Examining Autonomic Arousal in a Web-Based CME Simulation Activity

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# Disclosures of Potential Conflicts

**Gorrindo**

<table>
<thead>
<tr>
<th>Source</th>
<th>Research Funding</th>
<th>Advisor/Consultant</th>
<th>Employee</th>
<th>Honorarium</th>
<th>Books, Intellectual Property</th>
<th>In-kind Services (example: travel)</th>
<th>Stock or Equity</th>
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<tr>
<td>AACAP Ethics &amp; CME Committees</td>
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<td>X</td>
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<td>MGH</td>
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</table>
Learning Objectives

• Review role of emotional engagement in adult learning.
• Describe use of simulation as a CME tool, with a focus on psychiatry.
• Apply theories of emotional engagement to design an experiment using web-based simulation.
• Analyze relationship between emotional engagement (autonomic arousal and self-reported engagement) and performance in simulation.
Background

Learning

Performance

Arousal
Background

Yerkes & Dodson (1908)

THE RELATION OF STRENGTH OF STIMULUS TO RAPIDITY OF HABIT-FORMATION

BY

ROBERT M. YERKES AND JOHN D. DODSON.

(From the Harvard Psychological Laboratory)

Learning

Arousal
Background

Yerkes & Dodson (1908)

White-black visual discrimination habit

Background

OF MICE AND MEN

A Novel by JOHN STEINBECK

AUTHOR OF 'TORTILLA FLAT'
Background

Yerkes-Dodson Law

Background

• Adult learning
  – Largely experiential
  – Yerkes-Dodson may be even more applicable
  – Appropriate signal to noise ratio
Background

- Adult learning
  - Largely experiential
  - Yerkes-Dodson may be even more applicable
  - Appropriate signal to noise ratio
Background

- Adult learning
  - Largely experiential
  - Yerkes-Dodson may be even more applicable
  - Appropriate signal to noise ratio
Background

• High-Fidelity Simulation
  – Elements of surprise
  – Complexity typically surpasses usual clinical encounter
Background

• Online Clinical Simulations
  – How does these principles apply?

IBM Medical Avatar Project
Methods Overview

Clinical Simulation Assessment Tool (CSAT)

CSAT Activity Overview

Introduction   Simulation   Virtual Note   Feedback

- Simulation #12: Assessment of Patient Risk
  - Case Review
  - Patient Information
  - Patient's History
  - Progress Note Documentation

- Session Feedback
  - Excellent Job!!!
  - You completed 22 of 22 required elements correctly

- Part I: Review Today's Appointment
  - Anxiety
    - Correct:
    - Inappropriate/excessive anxiety is used in as many as 25% of patients with anxiety disorders and specific phobias.
    - Incorrect:
    - Inappropriate/excessive anxiety is used in as many as 25% of patients with anxiety disorders and specific phobias.

May, 2012
CSAT Interface

- Choose actions
- Case review
- Time left
- Exit simulation

Simulation
Case Review
Today you are meeting with Jack, a 40 year old male with a history of anxiety and 3 major depressive episodes in his 30s who presents for his first outpatient visit. He is a veteran of OEF in Afghanistan and returned from a deployment several months ago. You are currently

Time Remaining
12:41

I've made a decision about the appropriate level of care. Proceed with the final decision.

Fresh simulation
CSAT Interface

• Action Items

- Required
- Advised
- Incorrect
Immediate, Personalized Remediation

**Feedback Overview**

You may benefit from some additional training on this topic.

You completed 0 of 22 required elements correctly.

**Part I: Review Today's Appointment**

**Part II: Review Elements From Today's Appointment**

Below is a list of all possible interventions available in this scenario. They are grouped by symptoms, history, and interventions. Each item is labeled "required", "advised", or "not advised" based on published literature. Items are also listed as "selected" or "not selected" based on your action.

- Your action is inline with published guidelines
- You may wish to reconsider your action
- Your action is not in agreement with published guidelines

**Assess Symptoms**

- Anxiety: Required, Not Selected
- Homicidal Ideation and Intent: Required, Not Selected
- Hopelessness: Required, Not Selected

**Part III: Remediation of Required Elements that You Did Not Select**

Below, you will find additional information about the assessment of risk in this patient.

1. **Anxiety**
   - Unsuccessful suicide attempts are made in as many as 25% of patients with panic disorder and social phobia.
   - Be asked directly about plans and hopes for the future, because hopelessness and a lack of future plans are associated with a higher risk of suicide.

**Part IV: Review Documentation**

In the virtual note, you were asked to answer questions that pertained to the management of this virtual patient. Key elements that should be included in your responses are listed below:

**Question 1**: What is your assessment of this patient’s current level of risk for violence or suicidal ideation?
- Answers suppressed pending review of virtual note

**Question 2**: What additional information would you like to know about this patient?
- Answers suppressed pending review of virtual note

How did you do?

**Part V: Time Management**

Efficient time management is an important part of any clinical encounter.

- Allowed Time: 15 mins and 0 secs
- Time Used: 16 mins and 0 secs
Examples of Targeted Remediation, Generated Automatically Based on Participants’ Errors of Omission and Commission

14. History/onset of anxiety

The age of onset of anxiety disorders is typically in childhood or adolescence, and the course is often chronic-recurrent. Anxiety symptoms appear to precede the onset of depression symptoms more often than depression precedes the onset of anxiety. Thus, anxiety that predates a depressive clinical presentation may suggest a longstanding and underlying anxiety disorder. The presence of excessive worry and anxiety for at least 6 months is necessary for the diagnosis of generalized anxiety disorder.

22. Caffeine intake

The diagnostic criteria for GAD require that the disturbance is not due to the direct physiological effects of a substance. Caffeine intake has been associated with increased anxiety symptoms.

26. continue celexa 20mg

It has been conventional wisdom that 4 to 6 weeks is an adequate trial of an antidepressant. However, one of the most important findings of the STAR*D study was that many patients required longer than 8 weeks to respond, and an adequate trial may be 12 weeks or longer. During that study, medication dose was changed frequently (sometimes once a month) based on response. Some data suggest that without some clinical improvement after 2 to 4 weeks, the odds of a response are greatly diminished. This patient exhibits some improvement and thus may benefit from additional time at this dose.

Linked Peer-Reviewed Citations

Epidemiology of anxiety disorders.

Abstract This chapter presents an overview of the descriptive epidemiology of anxiety disorders based on recently completed surveys of the general population. The overall prevalence of anxiety disorders is shown to be quite high, but with considerable variation from the most prevalent (specific phobia) to the least prevalent (agoraphobia without a history of panic disorder). Age-onset AOD of anxiety disorders is typically in childhood and adolescence and the course is often chronic-recurrent. Anxiety disorders are highly comorbid with each other and with other mental disorders. Because of their early AOD, they are the temporally primary disorders in comorbid problems, raising the question whether early interventions to treat anxiety disorders might have a positive effect on the onset, persistence, or severity of secondary disorders such as mood and substance use disorders. This possibility has not yet been extensively explored but warrants further study given the high societal costs of anxiety disorders.

Caffeine challenge test and panic disorder: a systematic literature review.

Abstract This systematic review aimed to examine the results of studies that have investigated the induction of panic attacks and the anxiogenic effect of the caffeine challenge test in patients with panic disorder. The literature was searched in PubMed, Embase and Bireme databases and included studies published in English, Spanish or Portuguese. The search was performed in June 2011. The 13 papers included were analyzed. Most studies found that caffeine increased the frequency of panic attacks in patients with panic disorder. However, the results were variable in terms of the intensity of the effect. In summary, the available evidence is consistent with the hypothesis that caffeine is a putative trigger of panic attacks in patients with panic disorder.

Response rates to fluoxetine in subjects who initially show no improvement.

Abstract The authors conducted a retrospective analysis of the STAR*D (Sequenced Treatment Alternatives to Relieve Depression) study (http://star-d.mgh.harvard.edu). STAR*D is a large-scale, practical, clinical trial for patients with depression. Between 2002 and 2007, participants received the STAR*D treatments and were followed up through 43 weeks. This analysis was conducted to examine the response rates to fluoxetine in subjects who initially showed no improvement. Response was defined as a 50% or greater reduction in the Hamilton Rating Scale for Depression (HAM-D) total score from baseline. The analysis included 209 subjects who showed no improvement on the first treatment phase. Among these subjects, 180 received fluoxetine. The response rate to fluoxetine was 29.4% (95% CI: 18.7-40.0) among those who continued on fluoxetine for at least 4 weeks. The response rate was 10.0% among those who switched to a different treatment. This analysis provides evidence that fluoxetine may be effective for those who do not respond to the initial treatment.
Hypotheses

1. The difference in autonomic arousal, as measured by galvanic skin response (GSR) within participants will be greater when comparing a multimedia CSAT to a neutral condition than comparing a still-image CSAT to a neutral condition.

2. GSR will correlate with retention during cognitive debriefing.

3. GSR will correlate with performance during the CSAT.
Experimental Design
Simulation

GSR Leads

User Interface Device

ECG Leads
Inclusion Criteria

- Healthcare provider
- Right-handed
- Not on any medication that interferes with autonomic function
- No medical conditions associated with cardiac arrhythmia
- Study approved by the Partners Healthcare System IRB
Design

Phone Screen

High Valence
- Neutral Content
- GSR measured
- Clinical Encounter
- Cognitive Debrief

Low Valence
- GSR measured
- Cognitive Debrief
Clinical Encounter: High Valence Clip
Clinical Encounter: Low Valence Clip
Data Collection
LabChart Schematic

Intro clip begins
Participant clicks “Start Simulation”
First clip
Participant selects first clip
Second clip
Participant selects second clip
Greet Patient clip begins (auto)
Participant clicks “Finish Simulation”
Participant chooses exit item
Participant chooses exit item

trial

www.mghcme.org

ECG
GSR
Heart Rate

www.mghcme.org
Results: Autonomic Engagement

Video clip
Written & Oral Debriefings
RESULTS
### Participant Demographic Characteristics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Low Valence (9)</th>
<th>High Valence (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4 (44.4)</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td><strong>Profession</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse</td>
<td>2 (22.2)</td>
<td>1 (14.3)</td>
</tr>
<tr>
<td>Psychiatrist</td>
<td>2 (22.2)</td>
<td>4 (57.1)</td>
</tr>
<tr>
<td>Psychologist</td>
<td>3 (33.3)</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>Social Worker</td>
<td>1 (11.1)</td>
<td>0</td>
</tr>
<tr>
<td>Mental Health Associate</td>
<td>1 (11.1)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Time Spent with Patients</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50% of week or less</td>
<td>5 (55.6)</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td>More than 50% of week</td>
<td>4 (44.4)</td>
<td>4 (57.1)</td>
</tr>
</tbody>
</table>
Results: Autonomic Engagement
Results: Autonomic Engagement

Mean = 0.88
Std. Dev. = 0.939
Median = 0.49

![Graph showing frequency of increases in GSR from tonic level]
## Engagement

<table>
<thead>
<tr>
<th></th>
<th>Low Valence (average)</th>
<th>High Valence (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-Reported Engagement</strong></td>
<td>5.3</td>
<td>6.6</td>
</tr>
<tr>
<td><strong>Percent of Clips Evoking GSR &gt; 0.5 μs</strong></td>
<td>45.3%</td>
<td>56.5%</td>
</tr>
</tbody>
</table>
Results: Engagement \times Engagement

![Graph showing the relationship between self-reported engagement and percent of clips evoking autonomic response.](image)

$R^2$ Linear = 0.042
Performance

Efficient Use of Time

Percent of Chosen Actions Listed as "Required"

- Low Valence: 84%
- High Valence: 76%

Condition
- * t (14) = 2.43
  p = .03
Performance

- Percent of Clips Evoking μS Increase > .5
- Percent of Full Engagement (out of 10) Self-Reported

R² Quadratic = 0.1
R² Quadratic = 0.13
## Performance

Actions Chosen in Simulation by Condition

<table>
<thead>
<tr>
<th>Actions Participants Chose in CSAT</th>
<th>Low Valence N (%)</th>
<th>High Valence N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selected Intervention</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract for Safety</td>
<td>7 (77.8)</td>
<td>5 (71.4)</td>
</tr>
<tr>
<td>Secure Firearms&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3 (33.3)</td>
<td>6 (85.7)</td>
</tr>
<tr>
<td>Refer to Psychopharmacology Specialty Clinic</td>
<td>6 (66.7)</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>Discuss Willingness for Hospitalization</td>
<td>3 (33.3)</td>
<td>7 (100)&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Call Security (Secretly)</td>
<td>0</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td>Escort to Emergency Department</td>
<td>0</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td><strong>Selected Level of Follow-up Care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient (One Week or More)</td>
<td>6 (66.7)</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>Hospitalization (Partial or Inpatient)</td>
<td>3 (33.3)</td>
<td>3 (42.9)</td>
</tr>
<tr>
<td>Emergency Department</td>
<td>0</td>
<td>2 (28.6)</td>
</tr>
</tbody>
</table>

<sup>a</sup>: All participants asked whether he had access to firearms

<sup>*</sup>: p = .01
Performance

Percent of Full Engagement (out of 10) Self-Reported

Percent of Clips Evoking μ Increase > .5

Level of Follow-up Care

Engagement

Emergency Dept  Hospitalization  Outpatient
# Retention

## Retention of Key Information (Free Text)

<table>
<thead>
<tr>
<th>Clip Title</th>
<th>Low Valence</th>
<th></th>
<th>High Valence</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Viewed Clip (N)</td>
<td>Retained Clip (%)</td>
<td>Viewed Clip (N)</td>
<td>Retained Clip (%)</td>
</tr>
<tr>
<td>Homicidal Ideation/Intent</td>
<td>7</td>
<td>28.6%</td>
<td>7</td>
<td>57.1%</td>
</tr>
<tr>
<td>Suicidal Ideation/Intent</td>
<td>9</td>
<td>77.8%</td>
<td>7</td>
<td>71.4%</td>
</tr>
<tr>
<td>Substance Use</td>
<td>9</td>
<td>33.3%</td>
<td>5</td>
<td>80%</td>
</tr>
<tr>
<td>Access to Firearms</td>
<td>8</td>
<td>100%</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>Suicide Attempts</td>
<td>8</td>
<td>62.5%</td>
<td>6</td>
<td>66.7%</td>
</tr>
<tr>
<td>Self-Identified Support</td>
<td>8</td>
<td>100%</td>
<td>5</td>
<td>80%</td>
</tr>
</tbody>
</table>
Retention

Retention of Key Information (Multiple Choice Questions)

<table>
<thead>
<tr>
<th>Introductory Information</th>
<th>Low Valence N (%)</th>
<th>High Valence N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient's Military Experience</td>
<td>7 (77.8)</td>
<td>6 (85.7)</td>
</tr>
<tr>
<td>Reasons for Referral</td>
<td>2 (22.2)</td>
<td>6 (85.7)*</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 6.35, \ p = .04 \]
Retention

- Percent of Clips Evoking μS Increase > .5
- Percent of Full Engagement (out of 10) Self-Reported

R² Quadratic = 0.18
R² Quadratic = 0.01
Take-Home Points

• The relationship between autonomic engagement and learning is complicated

• Self-reports of engagement don’t necessarily correlate with autonomic measures of engagement
Thank You

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