



“DID YOU MEAN TO DO THAT?”: UNDERSTANDING THE DIFFERENCE BETWEEN ALIEN ARM SYNDROME AND UTILIZATION BEHAVIOUR



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Poornima Viswanathan
Stroke Rehabilitation Physiotherapist
Hutt Valley District Health Board**

BACKGROUND

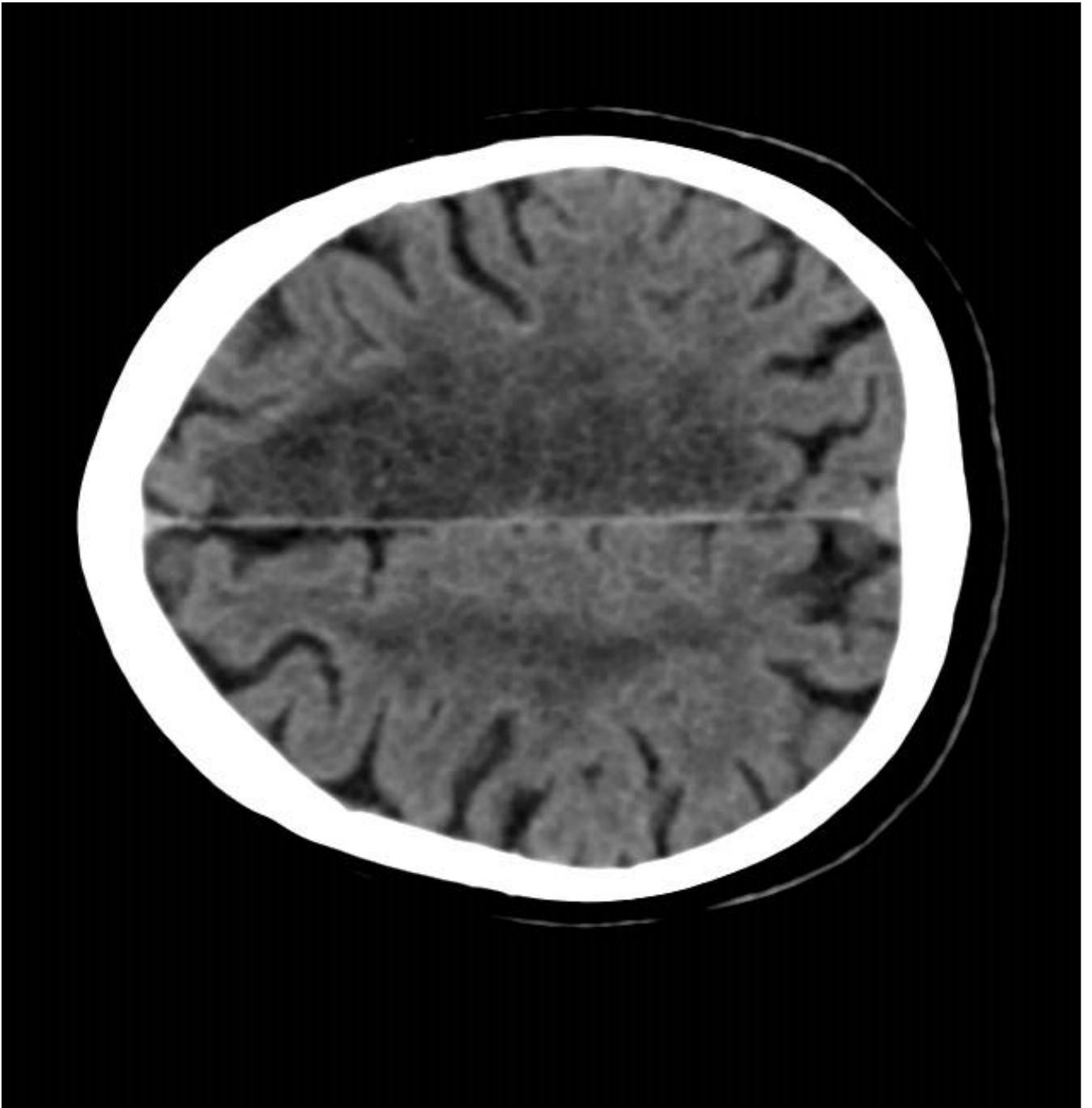
- Apraxic upper limb movements can be difficult to differentiate and are therefore easily mislabelled.
- In particular Alien Arm Syndrome and Utilization Behaviour both present with arm movements that are often inappropriate to the context but have defining characteristics.



APRAXIA

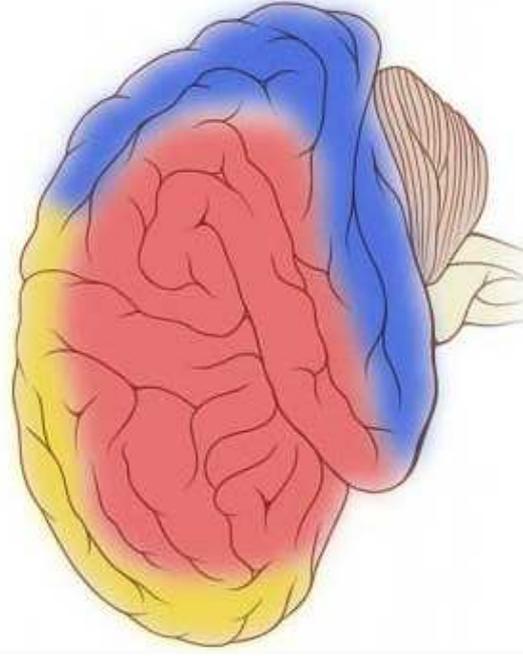
- Defined as:
 - Deficit in ability to understand an action or to perform an action in the response to verbal command or imitation in the absence of basic sensory or motor impairments
- 30% post stroke demonstrate apraxia
 - 50% post left hemispheric stroke
 - <10% post right hemispheric stroke



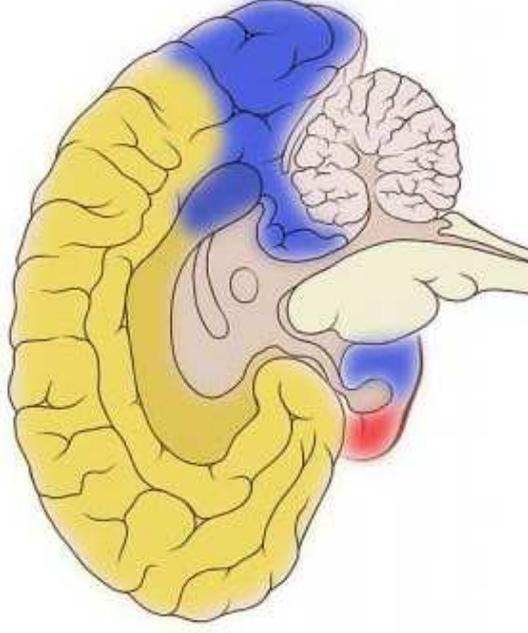




Lateral Brain



Medial Brain



-  Anterior Cerebral Artery
-  Middle Cerebral Artery
-  Posterior Cerebral Artery



ADMISSION TO REHAB

- Right UL/LL 0/5
- Lie to sit Ax2
- Ax2 sitting balance
- High tone R) UL
- Severe receptive and expressive aphasia



PROGRESS

- Developed some return R) UL
 - Holding wheelchair brake
 - Holding therapists hand
 - Holding various parts of the gutter frame
 - Unable to let go
- These issues continued to discharge



SPECIALIST OPINIONS

- ?Botox
- Neurologist
 - Utilization behaviour
 - Magnetic Apraxia
 - Grasp reflex
 - Inter-manual conflict



ENVIRONMENTAL DEPENDENCY SYNDROME

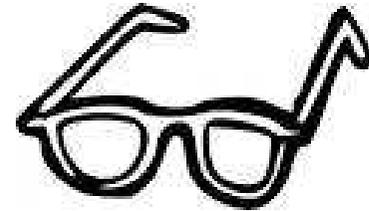
Loss of frontal inhibition and the resultant over activity of the parietal lobes

“Excessive dependence on environmental cues”

- Magnetic Apraxia
- Imitation behavior
- Utilization behavior



UTILIZATION BEHAVIOUR



- First described by Lhermitte in 1983
- Classically described where irrelevant objects were incidentally present on a desk and the patient was not instructed to use them
- Hypothesized components:
 - A failure to prioritize task based goals over other ongoing information held in working memory
 - A problem in response inhibition once task-inappropriate information has been activated



TABLE 1: Summarizing data for lesion sites shown in literature to be concomitant with utilization behavior (UB) or Environmental Dependency Syndrome (EDS).

	Orbitofrontal region	Caudate nucleus	Mesial frontal lesions	Thalamus	Frontal white matter	Frontal and prefrontal cortex	Inferior frontal lobe	Superior frontal regions	Cingulate cortex (gyrus)	Temporo-polar lesion	Temporo-mesial lesion	Fronto-striatal projections	Supplementary motor area	Fronto-temporal lesions	Paraventricular and subventricular regions	Rolandic region	Olfactory cortex
Lhermitte, 1983 [1]	X	X															
Assal, 1985 [2]			XB				XR										
Lhermitte et al., 1986a [11]		XB	X	XI													
Lhermitte et al., 1986b (EDS) [11]					X		X										
Shallice et al., 1989 [9]			XB				XB										
Eisinger et al., 1991 [13]				XB													
Hoffmann and Bill, 1992 [31]						XB											
Degos et al., 1993 [29]		XR							XL								
Fukui et al., 1993 [32]									XB								
Brazzelli et al., 1994/1998 [33, 34]	XB		XB			XB			X	X	X		X				
Ghika et al., 1995 (EDS) [35]												X					
Hashimoto et al., 1995 [15]																	
Tanaka et al., 2000 (EDS) [36]								XL						XL			
Boccardi et al., 2002 [37]													XB				
Ishihara et al., 2002 [14]								XL									
Conchiglia et al., 2007 (EDS) [38]														XL			
Ghosh and Dutt, 2010, 2012 [3, 4]														XB			
Besnard et al., 2010 [7]	X					X							X		X	X	
Spiegel and Lamm, 2011 (EDS) [30]		XL	X														
Besnard et al., 2011 [8]	X		X			X	X	X						X			X
Balani et al., 2012 [39]			XB						X		XB			XB			

X: involvement without specified laterality; XB: bilateral involvement; XL: left hemisphere involvement; XR: right hemisphere involvement.

UTILIZATION BEHAVIOUR

- Unilateral or bilateral inferior frontal lesions
- Damage to the orbito-frontal structures
- Dysfunction of fronto-striatal pathways
 - Cingulate, caudate and anterior and medial nuclei of the thalamus
- Damage to supplementary area



SCORING SCALE FOR EACH COMPONENT OF ENVIRONMENTAL DEPENDENCY SYNDROME

	3	2	1	0
Grasping	No abnormal behaviour	Hesitation, questioning	Grasping but stopped when explicitly asked (Naive grasping)	Grasping even when explicitly asked to stop a few seconds before (obstinate grasping)
Imitation	No abnormal behaviour	Hesitation, questioning	Imitation for at least one gesture but stopped when explicitly asked (naive imitation)	Imitation of gestures even when asked to stop a few seconds before (obstinate imitation)
Utilization	No abnormal behaviour	Hesitation, questioning	Using at least one object but stopped when explicitly asked (naive utilization)	Using even when explicitly asked to stop a few seconds before (obstinate utilization)



METHOD FOR TESTING GRASPING

- Examiner sits in front of patient without table etc. in between
- Does not make eye contact
- Puts forefinger and middle finger in patients hands
- Exerts some pressure on the skin
- No instructions are given



METHOD FOR TESTING IMITATION BEHAVIOR

- Examiner sits in front of patient
- Does not make eye contact
- Does not answer any questions
- Performs various gestures:
 - Clapping hands
 - Slapping his/her thighs
 - Tapping desk
 - Military salute



METHODS FOR TESTING FOR UTILIZATION BEHAVIOR

- 1) Putting an object in the hands of the subject and then observing his behavior (Induced UB)
- 2) Positioning an object on the desk suddenly and not in front of the patient in a way that should not let him think that he has to use it. Observe if the object captures patient's attention and utilization occurs (Incidental UB)



METHODS FOR TESTING FOR UTILIZATION BEHAVIOR

- 3) Patients are asked to describe actions referring to some activities of daily living. While subjects are describing such activities the examiner let some objects suddenly appear in front of the patient. These objects may or may not be related to the action. (Double activation)



ALIEN HAND SYNDROME

- First described in 1908 by Goldstein
- A type of Apraxia with the feeling of estrangement between the patient and his hand
- A major characteristic is where the patient criticizes the behaviour of the affected limb with a feeling of frustration



PROPOSED THEORIES

- Damage to the left
 - Supplementary motor area
 - Anterior cingulate
 - Parietal lobe
 - Medial prefrontal cortex
 - Anterior corpus callosum
 - =reflexive grasping, groping and compulsive tool manipulation where the patient feels unable to prevent



PROPOSED THEORIES

- Right
 - Frontal and/or anterior callosal lesion
 - =intermanual conflict (where the affected hand tries to interfere with the unaffected hand)



DIFFERENTIAL DIAGNOSIS

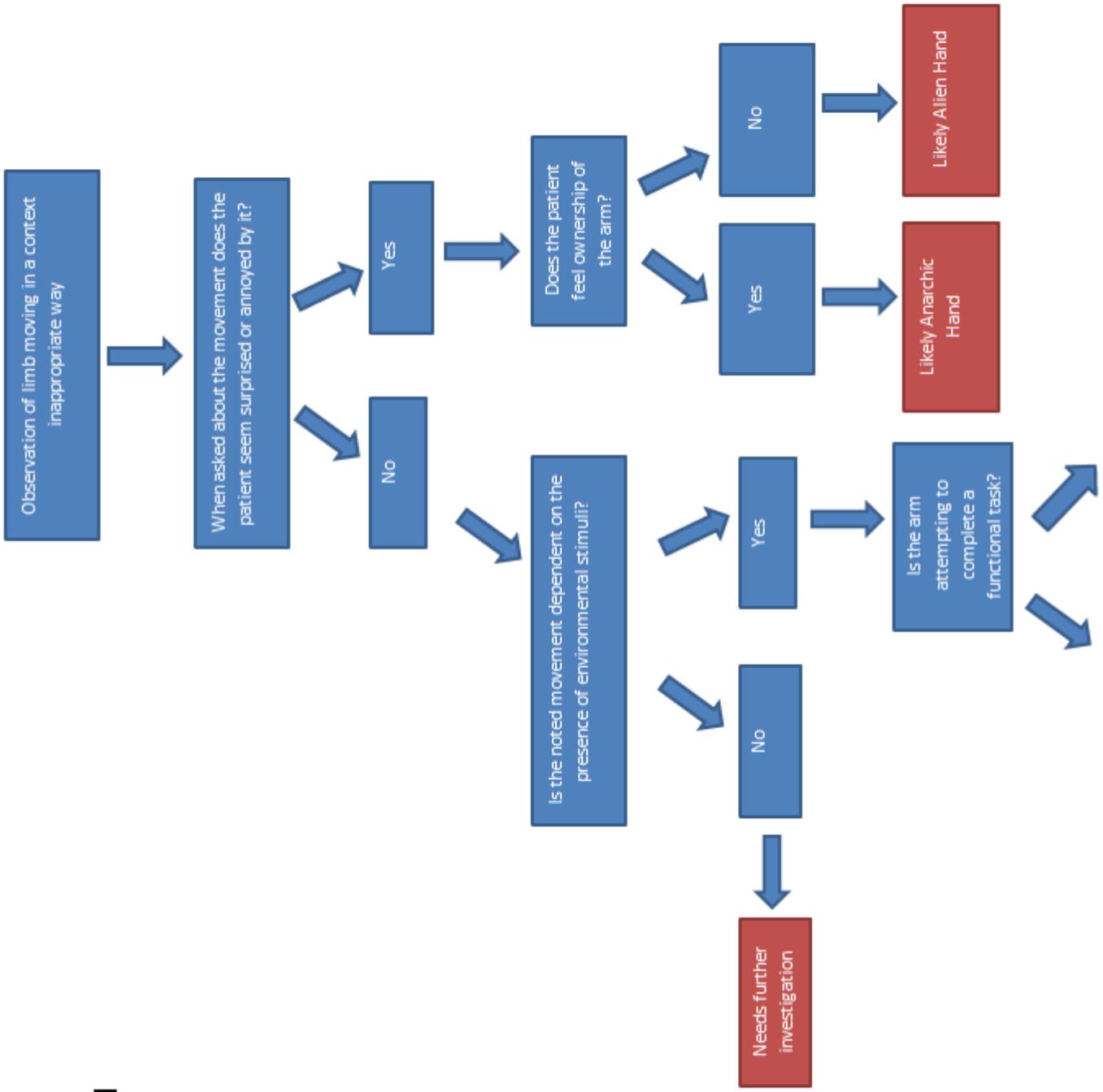
- UB vs Action Disorganization Syndrome (ADS)
 - Patient with UB can perform all the necessary steps to accomplish or execute a complex action whereas a patient with ADS is unable and shows many errors
- UB vs Alien Hand Syndrome (AHS)
 - UB is not associated with rejection of wanting to complete an action, a patient with AHS is aware of the disorder reporting “the arm is moving by itself”

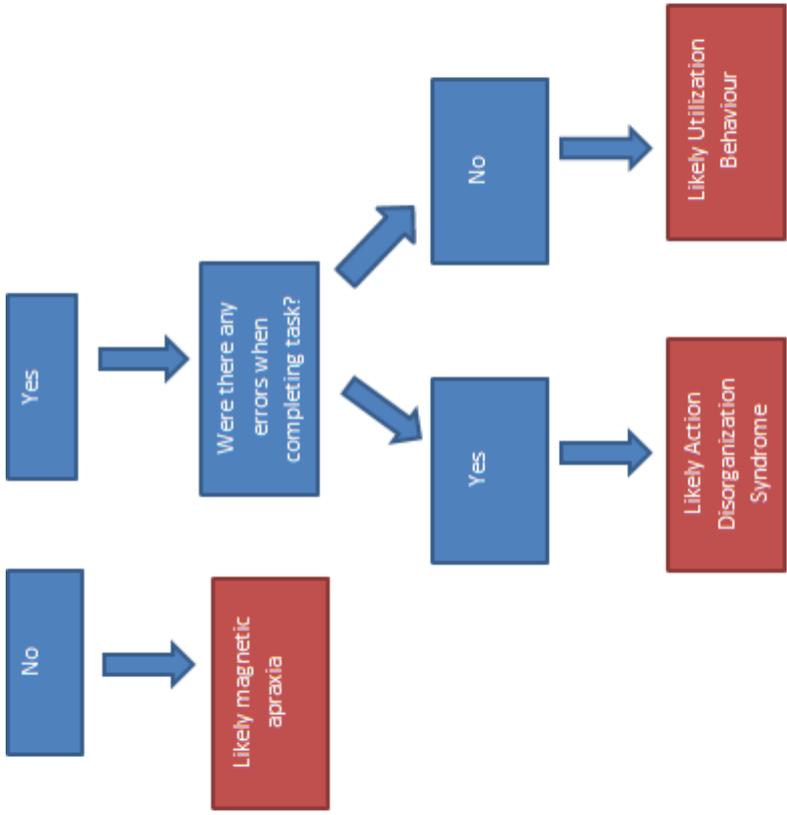


DIFFERENTIAL DIAGNOSIS

- Alien Hand Syndrome vs Anarchic Hand
 - Alien Hand – conditions involving the feeling of non-belonging of a hand
 - Anarchic Hand – conditions where subjects perform involuntary movements with their hand but acknowledge the hand is theirs
 - May report it has a mind of its own
 - Can be associated with Intermanual conflict: hand movements interfere with non-anarchic hand







TREATMENT OPTIONS

- Biofeedback
- Masking and/or restraining affected arm
- Cognitive therapy
- Practicing functional activities

- Remedial/Task Specific/Compensatory Strategies



DISCUSSION

- Developed some return R) UL
 - Holding wheelchair brake
 - Holding therapists hand
 - Holding various parts of the gutter frame
 - Unable to let go
- These issues continued to discharge



CONCLUSIONS

- When a patient is unable to accomplish routine action most likely he is not showing UB
- When a patient is telling you he did not want to perform the movements just executed UB can be excluded



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