

## The impact of fear, anxiety, and arousal on learning



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- ❑ Negative emotion elicited by perceived threat
- ❑ Response to discrete stimulus
- ❑ Adaptive response, essential for survival
- ❑ Specific response reflects individual's experiences
- ❑ Fight, flight, freeze, fidget



- ❑ Emotion of worry, dread, uneasiness, etc.
- ❑ Due to apprehensive anticipation of a threat
- ❑ Enhanced attention enables animal to respond when and if threat occurs
- ❑ Secondary to negative experience, loss of control, or unpredictable outcome



- ❑ Physiological/psychological state of being awake
- ❑ Activation of reticular activating system in brain stem, autonomic nervous system, endocrine system
- ❑ Increased heart rate and blood pressure
- ❑ Sensory alertness, mobility, readiness to respond
- ❑ Important in regulating attention, information processing, fight/flight



## "Stress response"

- ❑ Adaptive mechanism that enables rapid reaction
- ❑ "Stress" – multiple meanings
  - Physiological response
  - Event or situation that causes an impact on behavior, health, welfare
  - Adaption required
- ❑ Not necessarily negative!



## Stress response basics

- ▶ Autonomic nervous system output →
  - ▶ Increases sympathetic activity (gas pedal)
  - ▶ Decreases parasympathetic activity (brakes)
- ▶ Increased responsiveness to Sudden Environmental Contrasts (SEC)



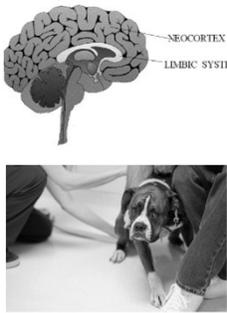
**Prefrontal cortex**

- ▶ Capacity for reasoning, forming concepts, information processing, cognitive regulation of emotional responses
- ▶ Activation is required for learning connections between behavior and consequences



**Limbic system**

- ▶ Activation occurs during times of danger or arousal
- ▶ Primes animal to respond with escape behavior or avoidance conditioning
- ▶ Under normal conditions, necessary for survival



**Developmental effects**

- ▶ Some stress is required for normal development
  - ▶ Increase in hippocampal glucocorticoid receptors affects feedback loop and behavioral response
- ▶ Priming of HPA axis (prenatal stress hormones) during early development affects sensitivity of stress response



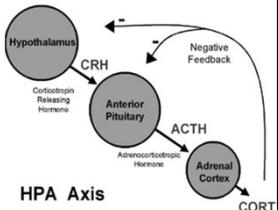
- ▶ "Experience expectant" – Limbic system plasticity
- ▶ Effect on growth/survival of dendrites, axons, synapses, interneurons, neurons, and glia
- ▶ Deprivation of sensory input?
  - ▶ Disturbance in social and emotional functioning
  - ▶ Limbic alterations dependent on deprivation age
    - ▶ (not well described in companion animals)
  - ▶ Social withdrawal, pathological shyness, explosive/inappropriate emotionality, inability to form normal attachments

**Stress response system**

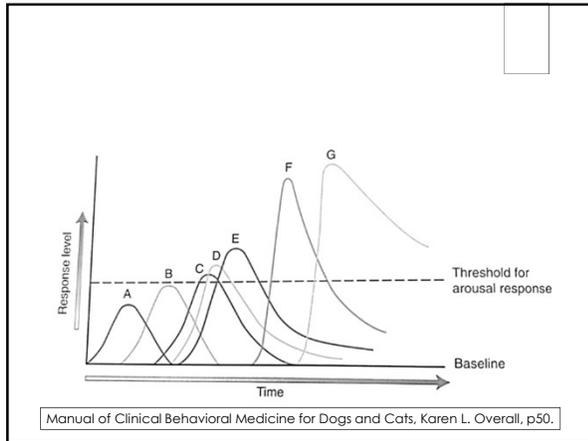
- ▶ Best adapted to acute stress
- ▶ Enables action, movement, response
- ▶ Chronic stress
  - ▶ Unable to control situation or escape from stressor
  - ▶ Sustained/repeated activation of stress response system
  - ▶ Consequences include increased BP, diabetes, infertility, growth inhibition, decreased attention span, inability to concentrate on tasks, changes in immune function...

**Relationship**

**HPA Axis**



- ▶ Increase in stress response?
  - ▶ Increased "readiness to respond"
  - ▶ Altered perception of surroundings
  - ▶ Response to lower intensity stimuli
  - ▶ Exaggerated rate/intensity of response ("reactivity")
- ▶ "Limbic override"
  - ▶ Decreased engagement of prefrontal cortex during periods of heightened arousal
  - ▶ Impact on learning?



## "Learning"

- ▶ Change in behavior based on past experience
- ▶ Learning is always happening, even when someone isn't actively teaching!
- ▶ Similar principles between species

- ▶ Affected by:
  - ▶ Environmental changes
  - ▶ Social pressure
  - ▶ Active training
  - ▶ Any perceived inputs or feedback
- ▶ Emotional state influences the type of learning most likely to occur

- ▶ "-" emotional state (fear/anxiety)
  - ▶ Primary motivation of avoidance
  - ▶ Experiences associated with danger are important to avoid in the future
- ▶ "+" emotional state (eating, play, social contact)
  - ▶ Primary motivation of acquisition, appetite, "seeking"
  - ▶ Experiences associated with reinforcement are important to seek out in the future

- ▶ Stronger influence of fear/aversive conditioning
- ▶ More important to be "safe" than "well fed"!

### Fear

- ❑ Arousal
  - ❑ Increased heart rate
  - ❑ Increased respiratory rate
- ❑ Rigidity / muscle tension
- ❑ Focus on or away from stimulus
- ❑ Raised hackles, tail down
- ❑ Ears back, lowered head
- ❑ Reaction stops when stimulus goes away!
- ❑ Level of reaction graded according to level of threat

### Anxiety

- ❑ Arousal
  - ❑ Increased heart rate
  - ❑ Increased respiratory rate
- ❑ Hypervigilance / scanning
- ❑ Hesitation responding to commands
- ❑ Loss of selective attention
- ❑ Restlessness
- ❑ Altered locomotor activity

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### What does "reactivity" look like?

- ▶ Common characteristics:
  - ▶ Easily stimulated to react
  - ▶ Excessive intensity of response
  - ▶ Slow recovery after stimulation
  - ▶ Poor regulation of arousal level
  - ▶ "React first, think later"
- ▶ "Modifier" rather than diagnosis or specific behavior/sequence
- ▶ Often follows breed traits and motor patterns
  - ▶ Exaggeration of existing patterns



- ▶ Changes in physiology are inward
- ▶ Changes in body language are outward
- ▶ Social cue to others
- ▶ Intention to "appease" or "defuse"
- ▶ Body language is indication of "threshold"



- ▶ Point at which change in behavior or emotional state occurs
- ▶ Over threshold?
  - ▶ Adaptation or Sensitization
  - ▶ Increased possibility of aversive conditioning, regardless of training method
- ▶ Under threshold?
  - ▶ Generally able to focus and learn more effectively
  - ▶ Starting point for foundation/skills training exercises



How is this relevant to dog training?

## Impact on Training

- ▶ Lack of attention to surroundings or consequences
  - ▶ Higher number of repetitions to solidify new skills or emotional patterns
  - ▶ Difficulty generalizing skills or emotion
  - ▶ Loss of selective attention
  - ▶ Hypervigilance



## Impact on Training

- ▶ Interference with taking direction from handler
  - ▶ Inability to look away from fear inducing stimulus (threat elsewhere)
  - ▶ Avoidance of eye contact (threat from handler)



## Negative impact on appetite/play/drive

- ▶ Safety more important than rewards
- ▶ Interference with reinforcement training
- ▶ Attempted reinforcement can be punishing!



## Hyperarousal or agitation

- ▶ Difficulty maintaining focus
- ▶ Inability to take food or interact safely
- ▶ Avoidance behavior
  - ▶ Shut down (disengagement from training process)
  - ▶ Learned helplessness (do nothing)
  - ▶ Defensive behavior



How does this affect our recommendations?

- ▶ Recognize fear, anxiety, arousal as "normal"
  - ▶ Response to threat, unpredictable outcome, negative experience, change in environment
  - ▶ Support appropriate interventions
  - ▶ Educate clients and owners



## Strategies and Recommendations

- ▶ Awareness of stimulus gradient during training
  - ▶ Identify "teachable moment"
  - ▶ Foundation training
    - ▶ Duration of "stay" command
    - ▶ Distraction level for "watch"
  - ▶ Desensitization and Counterconditioning
    - ▶ Intensity of stimulus
    - ▶ Arousal level



## Strategies and Recommendations

- ▶ Decrease expectations of performance
  - ▶ Reward smaller approximations of target behavior
  - ▶ Set "success" criteria at a reliably attainable level
  - ▶ Develop reliable behavior/consequence relationship
  - ▶ Goal of at least 90% correct response rate
  - ▶ High rate of reinforcement



- ▶ Increase reinforcement value during training
  - ▶ Increase appetitive motivation
  - ▶ Improve prefrontal incentive and ability to regulate emotional reaction



- ▶ Consistency
  - ▶ Within and between handlers
  - ▶ Visual cues, hand signals, tone of voice
  - ▶ Trying to guess what we want isn't helpful!



- ▶ Allow time to respond to cue or stimulus
  - ▶ Process information through prefrontal cortex
  - ▶ Habituate to situation or distractions
  - ▶ Emotional recovery between sessions or reps



- ▶ Active reward rather than distraction or bribe
  - ▶ Bribe - Give food in hopes that animal pays attention...
    - ▶ Distrust builds quickly if outcome is inconsistent or aversive!
  - ▶ Lure - Use food to guide attention to handler
  - ▶ Reward - Provide food after attention is given



- ▶ Awareness of methods and likely outcomes
  - ▶ Classical conditioning – change emotional response
  - ▶ Operant conditioning – change behavioral response



## Strategies and Recommendations

- ▶ Desensitization and counterconditioning should be enjoyable but relatively BORING!
  - ▶ Teach appropriate response or create conditioned emotional response
  - ▶ Below threshold
  - ▶ Redirecting *after* an undesired reaction is not the goal of counterconditioning!



## Strategies and Recommendations

- ▶ Use of medication or adjunctive therapies
  - ▶ Lack of response "in moment!" to changes in situation or body language of stimulus
  - ▶ Lack of improvement in response to reasonable and appropriate interventions
  - ▶ Inability to find sub-threshold stimulus intensity



- ▶ What is fear/anxiety/arousal?
- ▶ Brain Anatomy and Function
- ▶ Learning and Emotion
- ▶ Impact on Training
- ▶ Strategies and Recommendations



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Thank you!