ADHD AND RISK TAKING: ORIGINS AND OUTCOMES

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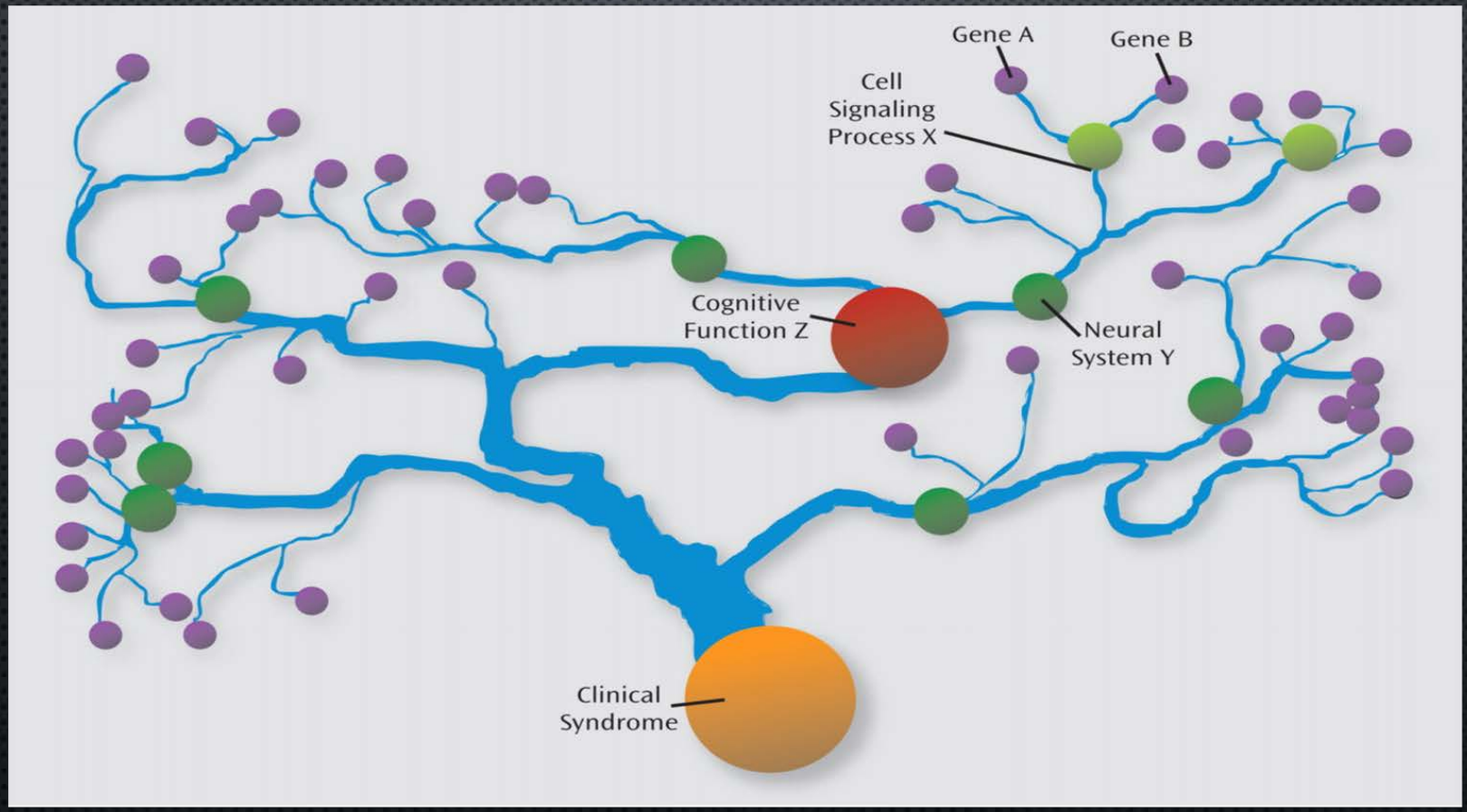
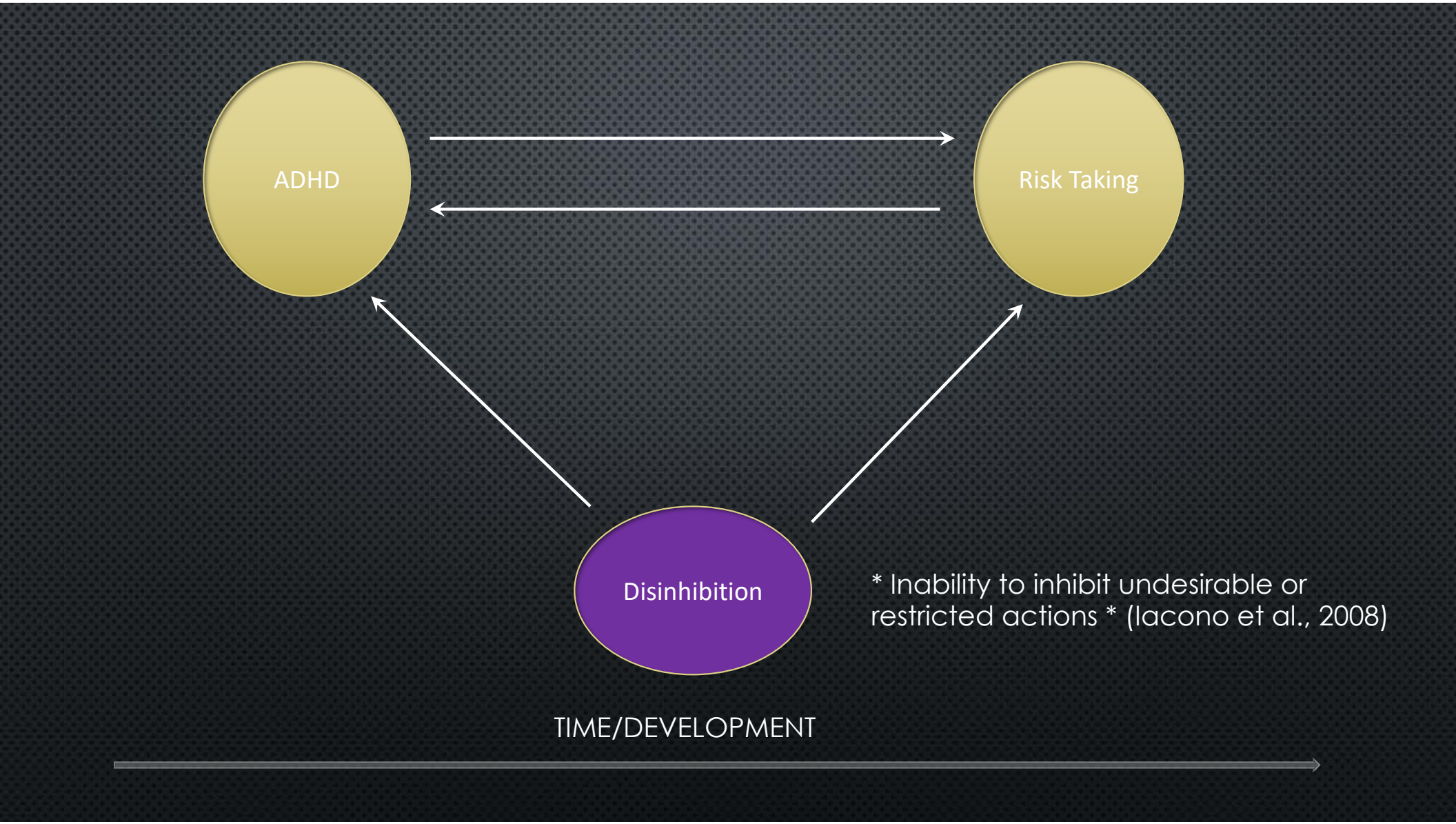
Presentation Outline

- I. Conceptual model of development
  - Risk factors, processes, outcome
- II. ADHD and risk-taking behavior
  - Clinically significant outcomes
  - Risk taking: laboratory, advantageous vs. disadvantageous, & role of decision making

WATERSHED MODEL (CANNON & KELLER, 2006)




ADHD
Risk Taking
Disinhibition
* Inability to inhibit undesirable or restricted actions * (Iacono et al., 2008)
TIME/DEVELOPMENT

ADHD DIAGNOSTIC CRITERIA

Attention Deficit Hyperactive Disorder

Must meet **at least 6** of the criteria within A1 and/or A2, and have experienced for at least the past 6 months.

A1: Inattention

a. Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or during other activities (e.g., overlooks or misses details, work is inaccurate).

b. Often has difficulty sustaining attention in tasks or play activities (e.g., has difficulty remaining focused during lectures, conversations, or reading lengthy writings).

c. Often does not seem to listen when spoken to directly (e.g., mind seems elsewhere, even in the absence of any obvious distraction).

d. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (e.g., starts tasks but quickly loses focus and is easily sidetracked; fails to finish schoolwork, household chores, or tasks in the workplace).

e. Often has difficulty organizing tasks and activities (e.g., difficulty managing sequential tasks; difficulty keeping materials and belongings in order; messy, disorganized, work; poor time management; tends to fail to meet deadlines).

f. Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (e.g., schoolwork or homework; for older adolescents and adults, preparing reports, completing forms, or reviewing lengthy papers).

g. Often loses things necessary for tasks or activities (e.g., school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, or mobile telephones).

h. Is often easily distracted by extraneous stimuli (for older adolescents and adults, may include unrelated thoughts).

i. Is often forgetful in daily activities (e.g., chores, running errands; for older adolescents and adults, returning calls, paying bills, keeping appointments).

A2: Hyperactivity and Impulsivity

a. Often fidgets with or taps hands or feet or squirms in seat.

b. Often leaves seat in situations when remaining seated is expected (e.g., leaves his or her place in the classroom, office or other workplace, or in other situations that require remaining seated).

c. Often runs about or climbs in situations where it is inappropriate. (In adolescents or adults, may be limited to feeling restless).

d. Often unable to play or engage in leisure activities quietly.

e. Is often "on the go," acting as if "driven by a motor" (e.g., is unable or uncomfortable being still for an extended time, as in restaurants, meetings, etc; may be experienced by others as being restless and difficult to keep up with).

f. Often talks excessively.

g. Often blurts out an answer before a question has been completed (e.g., completes people's sentences and "jumps the gun" in conversations, cannot wait for next turn in conversation).

h. Often has difficulty waiting his or her turn (e.g., while waiting in line).

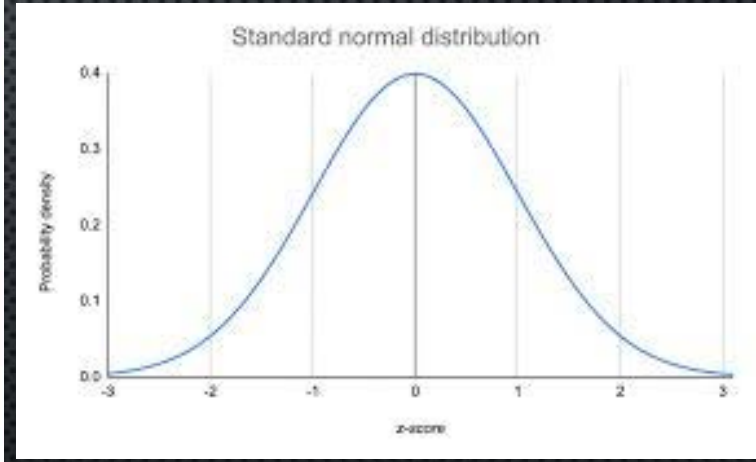
i. Often interrupts or intrudes on others (e.g., butts into conversations, games, or activities; may start using other people's things without asking or receiving permission, adolescents or adults may intrude into or take over what others are doing).

B. Several inattentive or hyperactive-impulsive symptoms were present prior to age 12.

C. Criteria for the disorder are met in two or more settings (e.g., at home, school or work, with friends or relatives, or in other activities).

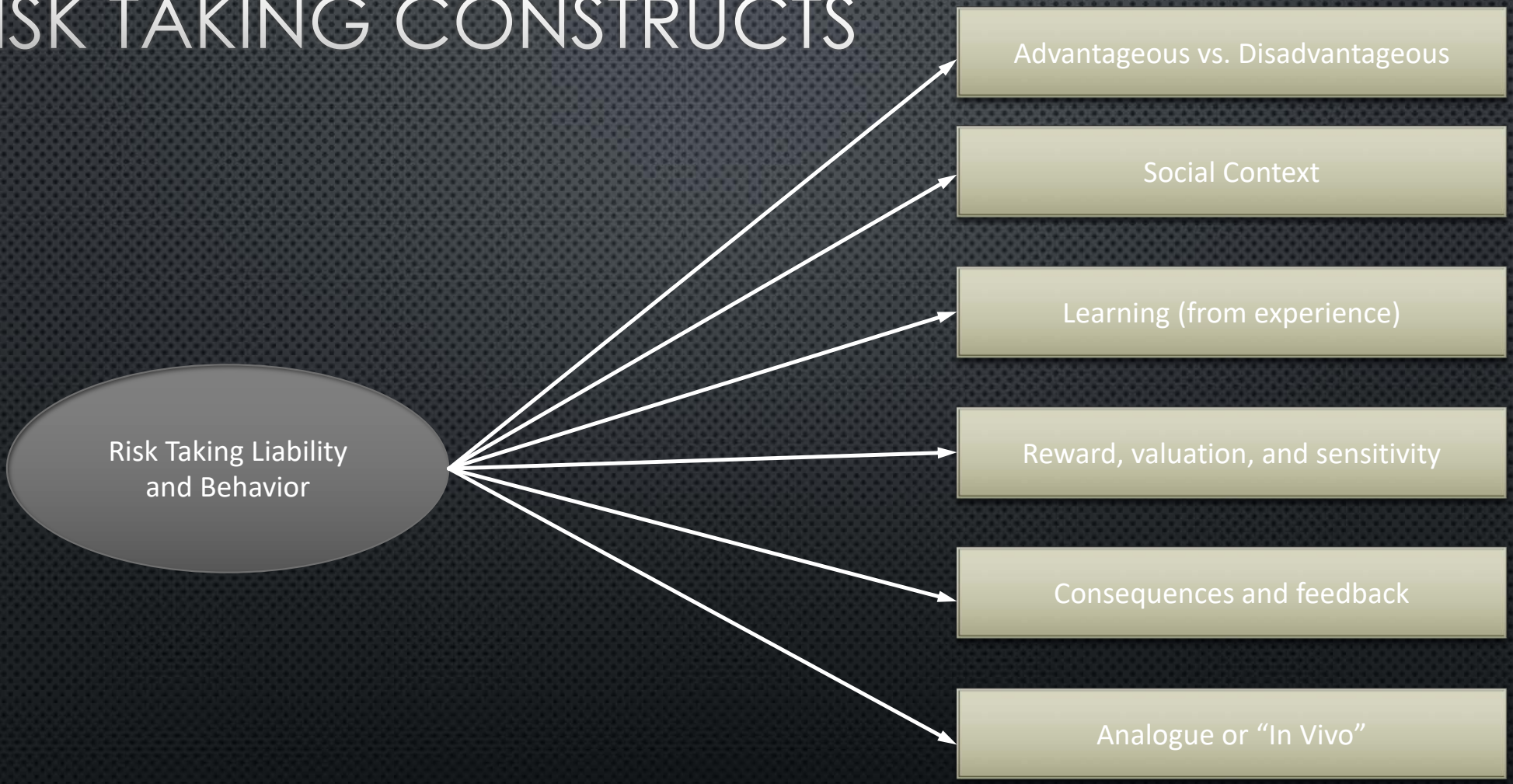
D. There must be clear evidence that the symptoms interfere with or reduce the quality of social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of schizophrenia or another psychotic disorder and are not better accounted for by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorder, or a personality disorder).



RISK TAKING BEHAVIOR

RISK TAKING CONSTRUCTS



EVIDENCE

- Study I: ADHD as a risk factor for alcohol and substance use disorder outcomes
- Study II: ADHD and risk taking meta-analysis
- Study III: ADHD and "in vivo" risk-taking behavior
- Study IV: Why might ADHD be related to risk taking behavior?

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Clinical Psychology Review

Prospective association of childhood attention-deficit/hyperactivity disorder (ADHD) and substance use and abuse/dependence: A meta-analytic review ☆

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ABSTRACT

Given the clinical and public health significance of substance disorders and the need to identify their early risk factors, we examined the association of childhood attention-deficit/hyperactivity disorder (ADHD) with substance use (nicotine, alcohol, marijuana) and abuse/dependence outcomes (nicotine, alcohol, marijuana, cocaine, other). To strengthen a potential causal inference, we meta-analyzed longitudinal studies that prospectively followed children with and without ADHD into adolescence or adulthood. Children with ADHD were significantly more likely to have ever used nicotine and other substances, but not alcohol. Children with ADHD were also more likely to develop disorders of abuse/dependence for nicotine, alcohol, marijuana, cocaine, and other substances (i.e., unspecified). Sex, age, race, publication year, sample source, and version of the Diagnostic and Statistical Manual of Mental Disorders (DSM) used to diagnose ADHD did not significantly moderate the associations with substance outcomes that yielded heterogeneous effect sizes. These findings suggest that children with ADHD are significantly more likely to develop substance use disorders than children without ADHD and that this increased risk is robust to demographic and methodological differences that varied across the studies. Finally, few studies addressed ADHD and comorbid disruptive behavior disorders (DBD), thus preventing a formal meta-analytic review. However, we qualitatively summarize the results of these studies and conclude that comorbid DBD complicates inferences about the specificity of ADHD effects on substance use outcomes.

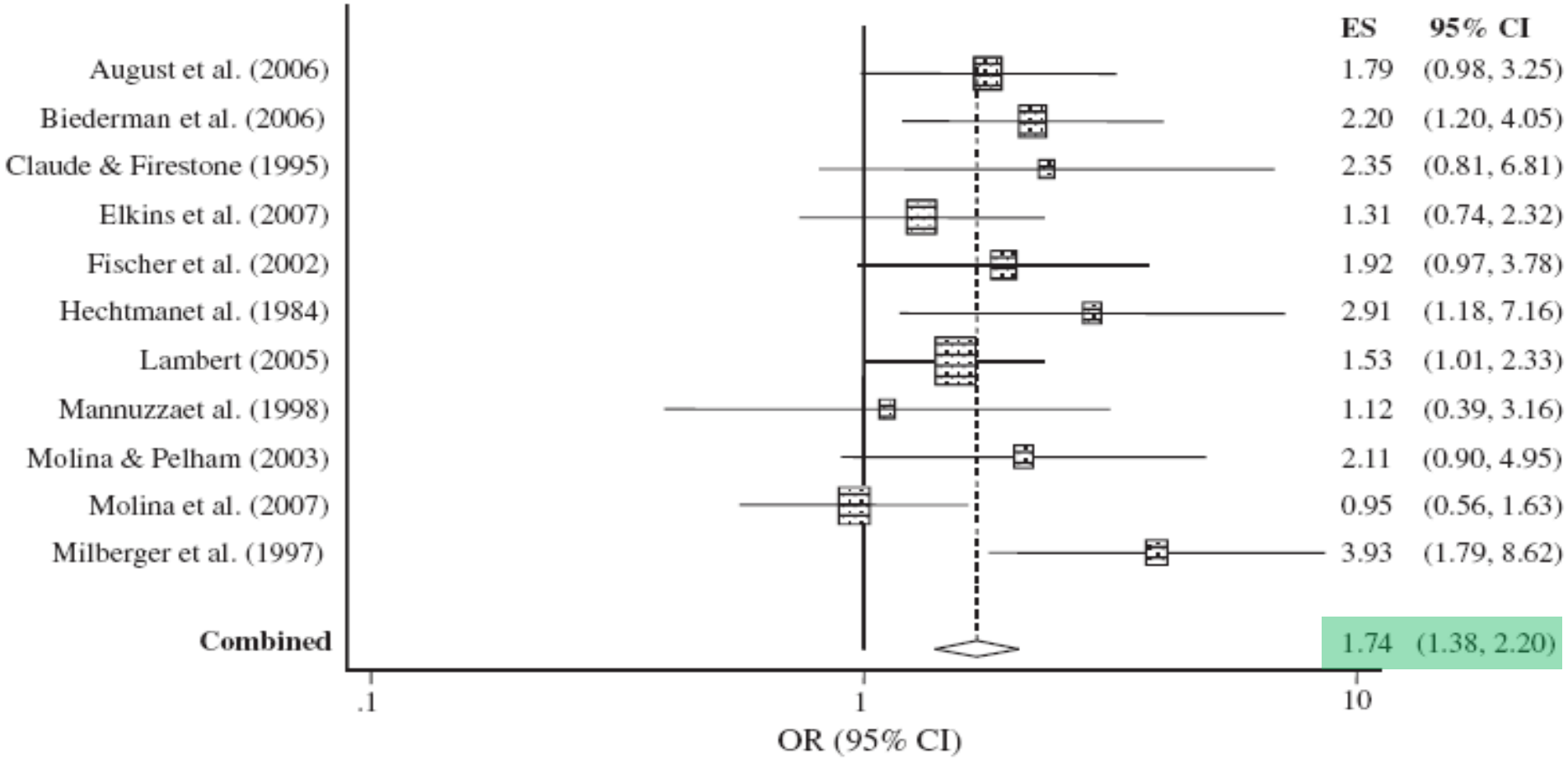


Fig. 4. Alcohol abuse or dependence predicted from childhood ADHD.

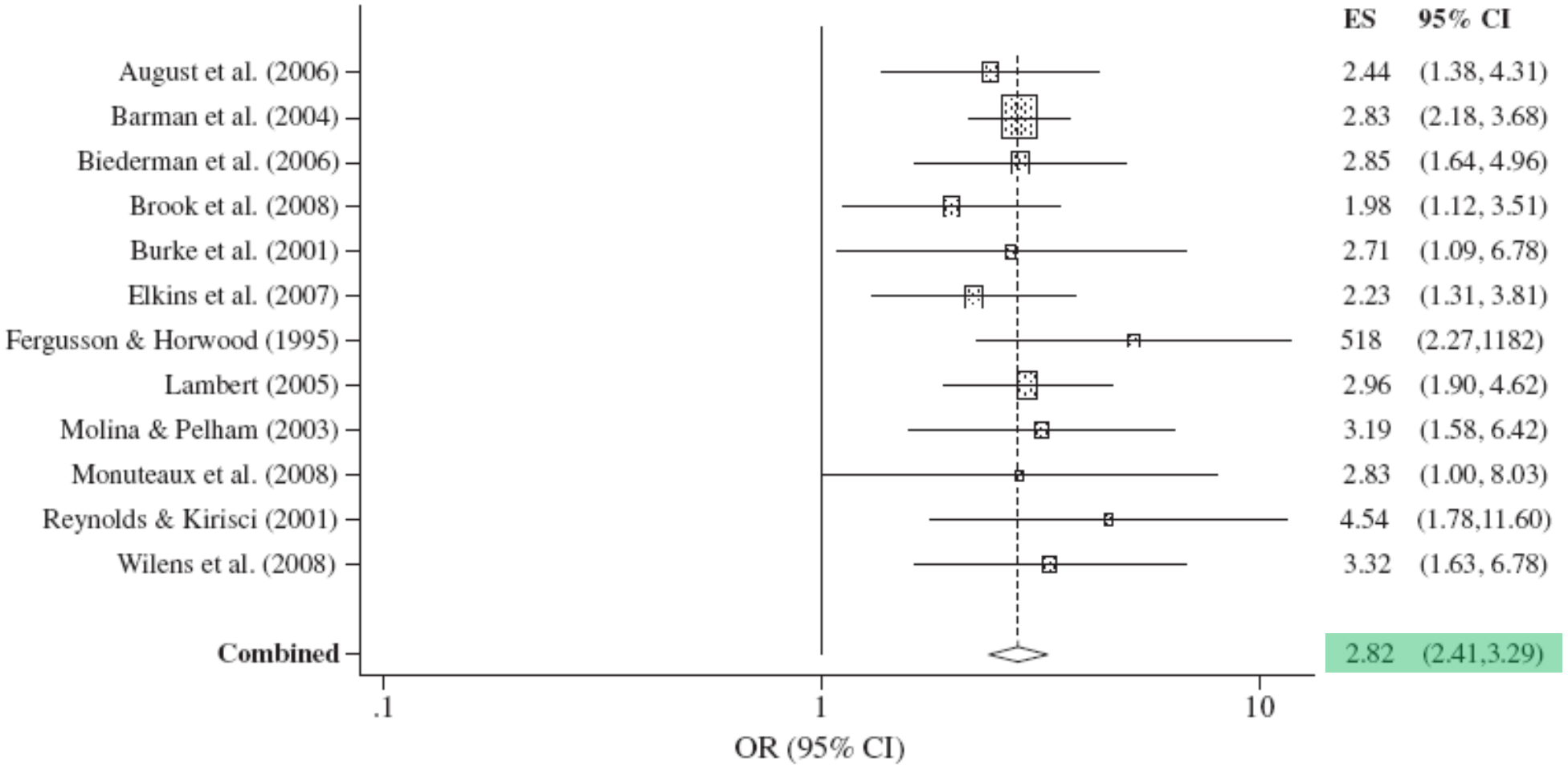


Fig. 2. Nicotine dependence predicted from childhood ADHD.

LESSONS FROM STUDY 1

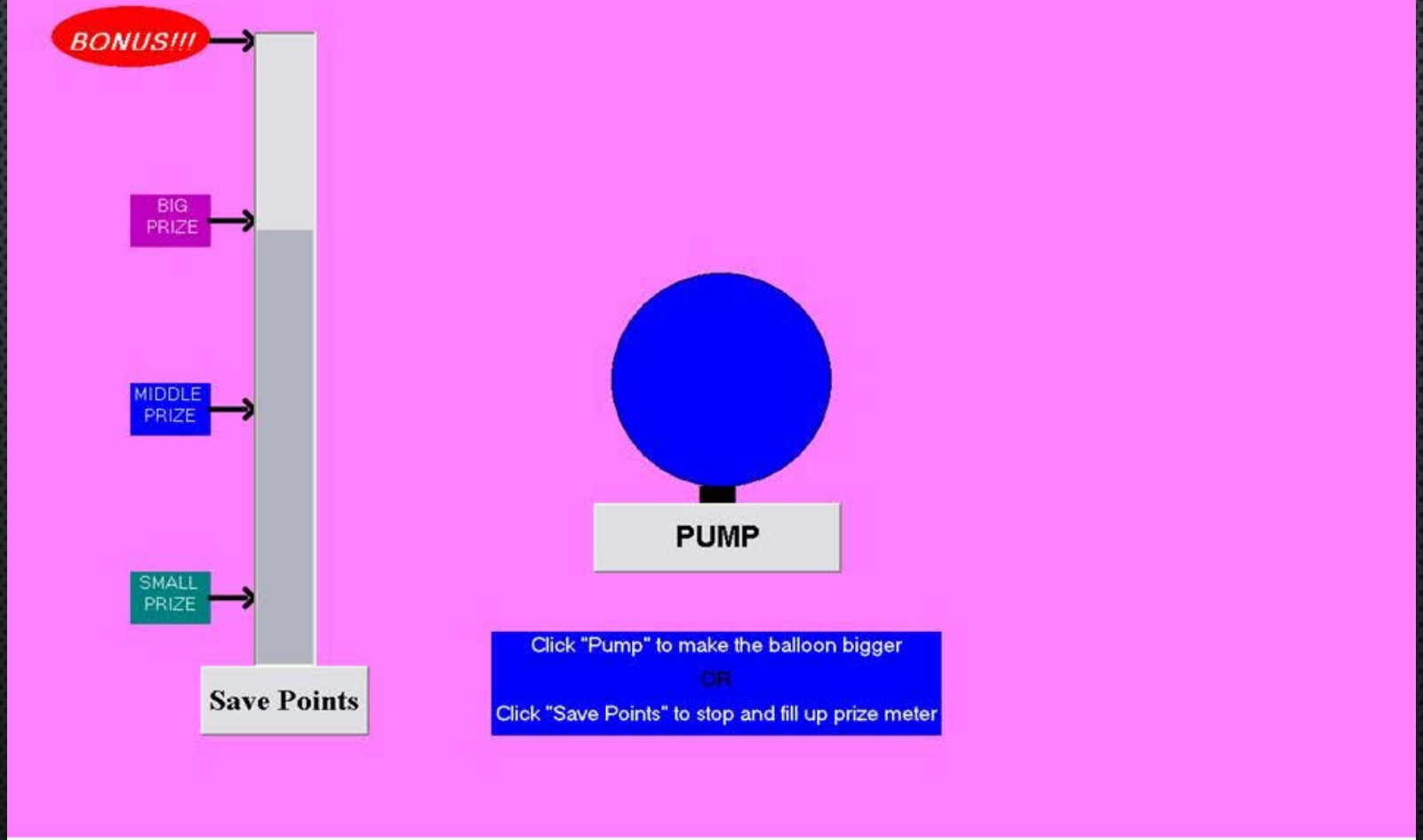
- I. CHILDHOOD ADHD *LONGITUDINALLY* PREDICTS CLINICALLY SIGNIFICANT ALCOHOL AND SUBSTANCE PROBLEMS IN ADOLESCENCE AND ADULTHOOD
- II. DOES ALCOHOL AND SUBSTANCE USE DISORDER EQUAL MALADAPTIVE RISK TAKING?
- III. KEY QUESTION: DOES ADHD RELATE TO RISK TAKING BEHAVIOR IN A LABORATORY SETTING AND PRIOR TO EXPLICIT ASUD?

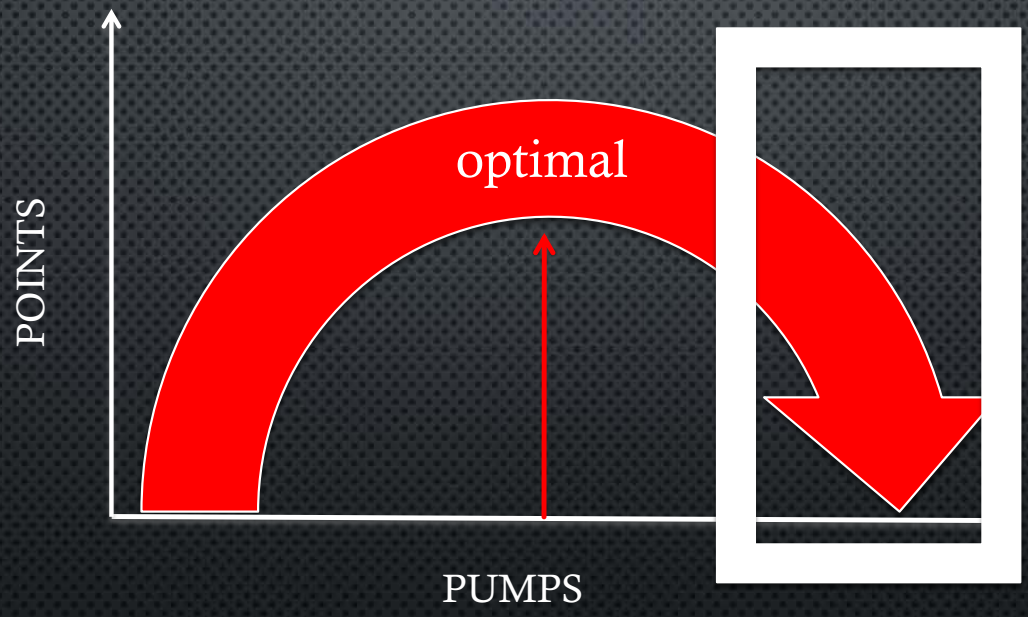
STUDY 2: BALLOON ANALOGUE RISK TASK (BART)

(BART; LEJUEZ ET AL., 2002 & BART-Y; LEJUEZ ET AL., 2007)

- PRESENTS 30 BALLOONS PARTICIPANTS PUMP UP FOR POINTS; BALLOONS EXPLODE AT A VARIABLE NUMBER OF PUMPS AND NO POINTS ARE EARNED FOR AN EXPLODED BALLOON
- BALLOONS EXPLODE BETWEEN 1 – 128 PUMPS

  64 = OPTIMAL
- SCORES PREDICT REAL-WORLD RISK-TAKING IN ADOLESCENTS AND PERSONALITY TRAITS OF SENSATION SEEKING AND IMPULSIVITY (LEJUEZ ET AL., 2003; LEJUEZ ET AL., 2007)


BONUS!!!
BIG PRIZE
MIDDLE PRIZE
SMALL PRIZE
Save Points
PUMP
Click "Pump" to make the balloon bigger
OR
Click "Save Points" to stop and fill up prize meter


optimal
POINTS
PUMPS

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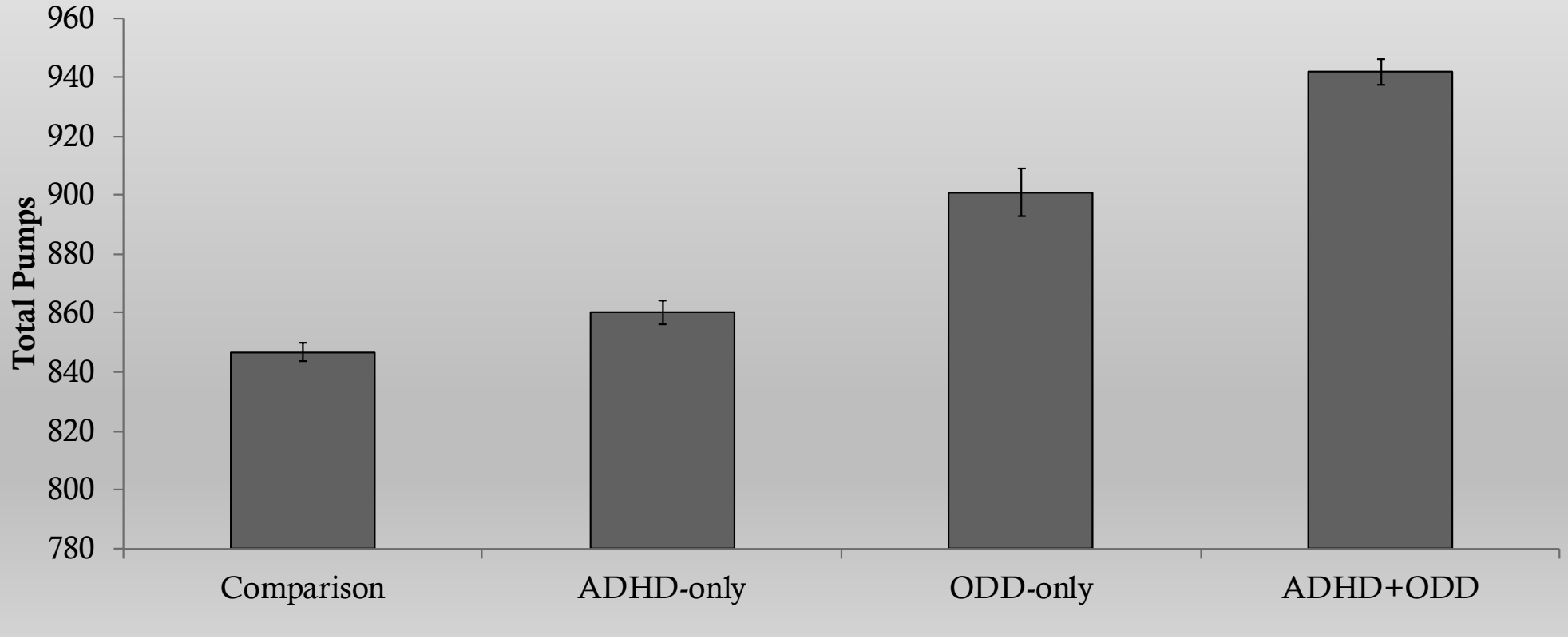
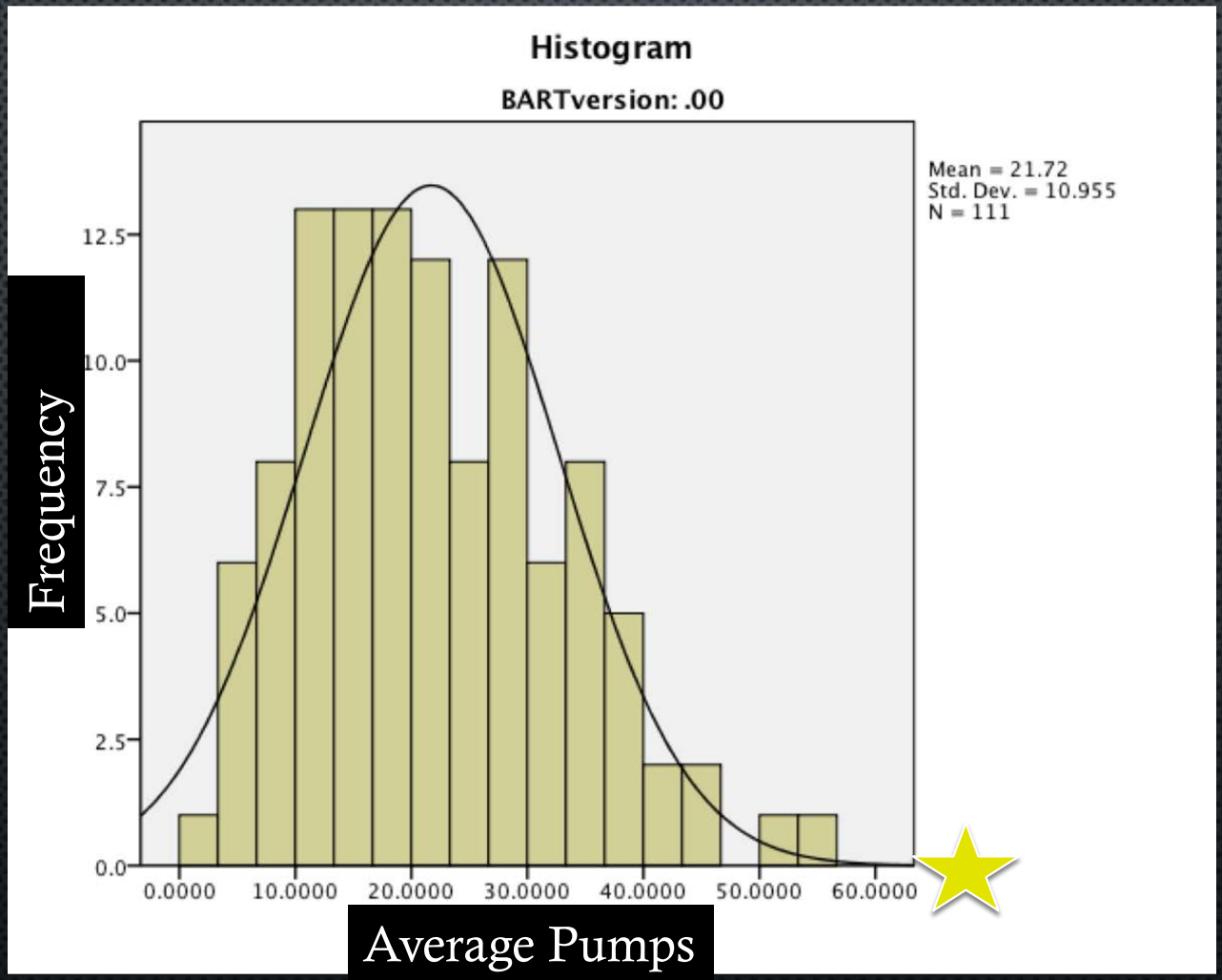
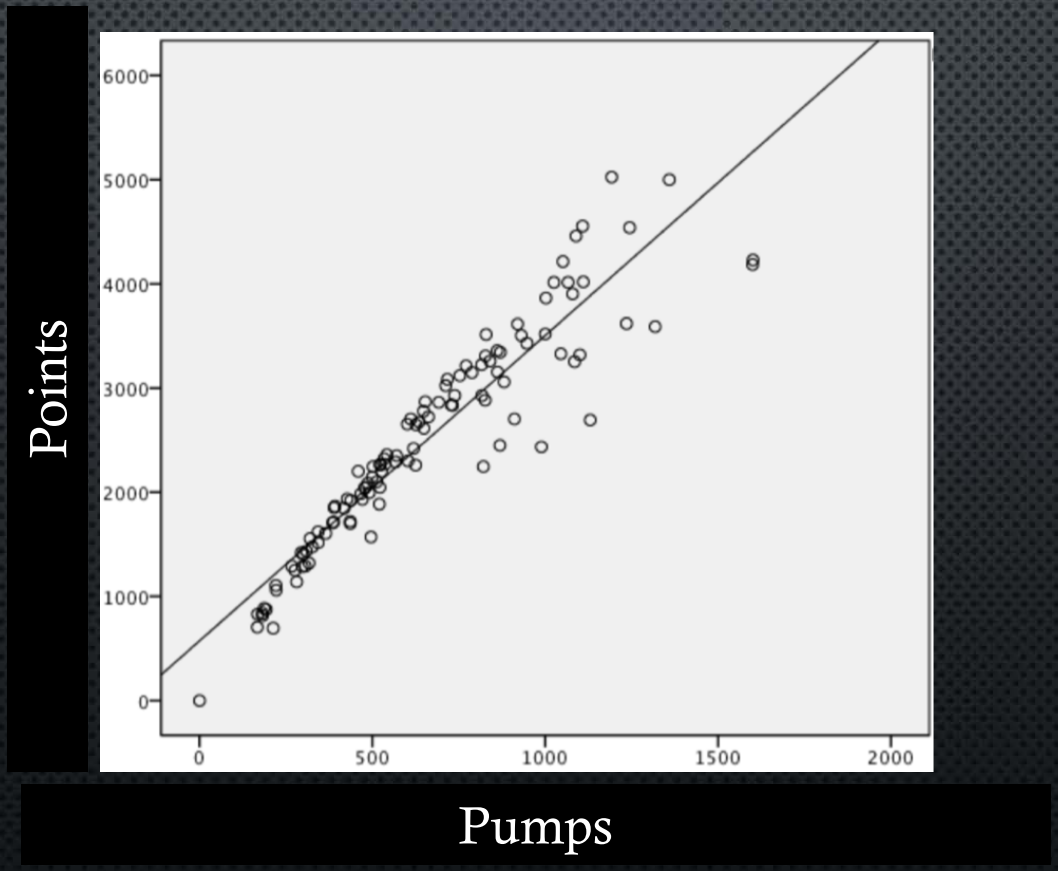
Risk Taking and Sensitivity to Punishment in Children with ADHD, ODD, ADHD+ODD, and Controls

Kathryn L. Humphreys · Steve S. Lee




Histogram
BARTversion: .00
Mean = 21.72
Std. Dev. = 10.955
N = 111
Frequency
12.5
10.0
7.5
5.0
2.5
0.0
0.0000
10.0000
20.0000
30.0000
40.0000
50.0000
60.0000
Average Pumps

ASSOCIATION OF PUMPS AND POINTS



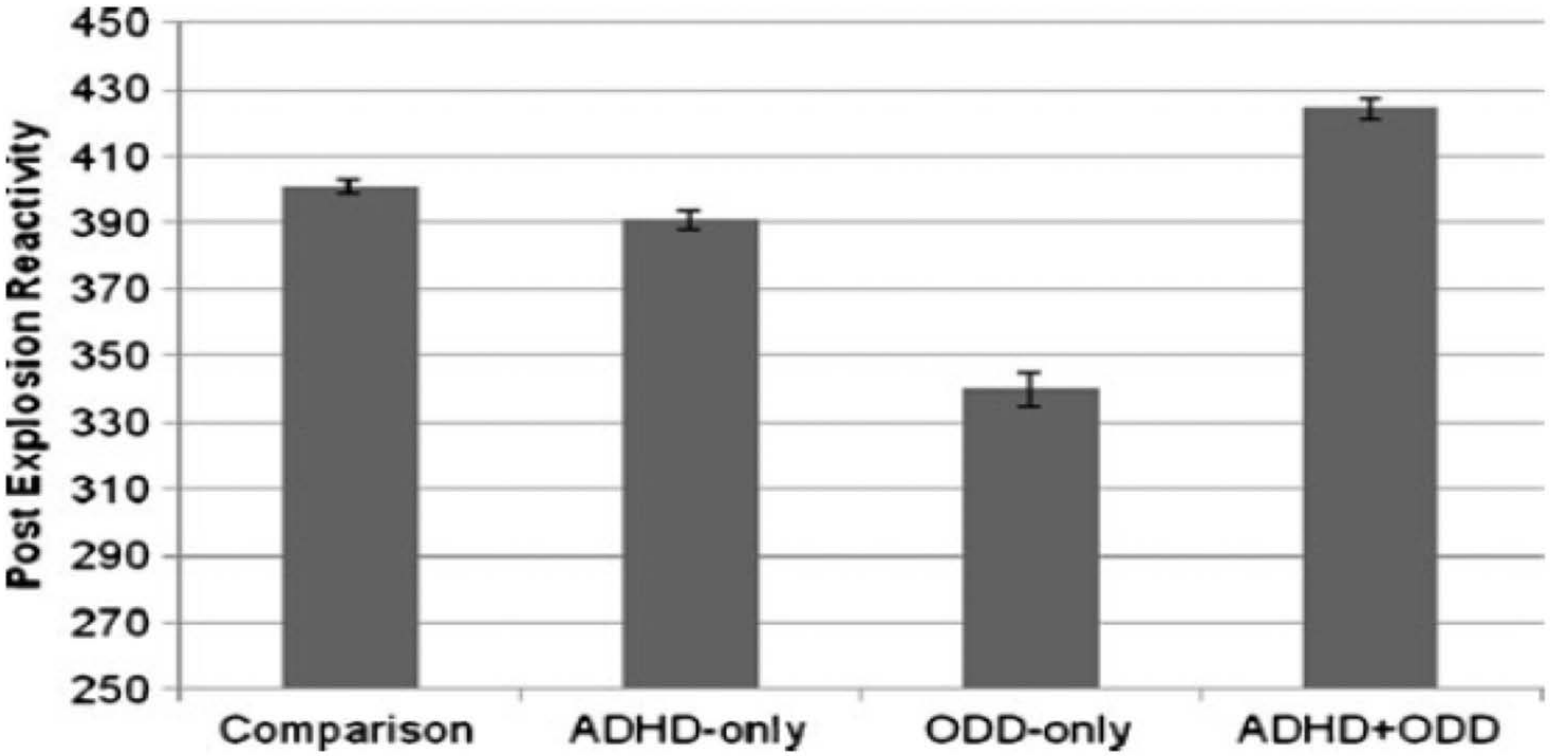


Fig. 2 Post explosion reactivity by group status. *Note*. Means and standard errors are modeled after adjusting for BART version, age, and number of explosions. Higher numbers indicate greater reduction in pumps following explosions. ADHD = attention-deficit/hyperactivity disorder. ODD = oppositional defiant disorder

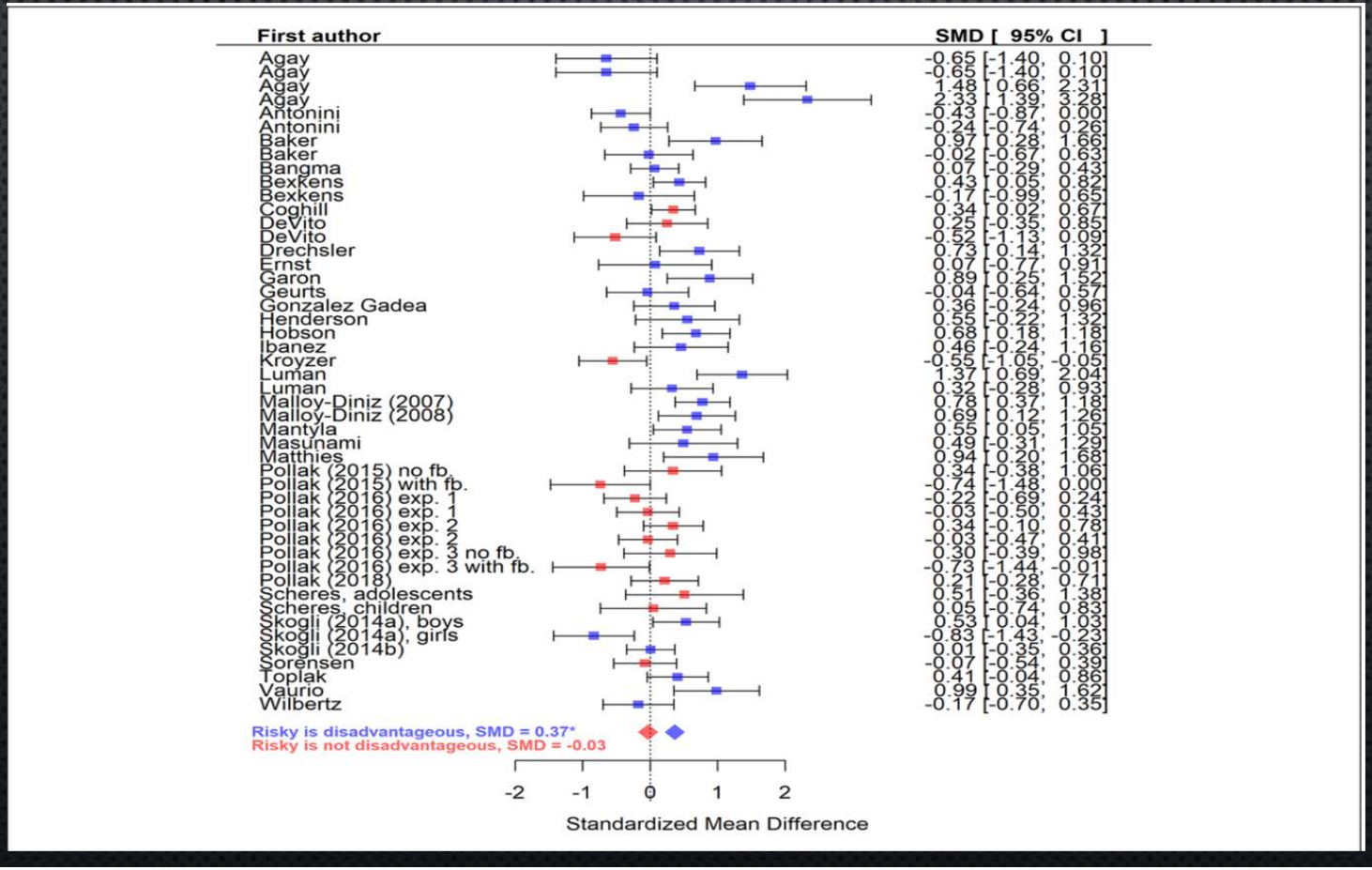
LESSONS FROM STUDY 2

- I. ADHD ASSOCIATED WITH MORE BALLOON PUMPS BUT LARGEST EFFECT FOR ODD PLUS ADHD + ODD
- II. BUT MORE PUMPS ≠ MALADAPTIVE RISK TAKING
  - OLDER YOUTH AND IQ BOTH ASSOCIATED WITH MORE PUMPS (POINTS)
- III. ADHD+ODD YOUTH WERE ALSO THE MOST SENSITIVE TO PUNISHMENT (I.E., DECREASED PUMPS AFTER EXPLOSION)
- IV. WE LACK AN *EXPLANATION* FOR THESE ASSOCIATIONS

RISK TAKING AS MULTIDIMENSIONAL

- I. Risk taking Patterns with outcomes may not be linear
  - "Some" risk taking is adaptive
- II. Risky decision making: choosing the option with the highest variability in outcomes
- III. Suboptimal decision making: choosing the option with low or lowest expected value
- IV. Example of Reckless driving:
  - Large variance of outcomes (and hence is risky decision making)
  - expected value is modest since joy is short-lived vs. risk of permanent injury

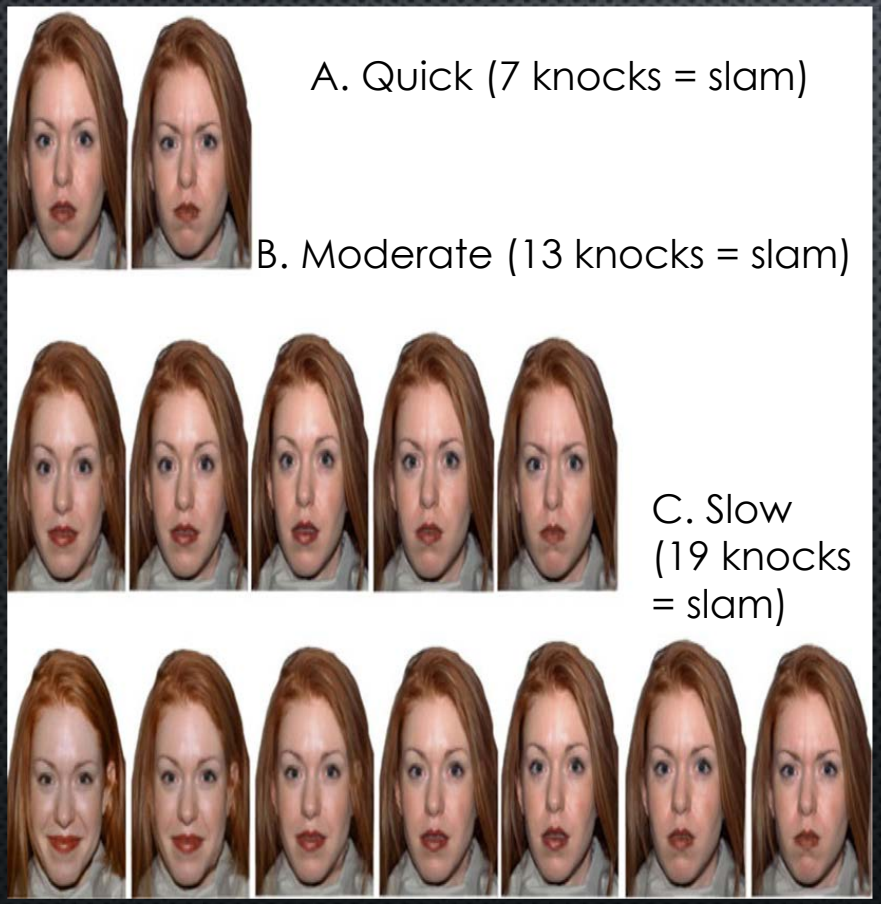
STUDY 3: ADHD AND RISK TAKING META-ANALYSIS (DEKKERS ET AL., 2021)



LESSONS FROM STUDY 3

- I. When risk taking is disadvantageous (i.e., expected value is the same), individuals with ADHD engaged in more risk taking behavior
- II. When risk taking is advantageous, ADHD vs. non-ADHD individuals were comparable
- III. Key question: what might *explain* this pattern?

STUDY 4



A. Quick (7 knocks = slam)

B. Moderate (13 knocks = slam)

C. Slow (19 knocks = slam)

- CHILDREN "KNOCK" ON DOORS AND "EARN" CANDY
- EACH KNOCK, FACE GROWS INCREASINGLY ANGRY (HAPPY → NEUTRAL → ANGRY)
- ONCE A FACE WAS ANGRY, A KNOCK WOULD RESULT IN CANDY BEING TAKEN AWAY
- **OUTCOME**: POINTS EARNED (NOT KNOCKS)

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CrossMark

Impaired Social Decision-Making Mediates the Association Between ADHD and Social Problems

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STUDY 4

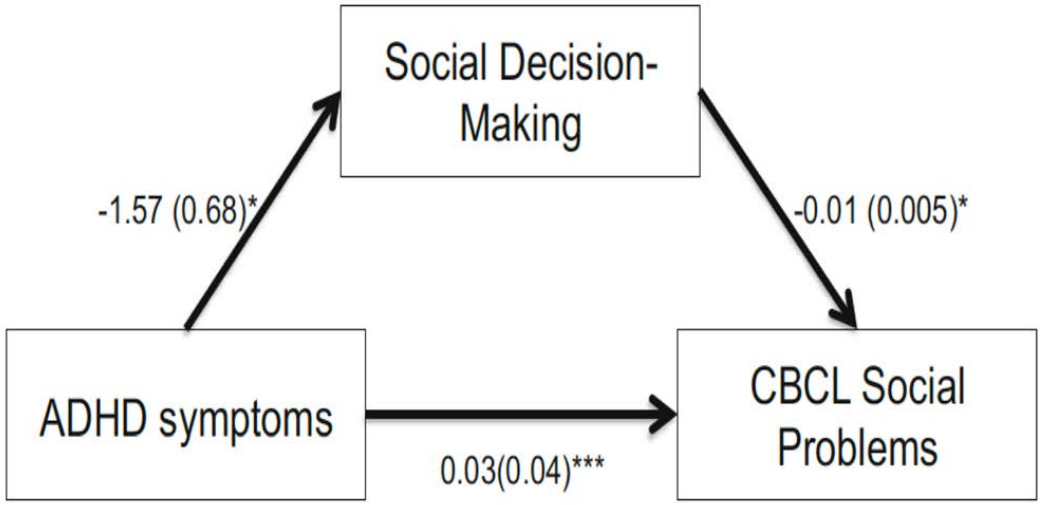

Fig. 2 Mediation model in which social decision-making mediates the association between ADHD symptoms at Wave 1 and CBCL social problems at Wave 2. Note. Coefficient (standard error). ADHD = attention-deficit/hyperactivity disorder. CBCL = Child Behavior Checklist. $*p < 0.05$. $***p < 0.001$.

Affect Recognition?

Cue Sensitivity?

Social judgement?

LESSONS FROM STUDY 4

- I. like ADHD linkages with social dysfunction, linkages with maladaptive risk taking behavior may be similarly anchored in disrupted decision making
  - Assessments of valuation, reward, etc. Akin to assessment of emotion in others (e.g., repetitive knocks on the door)?
- II. Current evidence suggests impaired decision making as central to ADHD → risk taking more than sensation seeking

FUTURE DIRECTIONS

- METHODOLOGY
  - A. "ECOLOGICALLY VALID" (E.G., SOCIAL CONTEXT)
  - B. DIVERSIFY REWARDS (E.G., MONETARY VS. SOCIAL)
  - C. RISK TAKING BEHAVIORS IN AREAS OF COMPETENCE
- HOW IS LEARNING IMPAIRED? DEFICITS IN ENCODING?

CLINICAL IMPLICATIONS

- Model and "scaffold" appraisals of risk taking
  - Salience of reward? Recall reward sensitivity & ADHD
  - Permanence of risk? Not all risk is created equally!
  - Discuss "cues" related to "ongoing" risk to support advantageous vs. maladaptive risk taking (e.g., when does "persistence" become unrealistic or intrusive?)

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