

Adolescent Brain Science and Legal Policy in Retrospect and Prospect

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Landmark Cases Involving Science of Adolescence

- *Roper v. Simmons* (2005)
 - Abolished the juvenile death penalty
- *Graham v. Florida* (2010)
 - Prohibits JLWOP for crimes other than homicide
- *Miller v. Alabama* (2012)
 - Prohibits mandatory JLWOP for all crimes



Justice Kennedy's Reasoning

- Immature judgment leads to “impetuous and ill-considered decisions”
- Susceptibility to external influences, especially peer pressure
- Unformed character makes adolescents better candidates for rehabilitation

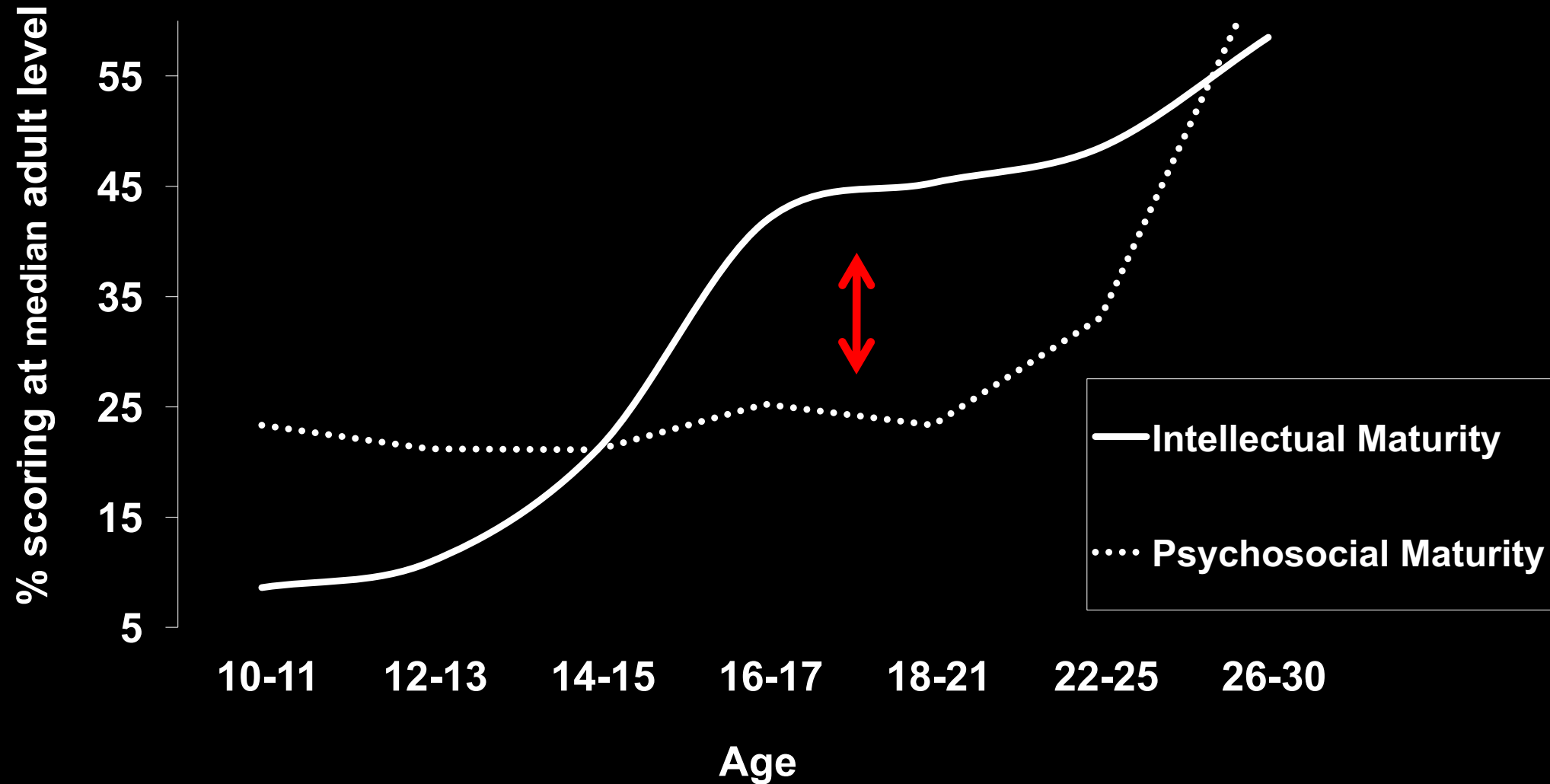




Does Adult Immaturity Mitigate Responsibility?



Individuals Mature Intellectually Before They Mature Socially and Emotionally

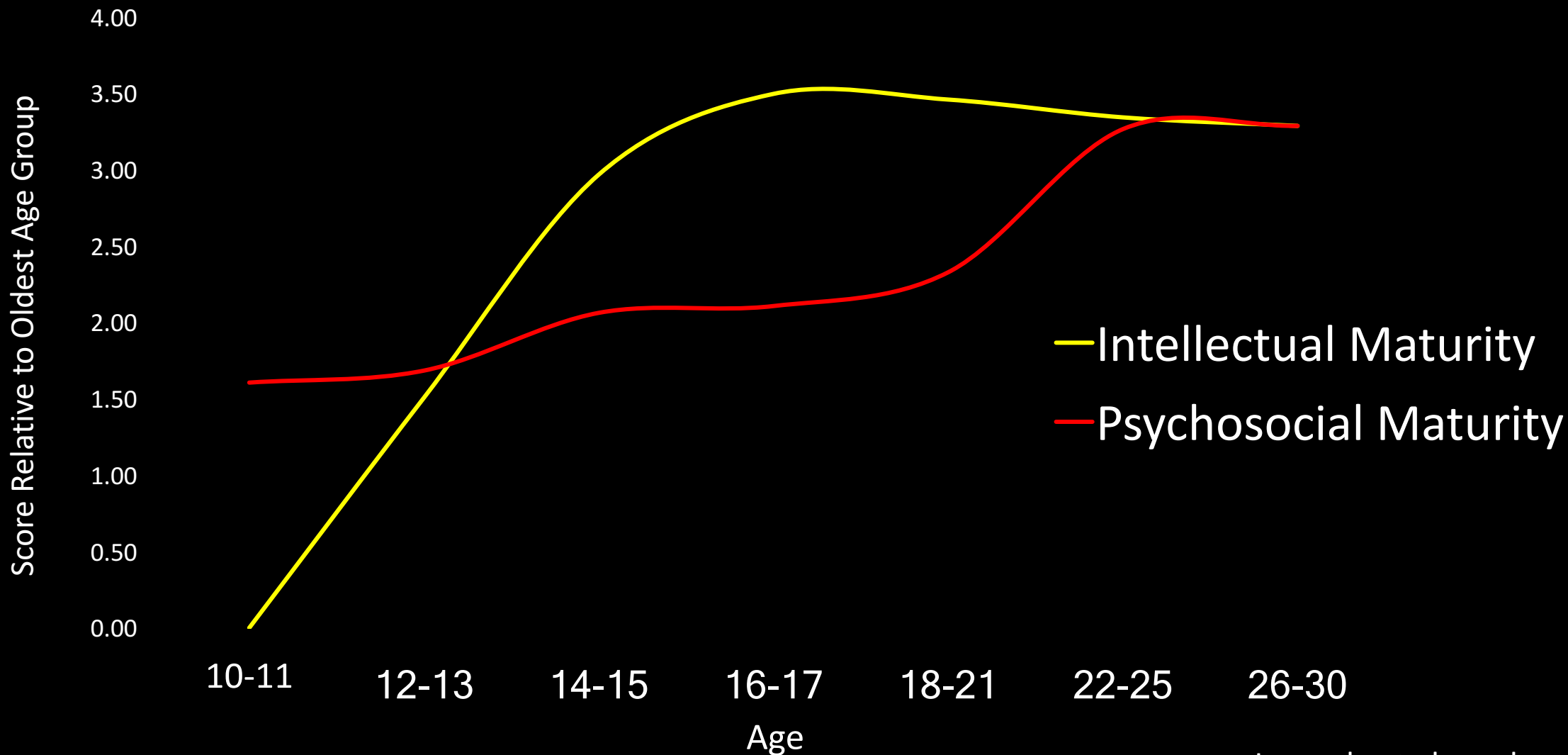


Cross-Cultural Replication

- China (Shanghai)
- Cyprus (Nicosia)
- Colombia (Medellin)
- India (Delhi)
- Italy (Naples/Rome)
- Jordan (Amman)
- Kenya (Maseno)
- Philippines (Manila)
- Sweden (Trollhattan)
- Thailand (Chiang Mai)
- United States (Durham)

Adolescents Around the World

Mature Intellectually Before They Mature Psychosocially



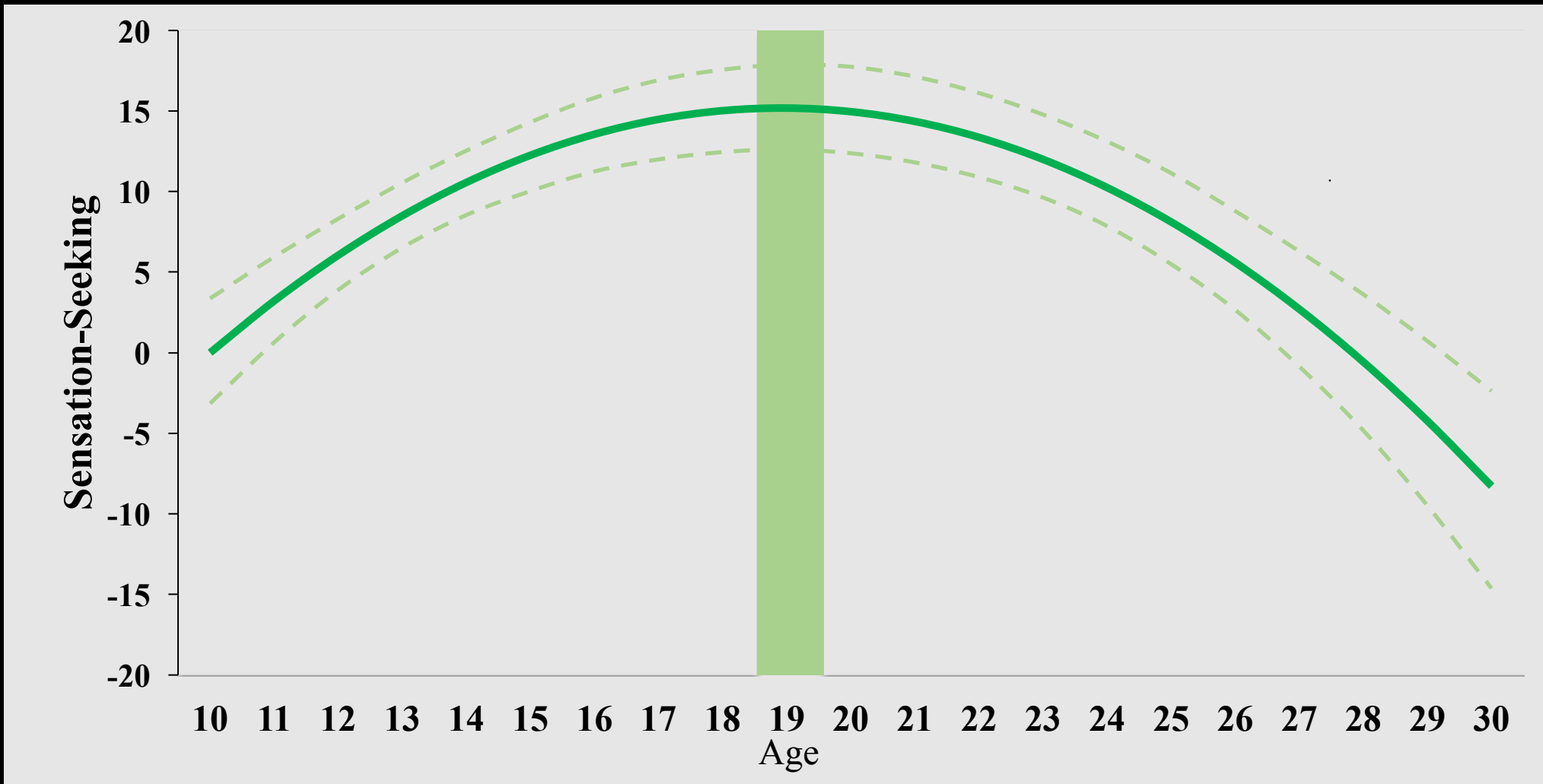
The Dual Systems Model



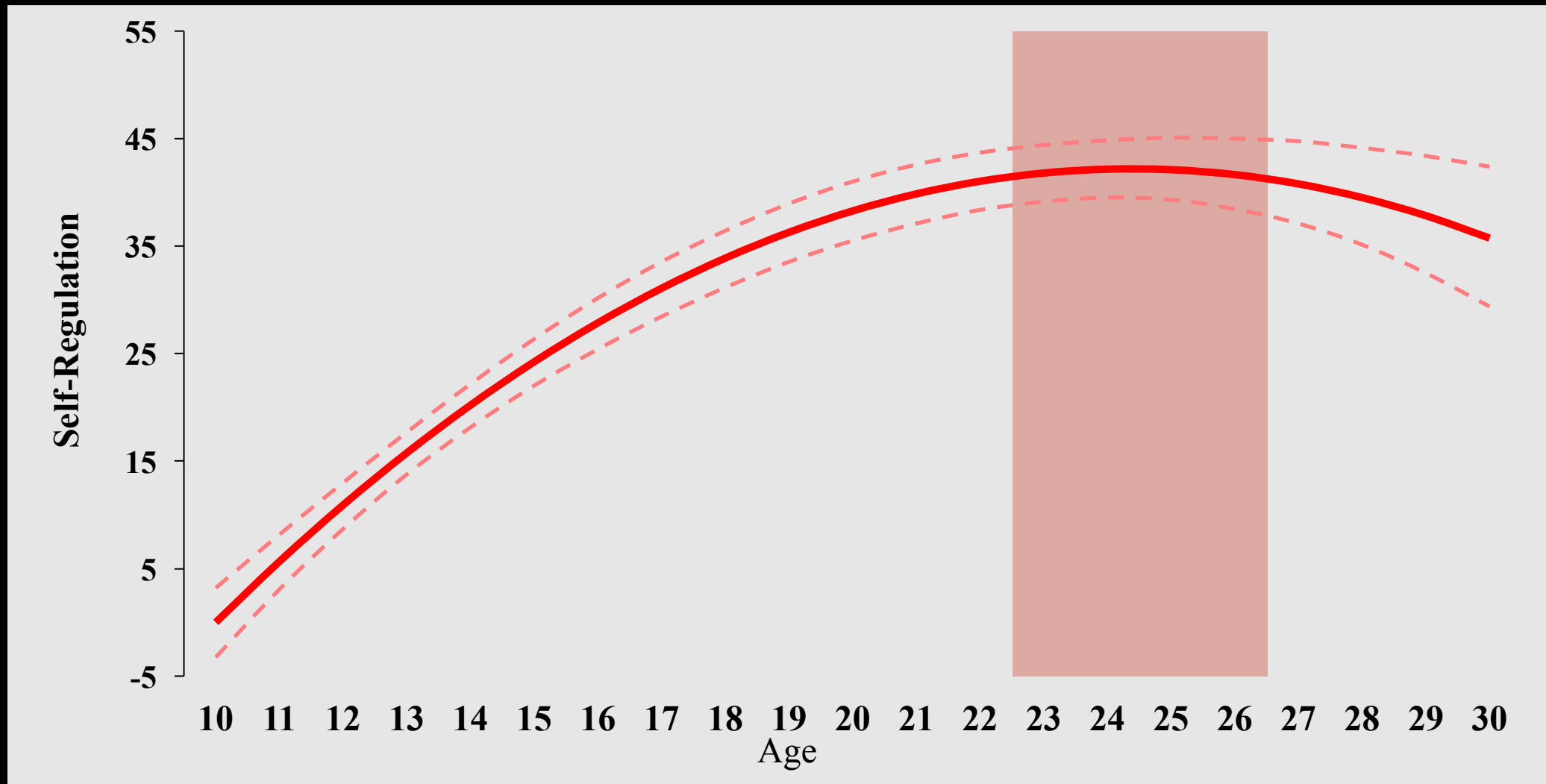




Age Differences in Sensation Seeking in an International Sample

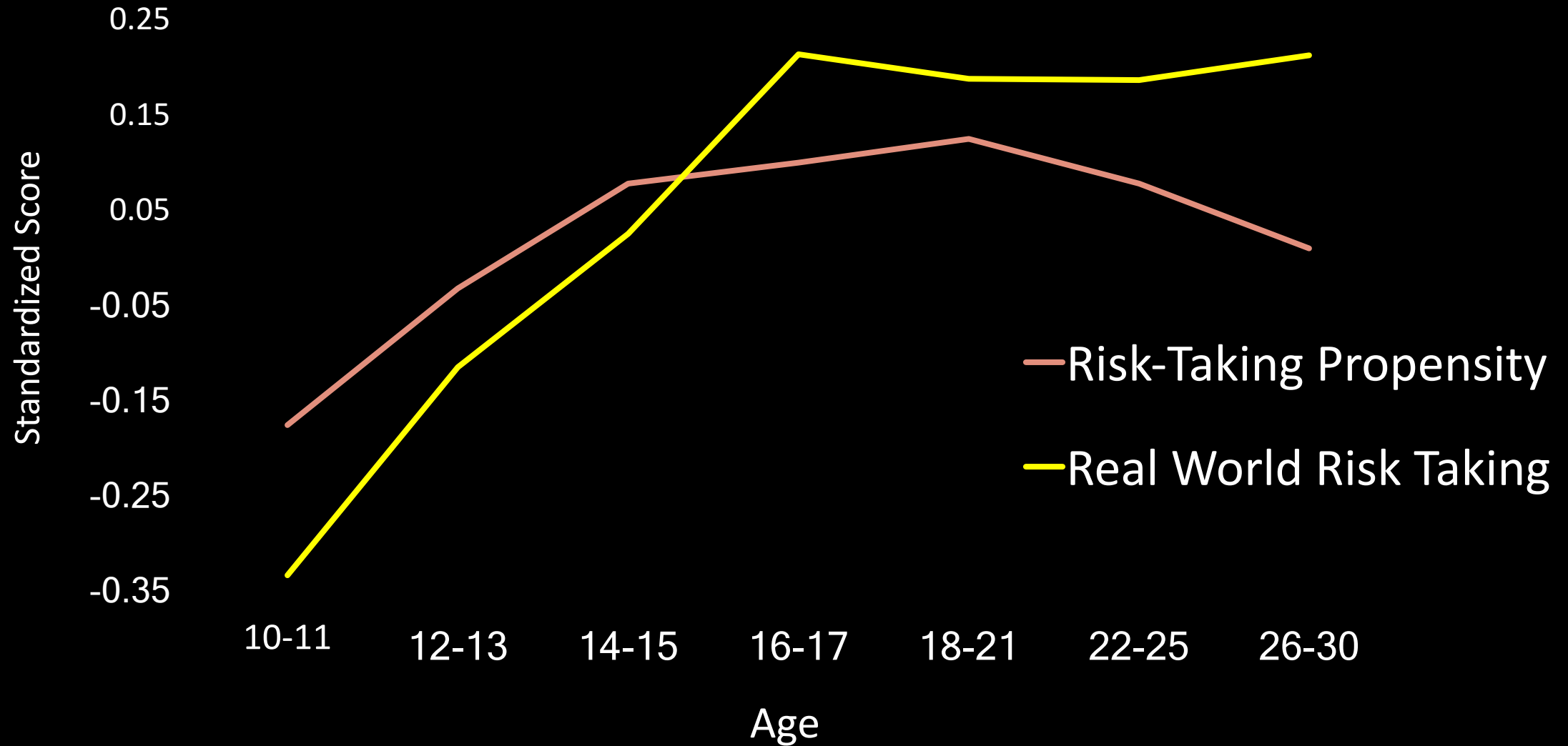


Age Differences in Self-Regulation in an International Sample

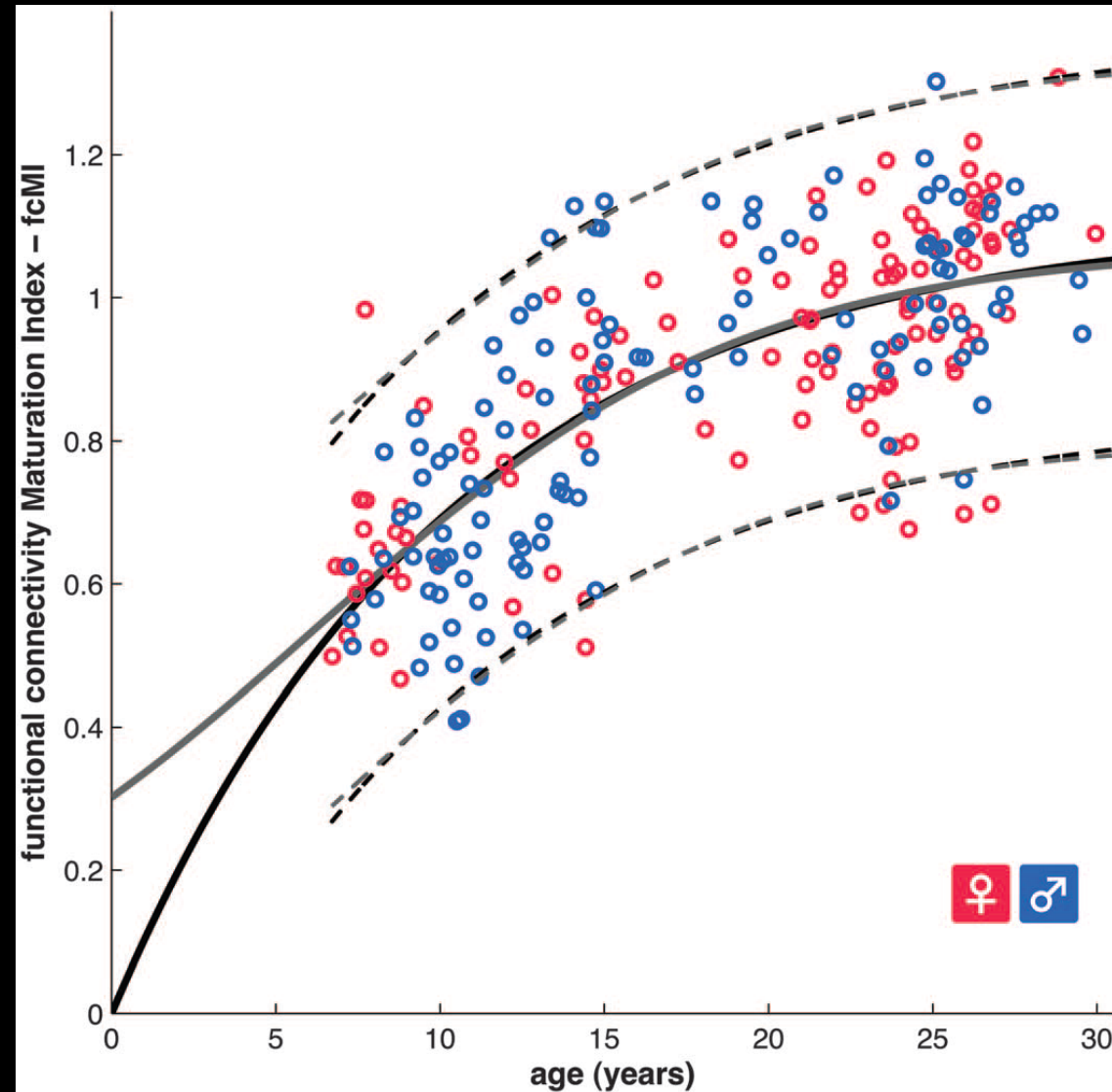




Risk Taking Versus Risk-Taking Propensity



Functional Connectivity Increases Until Age 22

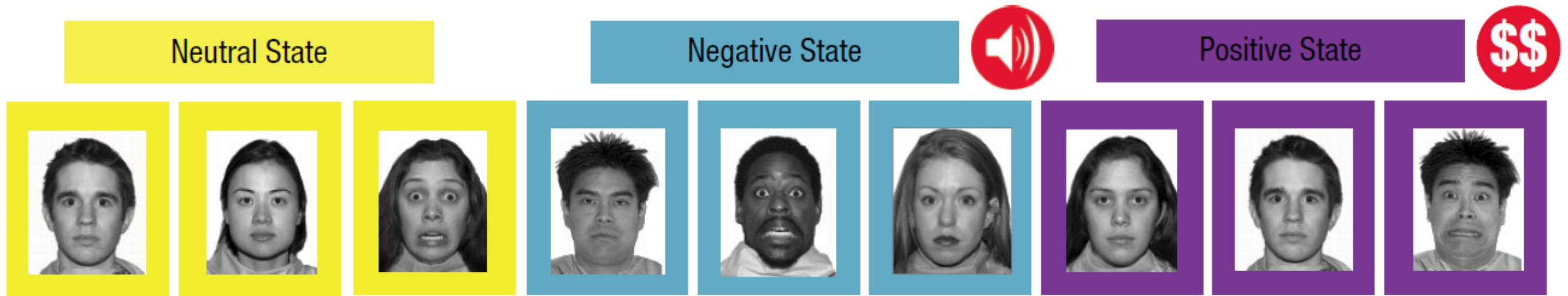


Cognitive Control Under Emotion Task

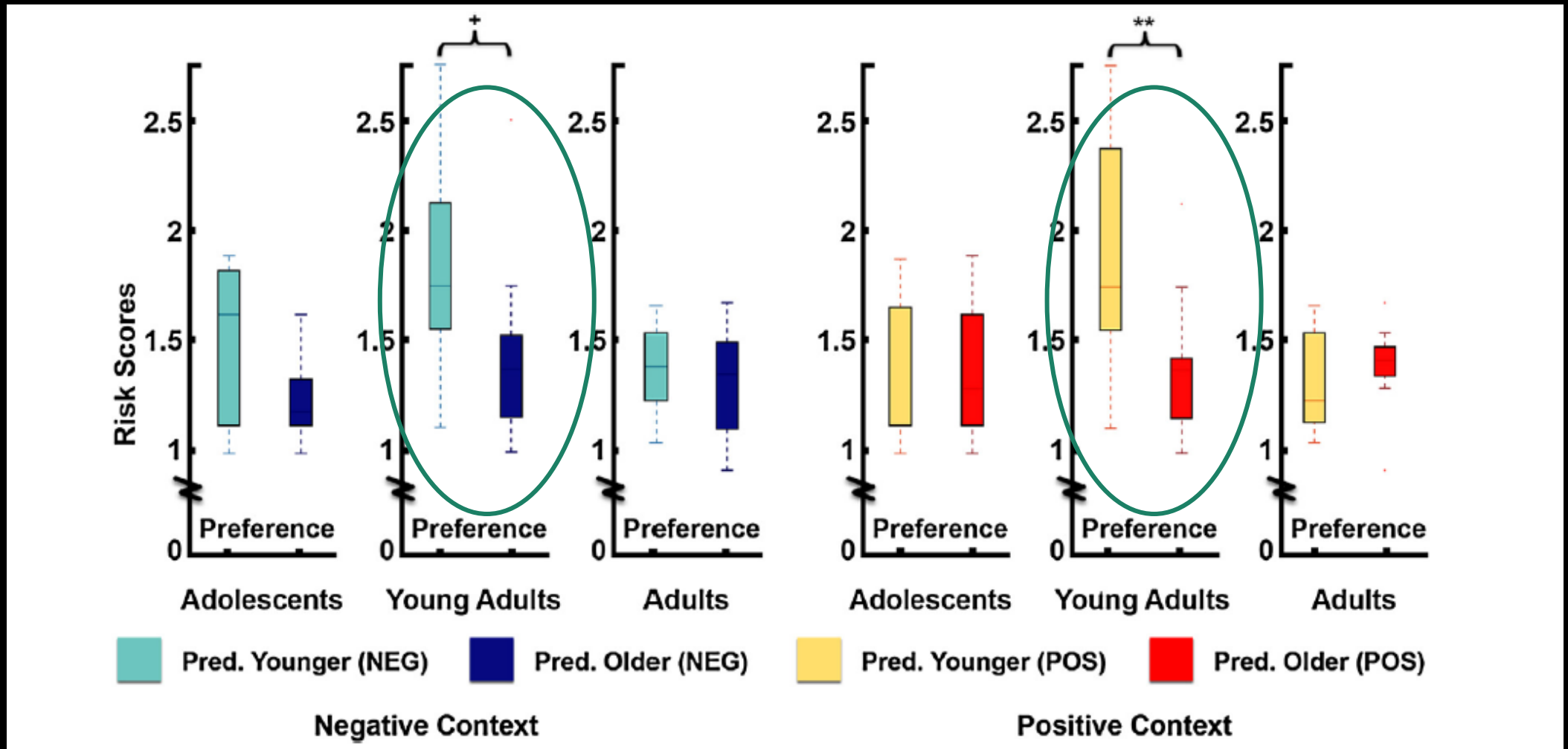
Emotional Go/No-Go

Under Neutral, Threatening, or Exciting Conditions

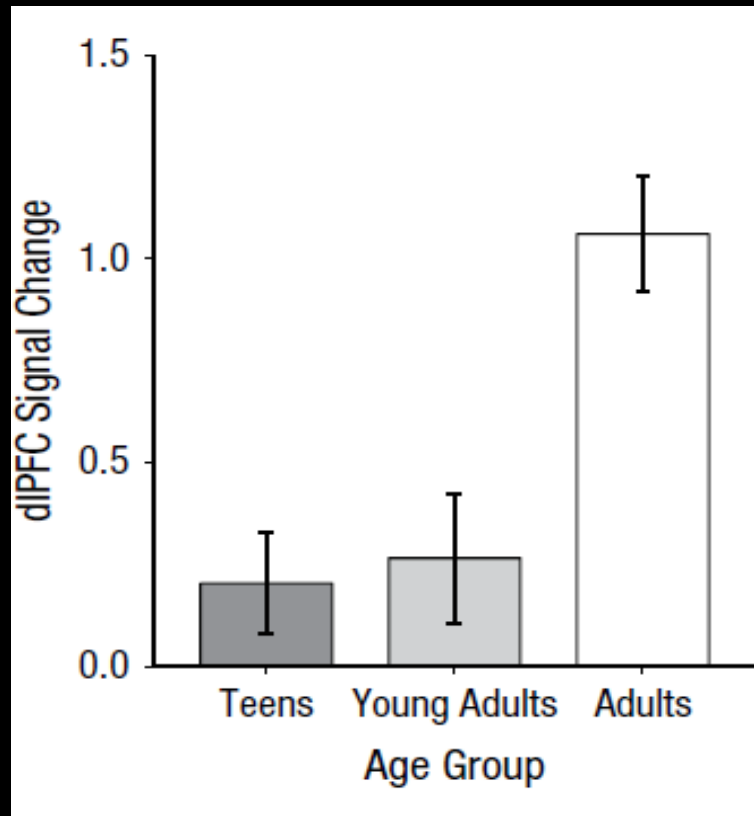
Example Block: "Only press to calm faces"



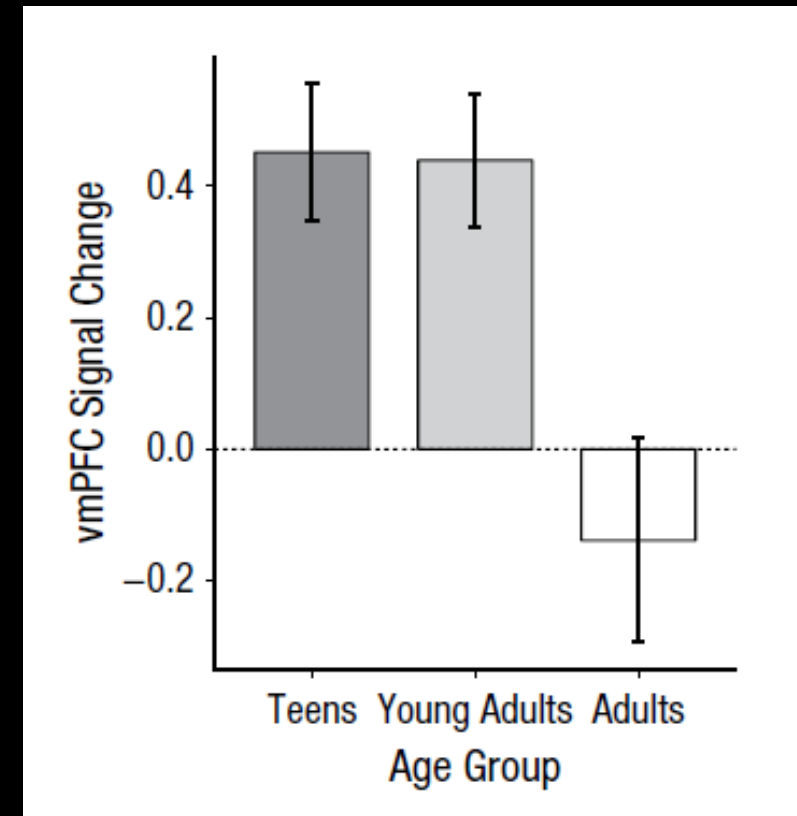
Among Young Adults, But Not Adolescents or Adults, Preference for Risk is Predicted by Brain Immaturity



Under Conditions of Negative Emotional Arousal, Young Adults Perform Like Teens



dlPFC Activation in Response to Fearful Faces

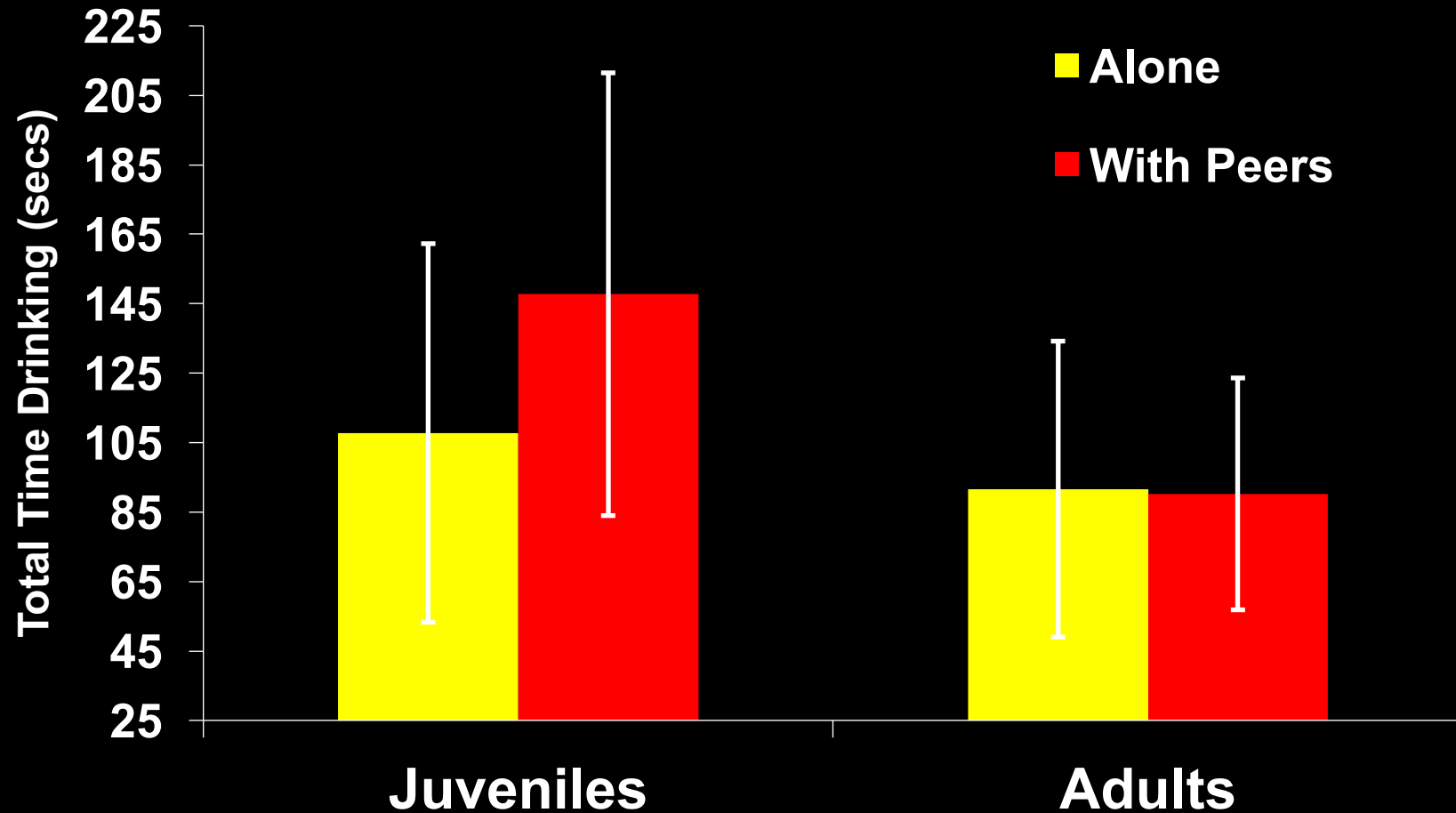


vmPFC Activation Under Threat

Impact of Peer Presence on Adolescent Decision Making

- Adolescents take more risks when peers are present
- Effect is seen with one, two, or three peers
- Strongest when adolescents are aware that negative outcome is likely
- Effect is mediated through activation of reward regions
- Peers also increase preference for immediate rewards
- Peers can be friends, strangers, or illusory
- Peers increase exploratory behavior, which facilitates learning
- Magnitude of peer effect on risk taking comparable to intoxication
- “Peer” presence affects adolescent rodents, but not adults

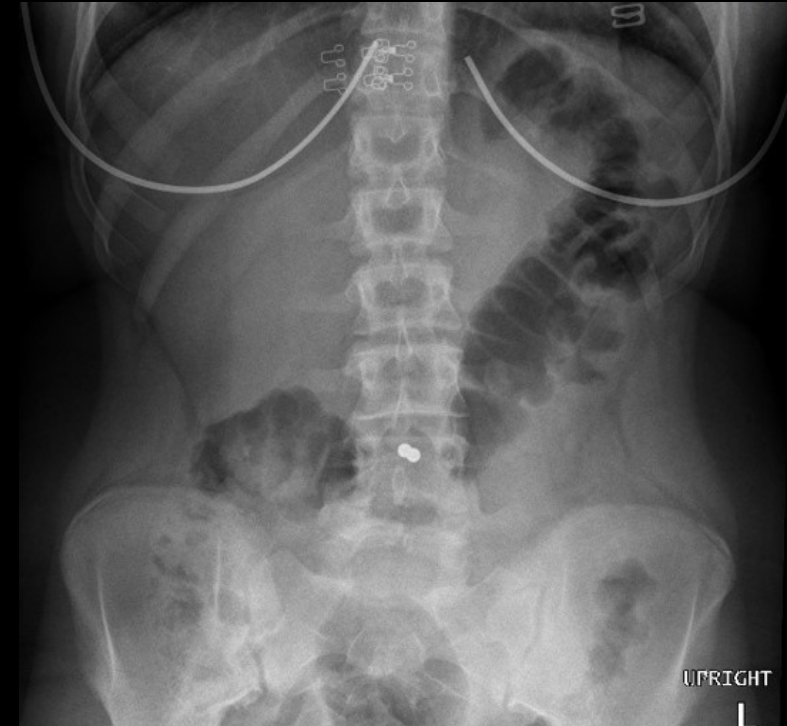
Adolescent Mice Spend More Time Drinking Alcohol When With Peers



Zen Magnets v. Consumer Products Safety Commission



Warning: DO NOT SWALLOW MAGNETS
How old do you have to be to play with these? Dunno. 14 years old in the US for a strong magnetic toy, unless it's not a toy, then no age limit, but they're fun magnet spheres, aren't they a toy? Unless it's a "science kit" then the government age recommendation is 8+. But really, it's whatever age at which a person stops swallowing non-foods. Strong magnets can cause fatal intestinal pinching. Place swallowing magnets on your don't do list along with breathing water, drinking poison, and running into traffic. Call poison control if more than one is swallowed. And keep these away from kids (and pets) who don't understand these dangers. Btw, this product is a "science kit" for sure.



REVENGE OF THE GREEN DRAGONS

by Fredric Dannen

AROUND seven o'clock on the night of July 16, 1989, Anthony Gullivan went out drinking. He was joined by his wife, Christine, and another couple. The Gullivans, who were both in their early thirties, were born in Ireland, but at present they lived in Jackson Heights, Queens. It was wet and windy, so the two couples took a cab to the Liffey Pub, an Irish bar in Elmhurst. They laughed and talked and drank Guinnesses until after nine, and then decided they were hungry for Chinese food.

This was a commodity not hard to come by in Elmhurst. In two decades, Elmhurst, Flushing, and other sections of Queens within a two-mile radius of Shea Stadium have become a second Chinatown, cleaner and more prosperous than the one in lower Manhattan. (The No. 7 subway train to Flushing has been dubbed the Orient Express.) The

let them finish their discussion. Moments later, Greg heard what sounded like firecrackers. When he turned around, one of the boys was crouching, his feet spread apart. He was firing a pistol.

"Carol, duck!" Greg yelled. Carol dived under the table, her eyes on the shooter. The boy caught her looking at him. She later estimated that they made eye contact for two or three seconds—long enough for her to fix an image in her mind of a handsome young man with spiky hair, huge eyes, and, for an

were paralyzed. He could feel his body going into shock.

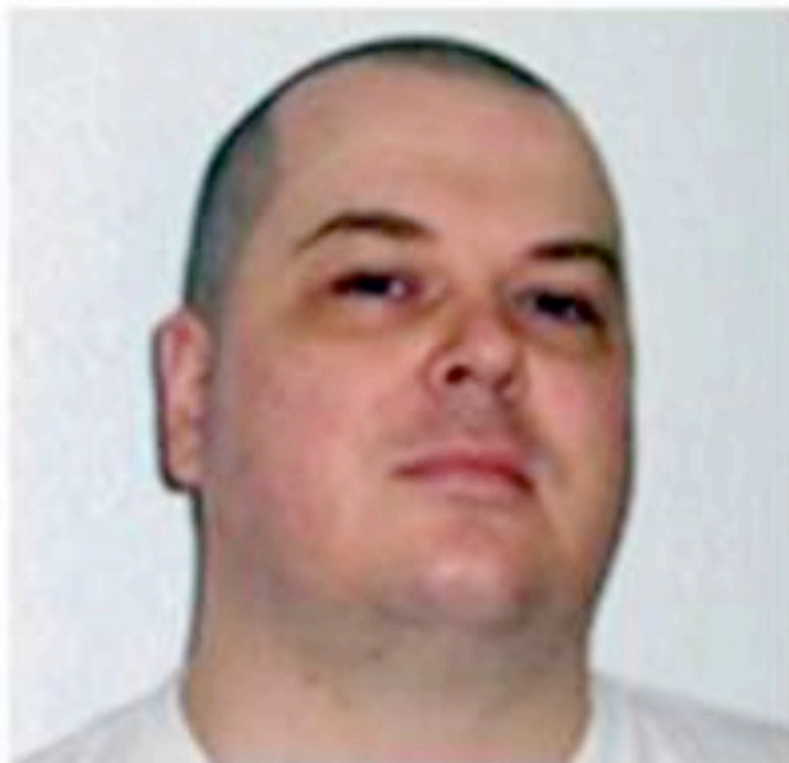
At her table toward the rear of the restaurant, Christine Gullivan looked over to her left and saw her dish fall. Her husband clutched his chest and said, "Christine, I think I've been hit!" She glanced up and saw a young man with a small, "James Bond-type" gun, his arms bouncing in recoil after each shot. Blue smoke rose in the background. Tony Gullivan was sliding off his chair. One of his friends grabbed him and laid him

on the ground on his back. There was blood on his T-shirt in the middle of his chest, a dot the size of a pen top. It was an exit wound; the bullet had entered his back on the right side and passed through his heart. Christine was screaming. She later recalled, "I held him in my arms, and his eyes rolled and his color changed. And I figured he died then."

The restaurant man-



Arkansas governor to spare the life of death row inmate



Death row inmate Jesse McDermott was convicted of directing the loading and unloading of a teenager who had told police about a southern Arkansas crime ring. (Arkansas Department of Correction via AP)

By **Associated Press**

Next Steps

- Research linking changes in brain structure and function to legally-relevant capabilities
- Research on adolescent neuroplasticity
- Research on brain development during the early 20s
- Research on the use of neuroscientific evidence to predict individual behavior

“I can live with doubt and uncertainty. I think it's much more interesting to live not knowing, than to have answers which might be wrong.”

Richard Feynman

Thanks

- Temple University Neurocognition Laboratory
 - Jason Chein
 - Natasha Duell
 - Grace Icenogle
 - Karol Silva
- MacArthur Foundation Research Network on Adolescent Development and Juvenile Justice
- MacArthur Foundation Research Network on Law and Neuroscience
- Jacobs Foundation
- National Institute on Drug Abuse
- National Institute on Alcohol Abuse and Alcoholism
- U.S. Army Medical Research and Materiel Command

More information at www.laurencesteinberg.com