Parallels in Models of Biological and Behavioral Immune Systems: Introducing the Adaptive Behavioral Immune System (ABIS)

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The ‘Big 4’: a BIG population health problem

- Deaths per year due to behaviors: 2, 9, 15, 26:
  1. Diet → 529,000
  2. Smoking → 490,000
  3. Inactivity → 90,000-100,000
  4. Alcohol → 88,000
  5. Drugs → 63,5000
  6. Sex → 20,000
  7. Sun Exposure → 20,000

**PROPOSAL:** The magnitude of risk associated with health behaviors is best understood when we consider them as a system.
Single-Separate or Multiple-Systemic

- Big 4 behaviors co-occur in nearly 80% of adults\textsuperscript{1}.
- High risk, high cost populations are those with multiple health risk behaviors\textsuperscript{5,12,16}.
- Need for theory-driven methods of clustering or systematizing co-occurring behaviors\textsuperscript{13}.

![Diagram showing the co-occurring behaviors: Smoking, Alcohol, Inactivity, Unhealthy Diet. Connections between these behaviors indicate their co-occurrence.](image-url)
Progressing from ‘The Big 4’: Identifying the Fundamental Functions (FFs)

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Breathing</td>
</tr>
<tr>
<td>Alcohol Misuse</td>
<td>Drinking</td>
</tr>
<tr>
<td>Unhealthy Diet</td>
<td>Eating</td>
</tr>
<tr>
<td>Inactivity</td>
<td>Moving</td>
</tr>
</tbody>
</table>

Diagram:
- Smoking
- Alcohol
- Breathing
- Drinking
- Inactivity
- Unhealthy Diet
- Moving
- Eating
What makes a function ‘Fundamental’?

Operationalizing the FFs:

1. They typically occur **every day**
2. They are **iterative** (i.e. prior repetitions impact present repetitions)
3. They can be expressed as **functional** or **dysfunctional**
4. **Dysfunctional** expression coincides with excess buildup of resources, toxins, and inflammation within the biological system

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Nominations for a fifth FF?
Viewing the Data with the ABIS: Single-Separate vs. Multiple-Systemic

**Single-Separate Behaviors**
- Diet
- Smoking
- Inactivity
- Alcohol
- Drug Use
- Unsafe Sex
- Skin

**Multiple-Systemic Behaviors**
- Diet
- Smoking
- Inactivity
- Alcohol
- Drug Use
- Unsafe Sex
- Skin

Graphs showing the comparison between single-separate and multiple-systemic behaviors.
Completing the ABIS

Executive Functions

Fundamental Functions

Decision-Making

Breathe, Drink, Eat, Move, Sleep
The Role of Executive Functions (EFs): Recognition, Decision, Direction

Dysfunctional

Executive Functions

Stage of Change + Decisional Balance

Healthy Breathing

Functional

Smoking
From the Strong & Weak Principles of Change to Executive Functions (EFs)

**Strong Principle of Change**

\[ PC \rightarrow A \approx 1 \text{ SD} \uparrow PROS_H \]

**Weak Principle of Change**

\[ PC \rightarrow A \approx 0.5 \text{ SD} \downarrow CONS_H \]
Integrating Levels of the ABIS

- Dysfunctional Health Status
  - Health Risk Behavior(s)
- Executive Functions (EFs)
  - Decisional Balance
  - Stage of Change
- Fundamental Functions (FFs) to Target
  - Breathing
  - Drinking
  - Eating
  - Moving
  - Sleeping
- Functional Health Status
  - Desired Outcome(s)
Parallels that Connect of ABIS and Biological Immune System (BioIS): Executive-Fundamental Functions

Expression of Health

Health-Supporting System

Executive Level

Fundamental Level

Health Status

Adaptive Behavioral Immune System (ABIS)

Biological Immune System (BioIS)

Stage of Change, Pros/Cons

Innate & Adaptive Immune System Branches

Breathing, Drinking, Eating, Moving, Sleeping

Colonies of the Human Microbiome
Parallels that Connect of ABIS and BioIS: Dysfunction

Expression of Health

Health-Supporting System
- Adaptive Behavioral Immune System
- Biological Immune System

Executive Level Dysfunction
- Remaining in PC despite disease diagnosis
- Autoimmunity

Fundamental Level Dysfunction
- “I really wanted to change, but I just found myself smoking”
- Dysbiosis*

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*Dysbiosis, is a term for a microbial imbalance or maladaptation on or inside the body
Parallels that Connect of ABIS and BIS: Signaling

Process of Health
- Adaptation to Changing Environment

Health-Supporting System
- Adaptive Behavioral Immune System
- Biological Immune System

Systemic Signaling Mechanism
- Stress Response
- Inflammatory Response

Intersection of the Immune Systems
- HPA Axis

(11, 29)
Future Directions of the ABIS

Problem
Recognize
Express
Change

Health Risk Behavior

Stage of Change
Decisional Balance

Breathing
Drinking
Eating
Moving
Sleeping

Health & Wellbeing
ABIS
Before dysfunction... there was function
Before disease... there was ease
A return to function and ease... is a breakthrough towards
Health and WELLBEING!
Pleas feel free to reach out with questions, interests or conversations:
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