

Alcohol and the Body

Eric W. Fish, Ph.D.
Bowles Center for Alcohol Studies
UNC School of Medicine

Donita Lynn Robinson, Ph.D.
Bowles Center for Alcohol Studies
UNC School of Medicine



Thanks to...

- UNC Bowles Center for Alcohol Studies
- Dr. Scott Swartzwelder, Dr. Jessica Hoffman
- National Institute on Alcohol Abuse and Alcoholism

1

Alcohol and the Body

Alcohol drinking and blood alcohol concentrations:

- Many factors impact BACs

The younger brain is different:

- Developmental differences in alcohol effects

Binge drinking is especially bad:

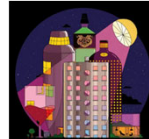
- Blackouts are neurological traumas



2

What Makes Alcohol Unique

- Legal within an acceptable limit
- Easily accessible
- Socially encouraged despite risk for abuse and addiction
- Strongly associated with a rite of passage- turning the drinking age
- Typically consumed orally, often with a meal, provides calories of its own
- Flavors added to mask aversive taste



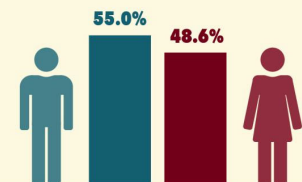
3

Who Uses Alcohol

- 84% of people ≥ 18 years old have tried alcohol
- 50% have used alcohol in the past month
- 23% have had a "binge" within the past month
 - "Binge" is defined for a woman as 4 or more drinks within a 2-hr period, 5 or more drinks within a 2-hr period for a man
- 6.4% have drank heavily in the past month - ~16 million adults
 - "Heavy Drinking" is defined as 5 or more drinks on any single day, or 15 or more drinks/week
- Increasing prevalence of alcohol drinking and related harm among women

MONTHLY ALCOHOL USE

Percentage of U.S. men and women who reported drinking alcohol in the past month.

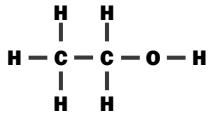


SOURCE: 2021 National Survey on Drug Use and Health**

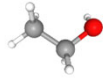


4

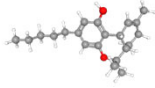
A Simple Molecule with Complex Actions



Ethanol



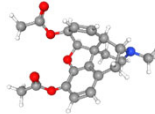
Δ⁹-THC



Cocaine



Heroin



5



6



"The King Drinks", Jacob Jordaens

7

A Standard Drink

Drink size calculator

Do you know how many "standard drinks" (also known as alcoholic drink equivalents) are in a:

- * 21 fluid ounce ballark souvenir cup of beer? 1.8 standard drinks per container
- * 40 fluid ounce bottle of malt liquor? 4.7 standard drinks per container
- * "half-pint" of 80-proof distilled spirits? 4.5 standard drinks per container
- * 25 fluid ounce bottle of wine? 5 standard drinks per container

12oz 5% beer

5oz 12% wine

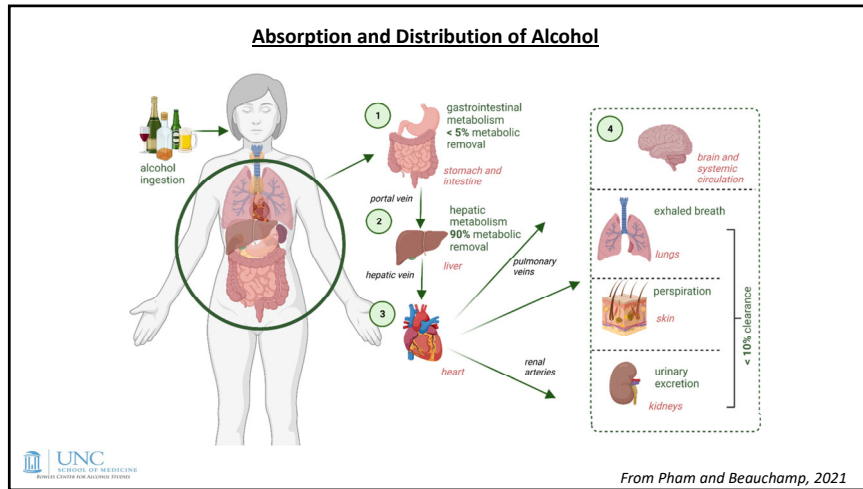
~4-6oz 12-18% cocktail

1.5oz 40% liquor

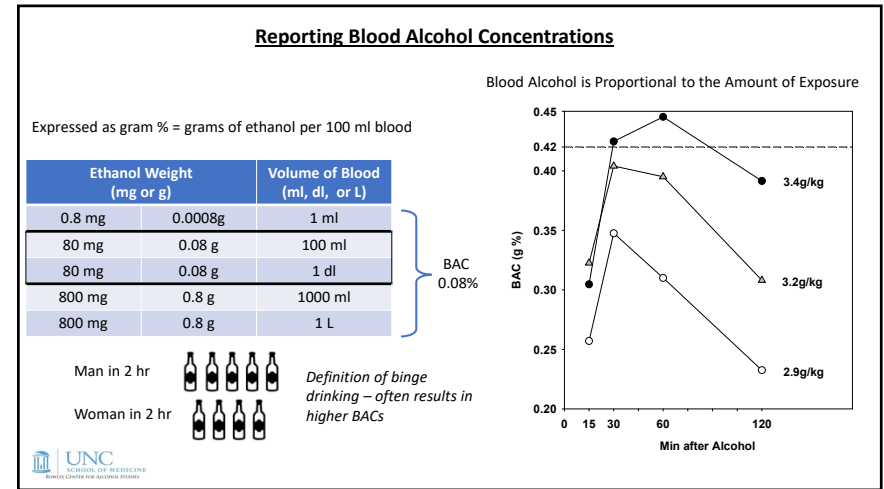
UNC UNIVERSITY OF NORTH CAROLINA
SCHOOL OF MEDICINE
ALCOHOL CENTER FOR ADDICTION STUDIES

<https://www.rethinkingdrinking.niaaa.nih.gov/tools/calculators/drink-size-calculator.aspx>

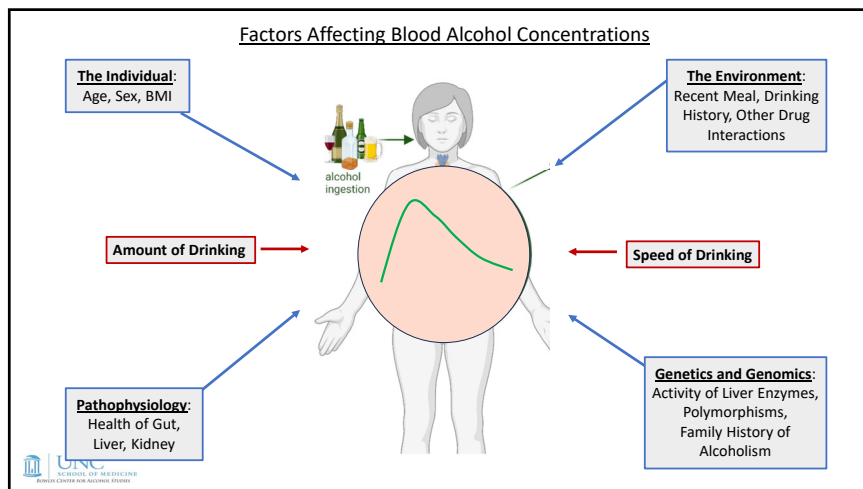
8



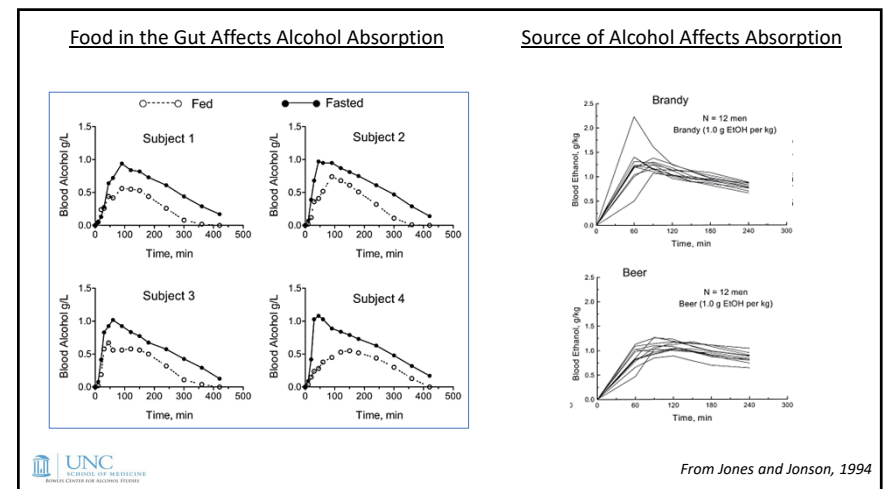
9



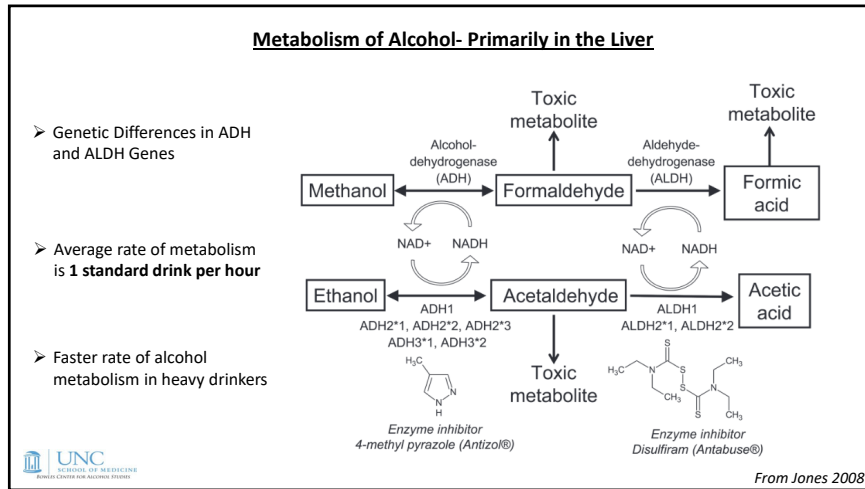
10



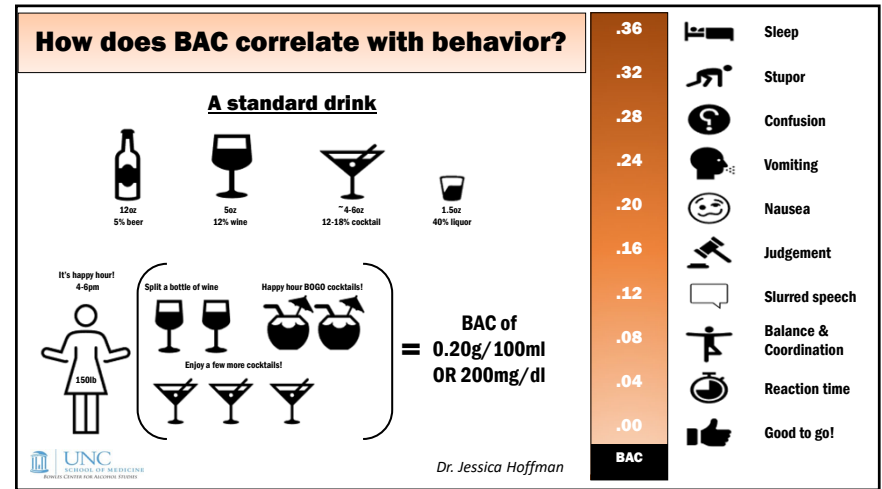
11



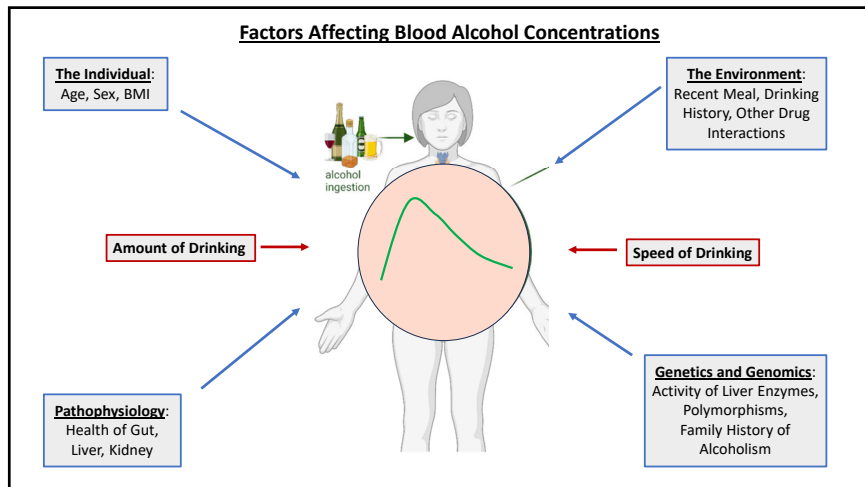
12



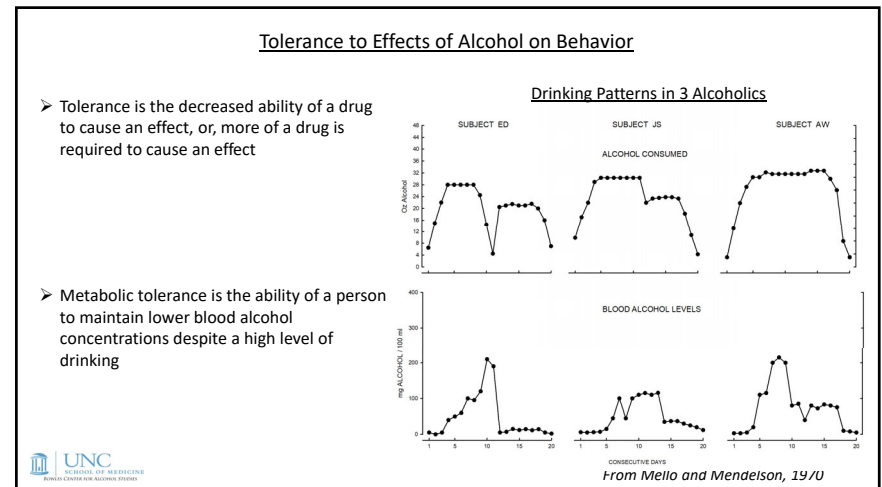
13



14



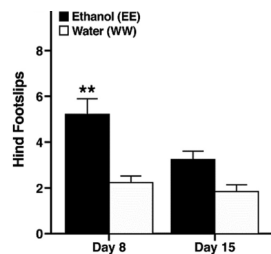
15



16

Tolerance to Effects of Alcohol on Behavior

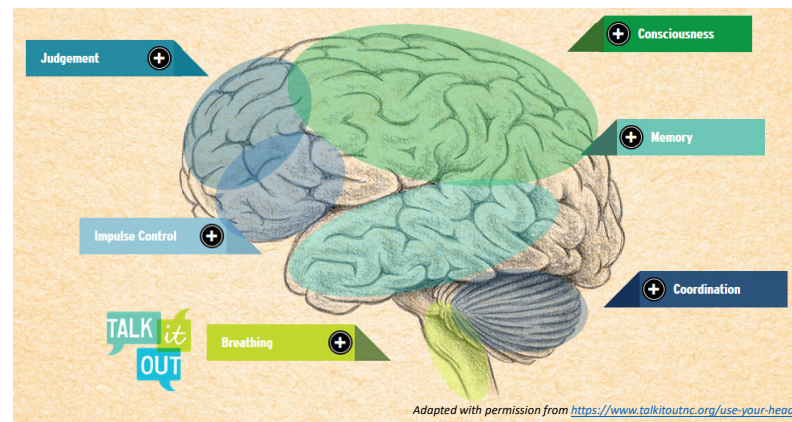
- Tolerance is the decreased ability of a drug to cause an effect, or, more of a drug is required to cause an effect
- Behavioral tolerance is a decreased sensitivity to an impairing effect of alcohol



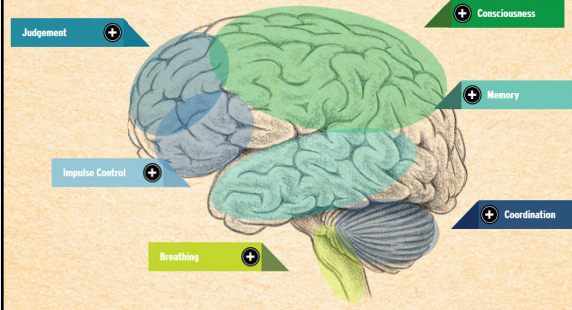
From Linsenhardt et al. 2011



Alcohol affects the entire brain



How does BAC correlate with behavior?



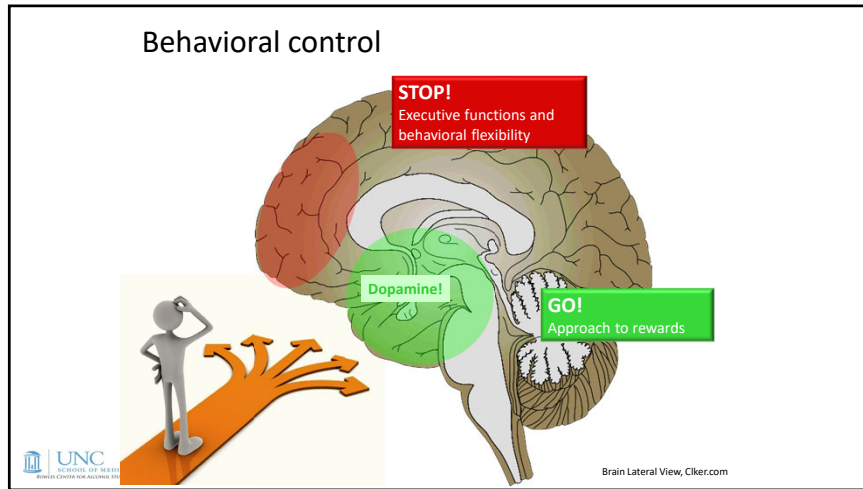
.36	🛌	Sleep
.32	🧠	Stupor
.28	🌀	Confusion
.24	🤮	Vomiting
.20	🤢	Nausea
.16	👊	Judgement
.12	🗣️	Slurred speech
.08	🚶	Balance & Coordination
.04	🕒	Reaction time
.00	👍	Good to go!
BAC		



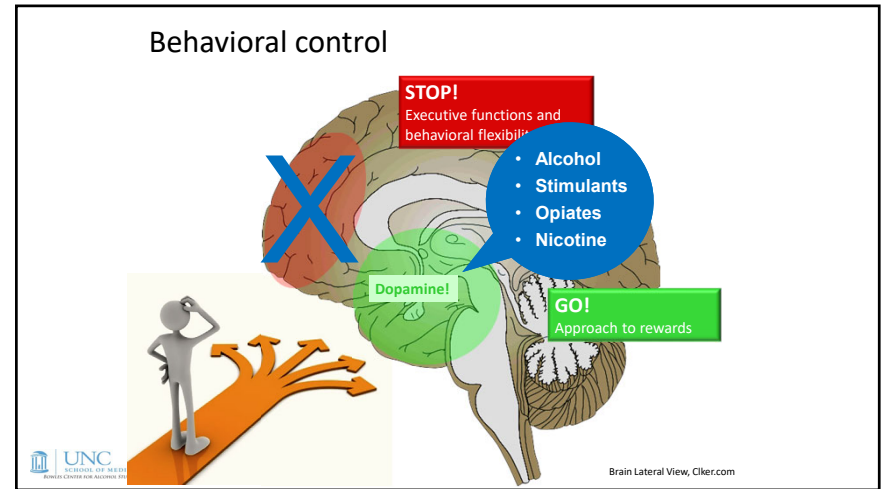
Alcohol and the Body

- Alcohol drinking and blood alcohol concentrations:
 - Many factors impact BACs
- The younger brain is different:
 - Developmental differences in alcohol effects
- Binge drinking is especially bad:
 - Blackouts are neurological traumas

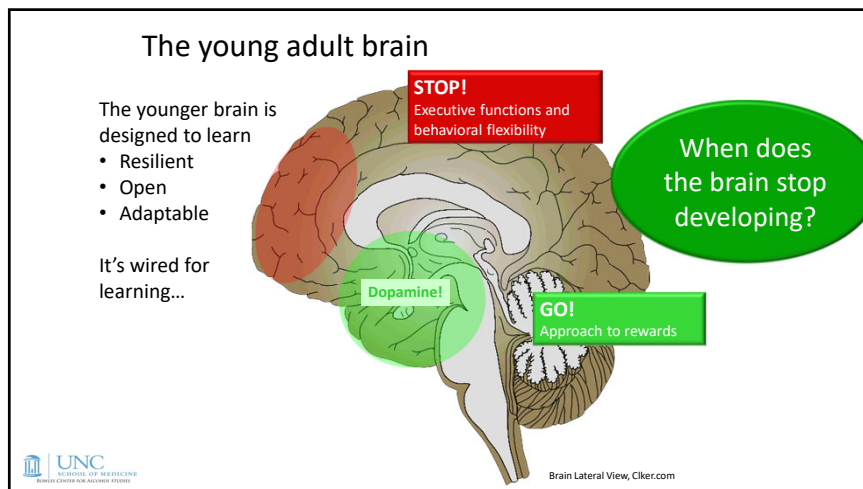




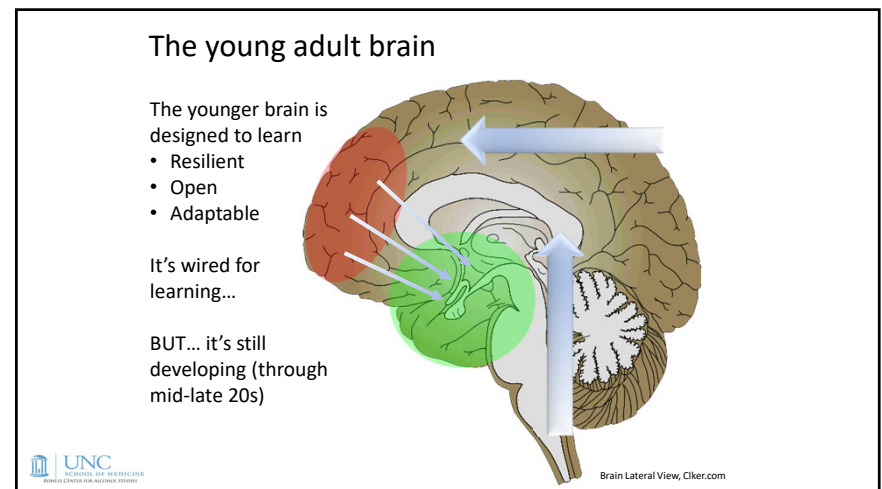
21



22



23



24

Go! system dominant in young adults

Decision-making:

- ↓ regard for negative consequences
- ↑ regard for positive consequences
- ↑ risk-taking
- ↑ novelty-seeking
- ↑ importance of social context

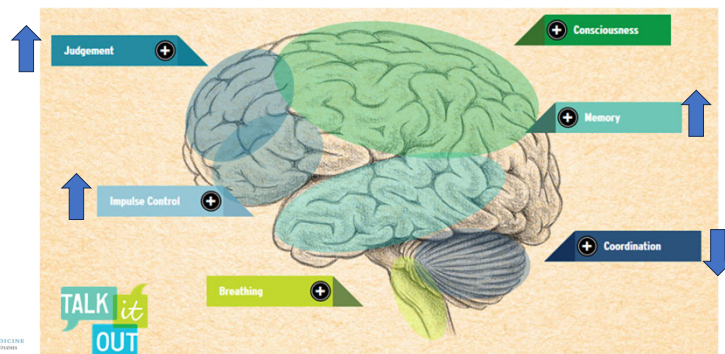


The young adult brain

Response to high dose of alcohol?

Young adults:

- ↑ sensitivity to alcohol reward
- ↓ sensitivity to alcohol sedation
- ↑ sensitivity to alcohol-induced memory disruption

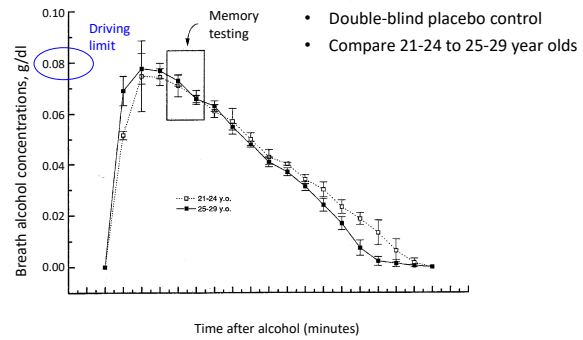


Young adults:

- ↑ sensitivity to alcohol reward
- ↓ sensitivity to alcohol sedation
- ↑ sensitivity to alcohol-induced memory disruption

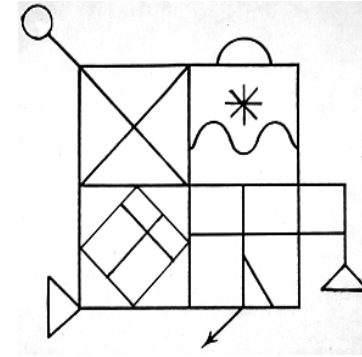


Young adults are sensitive to alcohol effects on memory



- Double-blind placebo control
- Compare 21-24 to 25-29 year olds

Adapted from Acheson, Alcohol Clin Exp Res, 1998

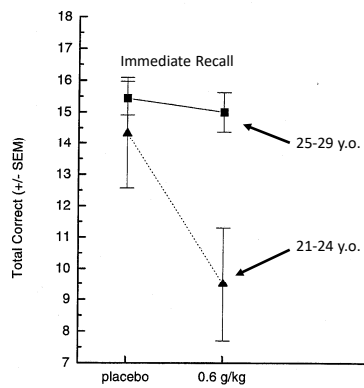


UNC
SCHOOL OF MEDICINE
RUNCHE CENTER FOR ALCOHOL STUDIES

Slide from Dr. H. Scott Swartzwelder

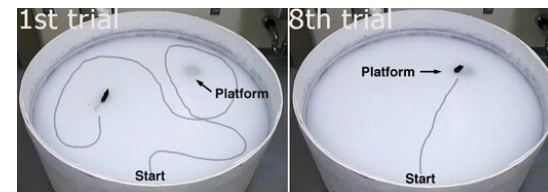
29

30



Acheson, Alcohol Clin Exp Res, 1998

Morris Water Maze

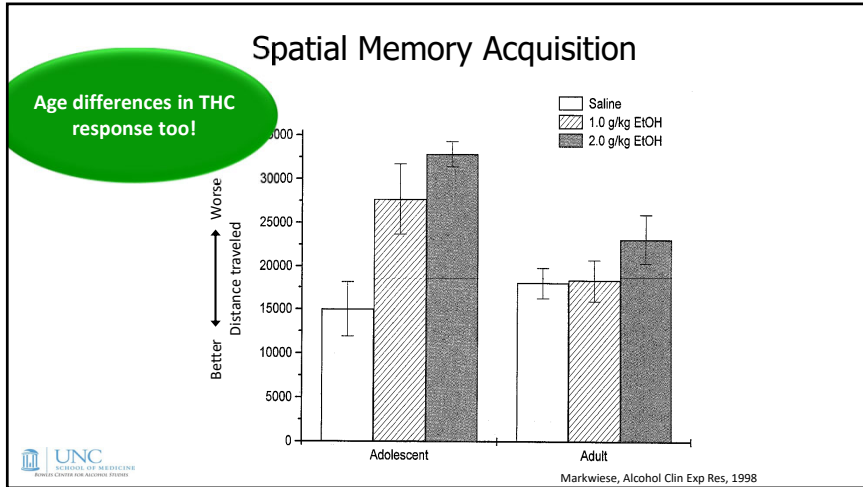


UNC
SCHOOL OF MEDICINE
RUNCHE CENTER FOR ALCOHOL STUDIES

Slide from Dr. H. Scott Swartzwelder

31

32



33

Alcohol and the Body

- Alcohol drinking and blood alcohol concentrations:
 - Many factors impact BACs
- The younger brain is different:
 - Developmental differences in alcohol effects
- Binge drinking is especially bad:
 - Blackouts are neurological traumas

Patterns of drinking matter

34

Something special about binge drinking?

- Binge: 5 drinks/session for men, 4 drinks for women
→ Produces high levels of alcohol in the blood
- Influenced by
 - Body weight
 - Sex
 - Food intake
 - Speed of drinking

NIH National Institute on Alcohol Abuse and Alcoholism

35

Young adults respond differently to alcohol...

- ↑ sensitivity to alcohol reward
- ↓ sensitivity to alcohol sedation
- ↑ sensitivity to alcohol-induced memory disruption

A perfect storm...

Young adults are more likely to binge drink and experience blackouts

Photo by oneinchurch/shutterstock.com

36

Events that Occurred During Blackouts

Event	Females ^a Males ^b	
	%	%
Insulted someone	30.4	36.0
Spent money not intended to be spent	20.4	35.4
Engaged in some form of sexual activity	24.6	25.0
Involved in an argument or fight	15.2	17.7
Vandalized property	4.7	29.6
Had unprotected intercourse	4.2	8.5
Had unwanted intercourse	5.8	4.3
Drove a car	1.6	3.7
Was arrested	0.0	0.0

Blackout is a neurological trauma

37

Blackouts...

- Survey of young adults one year **past** high school
- **Common:** 20% of drinkers reported a blackout in the past 6 months
- **Risk factors:** More prevalent among females and people who used other drugs, got drunk, had lower body weight, lived in dorms
- **Consequences:** After controlling for drinking levels, blackouts were the strongest predictor of most other alcohol-related problems (missing class/work, getting behind in school/work, DUI, fights, overdose, etc)



38

Take-home messages

Alcohol drinking and blood alcohol concentrations:

- *Many factors impact BACs, what's important is how it affects behavior and thinking*

The younger brain is different:

- *Developmental differences in alcohol effects on reward, memory and sedation*

Binge drinking is especially bad:

- *Blackouts are neurological traumas and a sign of other alcohol-related problems*

39