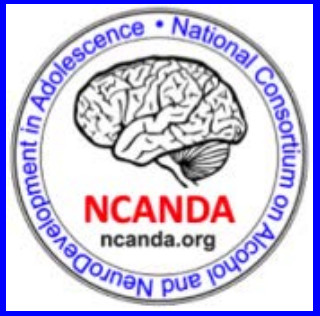
NCANDA Symposium
APA May 24, 2017



Executive Functioning Deficits and Problem Drinking

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NCANDA Executive Function Assessment

Problems with executive functioning in everyday life

- **Behavior Rating Inventory of Executive Function**

Performance-based cognitive tests

- **Attention: Continuous Performance Test**
- **Working memory: Short Fractal N-Back Test**

Delay Discounting task

fMRI Antisaccade Task: **Pittsburgh & Duke sites**

Behavior Rating Inventory of Executive Function

- 80 self-report items: often, sometimes, never
- Age adjusted t-scores: higher is worse
- Validity: inconsistency, extreme responses
  - 4 subjects with invalid scores were excluded

Global Executive Composite [GEC]

Behavioral Regulation	*Metacognition*
Inhibitory Control	Working Memory
Shift: Behavior/Cognition	Tasks: Plan
Emotional Control	Tasks: Organize
Monitoring	Tasks: Complete

Behavior Rating Inventory of Executive Function

Face validity: Example items

Behavioral Regulation

Inhibitory Control: “I have trouble waiting my turn.”

Shift: Behavior/Cognition: “I get upset by a change in plans.”

Emotional Control: “I have angry outbursts.”

Monitoring: “I don’t know when my actions bother others.”

Metacognition [Task Efficiency]

Working Memory: “I forget instructions easily.”

Tasks: Plan “I start projects without the right materials.”

Tasks: Organize “My desk/workspace is a mess.”

Tasks: Complete “I have problems completing my work.”

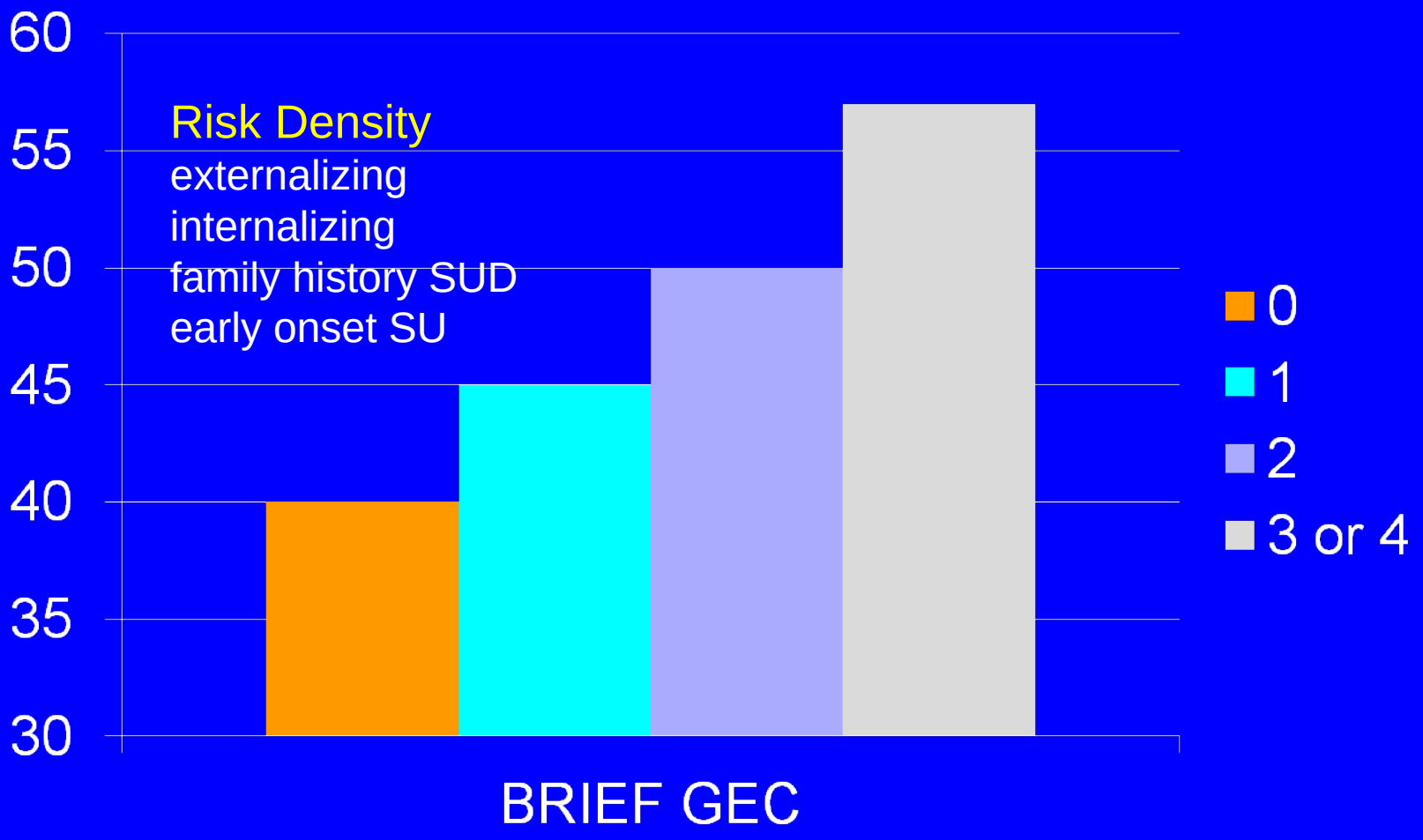
BRIEF GEC correlations

Concurrent Validity	r
UPPS Premeditation (lack of)	.44***
UPPS Perseverance (lack of)	.33***
UPPS Urgency (positive)	.45***
UPPS Urgency (negative)	.48**
UPPS Sensation Seeking	.10

Stability	
GEC BL x GEC 1 yr FU	.71***

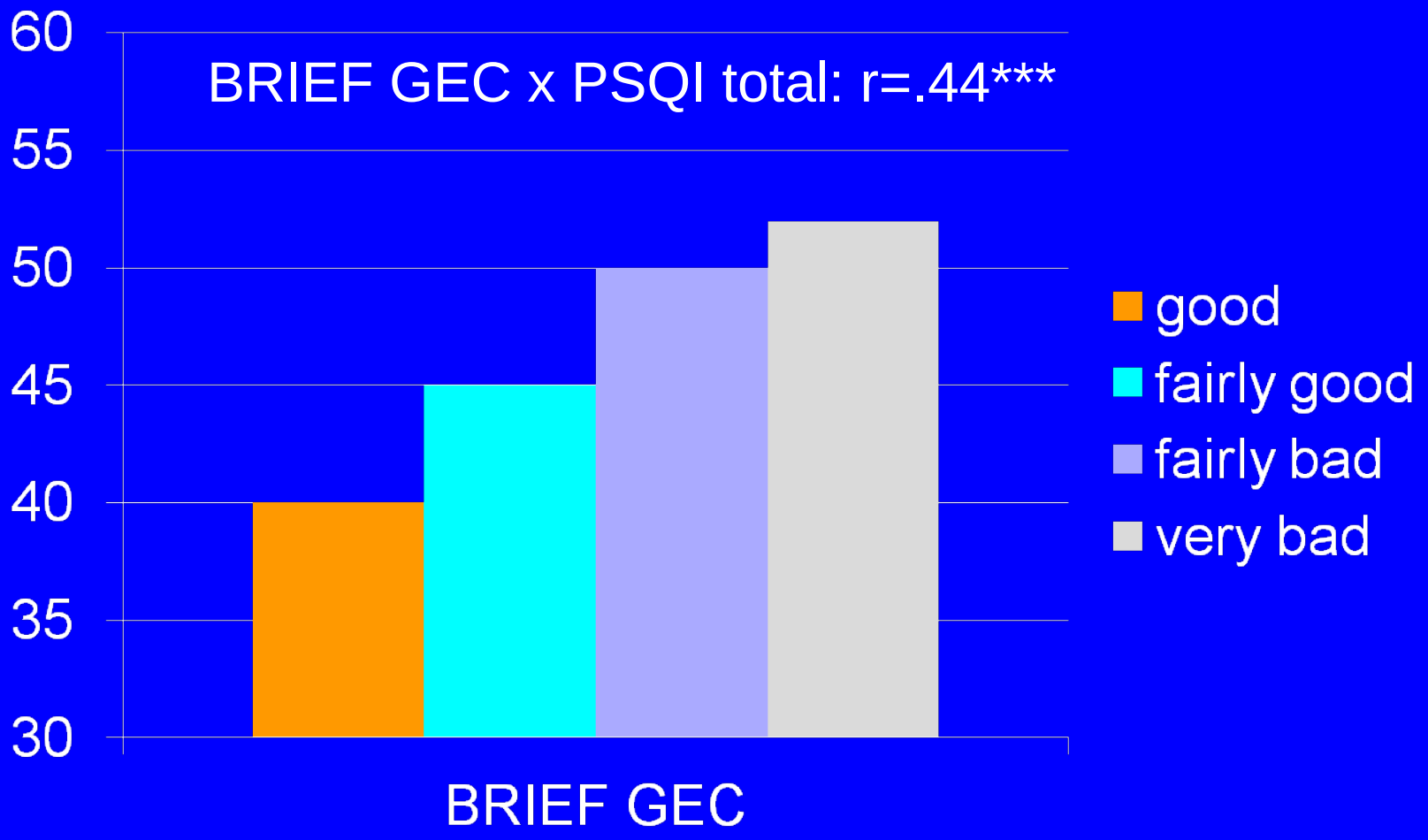
p: *<.05; **<.01; **<.001

Higher Risk Density & Worse Executive Functioning



F=52.3, df 3,727, p<.001; covariates: age, sex, SES; s.d.= 10;
see Brown et al. 2015 J Studies Alc Drugs for NCANDA Risk definition

Poorer Sleep Quality & Worse Executive Functioning



F=28.3, df 3,724, p<.001: covariates: sex, age, SES

Life Events Questionnaire

- 67 self-report items: yes or no
- Items classified by
  - Uncontrollable or controllable
  - Discrete or chronic
  - Positive or negative
- Composite Scales, e.g.
  - Negative Uncontrollable
  - Negative Controllable
  - Negative Composite

Life Events Questionnaire

Example items …during the past year…

Discrete Negative Uncontrollable: “My parents divorced…”
Discrete Negative Controllable: “…I ran away from home”
Chronic Negative Uncontrollable: “my parent had problems at work”
Chronic Negative Controllable: “…arguments with my parents…”
Discrete Ambiguous Uncontrollable: “Our family moved…
Discrete Positive Controllable: “I received a special award…”

BRIEF GEC x LEQ correlations

	r
Discrete Negative Uncontrollable	.19***
Chronic Negative Uncontrollable	.22***
Discrete Negative Controllable	.25***
Chronic Negative Controllable	.41***
Negative Composite	.39***
Discrete Positive Controllable	-.13***

p: *<.05; **<.01; **<.001; covariates: age, sex, SES

NCANDA Cognitive Performance Tests

Attention: Continuous Performance Test

Working Memory: Short Fractal N-Back Test

Emotion: Emotion Recognition; Differentiation

General Ability: Vocabulary, Reading, Math

Summary scores: accuracy & speed (*z* scores)

Sullivan et al. (2016) Neuropsychology 30 (4): 449-473

BRIEF x cognitive test correlations

BRIEF GEC	accuracy	speed
Attention	-.05	-.03
Working Memory	.02	-.01
Emotion	.02	.08
General Ability	-.04	.05

[p: *<.05; **<.01; **<.001; Covariates: age, sex, SES]

BRIEF x Delay Discounting

Delay Discounting: Expressed preference for smaller amount today vs larger amount later

BRIEF scale	$100	$1000
Inhibitory Control	.10*	.12**
Flexibility	.06	.07
Task Organization	.03	.01
Task Completion	.04	.04

[p: *<.05; **<.01; **<.001; Covariates: age, sex, SES]

Sullivan et al. (2016) Neuropsychology 30 (4): 449-473

BRIEF x MR structural: gray indices

	BRIEF GEC		
	volume	thickness	surface area
Frontal	-.04	-.05	-.01
Temporal	-.01	-.03	.02
Parietal	-.02	-.03	.01
Occipital	-.05	-.03	-.02
Cingulate	-.05	-.04	-.02
Insula	-.04	-.07*	-.02
TOTAL	-.04	-.06	.00

p: *<.05; **<.01; **<.001; Covariates: age, SES

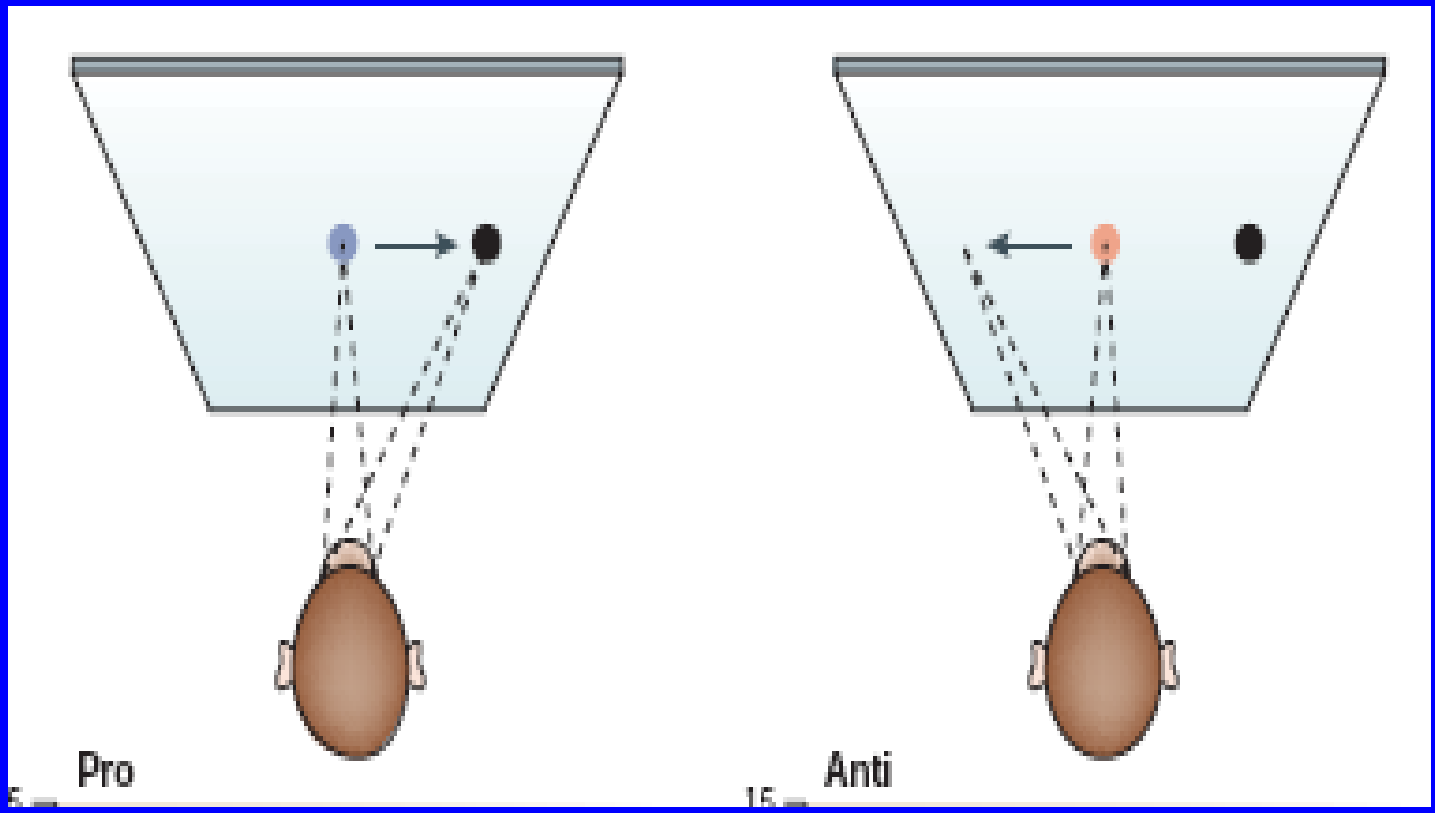
BRIEF x DTI indices: association fibers

	BRIEF GEC			
Fasciculi	FA	MD	L1	LT
Superior longitudinal	-.07	.05	.01	.02
Superior frontal-occipital	-.08*	-.01	-.07	.01
Sagittal stratum	.02	-.01	.02	-.04
Uncinate	-.08*	.06	.00	.06
Limbic tracts				
Fornix	.01	.03	.04	.01
Striatia terminalis	.00	.04	.09*	-.02
Anterior mid cingulum	-.02	.10*	.11**	.01
Inferior cingulum	.00	-.01	.01	-.03

p: *<.05; **<.01; **<.001; Covariates: age, sex, SES

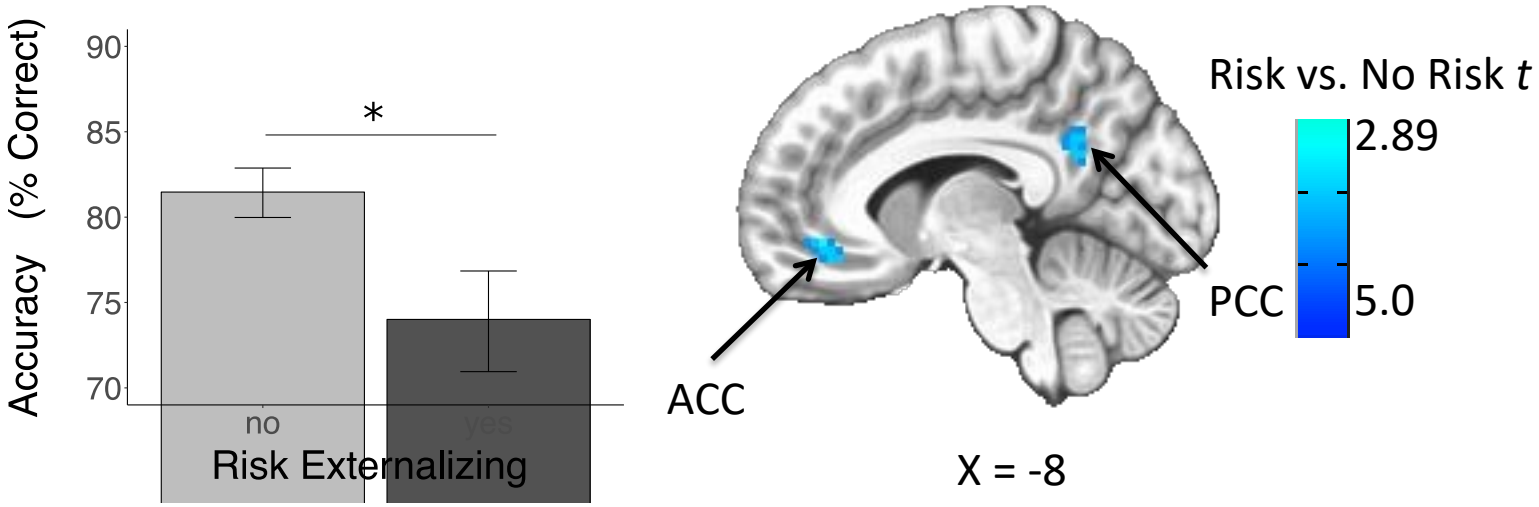
Behavioral regulation: Anti-Saccade Task

Look to the “mirror” location of the target



PRO-SACCADE **ANTI-SACCADE**

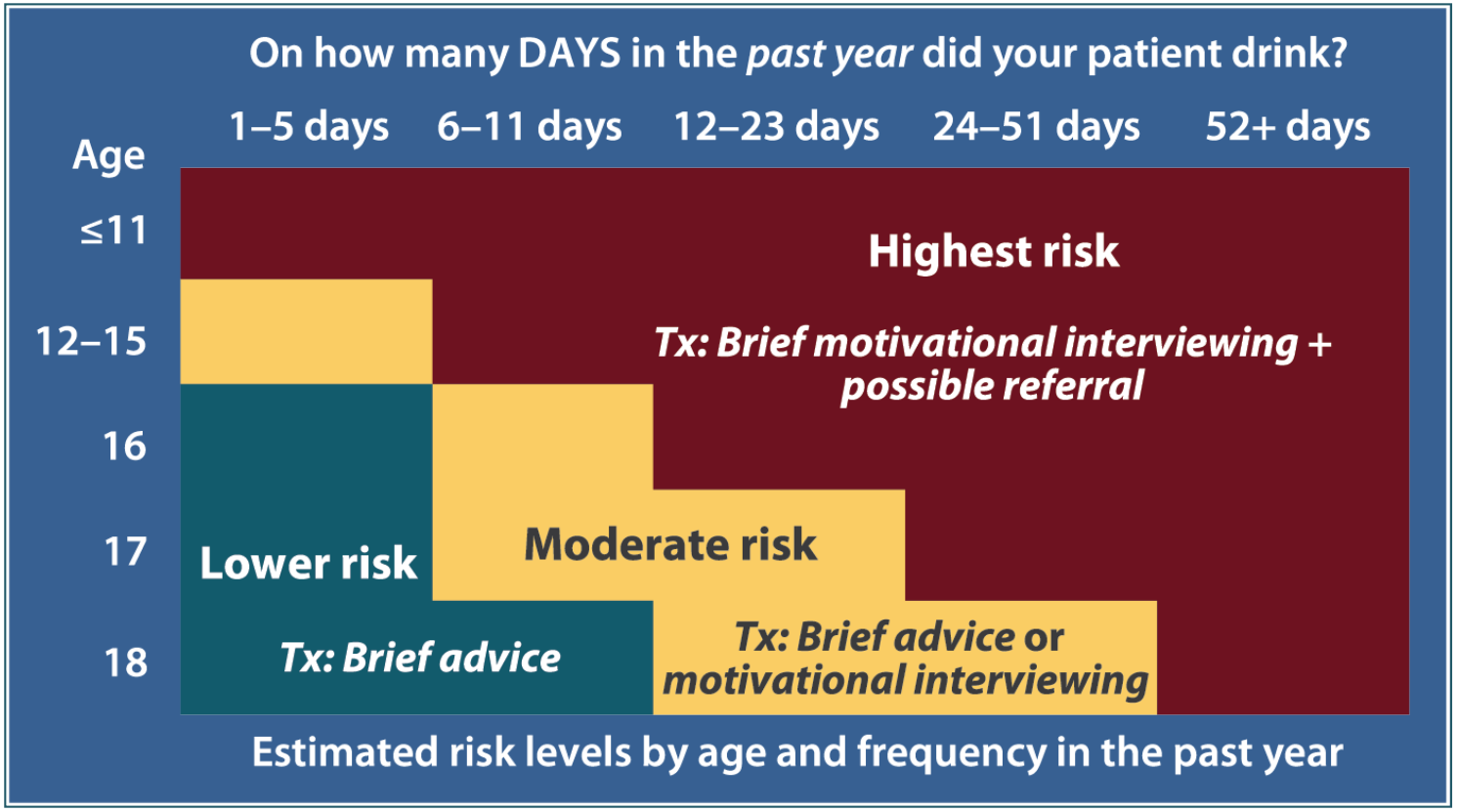
Munoz & Everling, 2004



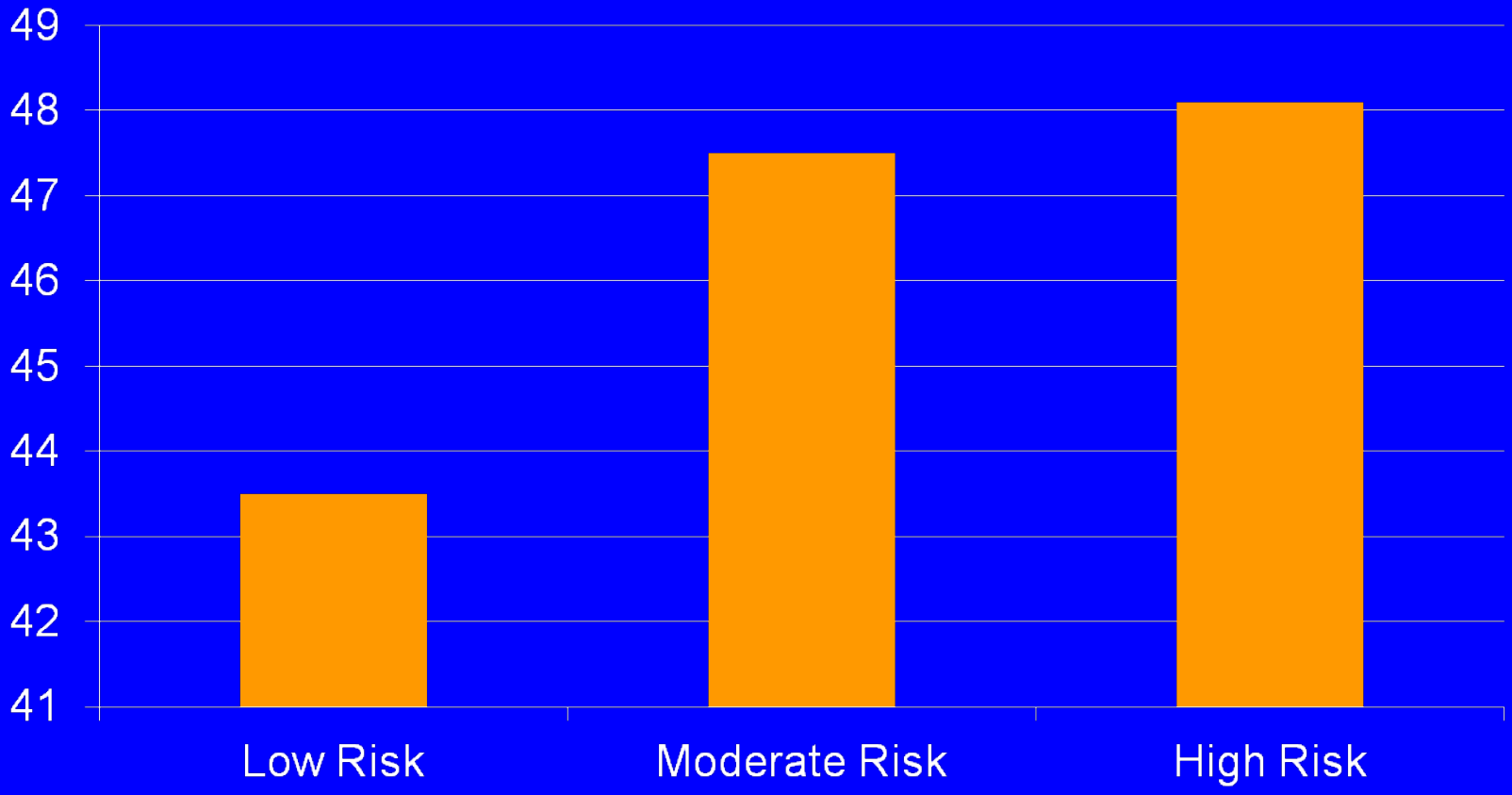
Participants in the externalizing risk group had significantly lower antisaccade accuracy at baseline ($p < .05$). Behavioral differences were accompanied by reduced activation in the anterior- and posterior cingulate cortices(ACC, PCC; $p < .05$, corrected) during the response period at baseline.

National Institute on Alcohol Abuse and Alcoholism

AUD Risk by # Days Alcohol Use in Past Year



AUD Risk Alcohol Use Frequency x BRIEF



F=7.0, d.f. 2,723; p<.01; covariates: sex, age, SES

Age Defined Binge Alcohol Use

Widmark equation to estimate BAC

Children differ by age and gender on

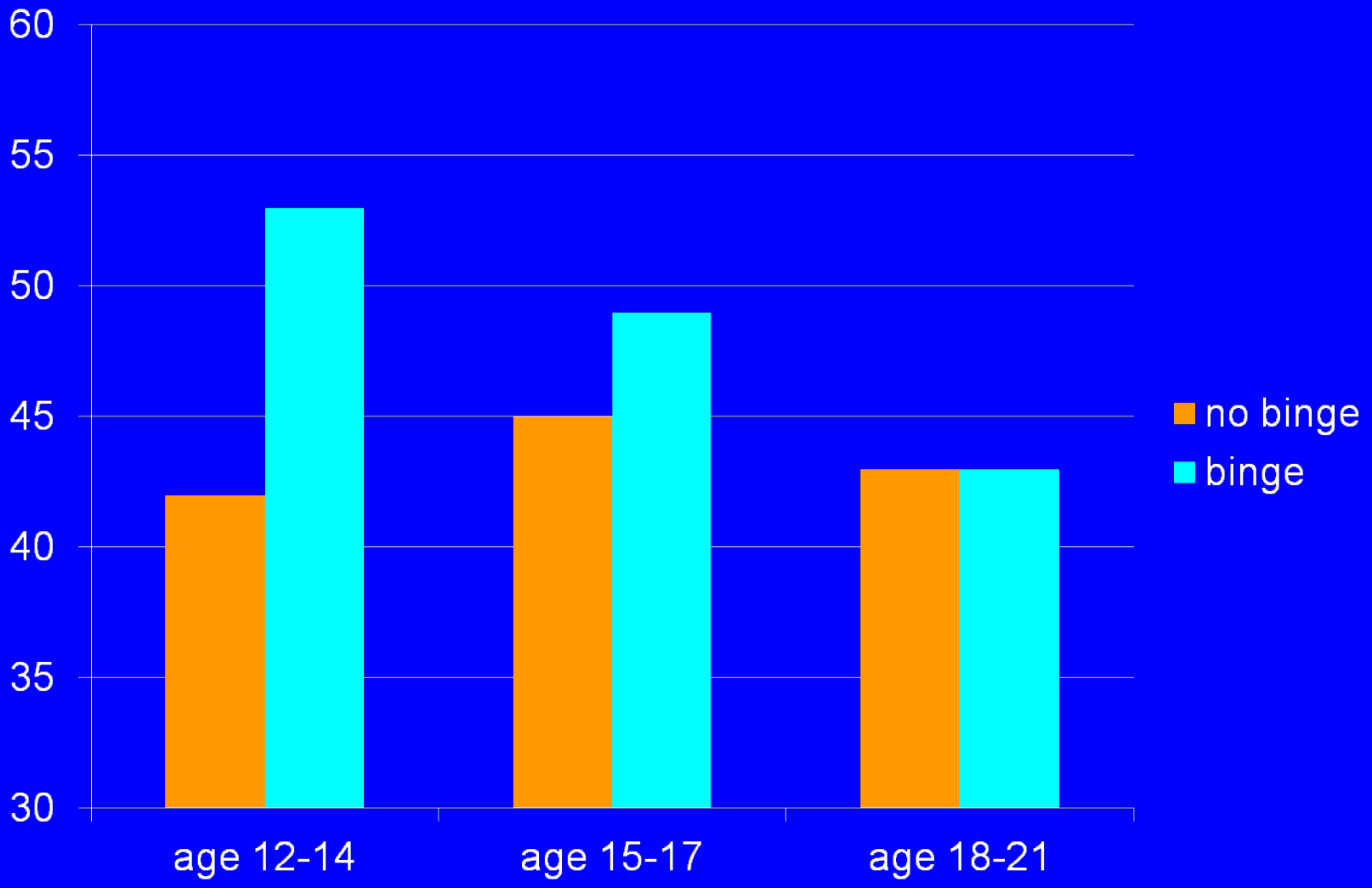
- body composition [total body water]
- alcohol elimination rate [accelerated]

Binge definitions

age	males	females
9-13	≥3	≥3
14-15	≥4	≥3
16-17	≥5	≥3
18 or older	≥5	≥4

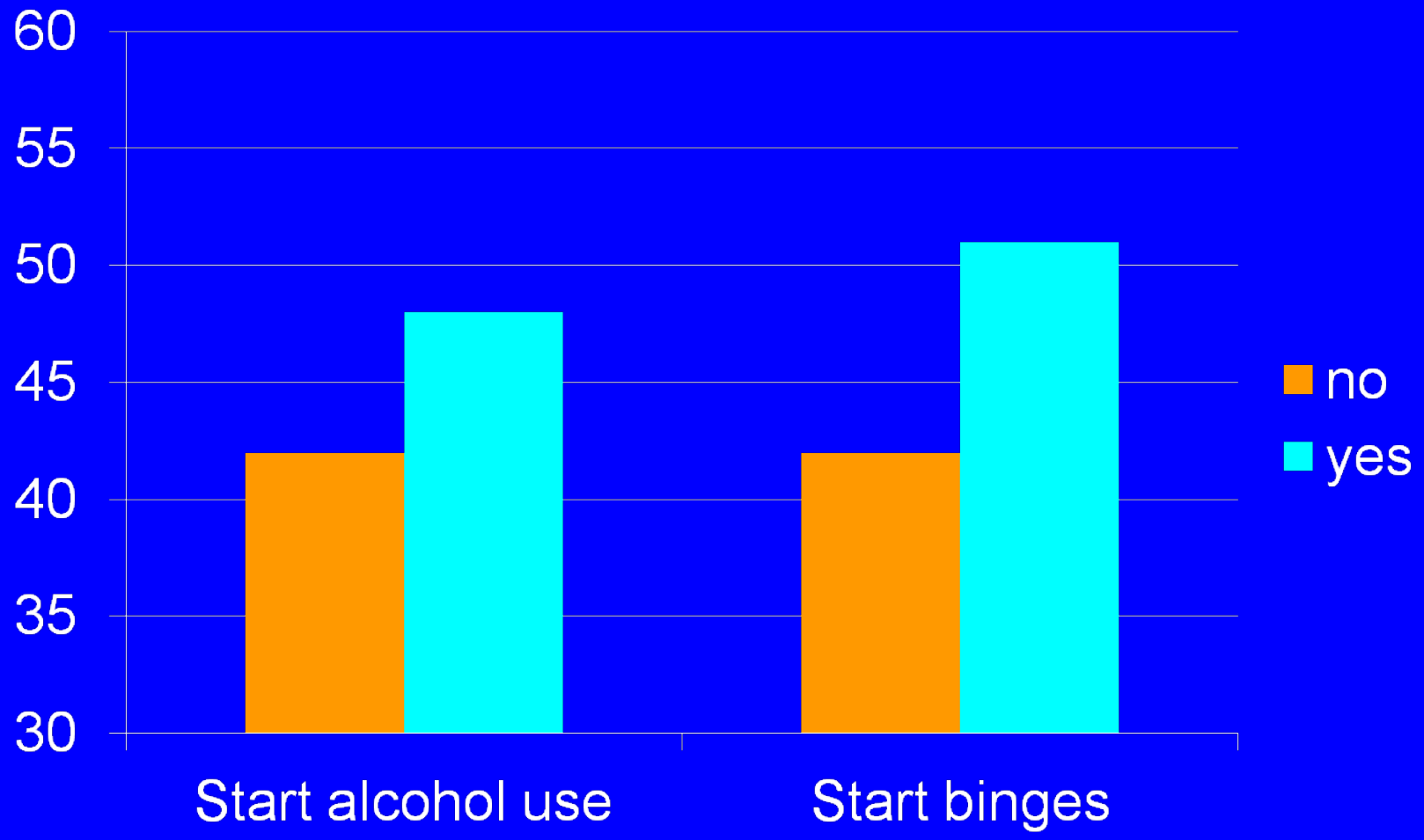
Donovan, 2009: Pediatrics 123: 975-981

BRIEF GEC x past year binge [baseline]



binge x age: F=3.1, df 2,810, p<.05

At ages 12 -14, worse BRIEF predicts initiation of alcohol use and binges at 1 year FU



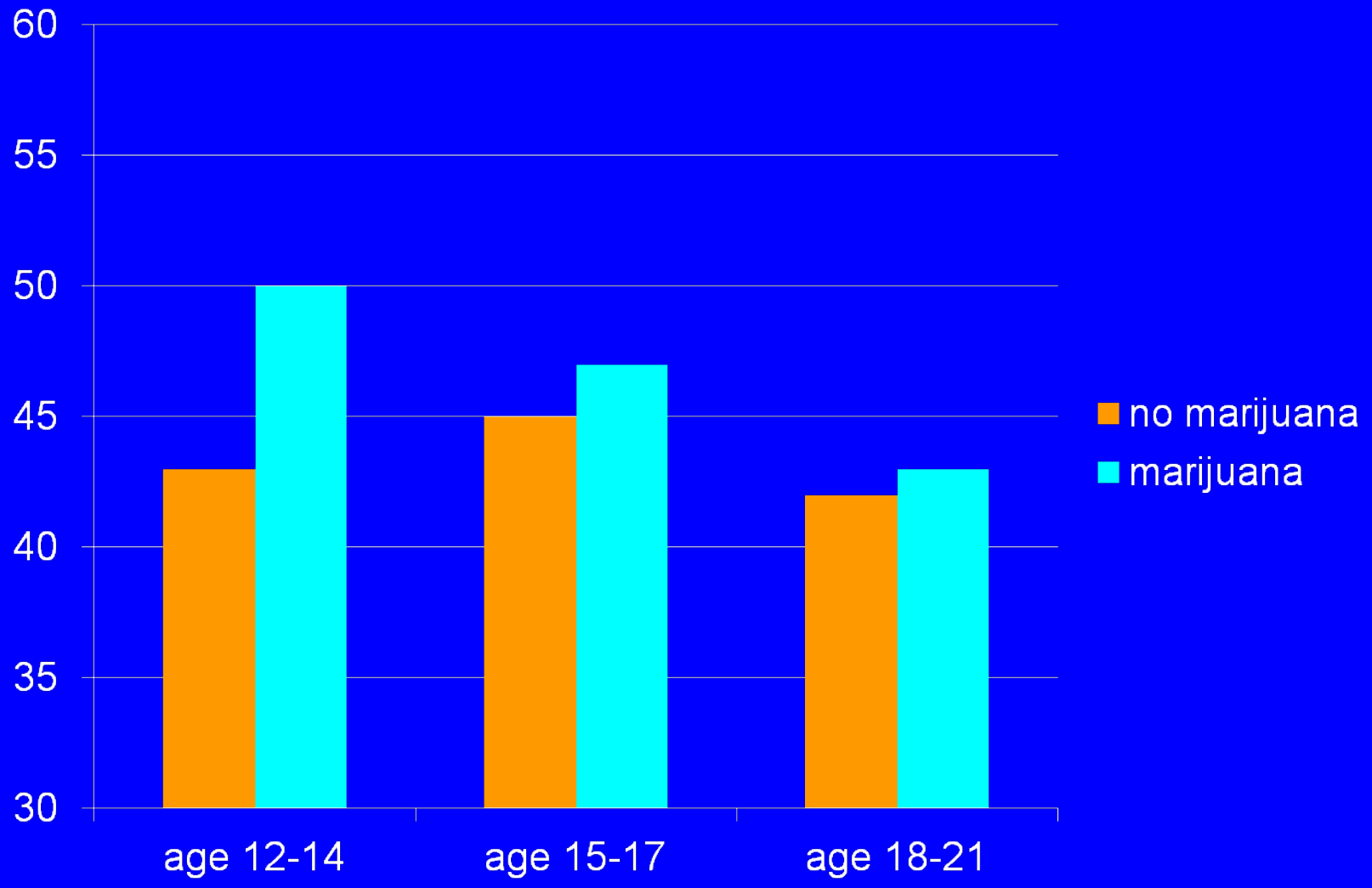
F=6.3; F=5.1, p≤.02: covariate: sex, age

BRIEF @ BL predicts # binge days 1 yr FU

	F	d.f.	p
Age 12-14.9	12.8	1,280	<.001
Age 15-17.9	1.5	1,280	ns
Age 18-21.9	2.9	1,164	ns

covariates: age, sex, # binge days @ BL

BRIEF GEC x any lifetime marijuana use [baseline]



marijuana; sex & SES: F=8.6, df 2,717, p<.05; age: F=1.7

BRIEF @ BL x # marijuana days past year

	F	d.f.	p
Age 12-14.9	1.0	1,295	ns
Age 15-17.9	5.0	1,306	<.05
Age 18-21.9	8.8	1,199	<.01

covariates: age, sex

NCANDA EF: Summary

- BRIEF validity measures EF construct
- EF problems in everyday life distinct from EF skills assessed by cognitive testing
- Correlated with other risk variables
  - Risk Density, Sleep Quality, Adverse Life Events
- BRIEF not sig. correlated with cortical gray volume, thickness, surface area; DTI indices
- Predicted initiation of alcohol use and binges in young adolescent period; marijuana use
- BRIEF compliments other measured constructs important for understanding adolescent substance use risks and outcomes