Shaping Behavior
with Emerging Real Time Technologies:
The role of Theory and Principles of Behavior

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Behavior is Central

- Lifestyles & Societal Behavior explains more than 75% of the variance in Morbidity/premature Mortality & quality of life.

- Principles of behavior offer guidance for Prevention and TX.
Why aren’t more people active?
Behavioral Ecological Model (BEM)

• Based on Biology/Ecology
  – selection of species
  – selection of behavior
  – selection of culture

• Based on Principles of Learning
  – Contingencies of Reinforcement
  – Hierarchical & interacting contingencies
  – Meta and Macro contingencies
Selected Principles of Behavior

- Contingent consequences = contingencies
- Some are reinforcing & others punishing
- Immediate Consequences are the most powerful
- Unpredictable consequences sustain behavior
- Complex or high intensity behavior is established by Shaping
- Auto-shaping may now be possible
- Competing contingencies weaken target behavior
- Real time measures of target and competing contingencies may now be possible
- Selecting competing contingencies to be removed may be enhanced by dynamic modeling
- Navigation models also may be programmed
SHS Exposure & Modeling
The monitoring system is capable of sending the data to any computing device for easy viewing of pollution levels and contextual info.
Application to PFA

Should I Smoke? Yes

Outside or Inside?

Outside

Were you reinforced or punished?

No

How to Respond to Alarm?

Inside

Go Outside

Suppress Sound

Terminate

Ventilate

Tamper
Effect of Light and Sound Feedback

Innovation for Smoke-Free Homes: Real-time Feedback, Funded by the National Heart, Lung, and Blood Institute, National Institutes of Health. R01HL103684-02

CV = Coaching Visit
Cascading & Interacting Contingencies

Parents Establish Home Bans

Dr. Explains Cotinine

Dr. provides real time feedback

Sustains smoking outside the home
Social Networks Defined by Contingencies

Asthmatic Preteen Passive Exposure

- Father Smoker Smoking is Macho
- Peer Smoking is Cool
- Uncle Smoker Hates smoke
- Sister Hates smoke
- Doctor Advises Never Smoke
- Mother smoker

Smoking is Macho
Smoking is Cool
Doctor Advises Never Smoke
Sedentary Industries = competing contingencies

Physical Activity Industries = Activity contingencies

- Screen time, classrooms, conferences
- Riding in cars/airplanes
- Restaurants, etc

- Corporations that make sports equip/clothing; Treadmills sell PA contingencies; Governments that create running paths and walkable environments create long-lasting contingencies
**Static and Adaptive Engineering:**

**Auto Shaping?**

**Figure 3.** Plots of observed intra-subject variation in steps/day over 6 months for four participants by group.
BEM Hypotheses

• Density of reinforcing contingencies predicts behavior in individuals and populations

• Density of competing contingencies delimits the reinforcing function of support contingencies

• To change and sustain health behavior it is necessary to measure and engineer cultural contingencies supporting target behavior continuously

• It may require elimination of competing contingencies at the same time.
Virtual Reality & Health Promotion

- Animation requires $ and professional studio talent
- Models and interaction with life-like Avatars
  * May teach skills
  * May translate to real life practices
  * Requires on-going contingencies
  * The Jury remains out with regard to health promotion practices.
What We Do & Do Not Know

• “Intensive” Counseling can be efficacious

• VR might provide models that prompt behavior; might enhance skills if imitated frequently; Not yet likely to change with real world conditions

• Feedback to patients & providers might decrease SHSe & promote PA w/o counseling

• Auto-shaping may be possible
• Dynamic systems must adapt to changing environments.
• Nothing stays the same!
• Maintenance requires dynamic changes in contingencies.