Combat Stress Reactions and Resilience

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Consequences of Stress

• When stress is manageable it is positive and leads to growth and enhanced competence
• When stress is uncontrollable and overwhelming it can be destructive and cause:
  1. Burnout
  2. Battle Fatigue
  3. Posttraumatic Stress Disorder
  4. Other psychiatric disorders (e.g. depression)
  5. Physical disorders (e.g. cardiac disorders)
Definition of battle fatigue

- Battle fatigue is a condition in which a soldier becomes ineffective as a temporary consequence of intense psychological and/or physiological stress caused by combat or other highly stressful missions/circumstances.

- It is *not a psychiatric diagnosis*, is considered to be treatable, and is attributed to stress related to military operations.
Combat Exposure

- Given enough combat exposure over time, every soldier may eventually cease to function effectively.
  - Via: Battle fatigue
  - Wounded*
  - Illness*
  - Killed in action*
  
*may be in part due to stress/battle fatigue
Stress Response

- The body has a remarkably similar set of neurobiological responses to a broad array of stressors
- The Stress Response is life saving but if it continues for too long it can cause health problems (e.g. cardiovascular system, immune system, nervous system)
- In some cases the Stress Response can become more damaging than the stressor itself
Damage from Stress Response: Animals vs. Humans

- Animals rarely experience damage from their own Stress Response
- Animals turn off the Stress Response once the stressor is over
- Humans can become stressed from ideas (perceptions, thoughts, emotions)
- Humans anticipate, worry and ruminate
- Anticipation, worry and rumination can activate the Stress Response
Damage from Stress Response most likely when

- a. Stress is unremitting
- b. Inability to adjust or habituate to stress
- c. Failure to shut off the Stress Response
- d. Stress response is insufficient
Historical terms of PTSD

1. Da Costa’s Syndrome
2. Irritable Heart of Soldiers
3. Railway spine
4. Nostalgia
5. Shell shock
6. Combat neurosis
7. Physioneurosis
Re-experiencing Symptoms

a. Intrusive distressing memories
b. Recurrent nightmares
c. Flashbacks
d. Intense distress following reminders of the trauma
Increased Arousal Symptoms

a. Difficulty sleeping
b. Irritability and angry outbursts
c. Difficulty concentrating
d. Hypervigilance and feeling on edge
e. Exaggerated startle response
Avoidance Symptoms

a. Avoid thoughts, feelings, conversations associated with the trauma
b. Avoid activities, places or people that arouse recollections of the trauma
c. Amnesia for important aspects of the trauma
d. Decreased interest in everyday activities
e. Feeling detached or estranged from others
f. Restricted range of emotions
g. Sense of foreshortened future
PTSD Associated Features

a. Strained interpersonal and family relationships
b. Altered capacity to function optimally in work and leisure
c. Changes in personality
d. Altered world view
f. Survivor guilt
Rates of Combat-related PTSD

- American Vietnam veterans: 18% lifetime, 9% current
- New Zealand Vietnam veterans: 28% lifetime
- Wounded Vietnam veterans: 40% lifetime
- WW II Pow’s: 48% lifetime
- Holocaust survivors: 47% current
- Iraq: 12% current
PTSD Is Highly Comorbid With Other Psychiatric Disorders

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major depression</td>
<td>48.5%</td>
<td>47.9%</td>
</tr>
<tr>
<td>Alcohol abuse/dependence</td>
<td>27.9%</td>
<td>51.9%</td>
</tr>
<tr>
<td>Drug abuse/dependence</td>
<td>26.9%</td>
<td>34.5%</td>
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<tr>
<td>Simple phobia</td>
<td>29.0%</td>
<td>31.4%</td>
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<tr>
<td>Social phobia</td>
<td>28.4%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Dysthymia</td>
<td>23.3%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Agoraphobia</td>
<td>16.1%</td>
<td>22.4%</td>
</tr>
<tr>
<td>Generalized anxiety disorder</td>
<td>15.0%</td>
<td>16.8%</td>
</tr>
<tr>
<td>Panic disorder</td>
<td>7.3%</td>
<td>12.6%</td>
</tr>
</tbody>
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Source: Kessler et al. (1995)
Impaired Quality of Life with PTSD

SF-36 = 36 item short form health survey
Lower score = more impairment
PTSD Is a Long-term Illness

**Chronicity of PTSD: Rate at 1-year Follow-up**

- Kessler, 1995: 66%
- Breslau, 1995: 57%
- Davidson, 1991: 48%
PTSD: Etiologic models

1 Psychological models
   a Developmental delay
   b Fear Conditioning

2 Neurobiological
   b Enhanced consolidation of memory
   a Stress sensitization
   c Failure of inhibition
   d Tissue damage

3 Existential/Spiritual
   a Loss of meaning and purpose
Sympathetic Nervous System

- Maximizes mobilization and utilization of energy under conditions of extreme stress.
  - Adrenalin and noradrenalin:
    » Shunt blood to active muscle group
    » Rapidly mobilizes blood glucose
    » Accelerates HR and increase BP
    » Dilates pupils
    » Constrict skin vasculature
- These activities prepare the organism for what Cannon termed the “fight or flight” response.
Adrenalin, Noradrenalin and Memory

• Adrenalin and noradrenalin also enhance the ability to selectively focus on dangerous stimuli in the environment.
• Enhance the consolidation of long term memory.
• The same neurotransmitters that are involved in fight/flight also help the organism to selectively focus on the dangerous stimulus and then remember that stimulus better than neutral stimuli.
Etiology: Neurobiologic

- Enhanced encoding of memory
- Stress sensitization
- Fear conditioning
- Failure of extinction
- Tissue damage (hippocampus)
“They seem to suffer from a chronic stimulation of the sympathetic nervous system. The perspire freely, are tremulous, restless, irritable, sleep poorly, and look very sick. At times these symptoms suddenly increase, especially in response to mild auditory and verbal stimuli, and the patient reacts as if they had received an injection of adrenalin.”
Numerous psychophysiological studies have shown that civilian and veteran trauma survivors with PTSD have exaggerated increases in blood pressure and heart rate when exposed to present day stressful stimuli, especially trauma related stimuli.
Evidence of Altered Catecholeamine Activity

1. Elevated 24-hour excretion of epinephrine and norepinephrine
2. Elevated 24-hour plasma samples of norepinephrine.
3. Decreased platelet alpha 2 adrenergic receptor number.
4. Exaggerated behavioral, physiological and biochemical responses to yohimbine.
5. Altered brain metabolism in response to yohimbine.
   (e.g. clonidine, propranolol).
ELEVATED CSF NE IN PTSD

Mean Concentration of CSF NE (pmol/ml)

PTSD (N=11)

Normal (N=8)

Time of Day

11am 12 noon 1pm 2pm 3pm 4pm 5pm

Geracioti 2001
Etiology: Neurobiologic

• Enhanced encoding of memory
• Stress sensitization
• Fear conditioning
• Failure of extinction
• Tissue damage (hippocampus)
Fear Conditioning

• Previously neutral stimuli get conditioned or paired with a fear provoking stimulus and subsequently became capable of provoking fear response by themselves (in the absence of the original fearful stimulus)

• Nearly every animal group

• Occurs rapidly (one trial)

• Relatively permanent
Fear Conditioning (cont.)

• Very difficult to extinguish.
• Fear conditioning can occur without cortical input
Encoding

When we experience a Trauma, all sensory aspects of the event are encoded together including the environmental context in which the event occurred.

The visual, auditory, tactile and olfactory elements of the experience are encoded together.
Retrieval

- A cue (part of original experience) can facilitate recall.
- The more closely a retrieval cue matches the original encoding, the greater the likelihood that a memory will be recalled.
- State of mind can serve as an important cue for remembering (e.g. SNS activation, sleep deprivation).
- Cues need not be conscious (e.g. weather, anniversaries).
- Recall depends in part on availability of retrieval cues (victim of the environment, delayed PTSD).
Traumatic Memory

1. Explicit Memory (intrusive memories)
2. Implicit Memory
   a. Fear conditioning
   b. Sensitization
3. Combination
   a. Repetition compulsion
   b. Hypervigilance, safety, foreshortened future
Hmmm... vaguely familiar, but I can't quite remember.

Oboy! Lunch!
Etiology: Neurobiologic

- Enhanced encoding of memory
- Stress sensitization
- Fear conditioning
- Failure of extinction
- Tissue damage (hippocampus)
MEDIAL PFC & Ant Cingulate

Bremner 99  Lanius ’00 (scripts)
Bremner 99  Shin ’01 (emotional stroop)
Shin 97     Semple ’00
Shin 99

OFC
Semple 93
Shin 99
Rauch 96

AMYGDALA

Rauch 96 (combat scripts)
Liberzon 99 (combat sounds)
Shin 97 (CSA scripts)
Rauch ‘00 (masked faces)
Semple ’00 (auditory CPT)
Bremner 2001 (unpub, fear conditioning)

HIPPOCAMPUS

Bremner 99

Shin 99 (CSA scripts)
Bremner 99 (CSA scripts)
Bremner 99 (combat slides & sounds)
Etiology: Neurobiologic

- Enhanced encoding of memory
- Stress sensitization
- Fear conditioning
- Failure of extinction
- Tissue damage (hippocampus)
Lesions to the hippocampus

- Excess cortisol can damage hippocampus
- Lesions to hippocampus impair ability to shut off stress response:
  - Glucocorticoid Cascade Hypothesis:
    - Damaged hippocampus
    - Impaired inhibition of Stress Response
    - Unchecked release of cortisol
    - Further damage to hippocampus
Conditions with reduced hippocampal volume

- Cushings Disease
- Recurrent Major Depression
- PTSD
- Aging
CSF CRH IN PTSD

Bremner 1997

Controls                    PTSD

CSF CRH (pg/ml)

15
10
0
20
25
30
35
40
45

11am 12 noon 1pm 2pm 3pm 4pm 5pm

Baker 1999

CSF CRH (pg/ml)

30
40
50
60
70

PTSD
HS
HIPPOCAMPAL VOLUME IN PTSD

(% DIFFERENCE BETWEEN PTS AND Controls)

Schuff 1997
Bonne 2001
De Bellis 2001
Bremner 1995
Bremner 1997
Vythlingam 2001

Vythilingam 2001 (unpublished)
Potential Chronic Adaptations

- Withdrawal / Avoidance
- Self-medication (CNS Depressants)
- Changes in character (Complex PTSD)
I’ve been a chiropractor for thirty-three years, working directly and indirectly with nerves through the spinal column. I’m thinking of retiring in a couple more years and going into worm farming. Worms are an asset to society.
Treatment of Stress Reactions

• Treatment for acute stress reactions is highly effective with excellent success rate

• Treatment for chronic PTSD also highly effective when using evidence based therapies such as Cognitive Processing Therapy (i.e. large majority of individuals with PTSD lose their diagnosis)
Treatment

• Prevent excess and prolonged arousal
  Safety (Remove danger/Therapeutic relationship)
  Mobilize social support and unit support
  Relaxation Training/Mediation/Mindfulness
  Cognitive Behavioral Therapy
  Medications (e.g. guanfacine)
• Prevent over consolidation and frequent rehearsal
  Psychoeducation
  Psychotherapy
  Medications (e.g. propranolol)

Reduce LC and amygdala hyperresponsivity
Bolster PFC executive and inhibitory capacity
SSRIs as First Line Drugs for PTSD

- Survey of 57 international PTSD experts (Foa et al 1999)
  - SSRIs
  - Nefazodone
  - Venlafaxine

- ISTSS treatment guidelines (Friedman et al 2000)
  - SSRIs
  - MAOS
  - TCAs
  - Antadrenergics
Training to Enhance Resilience

- Resilient individuals are those “who metaphorically resemble a twig with a fresh, green living core. When twisted out of shape, such a twig bends, but does not break; instead it springs back and continues to grow.”

- George Vaillant
John M. McGrath (1975), Prisoner of War: Six Years in Hanoi
Resilience Factors

1. Find role models
2. Develop a moral compass
3. Embrace religion, spirituality and/or altruism
4. Identify and foster signature strengths
5. Seek meaning and purpose in life
6. Face Fears
7. Learn to distinguish between fate and freedom
8. Learn to be optimistic
9. Appreciate humor
10. Establish and nurture a supportive social network
11. Train rigorously in multiple areas
12. Learn to cognitively reappraise failure and suffering
Training and Brain plasticity

• The brain is malleable, resilient and responsive
• Learning and remembering involve plasticity and the formation of new synapses
• Experience rewire the brain
• The more a skill is rehearsed the more space and wiring the brain devotes to supporting the new skill (e.g. violin players)
Exercise

Antidepressant effects of exercise:

- Increased plasma tryptophan and monamines
- Attenuated HPA axis response to stress
- Increased expression of gene involved in plasticity and neurogenesis (e.g. BDNF)
- Prevents stress induced diseases in hippocampal BDNF
Neurogenesis

• Growth of new cells
• Continues throughout life in various areas of the brain (hippocampus and olfactory bulb)
• Neurogenesis is inhibited by cortisol and chronic stress
• Neurogenesis is enhanced by
  a. Reducing cortisol and chronic stress
  b. Enriched environments and learning
  c. Exercise
  d. Anti-depressants
  e. Therapy
Cognitive Reappraisal

Ability to cognitively appraise, reframe or find positive meaning in adversity (e.g. redefining a crisis as a challenge and opportunity)
“On the plus side, you’ve cured by back pain.”
Lessons learned from VN

- PTSD is a distinct psychiatric disorder.
- PTSD has a distinct neurobiological pathophysiology.
- When untreated, PTSD can have a chronic debilitating course.
- PTSD often goes unrecognized in soldiers and veterans. Many never seek treatment.
- PTSD frequently misdiagnosed as ETOH/ Substance Abuse and Dependence/ Major Depression/ Personality Disorder and even Schizophrenia.
- Wounded more likely to develop PTSD
- Importance of social support before, during and after the war.
- We must not confuse the war and the warrior.
- Educating soldiers, families and the public about the psychological and physiological consequences of war
- Critical importance of belief in a meaningful cause and deriving positive meaning out of one’s military service.
- Treatment for acute stress reactions and chronic PTSD is highly effective
Ft. Drum Wellness and Resilience Building Program: Reducing Barriers to Care

- Government Accounting Agency: Only 15-22% of OIF/OEF veterans at high risk for PTSD referred to Behavioral Health
- Before Wellness Program (Ft. Drum): 15% of at risk soldiers requested referral to Behavioral Health
- After Wellness Program: 88% of at risk soldiers requested referral to Behavioral Health and 71% actually came to treatment.
- Extremely low discharge rate for a mental health disorder
- Behavioral Health intervention for combat stress reactions or PTSD is a combat force multiplier