Comprehending Challenging Behavior: A Framework for Explanations in Neurobehavior

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Brain Injury Alliance Colorado Conference
November 1, 2018

Fragmented Neurobehavior Treatment

--Environmental influences

--Neurological/Physiological influences

--There has been a lag in the integration between these two domains

--Neurobehavior treatment has not been clearly defined in a way that fosters integration

The Event To Be Explained…

- Labor Day family brunch
- Post meal conversation around the table
- Sudden laughter of children
- Footsteps running downstairs, thru living room and out front door
- Door slams
- Sound of lamp crashing to floor in foyer

"Event Is Described"	"Causes of Responding"
	Focus on the Behavior
"I've told them not to run in the house"	Running **describes** the form of behavior
"Joey led the charge out the front door"	**Trigger** was Joey
"They were bored in here with all the adult talk"	**State** of the system: Arousal ready for displacement
"And they were eager to play with that new hoop set you got for Joey's birthday"	**Purpose**, function
"Well let's not forget the sugar high from that excellent dessert"	**State** of the system: Arousal ready for displacement
	Focus on the Environment
"It's smithereens now–no way even grandpa could fix it"	Smithereens **describes** current status
"Its not completely their fault, Helen. That old lamp was pretty tippy: A strong wind would knock it over"	Many possible **triggers** for it to break
"It was Joey who bumped it over"	The particular **trigger** that tripped it
"Helen! It was missing its fourth leg!!"	**State** of the system: Lack of structural integrity
"Joseph, I think you loosened it just to make this happen, given how you hated that old lamp!"	**Purpose**, The reason the leg was loosened and broken off

From Kupfer, et al, 2016

Four Causes of Behavior

Formal Causes
- Explanatory schema; theory; METAPHORS”
- *“What” questions*
- *Joey runs and lamp breaks*

Efficient Causes*
- Triggers (Necessary & Sufficient)
- *“Why” questions (Under What Conditions?)*
- *Trigger for Joey and trigger for lamp breaking*

Material Causes
- Underlying substrates (mechanisms)
- *“How” questions*
- *Joey’s neuro-physiology and table strength*

Final Causes
- Reasons, Purpose, Function, Consequences*
- *Additional “Why” questions*
- *Joey’s new hoop and Joseph’s dislike of the lamp*

Four Causes of Behavior

Formal Causes

"Bob hit the charge nurse last evening"

Efficient Causes

"The charge nurse asked Bob to move his wheelchair away from the doorway"

Material Causes

"Bob fell from a ladder, sustained injury to frontal lobe and temporal lobe, subdural hematoma"

Final Causes

"When Bob strikes the charge nurse, she stops asking Bob to move"

4 Causes of Behavior

Proximate Final Causes – refers to immediate consequences of some behaviors or misbehaviors (escape/avoid of difficult tasks… like PT, OT, SLP…)

Ultimate Final Causes – may refer to learning histories or genetic influences (evolutionary fitness, *pre-existing conditions prior to injury*)

Arciniegas & McAllister (2008): Neurobehavioral management of traumatic brain injury in the critical care setting

	Stages of Posttraumatic encephalopathy	
Coma	Complete Impairment of Arousal	Formal
	"Augment catecholaminergic function" with Amantadine, Bromocriptine, Carbidopa/Levodopa, Methyphenidate	Material
	"Facilitate adaptive engagement & minimize overstimulation" by cues, signals to entrain sleep-wake cycles & feeding rhythms, no continuous feed, coma stimulation	Efficient/Triggers
	Consequences Management?	Final
Delirium	Alteration in Arousal, Profound Inattention	Formal
	"Imbalance between cerebral dopaminergic (excess) and cholinergic (deficient) function", use Donepezil, atypical antipsychotics such as Quetiapine, Olanzapine, Haloperidol (adjunct).	Material
	"Control the environment, decrease sensory overstimulation by normalizing light cues, reorient patients to decrease confusion, 1:1 staffing to reduce restraints	Efficient/Triggers
	Consequences Management?	Final

Arciniegas & McAllister (2008): Neurobehavioral management of traumatic brain injury in the critical care setting

	Stages of Posttraumatic encephalopathy	
Amnesia	Dense Impairment in New Learning	Formal
	Use cholinesterase inhibitors (Donepezil) or stimulant (methylphenidate) if no destruction of lateral orbitofrontal – no subcortical injury, otherwise use Valproic Acid	Material
	Cueing directions for daily tasks, patient/family/staff training, support groups	Efficient/Triggers
	Errorless learning*	Final
Post-traumatic dysexecutive syndrome	Impairments in higher-level attention, memory and other cognitive functions	Formal
	Treat cognitive, emotional, behavioral problems as above	Material
	Trigger management?	Efficient/Triggers
	Consequences management?	Final

Brain Injury and the Problem with Errors in Learning

- Errors are not necessary for learning to occur.
- Errors can be a function of:
  - poor analysis of behavior
  - a poorly designed teaching program
  - moving too fast from step-to-step in the program
  - lack of the prerequisite behavior necessary for success in the program.

Errorless Learning

- Errorless learning reduces
  - Errors
  - Anxiety
  - Feelings of inadequacy
  - Escape and avoidance
  - Aggression

Errorless Learning

Starts training early to prevent the cumulative effects of repeated errors

Uses maximum to minimum cues to guide successful responding

Uses fading procedures to reduce conspicuous cues

Errorless Learning

Fading: When stimulus (training) conditions are gradually adjusted and removed while the learned behavior remains intact.

Case Study

“Severe TBI, diffuse axonal injury, prolonged unconsciousness, multifocal left temporal bifrontal contusions resulting in aphasia, relative right-sided paresis, generalized weakness, abulia, apraxia, organic brain syndrome, Rancho V, currently in PTA”

“Behavioral disorder including, but not limited to: disinhibition, dyscontrol, aggression and perseveration”

Case Study

- AS, female, 25 yr. old, no significant medical history
- MVA
- GCS 3

Case Study

- Target behaviors
  - Hitting, biting, spitting, yelling, sexual/racial, homicidal, ….

Case Study

- Response Class (or target behaviors)
  - Hitting, biting, spitting, yelling, sexual/racial, homicidal, ….
- Violent during all treatments and therapies
- 60 days to treat before returning home to live with mother as Care-giver

What are the Environmental Variables Identified?

Functional Assessment (QABF)

Escape / Avoidance Functional Relation

Extinction for Physical & Verbal Aggression

- These responses no longer functioned or served as escape and avoidance.

What are the Environmental Variables Identified?

Reinforcement for Alternative "Competing" Behaviors

- DRA – Differential Reinforcement of Alternative Behavior
- Teaching Social Skills, Requesting Assistance and Breaks**, Cooperation, Planning.

  **These now function as escape and avoidance response

Rehabilitation / Therapy

Errorless Strategies

What are the Pharmacological Changes?

Medications at Admission:

- Tegretol 200mg/day
- Haldol 4mg/day
- Ativan 6mg/day
- Zoloft 75mg/day

Errorless Strategies

- Reduce Response Requirement
  - Task duration short
  - Task effort low
  - Maximum assist
  - Effective cueing
    - Specific, consistent, minimize excessive,
  - Frequent breaks and teaching mands
  - Positive reinforcement
  - Fading and Fluency

Phase One - Bedroom

- Donned in protective equipment
  - Us, not her….

    (easier to fade)
- Consistent method
- Consistent staff and therapists
- Care-giver (mother) present

Phase Two – PT Gym

- Donned in protective equipment
- Consistent method
- Consistent staff and therapists
- Care-giver present
- Protective equipment reduced (faded)

Phase Three – Alternative Behavior Training

- Practicing social skills, learning how to take breaks, say “no, thanks”, etc.
- No protective equipment

Phase Four – Care-giver Generalization

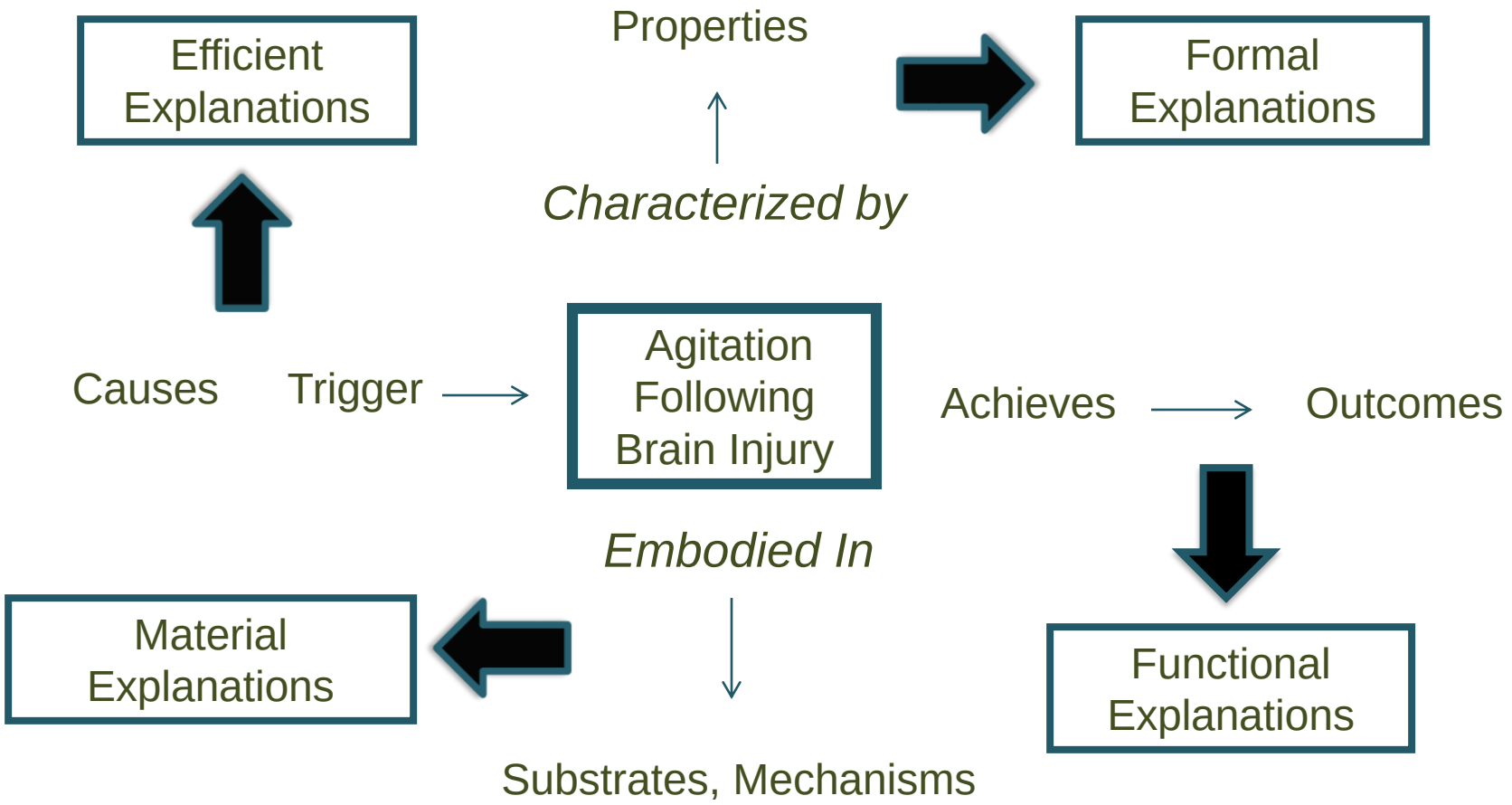
- Transition of Care to mother

Explaining Aggression Following Brain Injury

--Explanation is finding a rule, all of whose parts fit the phenomenon. Our sense of familiarity with the structure of the model is transferred to the phenomenon with which it is put in correspondence, putting our mind at ease.

A beCausal Analysis of Agitation Following Brain Injury

Behavioral/Social Systems



Neural Systems

Crossroads in Behavior Analysis Treatment

"There are two unavoidable gaps in any behavioral account: one between the stimulating action of the environment and the response of the organism, and one between consequences and the resulting change in behavior. Only brain science can fill those gaps. ***In doing so it completes the account; it does not give a different account of the same thing.*** Human behavior will eventually be explained (as it can only be explained) by the cooperative action of ethology, brain science, and behavior analysis." B.F. Skinner, 1989

Explaining Aggression Following Brain Injury

--No single type of explanation yields complete understanding: Com-***prehension*** involves getting our fingers on all four types of causes:

Formal, Efficient, Material, Final

Defining Neurobehavior

Practitioners of Neurobehavior strive to understand the immediate stimuli that induce an event, its underlying mechanism, its function *or purpose*, and how best to talk about it– a theory about it.

Thanks!