ENGINEERING NEURBIOLOGICAL SYSTEMS

BRIAN JOHNSON M.D.
STATE UNIVERSITY OF NEW YORK UPSTATE MEDICAL UNIVERSITY
BOSTON PSYCHOANALYTIC SOCIETY
<table>
<thead>
<tr>
<th>DRUG</th>
<th>AMERICAN DEATHS / YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>480,000</td>
</tr>
<tr>
<td>Alcohol</td>
<td>88,000</td>
</tr>
<tr>
<td>Opioid Overdose</td>
<td>59,000</td>
</tr>
<tr>
<td>Benzodiazepine Overdose</td>
<td>9,000</td>
</tr>
<tr>
<td>Cocaine</td>
<td>6,784</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>5,740</td>
</tr>
<tr>
<td><strong>Total Deaths from Drugs</strong></td>
<td><strong>648,524</strong></td>
</tr>
<tr>
<td><strong>Total Deaths in United States</strong></td>
<td><strong>2,626,418</strong></td>
</tr>
<tr>
<td>INDUSTRY</td>
<td>SALES - $ BILLIONS</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Benzodiazepine</td>
<td>509</td>
</tr>
<tr>
<td>Alcohol</td>
<td>212</td>
</tr>
<tr>
<td>Tobacco</td>
<td>128</td>
</tr>
<tr>
<td>Marijuana-If legalized in US</td>
<td>45</td>
</tr>
<tr>
<td>Mexican / Columbian Drug Cartels</td>
<td>29</td>
</tr>
<tr>
<td>Opioid Medications</td>
<td>19</td>
</tr>
<tr>
<td>Comparison-US Auto</td>
<td>70</td>
</tr>
</tbody>
</table>
Upstate Addiction/Pain Medicine

Transference Focused Psychotherapy Staff
- 2 Addiction Psychiatry Fellows
- PGY 1 Psychiatry Residents: 12 weeks
- MS 3 and 4 Medical Students

Pain Service
- Pain Fellows
- Internal Medicine, Neurology Residents
- MS 1 and 2 Medical Students
Engineering Biology

The purpose of an abstraction hierarchy is to hide information and manage complexity.

To be useful, biological engineering abstraction hierarchies must allow individuals to work at any one level of complexity without regard for the details that define other levels, yet allow for the principled exchange of limited information across levels.
BRAIN ADDICTION PATHS

Ventral Pallidum

GABA

Neurop GABA

Nucleus Accumbens Core

Motor Outputs

glutamate

Prefrontal Cortex

dopamine

glutamate

glutamate

Ventral Tegmental Area

VTA Interneuron

GABA

Opioid Peptide Neuron

Opiate

nicotine

Amygdala

Stimulants (cocaine, etc.) via dopamine reuptake inhib.

Neurop GABA

Nucleus Accumbens Shell

Craving/Dreaming Pathways: Neurop=neuropeptides, GABA=gamma amino butyric acid
Autism is a Hyperopioidergic Disease

Is Fibromyalgia an Endocrine/Endorphin Deficit Disorder helped by LDN? (Ramanathan, Panksepp, Johnson 2012)

Response to LDN

CPT in seconds.
Subjective pain scores on a scale of 0-10 (0: best & 10: worst).
Figure 1 – Relationship of pleasure and opioid tone in the central nervous system subcortical pathways
Public Health References

- SAMHSA. National Survey of Drug Use and Health. 2015.
- National Institute of Health: NIDA, NIAAA websites
- Alcohol: $212 Alcoholic Beverage Market Overview in The United States www.parkstreet.com/alcoholic-beverage-market-overview/
- Tobacco: $128 statistica website August 20, 2018
- Mexican / Columbian Drug Cartels: $29 NYTTimes 2012
- Opioid Medications: $19 CNBC on 4/27/16 reported $24 billion/year for opioid medications, 80% sold in the US
- Automotive Industry: $70 https://www.statista.com/topics/1721/us-automotive-industry/
- Engineering
Neuropsychoanalytic References


- Johnson B. Addiction and will. *Frontiers in Human Neuroscience* 2013;7:545. Doi


