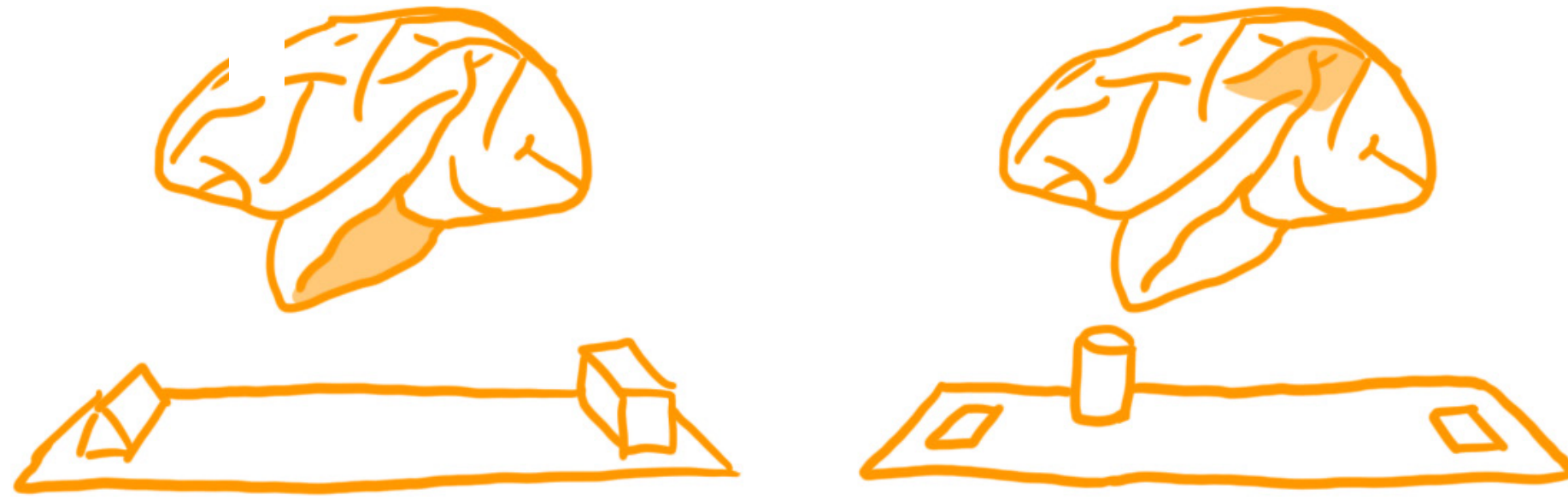
Dorsal stream: Flows from V1 to dorsal prestriate cortex to posterior parietal association cortex

Ventral stream: Flows from V1 to ventral prestriate cortex to the inferotemporal cortex



Dorsal & Ventral Streams

Visual streams: What vs. where



Ungerleider & Mishkin (1982):

1. Monkeys with lesions to inferotemporal cortex are impaired at discriminating objects (e.g., picking the pyramidal object for reward).

=> The 'what' pathway (ventral stream)

2. Monkeys with lesions to posterior parietal cortex fail to perform on location tasks (e.g., picking the object closest to some other object) =>

The 'where' pathway (dorsal stream)

Dorsal & Ventral Streams

Visual streams: What vs. Where

1. Patients with damage to inferotemporal cortex (part of the 'what' pathway) often have no difficulty reaching for objects that they have difficulty describing.
2. Patients with damage to posterior parietal association cortex (part of the 'where' pathway) often have difficulty reaching accurately for objects that they have no difficulty describing.

Dorsal & Ventral Streams

Visual streams: Perception vs. Action

Milner and Goodale (1991):

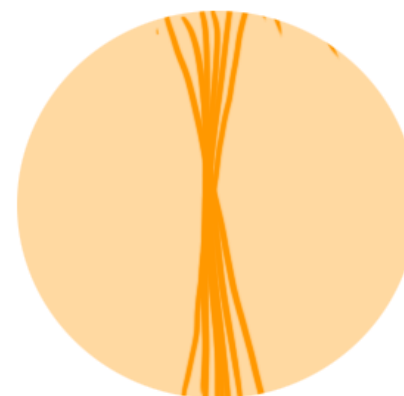
- Worked with a patient, DF, with extensive bilateral ventral-stream lesions.
- DF had a profound visual form agnosia, but some interesting spared abilities:



**Perceptual
Orientation
Matching**



**Visuomotor
"Posting"**



DF

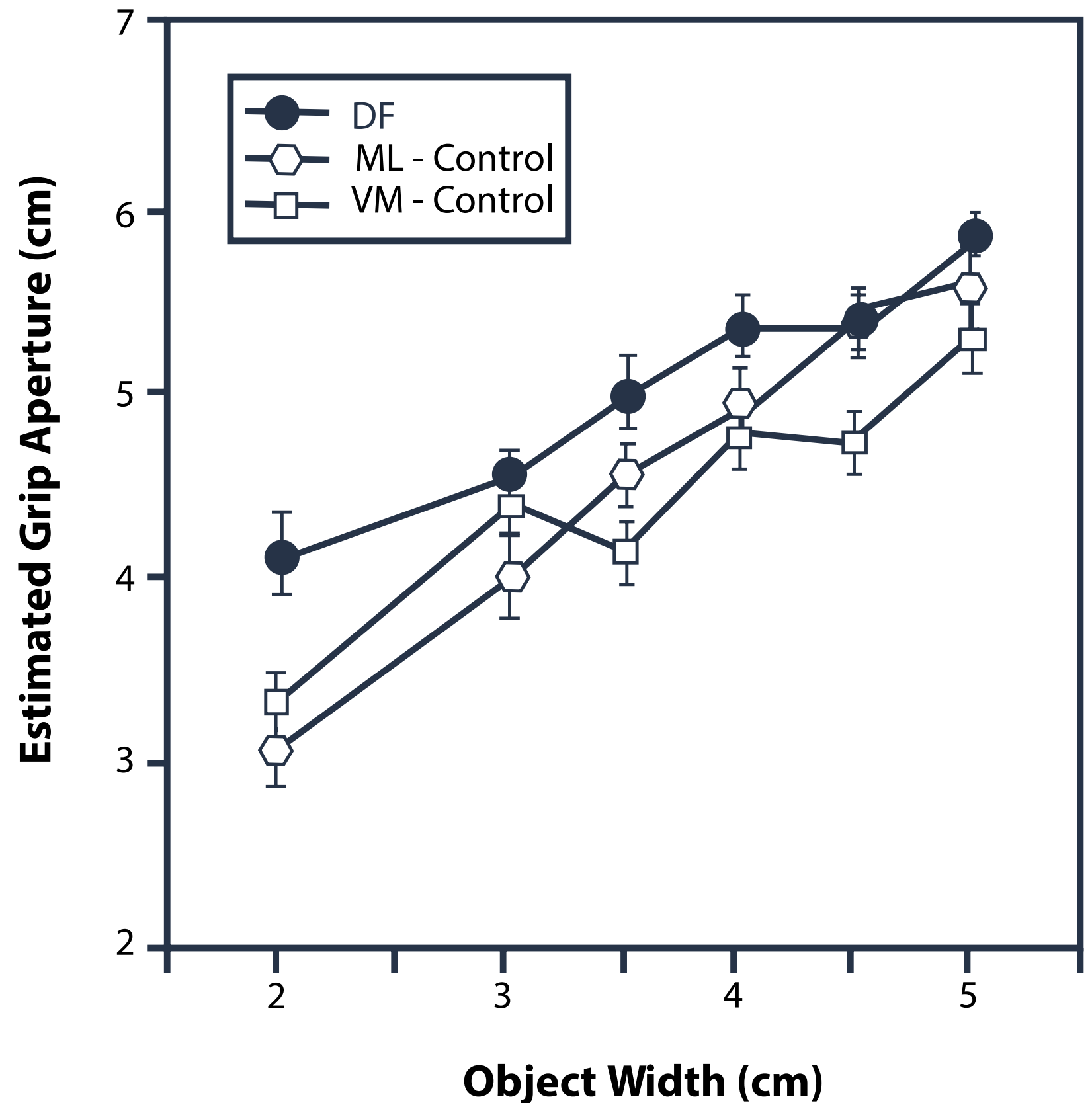
Control

She doesn't seem to know what the object is, but **she knows how** to act with it.

Dorsal & Ventral Streams

Visual streams: Perception vs. Action

DF could not discriminate between two blocks of different sizes/orientations. However, when asked to reach for them, she accurately changed the width and orientation of her grasp as she reached out.



Dorsal & Ventral Streams

Visual streams: Perception vs. Action

In 1991, Goodale and Milner argued that the key difference between dorsal and ventral streams is not the kinds of information they carry, but the use to which that information is put.

Dorsal stream: Direct behavioural interaction with objects (action).

Ventral stream: Mediate conscious perception of objects (perception).

Dorsal & Ventral Streams

Agnosia: From the Greek for “lack of knowledge”

Loss of ability to recognize objects, or sounds, or shapes, etc.
(with no evidence of significant memory loss)

Agnosias

Damage to Ventral Visual Pathway

Leads to **visual agnosias**:

Apperceptive agnosia: Failures in object recognition linked to problems in perceptual processing.

Associative agnosia: Normal visual representations but unable to use this information to recognise things.

Agnosias

Apperceptive Agnosia

Patients with an apperceptive agnosia are not impaired in matching different “normal” views of objects, only “unusual views”.

Agnosias

Apperceptive Agnosia

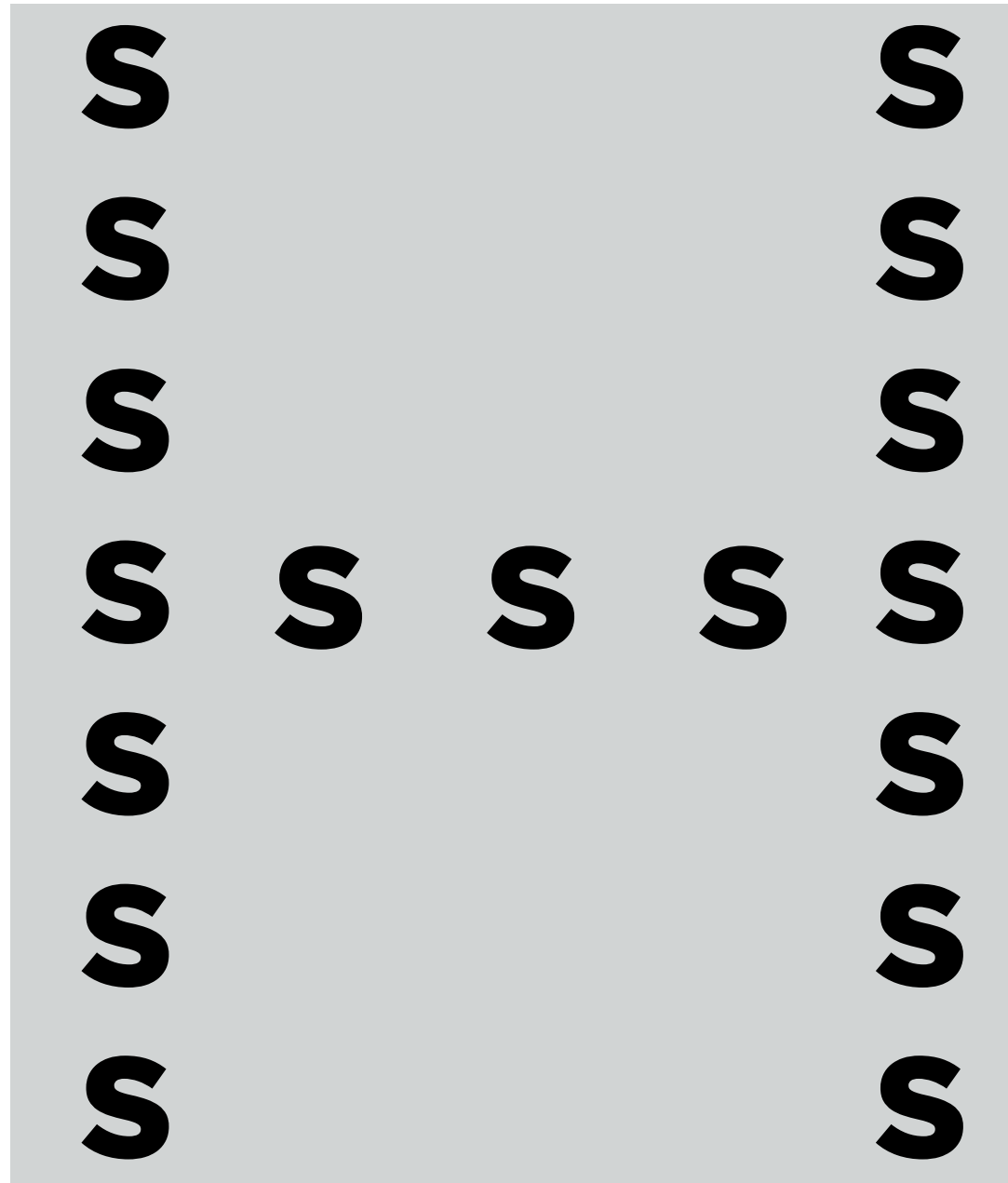
Their ability to recognize degraded stimuli is impaired.



Agnosias

Apperceptive Agnosia

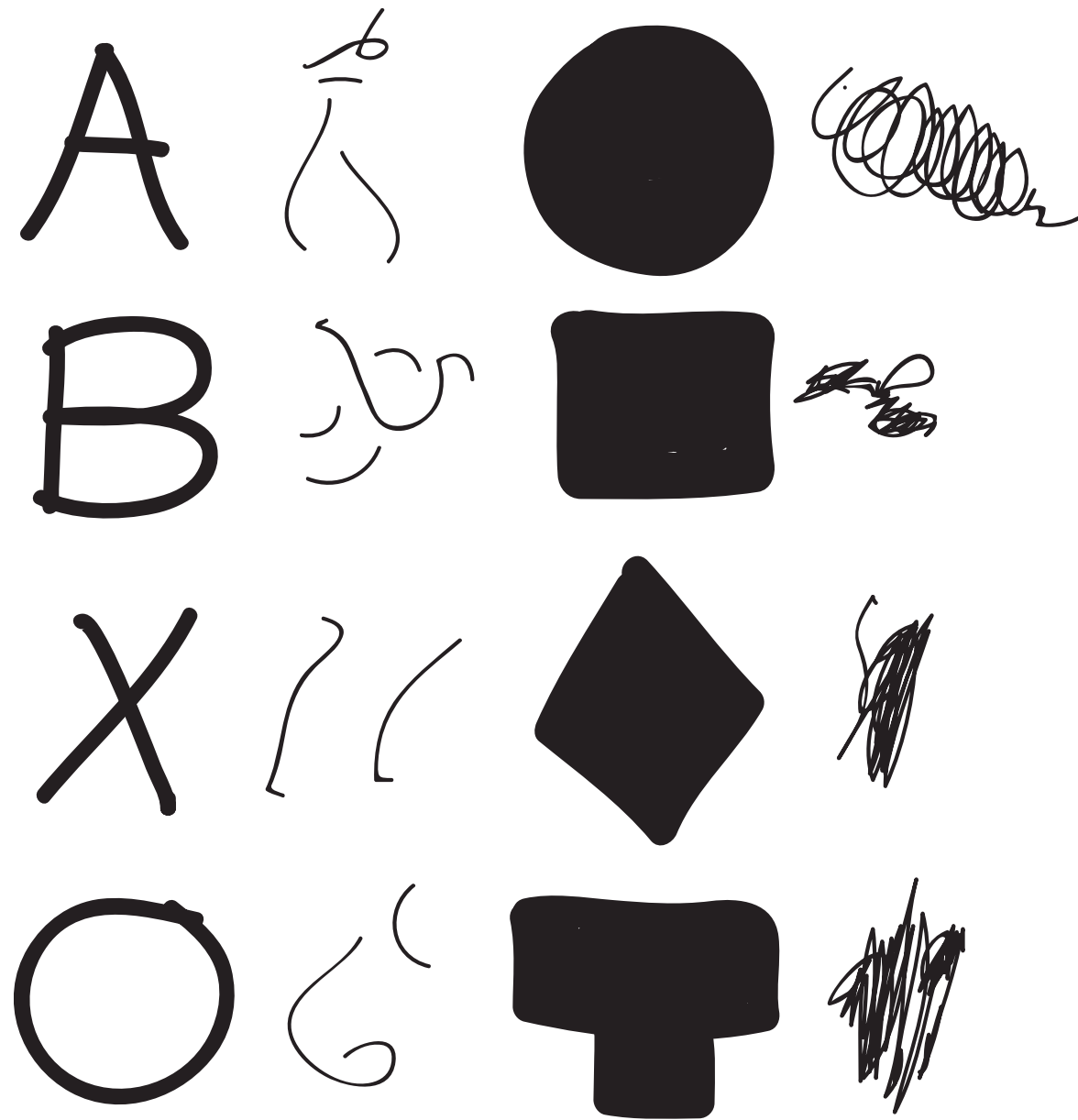
They are often better with local vs. global aspects of an object.



Agnosias

Apperceptive Agnosia

In severe cases, they may find it very difficult to copy objects or shapes.



Agnosias

Associative Agnosia

These patients do well on perceptual tests, but cannot access names or other information about objects.

Associative agnosics fail to experience familiarity with the stimulus.

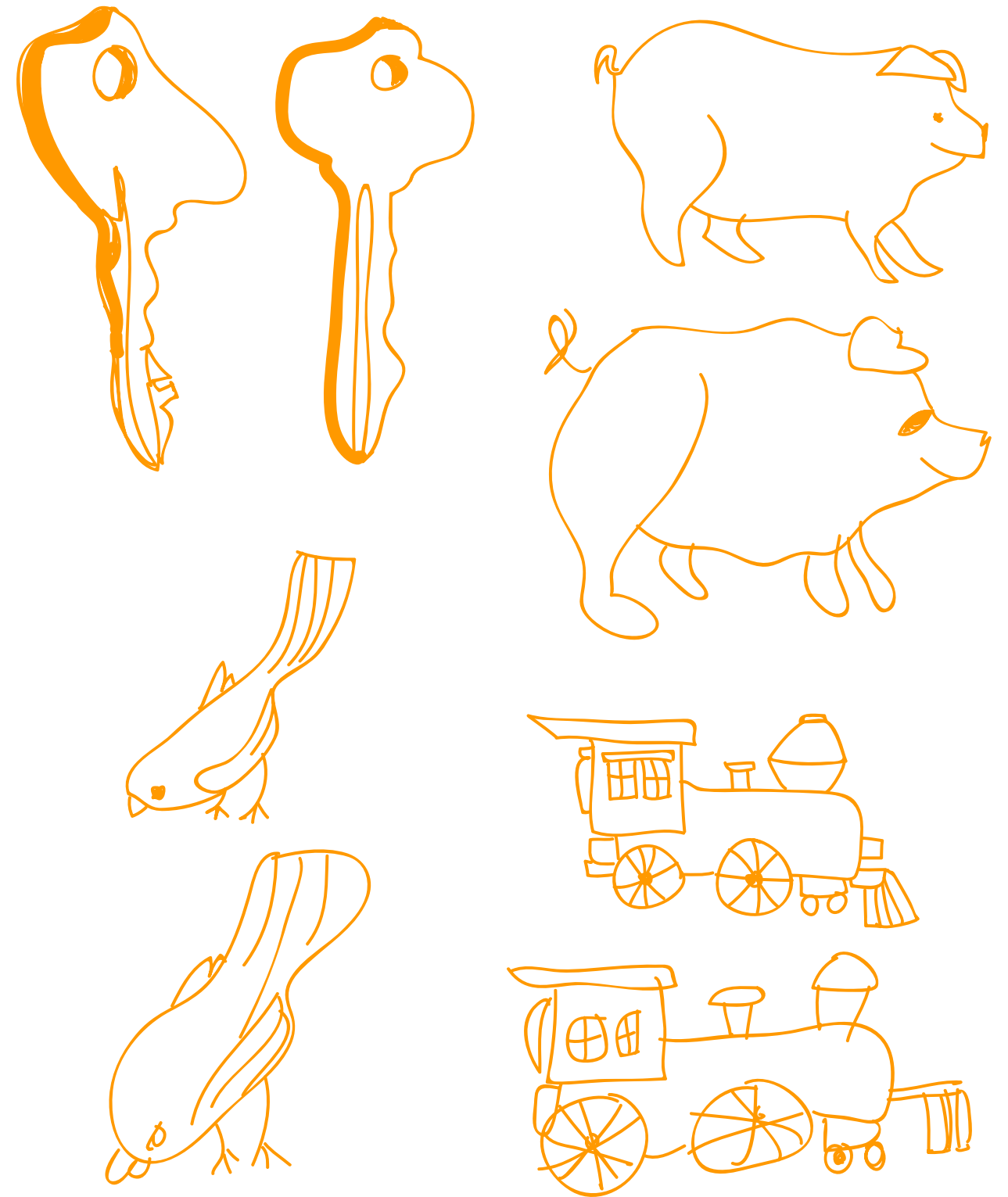
When given names of objects, they can often give accurate verbal descriptions.

Agnosias

Figure Copying: Associative Agnosia

Associative agnosics can copy objects accurately but they can't tell you what those objects are.

Thus, they show evidence of intact perceptual representations of objects. However, there is little evidence of an ability to recall associations with those objects.



Agnosias