

# **Anosognosia for Hemiplegia**

# Anosognosia

## Denial of illness (paralysis, also blindness)

Limb doesn't move, but no expression of frustration

Confabulation: arm belongs to someone else

Rationalization: didn't move arm because shoulder is sore today

Admits leg is paralyzed but not arm

Euphemisms for paralysis: "I've never been very ambidextrous"

False memory: patient later remembers she had moved arm

Some patients deny paralysis in *other* hemiplegia patients.

## Patients otherwise lucid and intelligent

Patients do not otherwise overestimate their abilities

## Following right parietal lesions, left sided paralysis

Seldom is there anosognosia following left parietal lesions (like neglect)

## **Drawing attention to paralysis doesn't help**

therefore, not just neglect

## **Despite Ramachandran story, there's some evidence of knowledge.**

Some patients appear to be aware of failure to perform motor acts, but quickly forget, and seem unable to update long-term knowledge about body.

Some patients show no denial if asked what tasks doctor could do perform if he had same condition.

**[RAMA BBC LECTURE]**

# Explanations

## protecting one's ego

not likely since paralysis without anosognosia following left parietal lesion

## disconnection from awareness (Joseph, 1993)

left hemisphere contains language and (verbal) awareness

left hemisphere loses access to sensory input or movement memories of right hemisphere

but why would patient confabulate?

## grossly amplified version Freudian defense mechanisms

<digression>

# Freudian Defense Mechanisms

## Ways the mind avoids anxiety, shame, or escapes unpleasant situations

- generally unconscious
- distortions, transformations, or falsification of reality

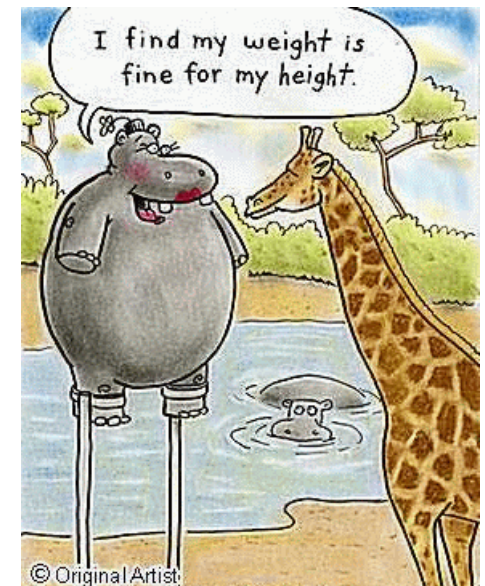
### Denial

claiming that what is true is false



### Projection

attributing uncomfortable feelings to others



### Rationalization

creating a false but believable justification

### Reaction Formation

behaving in a way opposite to how one feels, to hide unacceptable feelings

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e.g., denial

e.g., reaction formation — patient reports tying shoes the day before, and emphasizes “*with both hands*”

e.g., rationalization — “didn't want to smudge your nose”

e.g., suppression — deliberate (?) distraction maneuvers to change subject

# Does Patient Show Tacit Knowledge of Paralysis?

**Might expect so based on other domains:**

- implicit memory
- amnesia
- prosopagnosia
- subliminal perception

# Experiment 1: Task Choice

**Patient given choice between bimanual and unimanual task**

e.g., tying shoe vs. stacking blocks

**Larger prize associated with bimanual task**

e.g., \$5 vs. \$2

**No knowledge of paralysis → greater expected reward for bimanual task**

**Knowledge of paralysis → greater expected reward for unimanual task**

**Anosognosia patients chose bimanual, control patients (right hemi stroke, left neglect) chose unimanual.**

**No frustration, and no learning despite repeated failures**



## Experiment 2: Virtual Reality Box

**Patient inserts (paralyzed) left hand into gloved hole in box, but sees experimenter's hand in box via mirrors.**

**Patient instructed to tap hand to rhythm of metronome.**

**When patient sees hand moving, no surprise expressed.**

But there are also confabulations involving good hand: When patient moves good hand but sees no motion, also claims there is motion.

**Failure to detect a discrepancy between various feedback signals.**

- vision
- proprioception — stretch receptors in joints and muscles that provide body position feedback
- collateral discharge

# Experiment 3: Repressed Memories

**Perhaps knowledge of paralysis is present but not accessible — it is repressed.**

## **Manipulation**

Left ear canal irrigated with ice cold water, stimulating vestibular system.

## **Consequences**

denial of paralysis vanishes, as does denial that limb belong to patient

no surprise at admission (vs. if it were a sudden realization)

admission that arm had been paralyzed for some time -> memory was stored

8 hr later, patient claimed to have stated that she had no paralysis  
(remember the insufficient-justification essay-writing study from last class?)

## **Conclusion**

Memory is intact, but patient is trying to make sense of their experience.

## Failure to detect a discrepancy between various feedback signals.

- vision
- proprioception — stretch receptors in joints and muscles that provide body position feedback
- collateral discharge
- memory

## Rama's theories

(#1) cold water produces nonspecific arousal of right hemisphere, allowing it to function again

but why?

(#2) allows patient to orient to the left side, to eliminate neglect

but why confabulations concerning right hand?

(#3) involuntary eye mvts resulting from vestibular stimulation (nystagmus) leads to reawakening of memories, a la REM sleep

## Mike's theory

Neglect is often viewed as an imbalance between left and right hemispheres.

e.g., extinction resulting from competition

Cold water disrupts processing in left hemisphere, so the balance between left and right is restored.

# Why Do Defense Mechanisms Exist?

“Brain tries to arrive at the most *probable* and globally consistent interpretation of evidence derived from multiple sources.”

e.g., Necker cube

e.g., cue combination in vision [demo]

Jacobs experiment: motion and texture cues to cylinder diameter vary reliability -> subjects use more informative cues

e.g., constructive memory

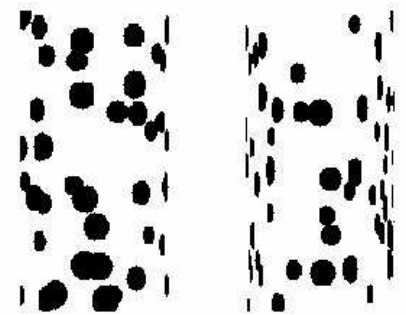


Figure 1

## In anosognosia

- motor cortex sends command to limb
- corollary discharge indicates limb was moved
- conflicting evidence (e.g., vision, proprioception)
- brain picks one account

**Defense mechanisms maintain integrated sense of self**

## Related ideas

Conscious states are interpretations of the world (here, via multiple modalities and the world includes internal states).

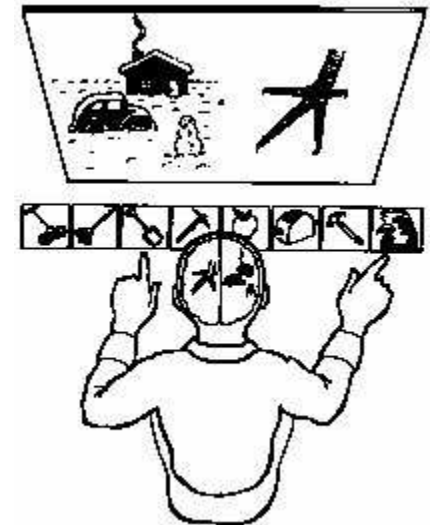
Individuals provide explanations of their behavior that are stories that seem coherent given the information they have to work with (input/output).

**Interpretation / coherence achieved by discarding some bits of evidence.**

**Similar account in for other neurological patients**

**e.g., split brain**

“I saw a claw and I picked the chicken, and you have to clean out the chicken shed with a shovel.”



# Function of Right Parietal Lobe

## Ramachandran

Left hemisphere constructs a story.

Right hemisphere serves as an anomaly detector that challenges bad stories.

i.e., plays Devil's advocate

explains why right hemisphere patients construct more elaborate rationalizations than left hemisphere patients

generate & test?

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## Mozer

Right hemisphere register locations of limbs and their movements in space in both left and right hemisphere

explains why patient with anosognosia also claims that other anosognosic is moving limbs

explains why patient would also show confabulation for right (nonparalyzed) hand