Inverted U-shaped Curves

The Neuroscience and Art of Resident Education

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Influences
Miller’s Pyramid of Clinical Competence

- **Knows**
- **Knows How**
- **Shows How**
- **Does**

Learning → Competence → Performance

Adapted from Miller, 1990
Yerkes-Dodson
Yerkes-Dodson

![Graph showing the relationship between shock intensity and trials to criterion for simple and difficult discriminations.](image)

Yerkes and Dodson, 1908
Arousal and Task Performance

Diamond et al., 2007
Arousal and Task Performance

More Complete

Commonly Cited

Diamond et al., 2007
Tension/arousal/anxiety and Performance

http://challengingcoaching.co.uk/the-yerkes-dodson-curve-performance-under-pressure/
So what does a good teacher do?
Create tension — but just the right amount.

Donald Norman
NE, DA, and Task Performance

Blier and Briley, 2011
Dopamine and Memory Performance

Cools and D’Esposito, 2011
Episodic memory is selective.

Victoria Monument
Union Square - San Francisco, CA

Merlion
Sentosa - Singapore

Wright Brothers Monument
Kitty Hawk, NC
Reward and Memory Systems are Connected

Dopamine facilitates LTP

- **D1/D5 Agonism**
  - (Huang & Kandel, 1995)

- **D1/D5 Antagonism**
  - (Huang & Kandel, 1995; Otmakhova and Lisman, 1996; Li et al, 2003)
Reward motivation enhances episodic memory

(Adcock et al, 2006)
Can increased dopamine levels **enhance** reward-motivated memory?
Pharmacological manipulation

l-dopa

placebo
Task Design: Encoding Manipulation

- **Encoding**
  - I-dopa
  - Placebo

- **Retrieval**
  - 24-hour delay recognition test
Dopamine and Memory Performance

encoding

[Diagram of encoding process]

retrieval

24-hour delay recognition test

encoding 1 retrieval 1 encoding 2 retrieval 2

day 1 day 2 / / day 8 day 9

capsule 1 capsule 2

Sumner et al., CNS Abstracts, 2013
Dopamine and Memory

Corrected Recognition (Hit Rate - FA Rate)

Placebo  L-Dopa

All Values

Good Placebo Performers  Poor Placebo Performers

Sumner et al., CNS Abstracts, 2013
Dopamine and Memory

Sumner et al., CNS Abstracts, 2013
Goldenlocks Principle

http://itelementaryschool.com/
Just the Right Amount

Stimulation ↔ Calming

Support ↔ Autonomy

Structure ↔ Flexibility

...
Arousal/Anxiety/Stress and Performance

**Burnout**

*Burnout = state of low energy, withdrawal, sense of inefficacy*

Maslach and Leiter 2016
Key Factors in Burnout

- Workload
- Reward
- Control
- Community

Maslach and Leiter 2016
Positive Antithesis of Burnout

**Burnout** = state of low energy, withdrawal, sense of inefficacy

**Engagement** = state of high energy, strong involvement, sense of efficacy

Maslach and Leiter 2016
Key Factors in Burnout Engagement

- Workload
- Reward
- Control
- Community
engagement
Key Factors in Burnout Engagement

- Workload
  - Now
  - Later
Key Factors in Burnout Engagement

Reward

I respond well to positive reinforcement

that is timely and specific

Komaki 1998
Enthusiasm
“The questions are profound, the patients are fascinating, and the tools are finally available to make unprecedented progress.”

Insel Director’s Blog 2012
They see psychiatry as the natural application of their interest in how the brain works.
Neuropsychiatry Series at CRH

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Key Factors in Burnout Engagement

- Workload
- Reward
- Community
- Control
Key Factors in Burnout Engagement

Control
Key Factors in Burnout Engagement

Control
Key Factors in Burnout Engagement

- Workload
- Reward
- Control
- Community
Key Factors in Burnout Engagement

Reward
Workload
Community
Key Factors in Burnout Engagement

- Workload
- Reward
- Control
- Community
Balance of Factors

- Reward
- Workload
- Community
- Control