Impulsive and Compulsive Disorders
Learning Objectives

- Describe the hypothetical shared neurobiology of impulsive-compulsive disorders
- Evaluate potential conditions/behaviors that may be considered impulsive-compulsive disorders
- Describe treatments for obesity/food addiction
Pretest Question 1

Which of the following is considered the pleasure center of the brain?

A. Cortico-striatal-thalamo-cortical loop
B. Mesolimbic dopamine pathway
C. Mesocortical dopamine pathway
D. None of the above
Possible Categorization of Impulsivity and Compulsivity Endophenotypes as Impulsive-Compulsive Disorders

<table>
<thead>
<tr>
<th>Obsessive-compulsive related spectrum disorders</th>
<th>Substance/behavioral addictions</th>
<th>Disruptive/impulse control</th>
<th>Sexual</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCD</td>
<td>Drug addiction</td>
<td>Pyromania</td>
<td>Hypersexual disorder</td>
</tr>
<tr>
<td>Hair pulling (trichotillomania)</td>
<td>Gambling</td>
<td>Kleptomania</td>
<td>disorder</td>
</tr>
<tr>
<td>Skin picking</td>
<td>Internet addiction</td>
<td>IED</td>
<td>Paraphilias</td>
</tr>
<tr>
<td>Body dysmorphic disorder (BDD)</td>
<td>Food addiction (binge eating, obesity)</td>
<td>Impulsive violence</td>
<td></td>
</tr>
<tr>
<td>Hoarding</td>
<td>Compulsive shopping</td>
<td>BPD</td>
<td></td>
</tr>
<tr>
<td>Tourette's syndrome/tic disorders</td>
<td></td>
<td>Self-harm/parasuicidal behavior</td>
<td></td>
</tr>
<tr>
<td>Stereotyped movement disorders</td>
<td></td>
<td>Antisocial behavior</td>
<td></td>
</tr>
<tr>
<td>Autism spectrum disorders</td>
<td></td>
<td>Conduct disorder</td>
<td></td>
</tr>
<tr>
<td>Hypochondriasis</td>
<td></td>
<td>ODD</td>
<td></td>
</tr>
<tr>
<td>Somatization</td>
<td></td>
<td>Mania</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ADHD</td>
<td></td>
</tr>
</tbody>
</table>

Stahl's Essential Psychopharmacology. 4th ed. 2013. Copyright NEI. All rights reserved.
**Impulsivity**

Tendency to act prematurely without foresight; actions that are poorly conceived, prematurely expressed, unduly risky, or inappropriate to the situation and that often result in undesirable consequences; predisposition toward rapid, unplanned responses to internal and external stimuli without regard for the negative consequences of those responses to self or others; often measured in 2 domains: the choice of a small, immediate reward over a larger, delayed reward or the inability to inhibit behavior to change a course of action or stop a response once it is initiated

**Compulsivity**

Repetitive actions inappropriate to the situation that persist, that have no obvious relationship to the overall goal, and that often result in undesirable consequences; behavior that results in perseveration in responding in the face of adverse consequences; perseveration in responding in the face of incorrect responses in choice situations or persistent reinitiation of habitual acts
### Other Key Terms

<table>
<thead>
<tr>
<th><strong>Abuse</strong></th>
<th>Self-administration of any drug in a culturally disapproved manner that causes adverse consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Addiction</strong></td>
<td>Behavioral pattern of drug abuse characterized by overwhelming involvement with the use of a drug (compulsive use), the securing of its supply, and a high tendency to relapse after discontinuation</td>
</tr>
<tr>
<td><strong>Cross-tolerance and Cross-dependence</strong></td>
<td>The ability of a drug to suppress the manifestations of physical dependence produced by another drug and to maintain the physically dependent state</td>
</tr>
<tr>
<td><strong>Dependence</strong></td>
<td>The physiological state of adaptation produced by the repeated administration of drugs such as alcohol, heroin, and benzodiazepines when they are abruptly discontinued and are associated with physical drug withdrawal distinct from the motivational changes of acute withdrawal and protracted abstinence, which are part of addiction</td>
</tr>
<tr>
<td><strong>Habit</strong></td>
<td>A response triggered by environmental stimuli regardless of the current desirability of the consequences; this conditioned response to a stimulus is reinforced and strengthened by either past experience with reward (positive reinforcement) or the omission of an aversive event (negative reinforcement)</td>
</tr>
</tbody>
</table>
## Other Key Terms (cont.)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebound</td>
<td>The exaggerated expression of the original condition sometimes experienced by patients immediately after the cessation of an effective treatment</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>The tendency of a pleasure-producing drug to lead to repeated self-administration</td>
</tr>
<tr>
<td>Relapse</td>
<td>The reoccurrence of the original condition from which a patient suffered upon discontinuation of an effective medical treatment</td>
</tr>
<tr>
<td>Tolerance</td>
<td>Develops when a given dose of a drug produces a decreased effect after repeated administration or when increasingly larger doses must be administered to obtain the effects observed with the original use</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>The psychological and physiological reactions to the abrupt cessation of a dependence-producing drug</td>
</tr>
</tbody>
</table>
Impulsivity and Reward
Compulsivity and Motor Response Inhibition

dorsal
Impulsivity

Reward/Affect

- ACC
- VMPFC
- Ventral striatum

Cognition

- OFC
- Dorsal striatum

Response Inhibition

- OFC
- Dorsal striatum

Memory

- Amygdala
- Hippocampus

Reward Conditioning

T

T

T

Response Inhibition

Reward/Affect

Impulsivity

Cognition

Memory

Reward Conditioning
**IMPULSIVITY**

- "naughty"
- "high"
- transition to addiction
- binge/intoxication/excessive behavior
- abstinence/withdrawal/negative affect
- anticipation/preoccupation/craving/arousal

**Compulsivity**

"naughty" and "high" lead to transition to addiction, which in turn leads to binge/intoxication/excessive behavior. This behavior results in abstinence/withdrawal/negative affect, which further leads to anticipation/preoccupation/craving/arousal.
reward: DA mesolimbic pathway

natural highs

behaviorally induced highs

substance-induced highs
Pretest Question 2

What role does the amygdala play in substance abuse?

1. Releases phasic bursts of dopamine to the nucleus accumbens when drugs of abuse are present
2. Communicates to the ventral tegmental area when cues related to drugs of abuse are present
3. Site of binding for most drugs of abuse
4. 1 and 2
5. 1, 2, and 3
Neurotransmitter Regulation of Mesolimbic Reward

nucleus accumbens (NA)

- PFC
- amygdala
- hippocampus

VTA
- cannabinoid
- 5HT
- GABA

VTA projections:
- DA
- 5HT
- enkephalin

Raphe
- GABA

PPT/LDT
- raphe

Arcuate nucleus
- cannabinoid

Stahl's Essential Psychopharmacology, 4th ed. 2013. Copyright NEI. All rights reserved.
Pretest Question 3

A 29-year-old patient is morbidly obese and reports that he is "addicted to food." Hunger circuitry is connected to reward circuitry via dopaminergic projections from the hypothalamus to the nucleus accumbens.

1. True
2. False
Food Addiction: Is Obesity an Impulsive-Compulsive Disorder?

- Obesity, appetite, eating, and the dimensions of impulsivity/compulsivity
- Enhanced reward of food/enhanced motivation and drive to consume food
- Increasing amounts of food to maintain satiety, tolerance
- Lack of control over eating—cannot stop
- Great deal of time spent eating
- Conditioning and habits to food and food cues
- Distress and dysphoria when dieting
Food Addiction: Is Obesity an Impulsive-Compulsive Disorder?

- Eating too rapidly or too much when not hungry, to the point of being uncomfortably full
- Overeating maintained despite knowledge of adverse physical and psychological consequences caused by excessive food consumption
- Eating alone; feeling disgusted with oneself, guilty, or depressed
- Binge eating can occur with or without purging
- Bulimia is binge eating with self-disgust and purging leading to attempts to prevent weight gain by excessive exercise, induced vomiting, abuse of laxatives, enemas, or diuretics
Peptides Regulate Appetite in the Hypothalamus

NPY
AgRP

appetite stimulating

appetite suppressing

AgRP
NPY

POMC

MC4R

MSH

appetite

POMC

NPY

AgRP

appetite suppressing

appetite stimulating
Phentermine Actions: Enhance POMC

[Diagram showing the actions of phentermine on POMC neurons, with arrows indicating appetite suppression and appetite suppression.]

NPY
AgRP

appetite stimulating

appetite suppressing

AgRP
NPY

DA
NE

phentermine

Stahl's Essential Psychopharmacology. 4th ed. 2013. Copyright NEI. All rights reserved.
Phentermine Actions: Enhances POMC

Several novel treatments for obesity
Topiramate Potentiates Phentermine

- **NPY**
- **AgRP**
- **MSH**
- **MC4R**
- **MC4R**

**appetite suppressing**

**appetite stimulating**

**topiramate**

**glu**

**GABA**

**DA**

**NE**

**phentermine**

Stahl's Essential Psychopharmacology, 4th ed. 2013. Copyright NEI. All rights reserved.
Topiramate Potentiates Phentermine

Phentermine as a monotherapy
**Bupropion Actions: Enhance POMC**

- **NPY AgRP**
- **MC4R**
- **MSH**
- **POMC**
- **MC4R**
- **AgRP**
- **NPY**
- **DA**
- **NE**
- **bupropion**

- **Appetite stimulating**
- **Appetite suppressing**

- **Appetite**
Naltrexone Potentiates Bupropion

Stahl's Essential Psychopharmacology. 4th ed. 2013. Copyright NEI. All rights reserved.
Bupropion plus Naltrexone
Lorcaserin Actions: Enhance POMC

Lorcaserin actions enhance POMC, which is involved in appetite suppression. Lorcaserin activates 5HT2C receptors, which in turn activates MC4R receptors, leading to decreased appetite. This is shown with the symbols for appetite stimulating (AgRP, NPY) and appetite suppressing (MSH, POMC) pathways.
Lorcaserin Actions: Enhance POMC
Naltrexone Potentiates Zonisamide

**MC4R**

NPY
AgRP

**appetite suppressing**

**appetite stimulating**

**MSH**

**naltrexone**

zonisamide

AgRP
NPY

**glu**

GABA

**appetite**
Histamine H1 Antagonism Combined With Serotonin 2C Antagonism Stimulates Appetite
Serotonin 2C Agonist Lorcaserin Suppresses Appetite

5HT neurons → hypothalamus via lorcanerin

Appetite suppression
When Does an Impulse Become an Impulsive-Compulsive Disorder?

• Gambling disorder
• Internet addiction
• Pyromania
• Kleptomania
• Paraphilias
• Hypersexual disorder
Are There Neurodevelopmental Impulsive-Compulsive Disorders?

- Attention deficit hyperactivity disorder (ADHD)
- Autism spectrum disorders
- Tourette's syndrome and tic disorders
- Stereotyped movement disorders
Can Violence Be an Impulsive-Compulsive Disorder?

- Intermittent explosive disorder
- Impulsive violence in psychosis, mania, and borderline personality disorder
- Self-harm and parasuicidal behavior/violence against self
- Oppositional defiant disorder
- Conduct disorder
- Dyssocial personality disorder
- Antisocial personality disorder
- Psychopathy
OCD or ICD? Are Obsessive-Compulsive Spectrum Disorders Also Impulsive-Compulsive Disorders?

- Obsessive-compulsive disorder (OCD)
- Body dysmorphic disorder (BDD)
- Hoarding
- Trichotillomania (TTM)
- Skin picking
- Compulsive shopping
- Hypochondriasis
- Somatization
• Impulsivity and compulsivity are dimensions of psychopathology that cut across many psychiatric disorders

• Both drugs and behaviors can be associated with impulsivity/compulsivity