

# Associations between Executive Functioning, Affect-regulation Drinking Motives and Heavy and Problematic Drinking

Presented to Thesis Committee  
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**Why do some individuals engage in heavy/problematic drinking more than others?**



**Why are some individuals more able to control their drinking than others?**

# Motivational and Cognitive Approaches

- Motivational approach:
  - motivations to use alcohol to regulate positive and negative mood

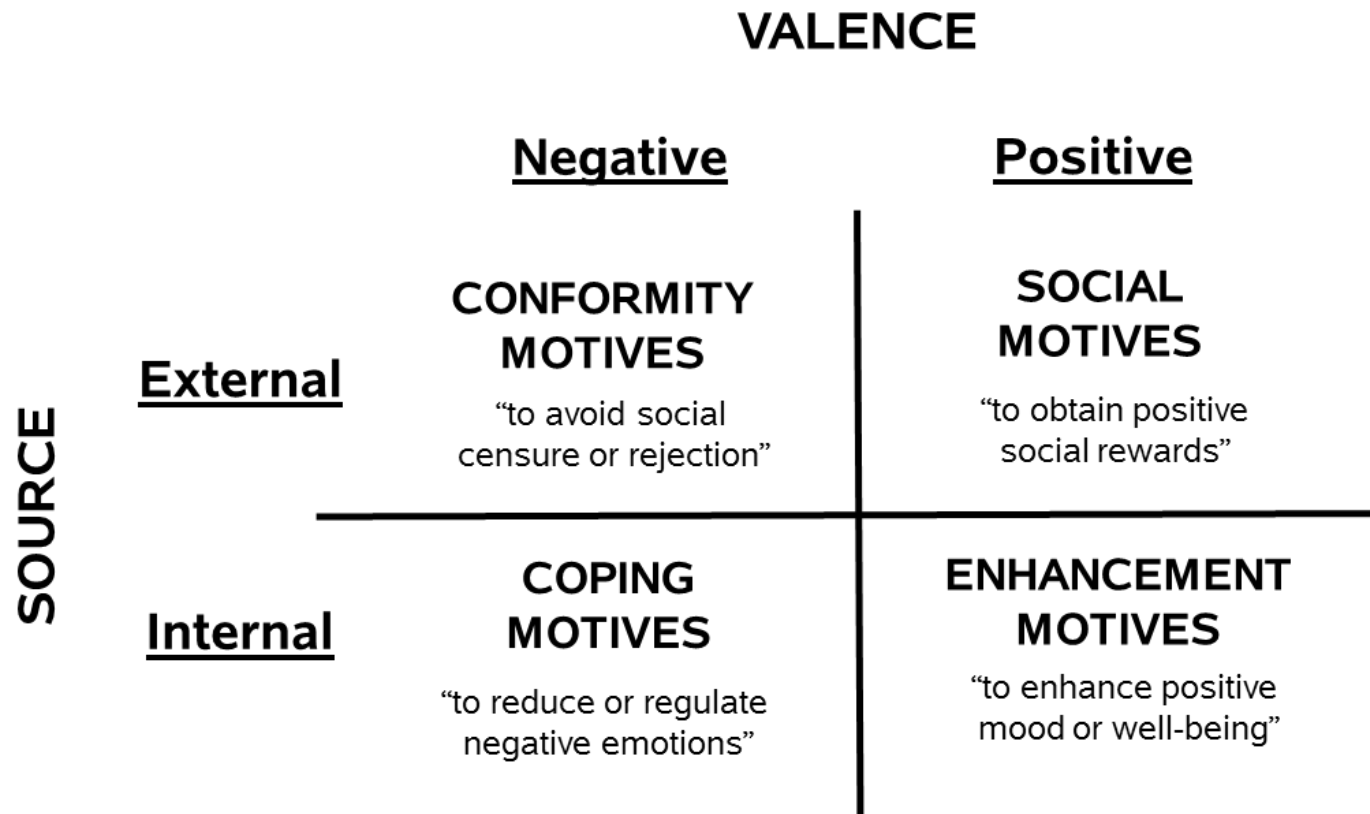
Cooper, 1994; Cooper, Frone, Russell, & Mudar, 1995;  
Cooper, Kuntsche, Levitt, Barber, & Wolf, 2015, for review

- Cognitive approach:
  - deficits in cognitive control or executive functions

Day, Kahler, Ahern, & Clark, 2015, for review; Gierski et al., 2013; Hester, Lubman, & Yücel, 2010; Nigg et al., 2004; Rangaswamy & Porjesz, 2008

# **MOTIVATIONAL PERSPECTIVE**

# People Drink for 4 Reasons or Motives

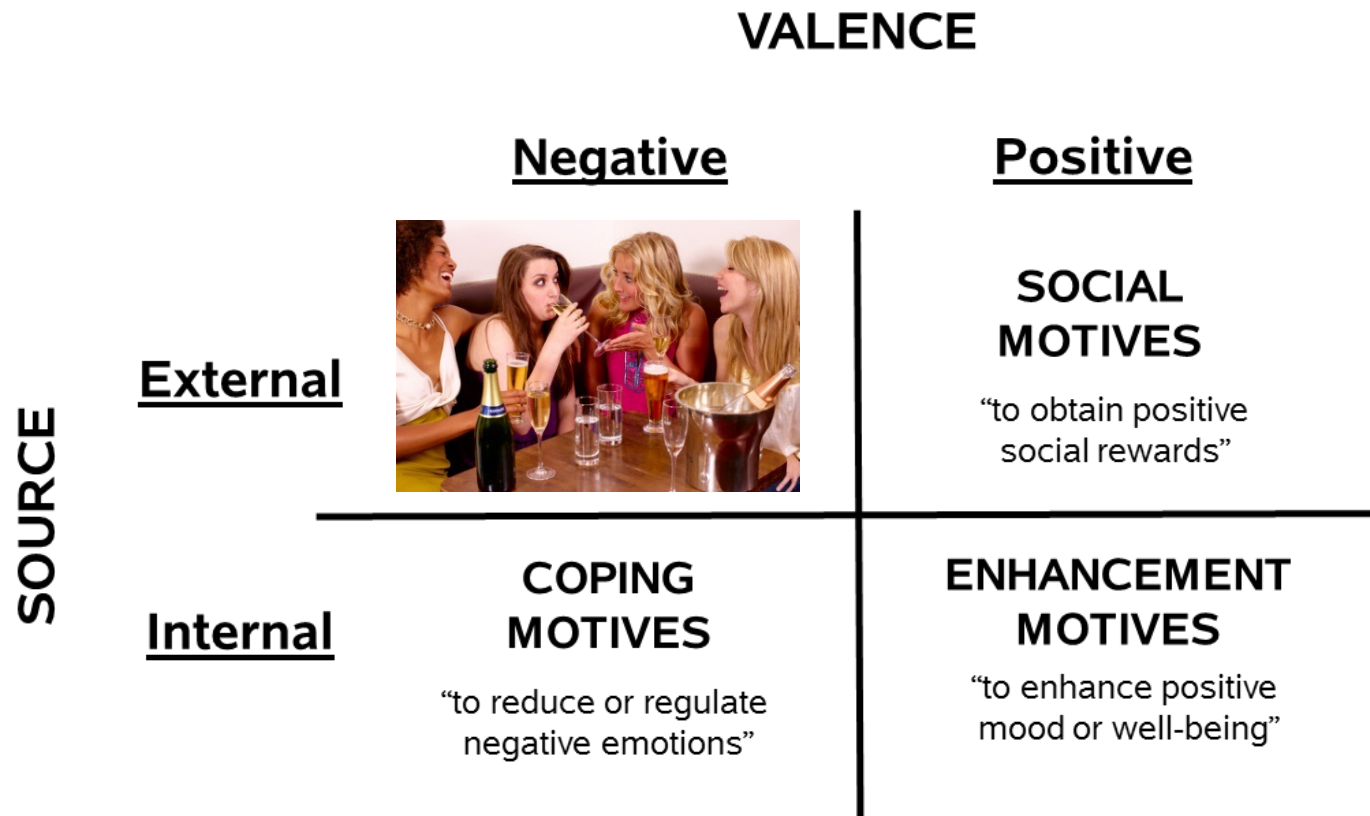


Cooper, 1994

Cooper, Frone, Russell, & Mudar, 1995

Cooper, Kuntsche, Levitt, Barber, & Wolf, 2015

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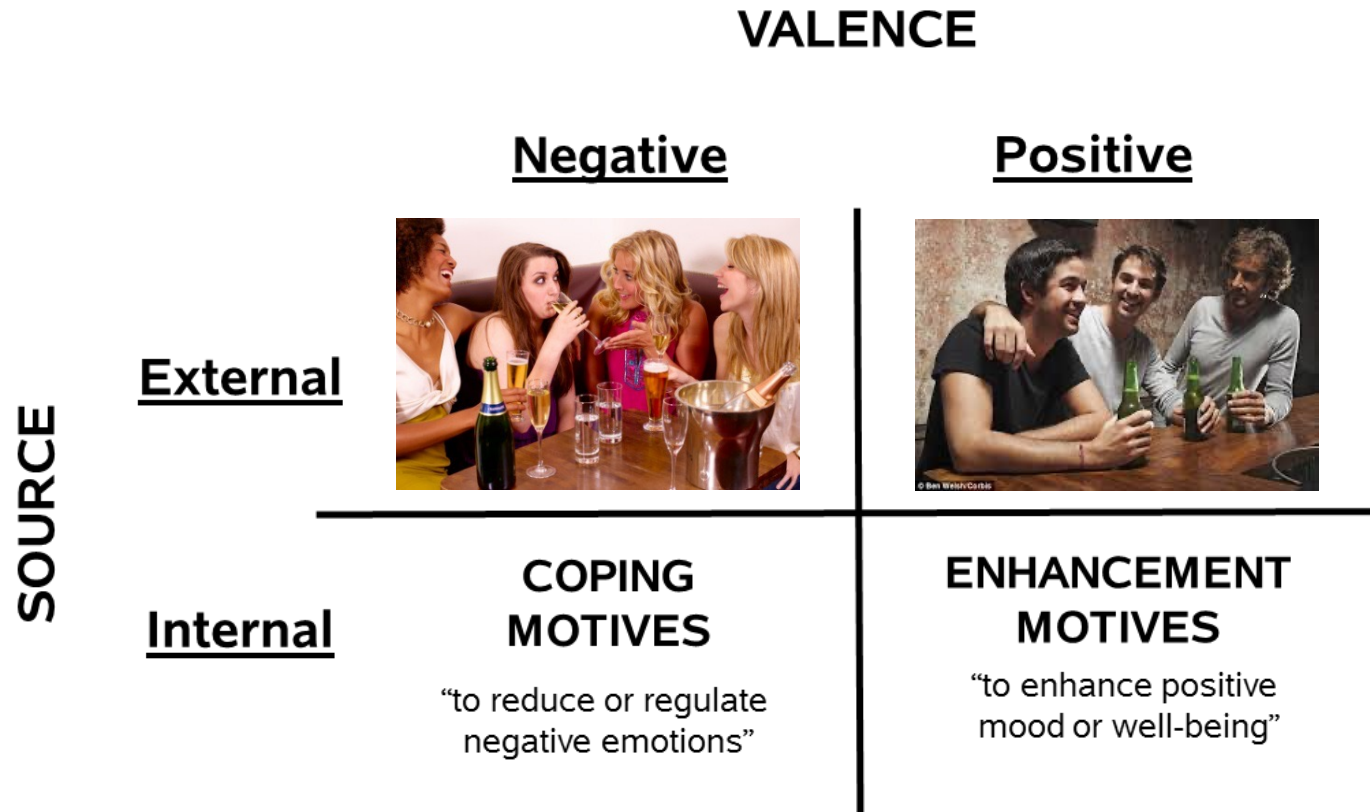


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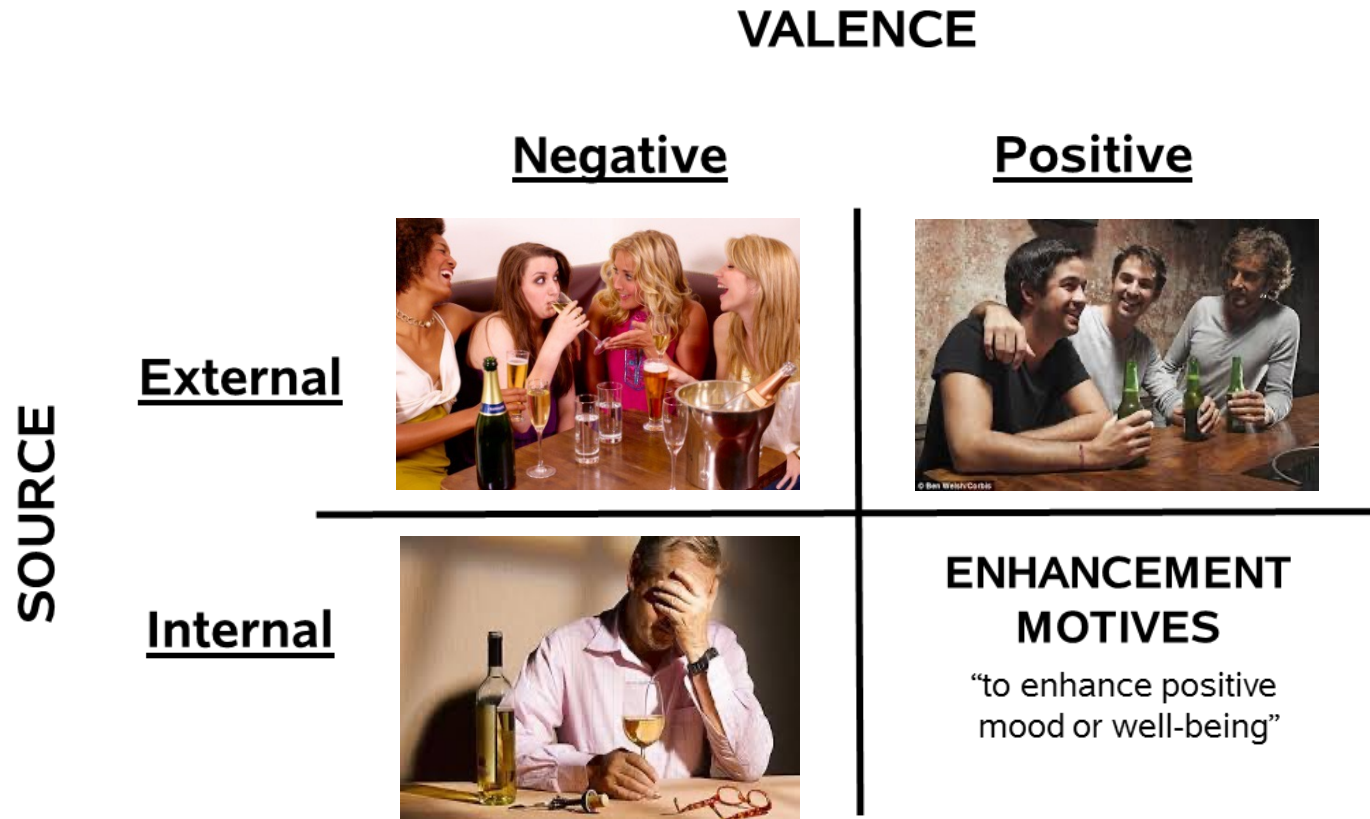
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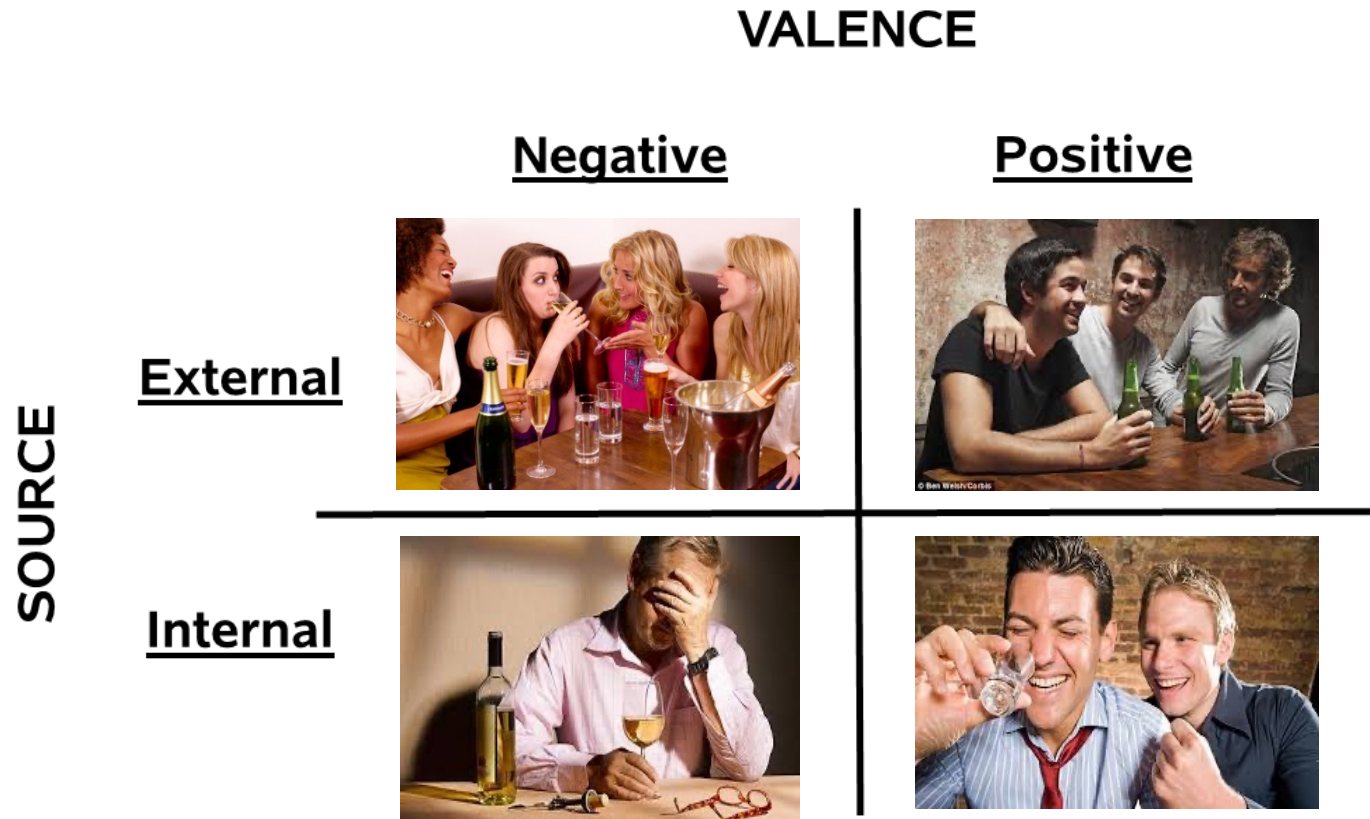


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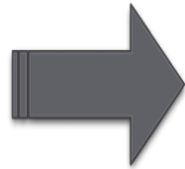
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# Enhancement Motives & Coping Motives

Coping  
Motives



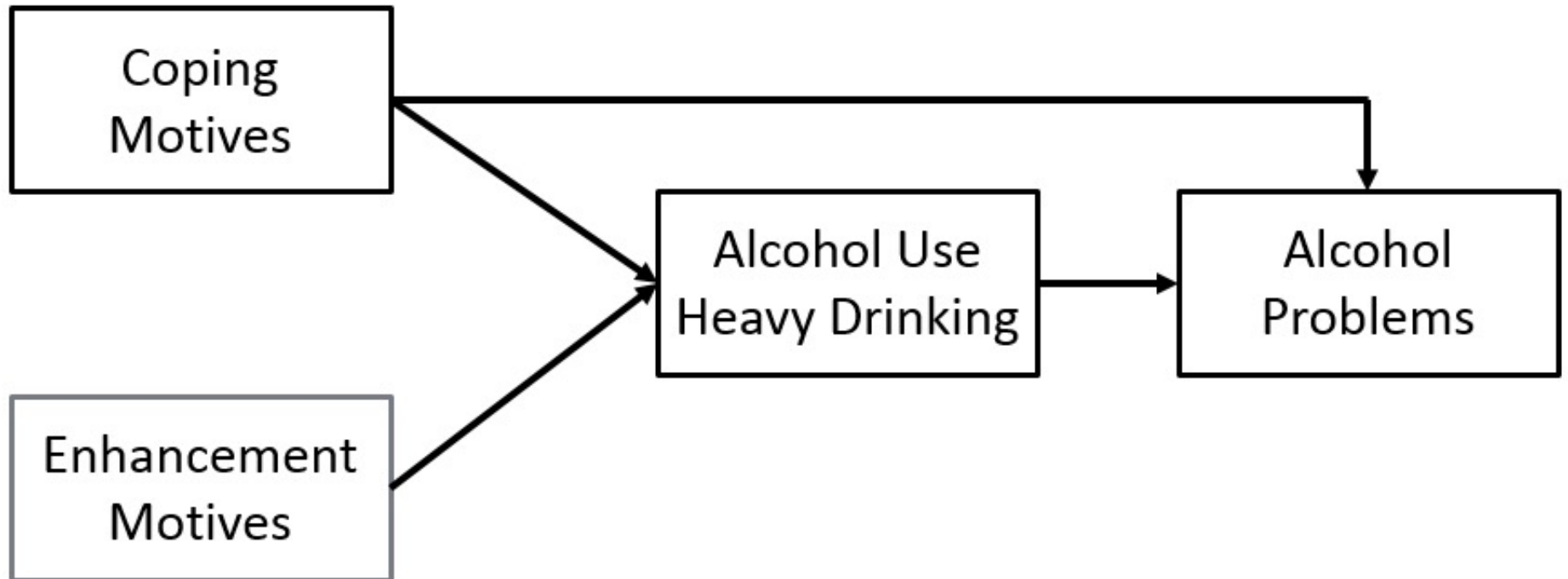
to avoid or alleviate negative effects of aversive and undesired internal (emotional) states (avoidance motivational process or negative reinforcement motivation)

Enhancement  
Motives



to enhance positive internal (emotional) experiences (approach motivational process or positive reinforcement motivation)

# Enhancement Motives & Coping Motives



Cooper, Frone, Russell, & Mudar, 1995

Cooper, Kuntsche, Levitt, Barber, & Wolf, 2015

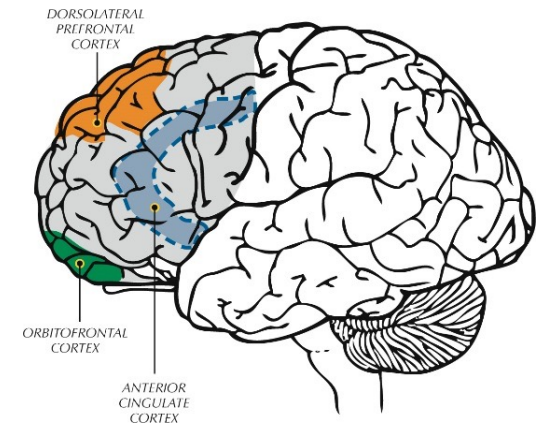
# **COGNITIVE SCIENCE PERSPECTIVE**

# Executive Functioning, Alcohol Use and Alcohol-related Problems

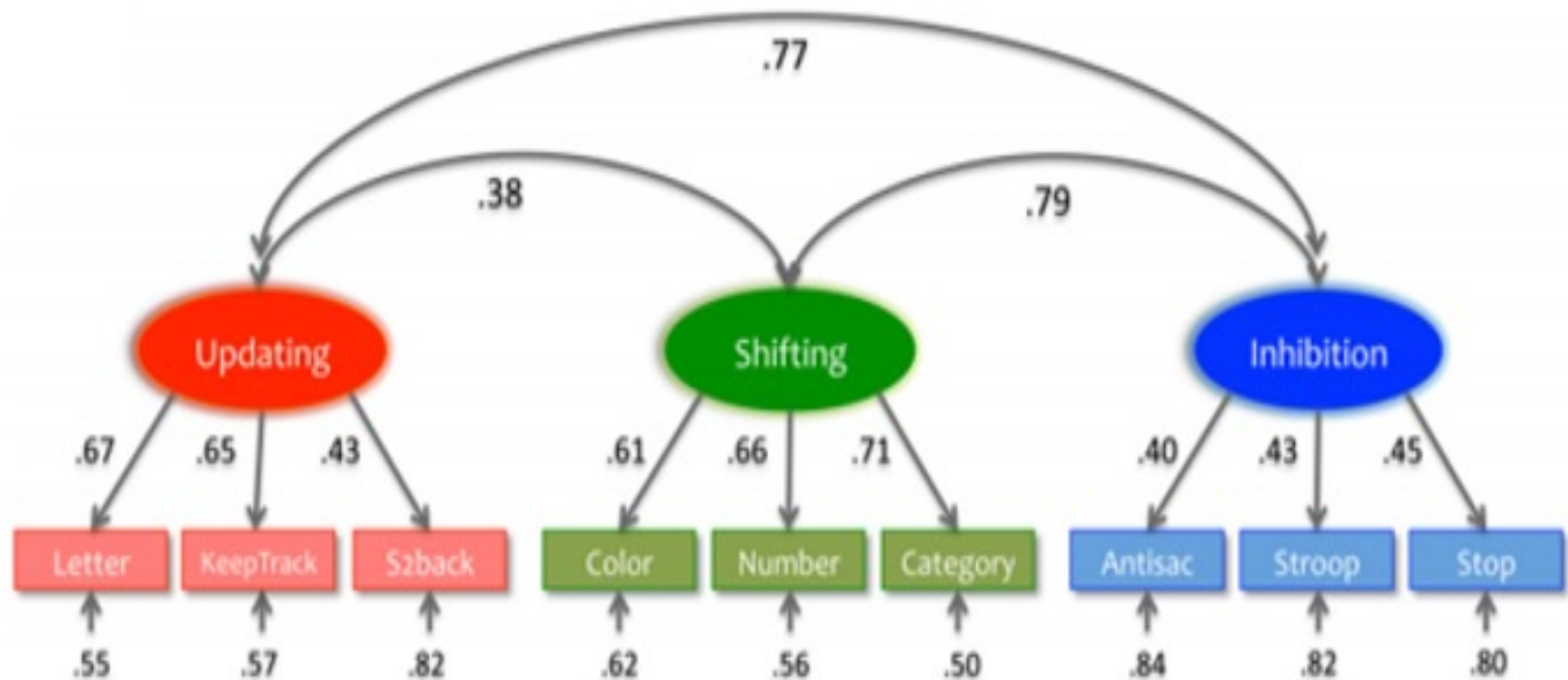
- Subtle premorbid impairment in executive cognitive functioning or cognitive control impairments may serve as a predisposing biological risk factor or vulnerability for heavy/problematic drinking and AUDs.
- Deficits in higher-level executive control as highly heritable neurocognitive endophenotype or intermediate phenotype factors that underlie and contribute to initiation and maintenance of heavy/problematic drinking and AUDs.

# Executive Functions (EFs)

- Executive functions (EFs) have been defined as higher-level cognitive control processes shown to reflect considerable genetic influences (Friedman et al., 2008; Miyake and Friedman, 2012). These processes are typically assumed to play a decisive role in the self-regulation processes.



# “Correlated factors” model and “Nested factors” model of EFs

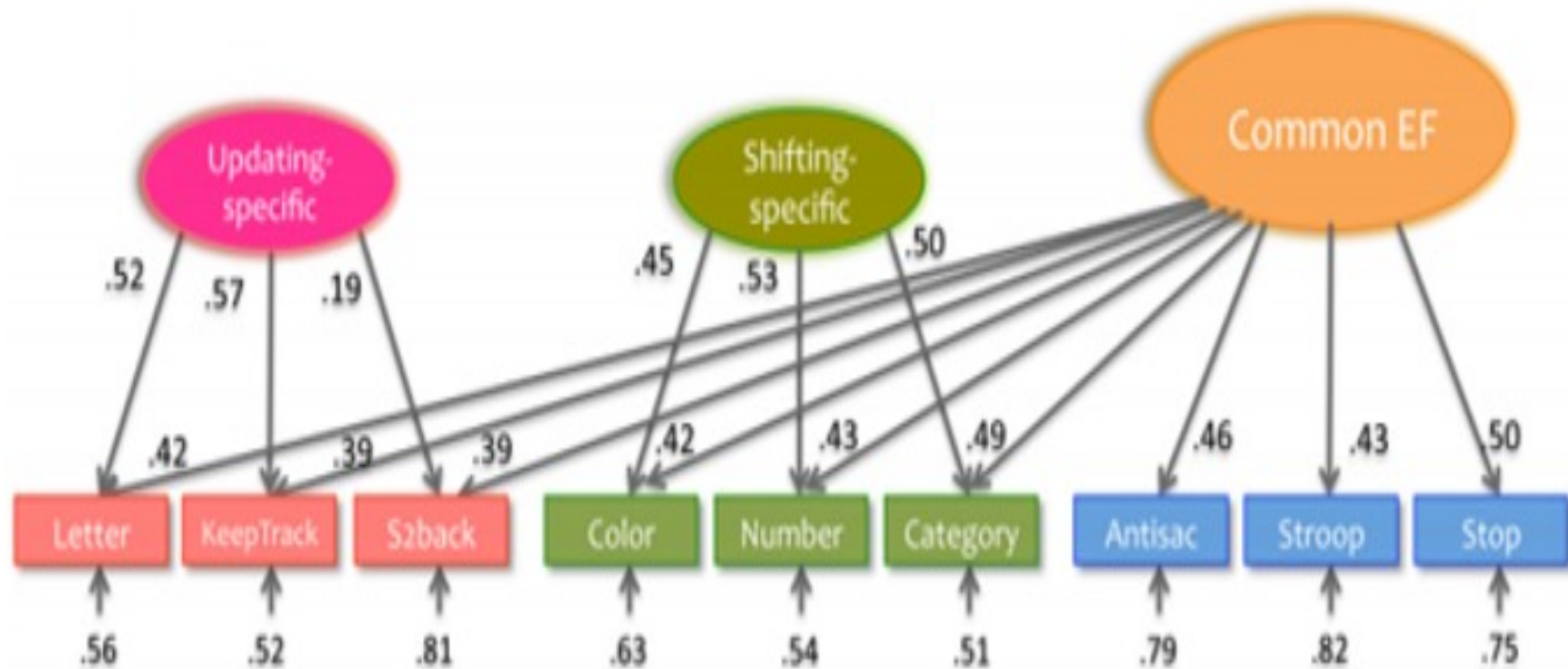


Miyake, 2000

Miyake & Friedman, 2012



# “Correlated factors” model and “Nested factors” model of EFs



# Deficits in Executive Functioning and Individual Differences in Alcohol-Related Behavior

- Deficits in inhibitory control ability have been shown:
  - To predict individual differences in the initiation of alcohol consumption (Peeters et al., 2015).
  - To predict the quantity and frequency of alcohol consumption (Fernie, Peeters, Gullo, Christiansen, Cole, Sumnall, & Field, 2013; Squeglia, Jacobus, Nguyen-Louie, & Tapert, 2014).
  - To predict heavy/problematic alcohol consumption prospectively (see Nigg, Wong, Martel, Jester, Puttler, Glass, Adams, Fitzgerald, & Zucker, 2006; Squeglia et al., 2014).

# Deficits in Executive Functioning and Individual Differences in Alcohol-Related Behavior

- Deficits in working memory updating have been shown:
  - To predict both initiation of alcohol consumption and heavy drinking (Peeters et al., 2015; Khurana et al., 2012).
  - To predict increased alcohol consumption (Khurana et al., 2012), as well as alcohol-related problems (Finn, 2002; Finn & Hall, 2004; Finn et al., 2009)
- Little is known about the effects of shifting ability due to the fact that no study has examined the association between shifting ability and alcohol use or heavy/problematic drinking.

# **OVERVIEW OF THE PRESENT STUDY AND HYPOTHESES**

# Overview of the Present Study and Hypotheses

- Enhancement motives are expected to strongly and positively predict heavy drinking, but fail to predict alcohol-related consequences after controlling for alcohol consumption.
- Coping motives are expected to strongly and positively predict alcohol-related consequences over and above heavy drinking.

# Overview of the Present Study and Hypotheses

- We anticipate that EFs will negatively predict heavy drinking and alcohol-related problems.

# Overview of the Present Study and Hypotheses

- To test whether individual differences in executive functions (EFs) interact with affective drinking motives to reliably predict alcohol involvement and heavy drinking, as well as alcohol-related consequences.

# Overview of the Present Study and Hypotheses

- “Once an individual has initiated drinking (and/or the use of other drugs) and as a result the appetitive motivation to use alcohol has increased (especially after exposure to drug cues), it becomes important whether he or she gives in to this impulse or controls it.” (Wiers et al., 2007, p. 271).



# Overview of the Present Study and Hypotheses

We expect that, in general, drinking motives will more strongly predict alcohol consumption, heavy drinking and alcohol-related consequences among individuals low versus high in cognitive control/EF, as determined by performance on standard laboratory measures of EF.

# **METHOD**

# Sample

- Baseline data from a large alcohol challenge experiment of the Midwest Alcoholism Research Center (MARC)
- 801 participants
  - Participants excluded because they had no valid data on EF tasks or missing data across all items from the drinking motives measure.
- The final sample included 729 participants
  - 50.8% men;
  - 89.4% Caucasian;
  - mean age = 23.11 years ( $SD = 2.60$ )

# Materials and Measures

- Drinking Motives Questionnaire-Revised (Cooper, 1994):
  - Enhancement and coping motives
    - 1 = strongly disagree to 4 = strongly agree
    - “I drink because it helps me when I feel depressed or nervous.”
    - “I drink because it gives me a pleasant feeling.”
- Alcohol use:
  - Quantity and frequency of alcohol use during the past 3 months
    - “How often have you had some kind of beverage containing alcohol?”
    - “When you were drinking alcohol, how many drinks did you usually have on any one occasion?”

# Materials and Measures

- Heavy drinking:
  - Frequency of heavy drinking during the past 30 days
    - How many times in the past 30 days did you get a little buzzed or light-headed on alcohol?”
    - “How many times in the past 30 days did you get drunk (e.g., speech was slurred or unsteady on your feet) on alcohol?”
    - “In the past 30 days how many times have you had five or more drinks in a single sitting?”
    - “ In the past 30 days, how many times have you had twelve (12) or more drinks at a single sitting?”
    - 0 = none to 8 = every day.

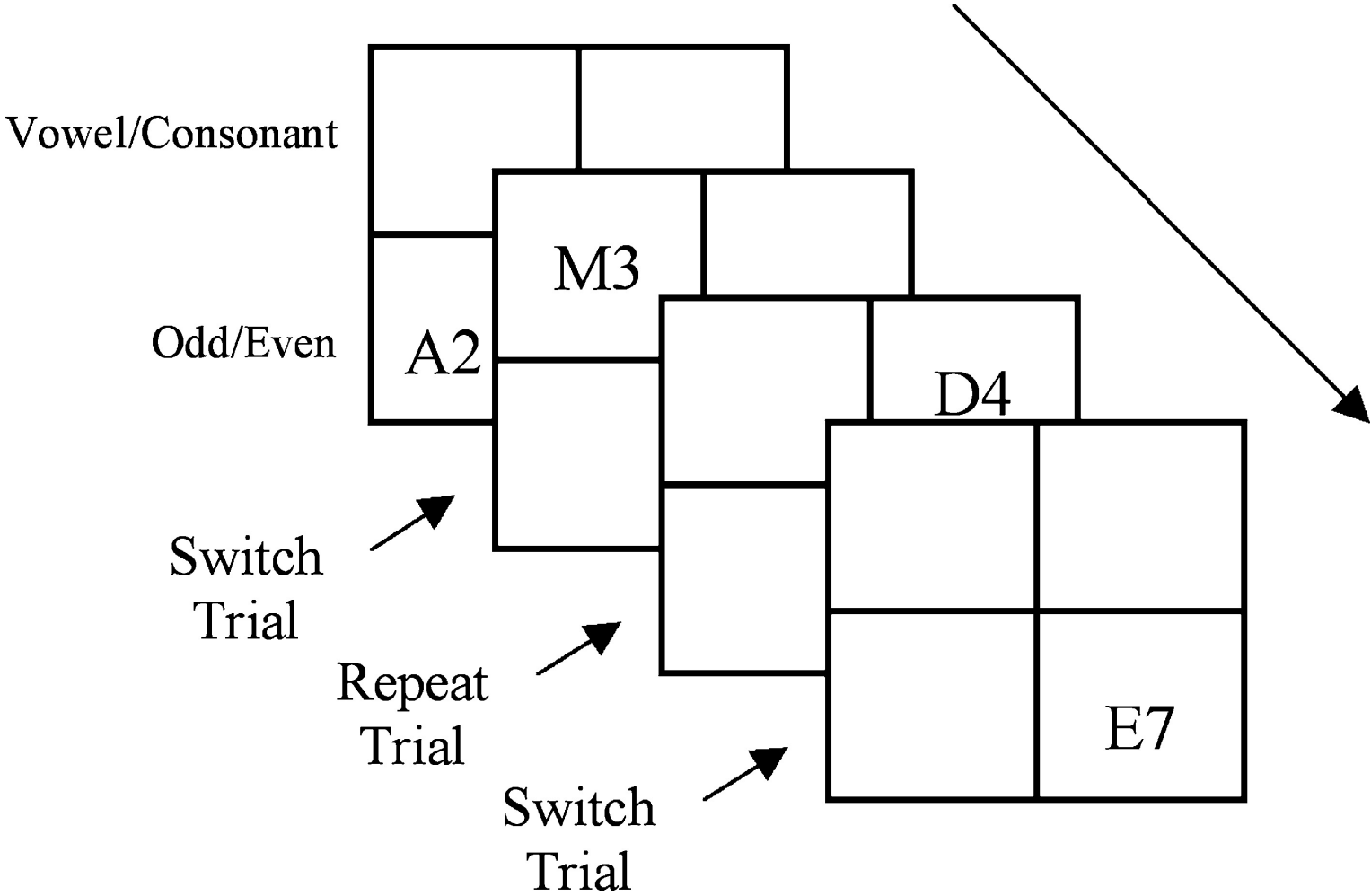
# Materials and Measures

- Negative alcohol-related consequences :
  - 24 items Young Adult Alcohol Problems Screening Test
    - “Have you ever lost friends, including girlfriends and boyfriends, because of your drinking?”
    - “Have you ever felt physically or psychologically dependent on alcohol?”
    - “Never,” “Yes, but not in the past year,” “Yes, in the past year but not the past three months,” “Yes, in the past three months: once; twice; three times, or four times”

# Materials and Measures

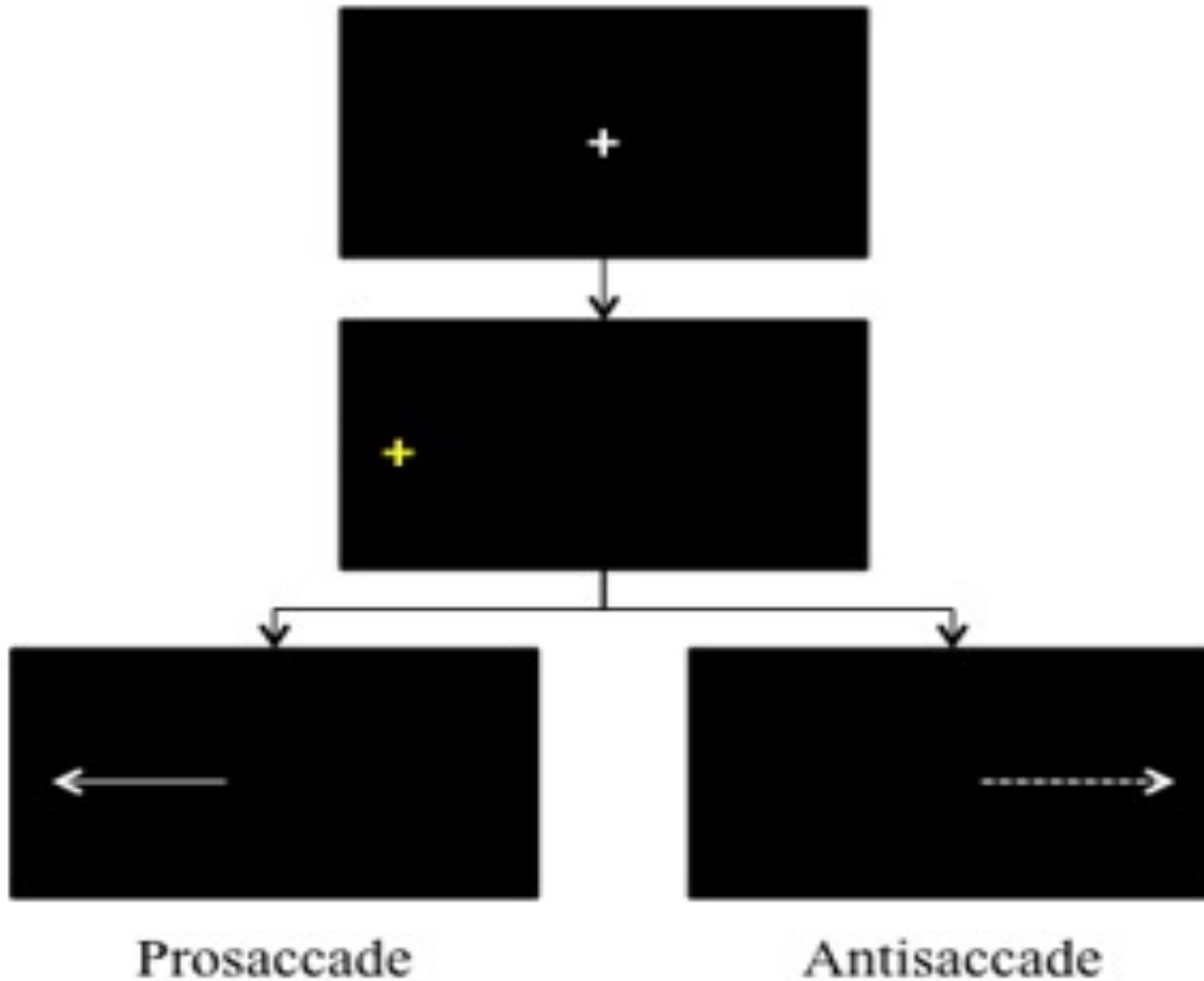
- Executive functions tasks
  - Working Memory Updating:
    - Spatial 2-back; Keep track; Letter memory
  - Inhibition:
    - Antisaccade; Stop-signal; Stroop
  - Task-switching:
    - Color-shape; Category switch; Number-letter

# Number-letter (Shifting)





# Antisaccade (Inhibition)



## Letter memory (Updating )

'A' ..., 'AB' ..., 'ABC' ..., 'ABCD' ..., 'BCDE' ...

"???"

...

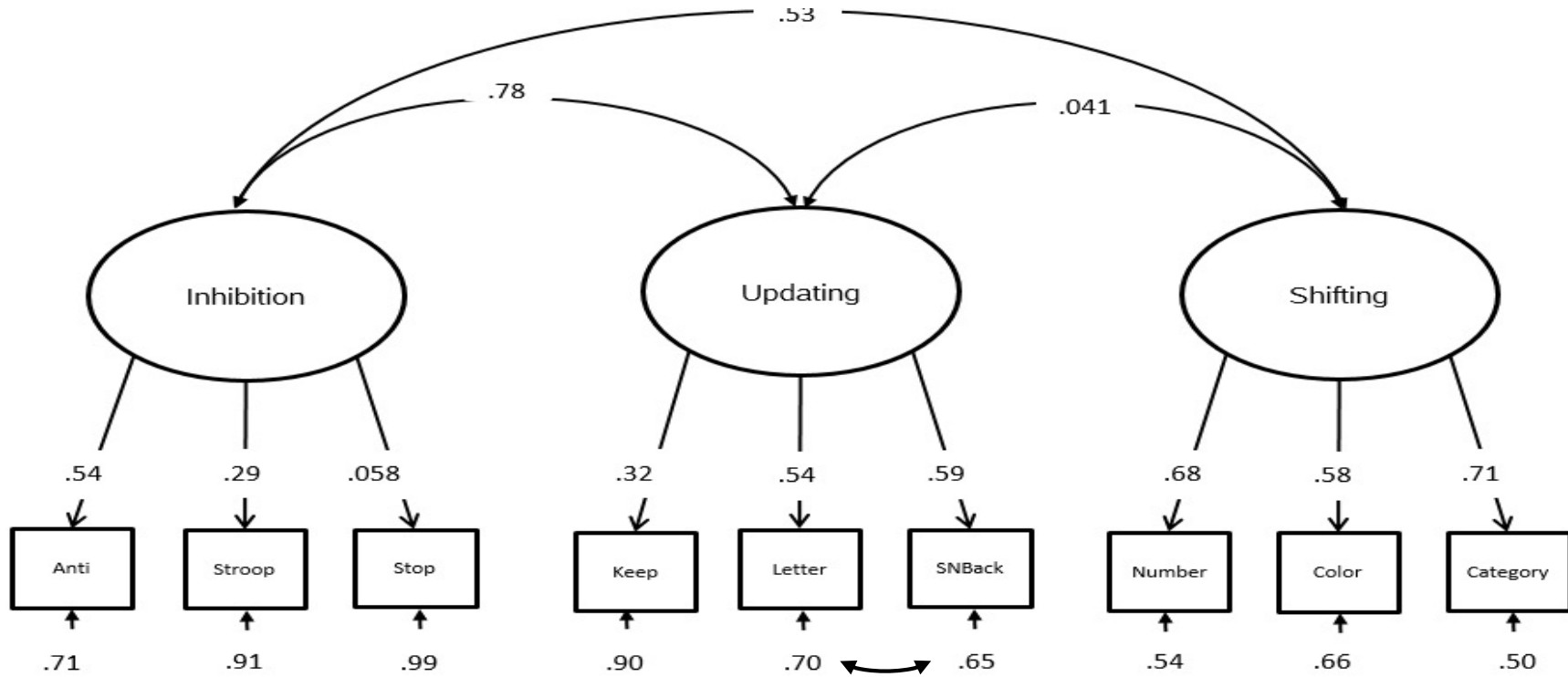
# **DATA ANALYTIC APPROACH**

# Data Analytic Approach

- Latent variable models – stepwise estimation approach
  - Measurement models:
    - Correlated and “nested” factors EF model
    - Two-factor motives model
    - Heavy drinking model
  - Baseline null comparison model
  - Interaction models:
    - 12 individual latent interaction models

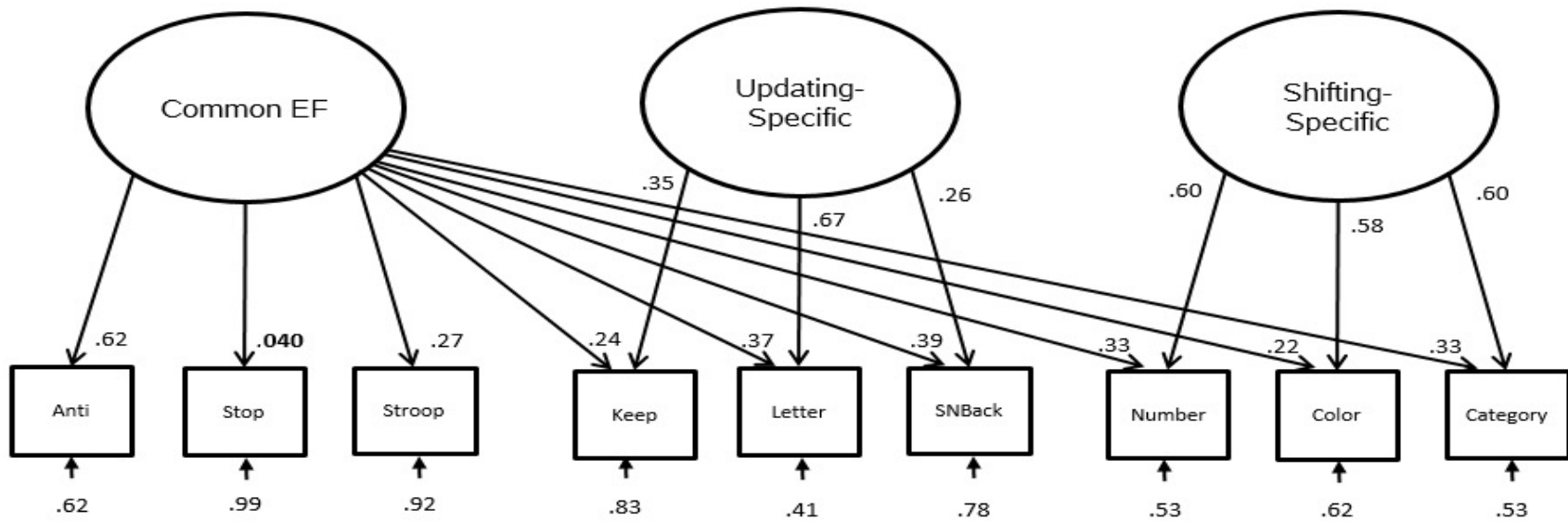
# RESULTS

# Measurement Models



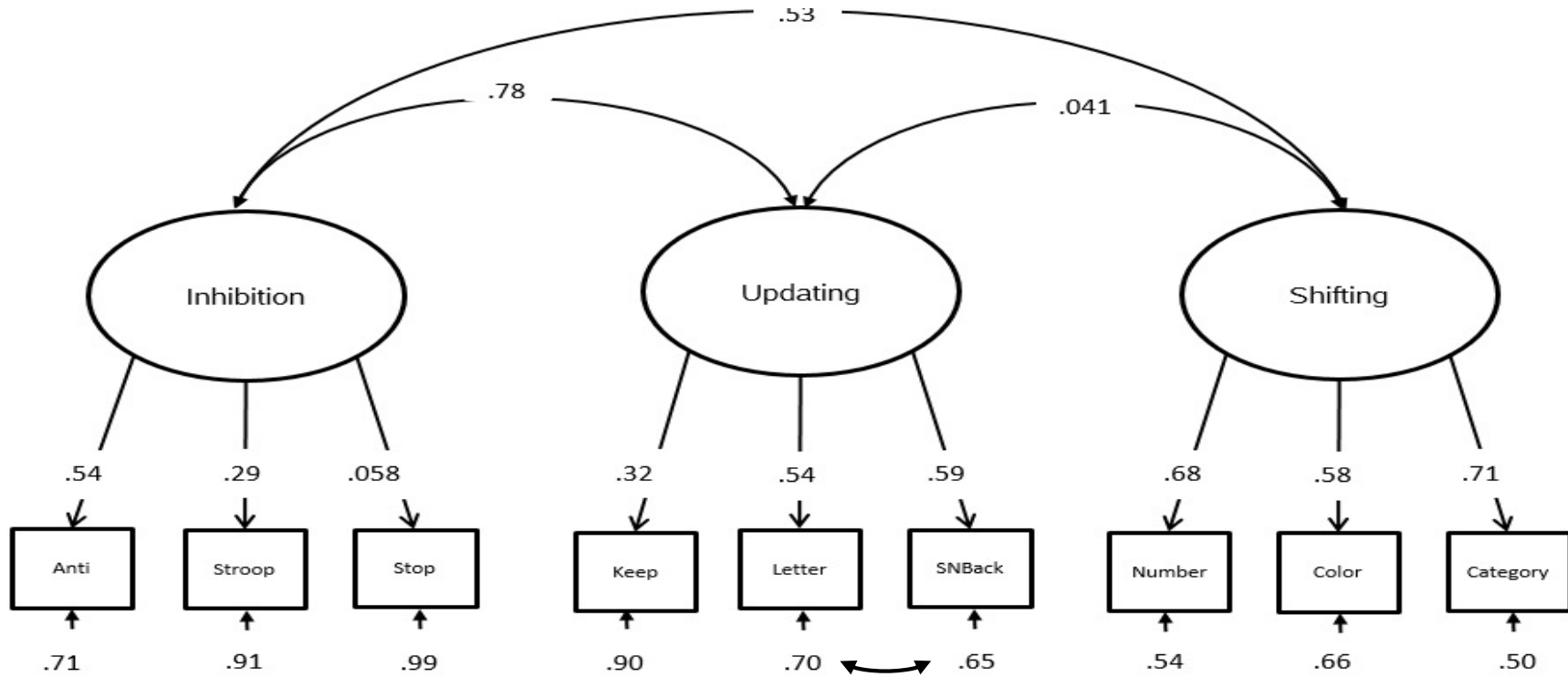
$\chi^2(22) = 36.73, p < .001, CFI = .98, TLI = .97, RMSEA = .029, SRMR = .026.$

# Measurement Models



$\chi^2(21) = 56.64, p < .001, CFI = .95, TLI = .91, RMSEA = .048, SRMR = .037.$

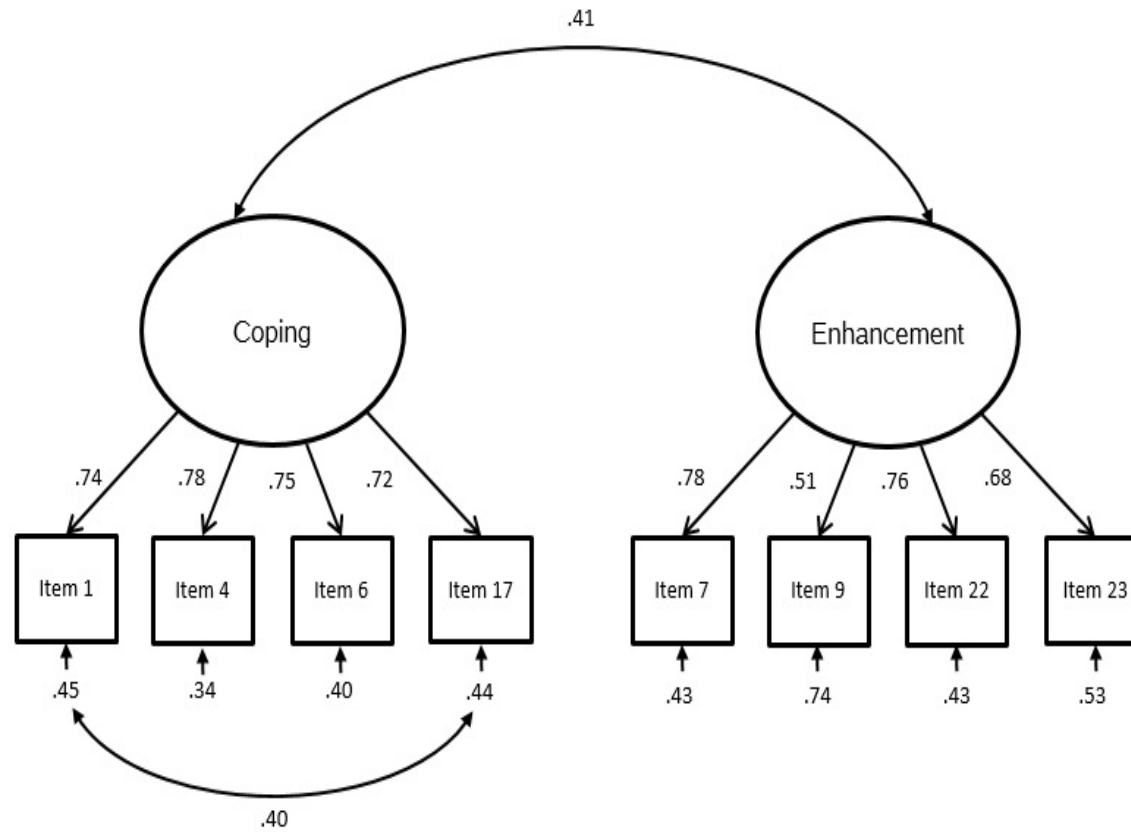
# Measurement Models



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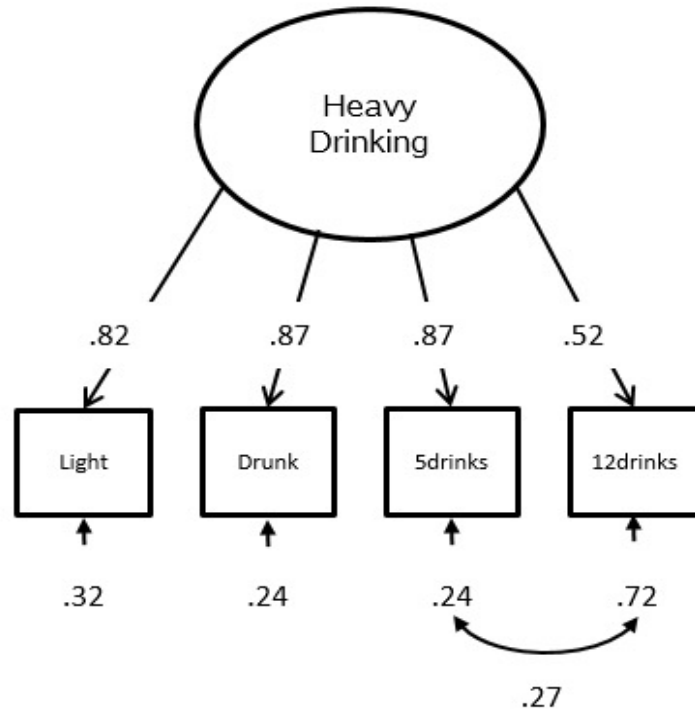


# Measurement Models



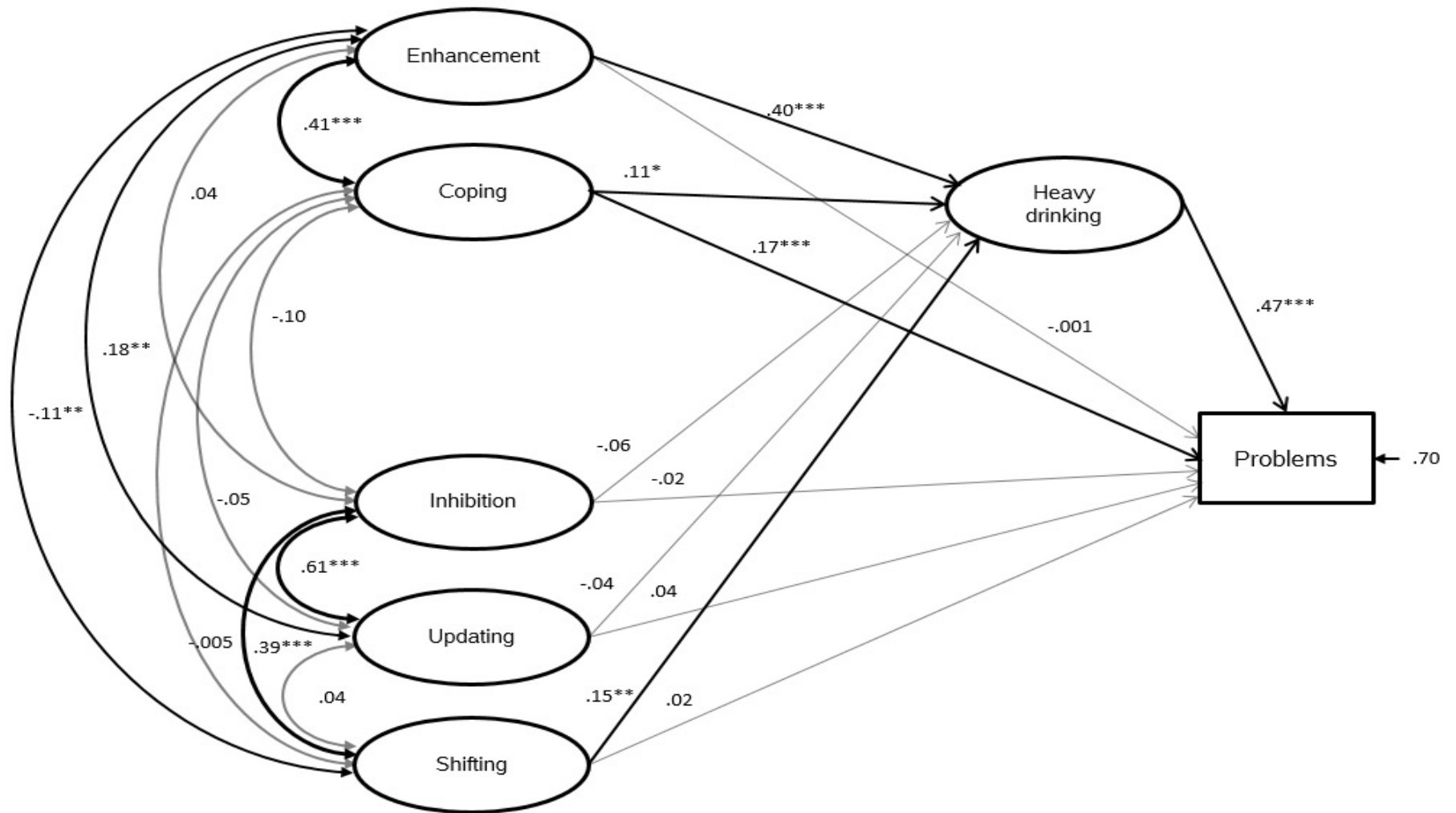
$\chi^2(18) = 51.94, p < .001, CFI = .98, TLI = .97, RMSEA = .051, SRMR = .027.$

# Measurement Models



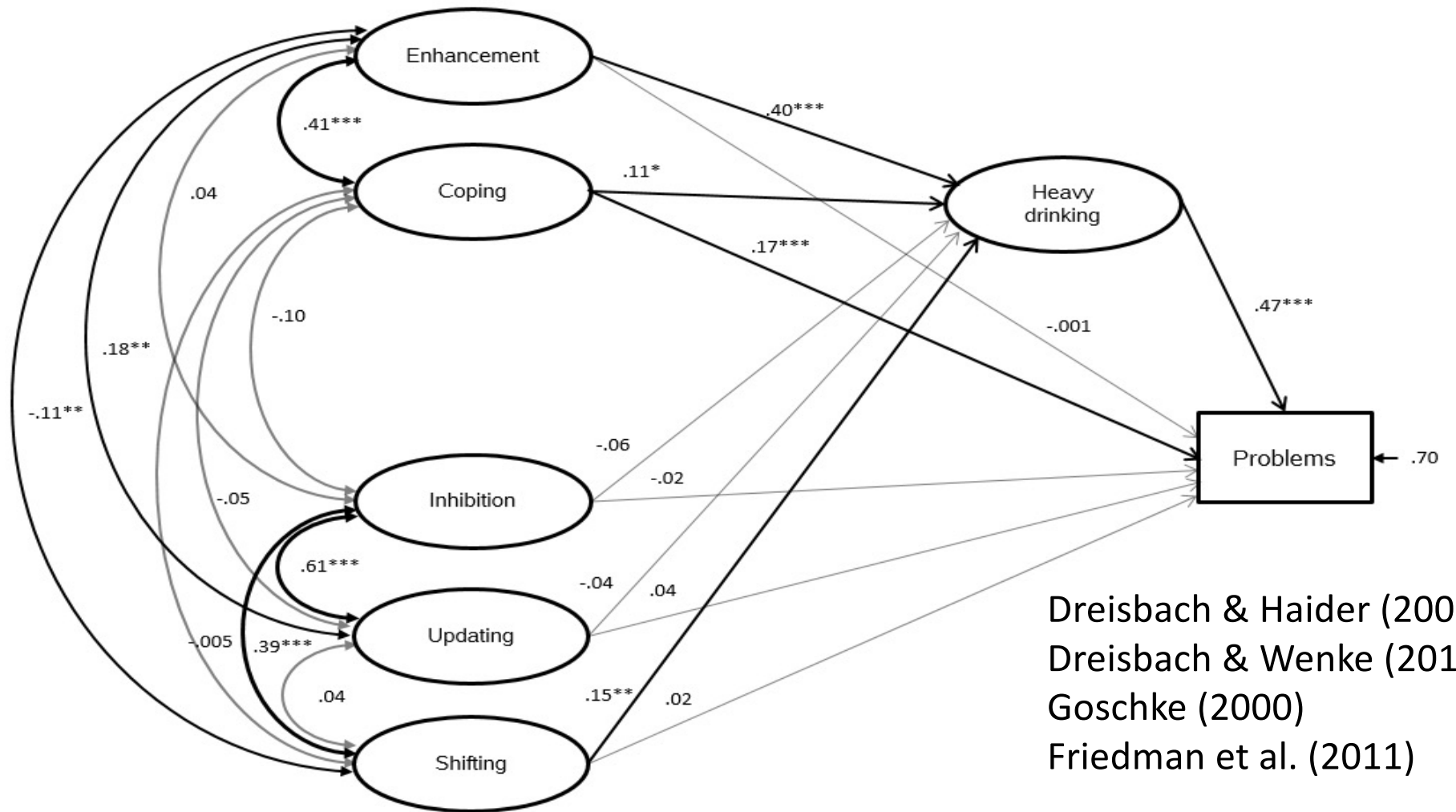
$\chi^2(18) = 3.10, p < .078, CFI = .99, TLI = .99, RMSEA = .054, SRMR = .008.$

# Null Comparison Baseline Model (Alcohol use)



$\chi^2(201) = 246.10, p < .001, CFI = .95, TLI = .94, RMSEA = .040, SRMR = .037.$

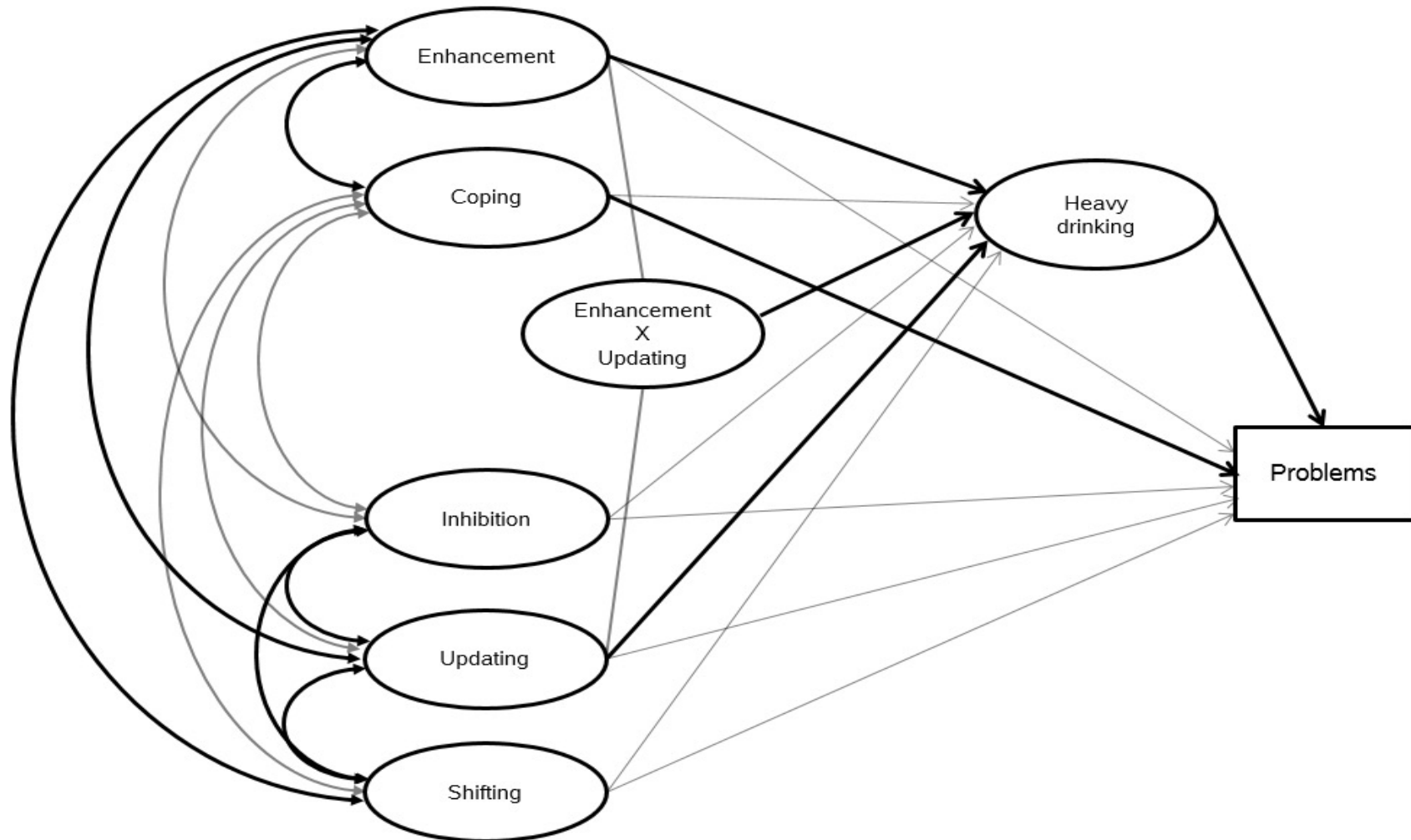
# Null Comparison Baseline Model (Alcohol use)



Dreisbach & Haider (2008)  
 Dreisbach & Wenke (2011)  
 Goschke (2000)  
 Friedman et al. (2011)

$\chi^2(201) = 246.10, p < .001, CFI = .95, TLI = .94, RMSEA = .040, SRMR = .037.$

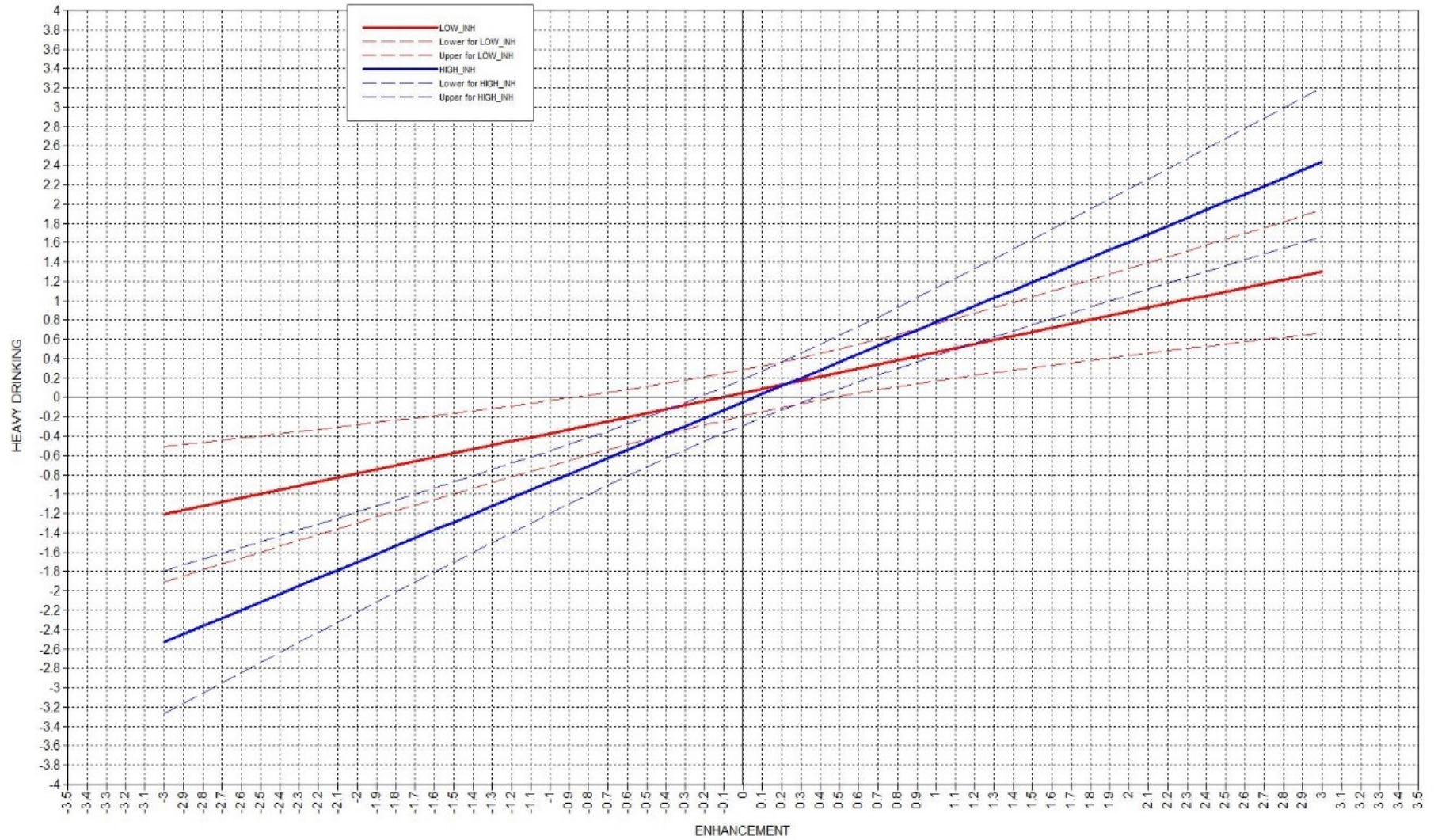
# Null Comparison Baseline Model (Alcohol use)



# Interaction Models

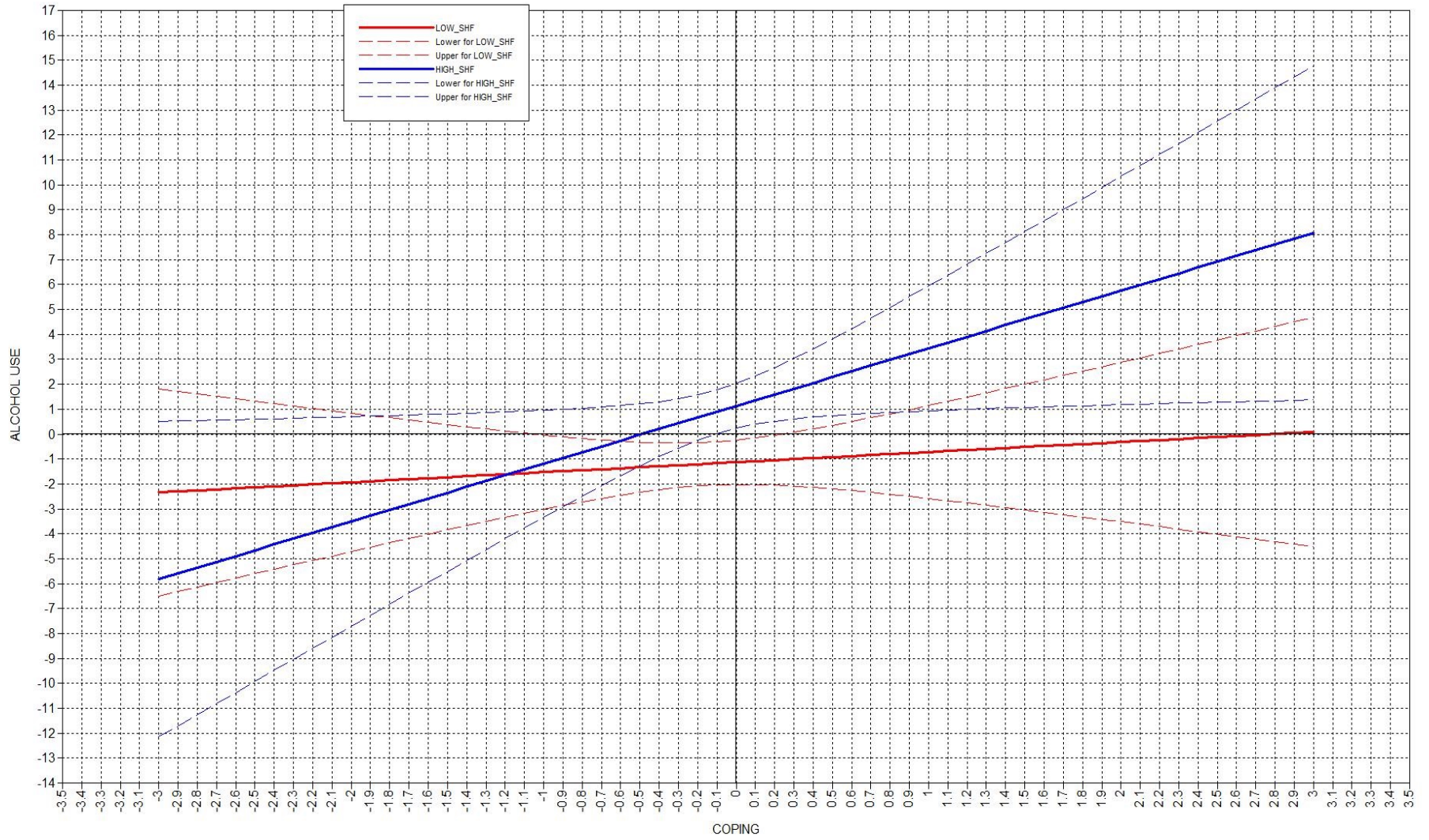
		Mplus output			
		Estimate	SE	Est./SE	p-value
<b>Heavy Drinking</b>					
	Enhancement x Inhibition	0.205	0.077	2.654	0.008
	Enhancement x Updating	0.101	0.081	1.252	0.211
	Enhancement x Shifting	0.067	0.064	1.049	0.294
	Coping x Inhibition	0.044	0.071	0.62	0.536
	Coping x Updating	-0.054	0.078	-0.697	0.486
	Coping x Shifting	0.089	0.06	1.49	0.136
<b>Alcohol Problems</b>					
	Enhancement x Inhibition	0.077	0.666	0.115	0.908
	Enhancement x Updating	0.167	0.527	0.317	0.751
	Enhancement x Shifting	0.546	0.361	1.513	0.130
	Coping x Inhibition	0.286	1.632	0.175	0.861
	Coping x Updating	-1.213	2.11	-0.575	0.565
	Coping x Shifting	1.038	0.361	2.875	0.004

# Interaction Models



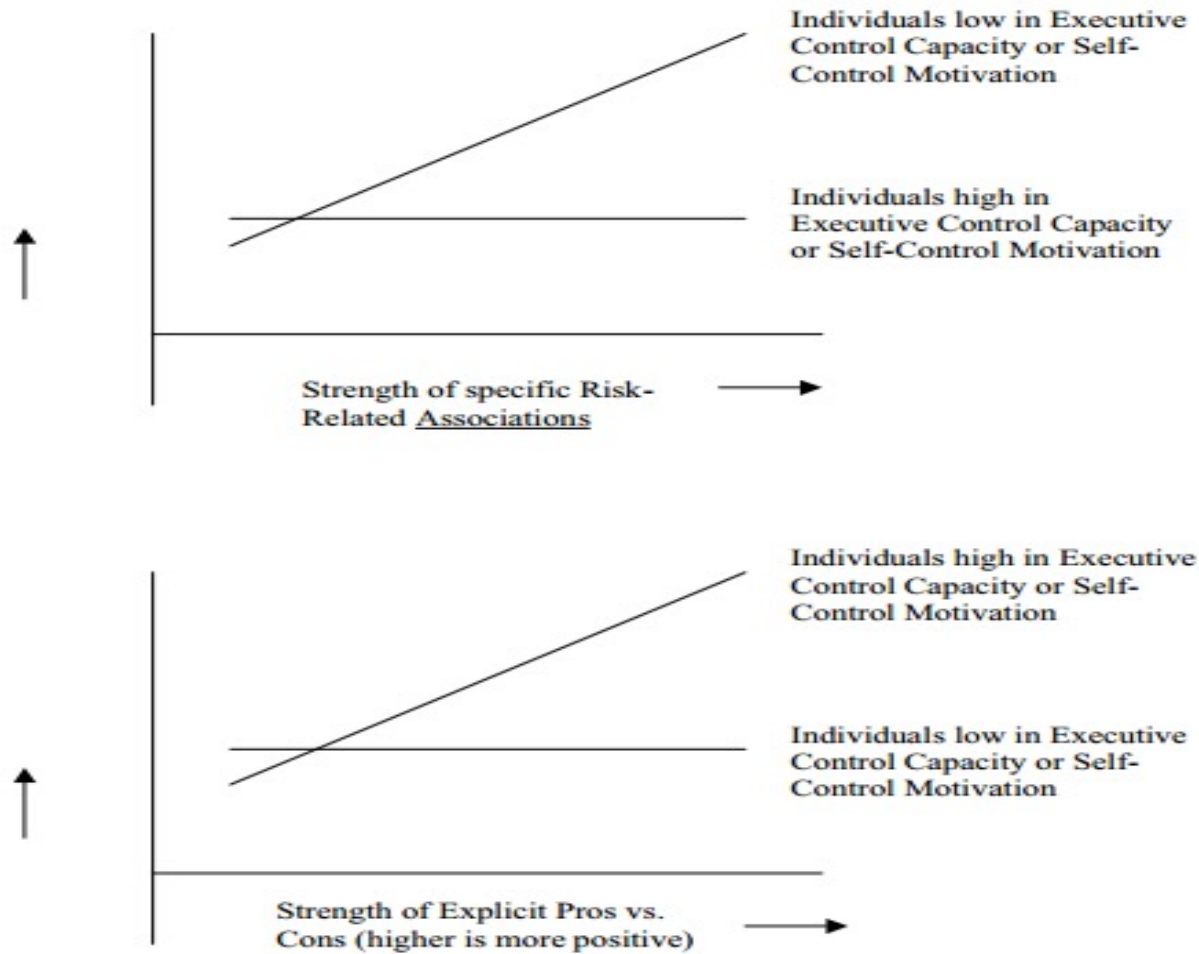


# Interaction Models

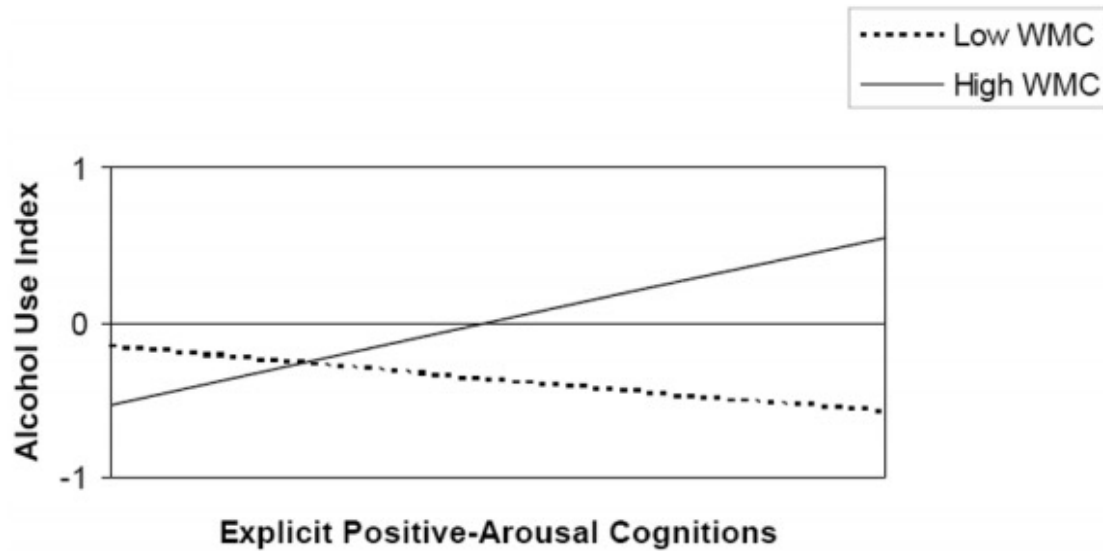
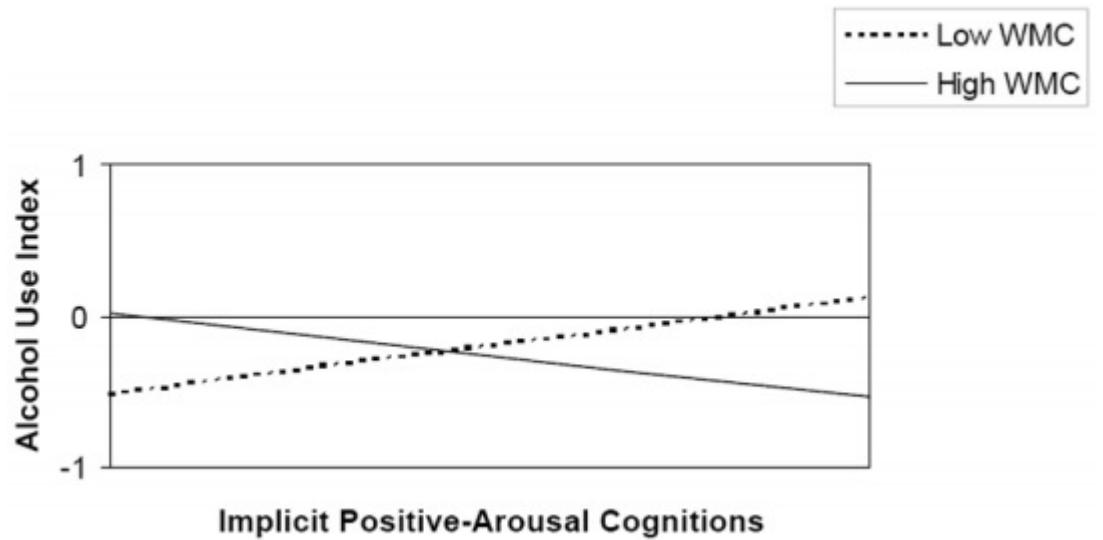




# Implicit vs. Explicit alcohol cognitions



# Implicit vs. Explicit alcohol cognitions



# Implicit vs. Explicit alcohol cognitions

How often do you drink because you like the feeling?

How often do you drink because it's exciting?

How often do you drink to get high?

How often do you drink because it gives you a pleasant feeling?

How often do you drink because it's fun?

How often do you drink to forget your worries?

How often do you drink because it helps you when you feel depressed or nervous?

How often do you drink to cheer up when you're in a bad mood?

How often do you drink because you feel more self-confident or sure of yourself?

How often do you drink to forget about your problems?

Drinking alcohol makes me feel excited.

Drinking alcohol makes me feel energetic.

Drinking alcohol makes me feel busy.

Drinking alcohol makes me feel lively.

Drinking alcohol makes me feel wild.

Drinking alcohol makes me feel relaxed.

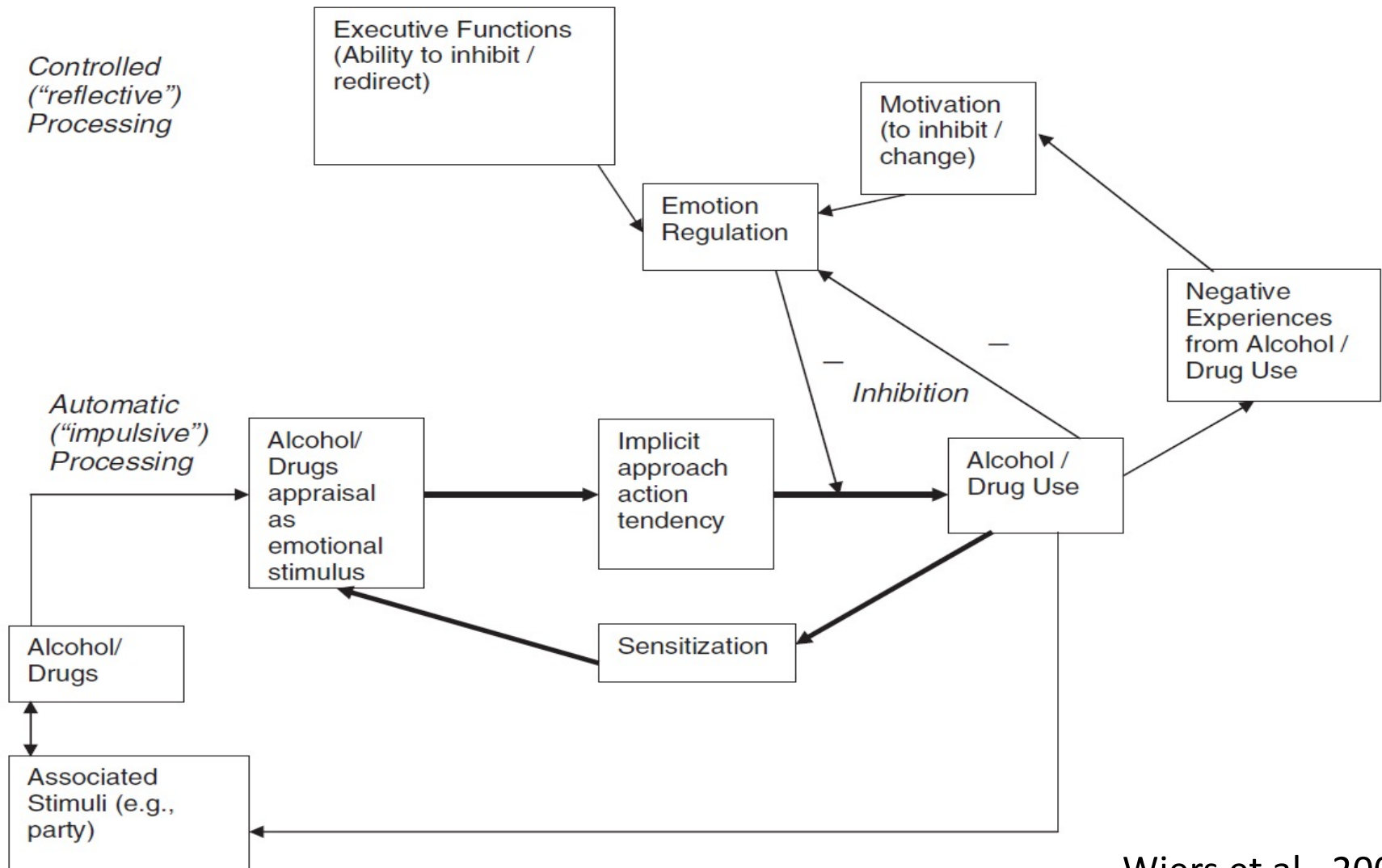
Drinking alcohol makes me feel clam.

Drinking alcohol makes me feel chill.

Drinking alcohol makes me feel tranquil.

Drinking alcohol makes me feel comfortable.

# Dual-process model of addiction



Wiers et al., 2007  
Wiers & Stacy, 2006

**TAKE HOME MESSAGE**

## Take home message

- Both enhancement motives and coping motives positively predict heavy drinking.
- Coping motives directly and positively predict alcohol-related negative consequences over and above alcohol use.
- The effects of enhancement motives on alcohol-related consequences were entirely mediated by heavy drinking.
- Shifting had small effect on heavy drinking, but Inhibition and Updating had no effect on either heavy drinking and alcohol-related consequences.

## Take home message

- Meaningful results!?
  - 2 out 12 interactions tested
  - The nature of the interactions was opposite to the predicted pattern
  - Results did not replicate for alcohol use

# **FUTURE DIRECTIONS**



# Follow-up

- Potentials benefits of “switch costs” (less shifting ability) for shielding attention from the interference of irrelevant information (Dreisbach & Haider, 2008; Dreisbach & Wenke 2011; Goschke, 2000)
- Are individuals high in shifting ability (larger “switch costs) more easily distracted or less able to shield their attention from the interference of tempting stimuli
  - Effects of shifting ability on attention bias for alcohol cues

**Questions?**