



Choice and Training

Kristina Spaulding, PhD, CAAB
Irith Bloom, CPDT-KSA, CBCC-KA, CDBC, VSA Faculty

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What is Stress?

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Think about it

- a. A physiological response to a trigger that causes a disruption to the status quo
- b. A physiological and emotional response to change
- c. An emotional reaction to unpleasant, (seemingly) inescapable circumstances
- d. Any experience that results in fear, anxiety or other emotional distress

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Stress

- Triggering event
- Disruption/challenge to status quo
- Physiological reaction

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Think about it

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Function of Stress

- Adaptive
- Helps animal survive
- Preparation (developmental stress)

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Types of Stressors

- Physical
- Psychological

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Categories of Stress

- Good stress
- Tolerable stress
- Toxic stress

NOTE: Definitions by Bruce McEwan, Ph.D. of Rockefeller University

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Good Stress

- Challenging in short run
- Rewarding in long run
- Can result in 'personal growth'

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Tolerable Stress

- Challenging
- Negative/Distressing
- Animal can cope
- Can result in 'personal growth'

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Toxic Stress

- Challenging
- Negative/Distressing
- Animal **unable** to cope

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Activity

- Task:
 - Watch the video
 - Note the body language you see
- Discussion:
 - Do you think the dog is stressed?
 - On a scale of 1 (good stress) to 10 (unbearably toxic stress), where is the dog?
 - Hold up the appropriate number of fingers

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Determining Type of Stress

- Signs of distress?
- Focus/ability to work?
- Motivation?
- Normal self-control?
- Quick return to baseline?
- Behavior deteriorating?
- Abnormal behavior?

Many thanks to Kristina's June 2021 IAABC Stress Class for help developing this list!

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Type of Stress

- Depends on individual's experience
- Example: COVID-19 Pandemic

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Bottom Line

- Specific stressor is not the key
- Individual's ability to cope is the key

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Impacts of stress

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Impacts of chronic stress

- Partial list
 - Decreased growth
 - Decreased immune function
 - Reproductive issues
 - Slower healing
 - Gastrointestinal problems
 - Heart issues
 - Muscle loss
 - Early death
 - Decreased behavioral health

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Fear learning

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Enhanced fear learning

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Recent stressful experience -> Enhanced fear learning

Long and Fanselow, 2012; Rau et al., 2005; Schmetzer, 2015

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Typical study

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graph LR; S1[Stressor] --> R1["Rest period"]; R1 --> D1[Different stressor]; D1 --> F1[Stronger fear learning]; N1[No stressor] --> R2["Rest period"]; R2 --> S2[Stressor]; S2 --> F2[Less fear learning];
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Cordero et al., 2003

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Extinction learning

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Extinction of behavior
(e.g. jumping)

- Is this the same or a different type of learning?

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Extinction is fragile

Pavlov, 1927; Konorski, 1967; Bouton, 1993

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Fear learning is not erased

Pavlov, 1927; Konorski, 1967; Bouton, 1993

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Okay, but I don't use extinction...

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- Previous learning
- Fear extinction
- Counter conditioning
- ...is the smoke alarm going off?

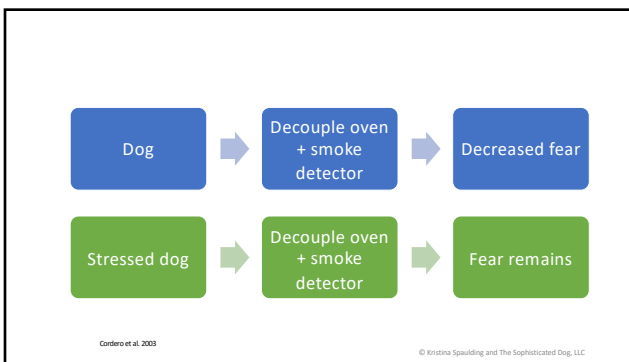
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Impaired fear extinction

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Stress and extinction

- Decreased reduction in conditioned fear
- Increased recovery of fear across sessions

Maren and Holmes, 2016; Wilson et al., 2013

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Immediate extinction deficit

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Applications

- Go beyond counter conditioning/desensitization
- Addressing stress is key!

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Cognitive/Goal-directed memory

- Flexible, consciously accessed (explicit)
- Hippocampus based

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Habit memory

- Rigid, unconscious (implicit)
- Neostriatum based

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Habit memory

- Extensive training
- Distraction
- Stress

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Applications

- Relevance matters
- Performance under stress
 - Likely poor
 - Likely to revert to "habit"
- Practice, practice, practice!

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Learned Helplessness

- The belief that one's behavior has no impact on the outcome

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Warning!

- Some of this research is not fun to think about
- But we can use it to help other animals

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Seminal research!

- Leaf, 1964; Overmier & Leaf, 1965

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Definitions (Maier and Seligman, 2016)

- Objective helplessness
- Subjective helplessness

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This was a radical idea!

According to Maier and Seligman (2016)

- This made waves
- Suggestion of animal cognition in 1960s

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This was a radical idea!

- Richard Herrnstein objects:

*“You are proposing that animals learn that responding is ineffective. Animals learn responses; they don’t learn **that** anything.”*

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Is the problem electric shock or lack of control?

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Another study

- Seligman & Maier (1967)

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Control is the key

- Other terms related to control:
 - Contingency (control) vs. non-contingency (no control)
 - Agency (perceived control)
- Maier and Seligman, 2016
 - Animal learns that the probability of an outcome given a response is different from the probability of an outcome given no response

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Effects of *inescapable* shock

- Reduced or impaired
 - Offensive aggression
 - Social dominance
 - Food/water intake
 - Preference for sweetness (anhedonia)
 - Exploration
 - Instrumental/Skinnerian learning (even when control restored)
 - Fear extinction

Maier & Watkins, 2005; Rau et al. 2005; Haselton et al. 2015; Maier and Seligman 2016

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Effects of *inescapable* shock

- Increased
 - Defensive behavior when threatened
 - Attention to external stimuli
 - Fear learning
 - Neophobia

Maier & Watkins, 2005; Rau et al. 2005; Haselton et al. 2015; Maier and Seligman 2016

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Similar effects seen in humans

- Learned helplessness
 - Model for depression
- Actual or perceived control
 - Decrease perception of pain intensity

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Impact of Control

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Benefits of Control

- Watson & Ramey 1972
 - Control over mobiles
 - Yoked pairs
 - Experiment was about learning, not control

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Benefits of Control

- Escapable shock
 - Inoculates animal against inescapable shock
 - Generalizes across context
 - Lasts *at least 7 days*

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Benefits of Control

- Escapable shock
 - Prevents emotional boost to memory
 - Decreases fear conditioning
 - Improves (fear-related) extinction learning
 - Decreases freezing
 - Increases exploration
 - Increases instrumental learning
- *Often better than in animals never shocked!*

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Good News!

- Generalizes across valence
 - Control over aversive -> control over appetitive
- Better yet...
 - Control over appetitive -> Control over aversive

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Non-Contingent Reward

- “Non-contingent” access to food/water
 - Decreases learning about contingent rewards
 - Impairs ability to avoid bad things (shocks)

Joffe et al., 1973; Goodkin, 1976; Overmier et al. 1980; Lucas et al. 2014

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Contingent Reward

- Rats raised with control over food, water, light
 - Decreased reactive and defensive behavior as adults
- Additional benefits
 - Improves avoidance learning
 - Increases exploratory behavior
 - Reduces neophobia

Goodkin, 1976; Joffe et al., 1973; Mineka et al. 1986

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More evidence for benefits of control

- Opportunity to choose
 - Activates reward-processing area of brain
- Performance enhanced
 - Free choice > forced choice
- Animals prefer choice over no choice even if
 - Requires more effort
 - Doesn't improve outcome

• Leotti and Delgado, 2011, 2014 and Fujiwara et al. 2013; Murayama et al. 2013; Catania and Sagvolden, 1980; Bown et al. 2003; Leotti et al. 2010

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Maier and Seligman: Conclusion

- “We are mindful that in the theory of explanatory style, ‘hope’ consists largely in the habit of expecting that future bad events will not be permanent, global, and uncontrollable; rather they will be temporary, local and controllable (Seligman, 1991, pp. 48-49). Such expectations are likely the best natural defense against helplessness, and we speculate that the ventromedial prefrontal cortex-dorsal raphe nucleus circuit may be usefully thought of as the ‘hope circuit.’”

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Putting it all together

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Moscarello and Hartley, 2017

- Animals estimate agency in unfamiliar environments
 - Two types of approaches

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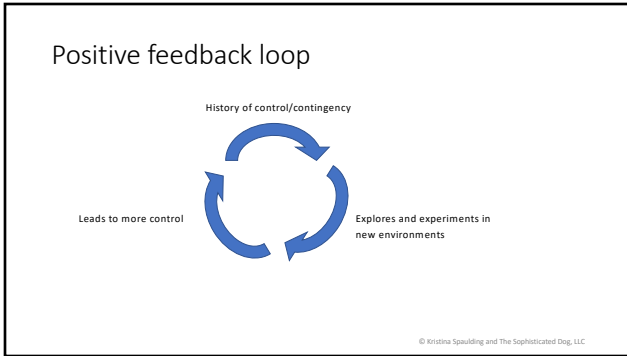
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Proactive

- Estimate: High agency
- “What can I do in this environment?” (Moscarello and Hartley, 2017)
- More exploratory and flexible behavior
- Goal-directed
- Uses more cognitive resources

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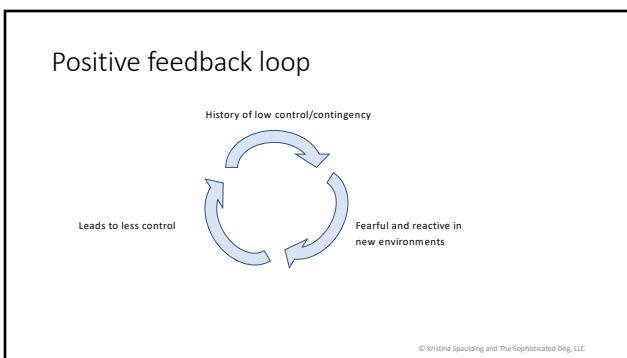
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Reactive*

- Estimate: Low agency
- “What can this environment do to me?” (Moscarello and Hartley, 2017)
- Innate, rapidly initiated behaviors
- Habit (rigid, inflexible)
- Doesn't require action-outcome processing
- Uses fewer cognitive resources

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Agency is key

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Thank you!

- To all of you!
- To Jennifer Franco and the APDT

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Get in touch

- Irith
 - Mailing list: <https://tinyurl.com/mry7tpf3>
 - Trainer@TheSophisticatedDog.com
 - www.PorterLabs.ai
 - www.AwesomeDogProject.com
 - www.TheSophisticatedDog.com
- Kristina
 - Mailing list: <http://eepurl.com/grDzPH>
 - sciencerocks@sciencemattersllc.com
 - www.sciencemattersllc.com/

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