Comprehending Challenging Behavior: A Framework for Explanations in Neurobehavior

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

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)
**Stages of Posttraumatic encephalopathy**

<table>
<thead>
<tr>
<th>Coma</th>
<th>Alteration in Arousal, Profound Inattention</th>
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<tbody>
<tr>
<td>“Augment catecholaminergic function” with Amantadine, Bromocriptine, Carbidopa/Levodopa, Methyphenidate</td>
<td>“Imbalance between cerebral dopaminergic (excess) and cholinergic (deficient) function”, use Donepezil, atypical antipsychotics such as Quetiapine, Olanzapine, Haloperidol (adjunct).</td>
</tr>
<tr>
<td>“Facilitate adaptive engagement &amp; minimize overstimulation” by cues, signals to entrain sleep-wake cycles &amp; feeding rhythms, no continuous feed, coma stimulation</td>
<td>“Control the environment, decrease sensory overstimulation by normalizing light cues, reorient patients to decrease confusion, 1:1 staffing to reduce restraints</td>
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**Consequences Management?**

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

Efficient Explanations

Properties

Formal Explanations

Characterized by

Agitation Following Brain Injury

Achieves Outcomes

Embodied In

Material Explanations

Substrates, Mechanisms

Functional Explanations

Neural Systems

Causes Trigger

Achieves Outcomes

Material Explanations

Substrates, Mechanisms

Functional Explanations

Neural Systems
“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: Comprehension 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!