The 7th International Conference on FASD
Research: Results and Relevance
Integrating Research, Policy and Promising Practice Around the World

E6 - Prenatal Alcohol Exposure and Social Behavior Function

Challenges Associated with Navigating the Social World with FASD

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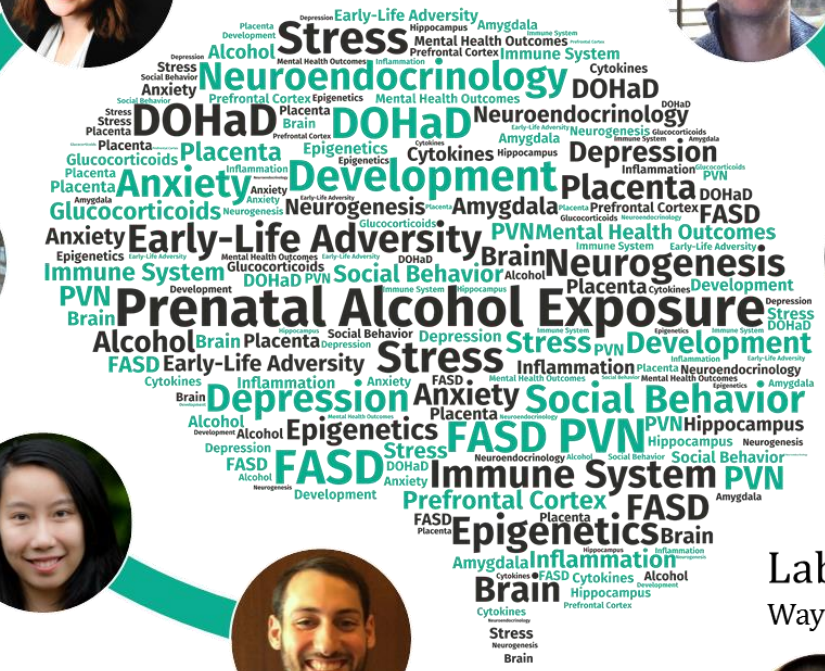

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CIHR IRSC
Canadian Institutes of Health Research
Instituts de recherche en santé du Canada

SSHRC CRSH
Social Sciences and Humanities Research Council of Canada
Conseil de recherches en sciences humaines du Canada

Canada

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Bourses d'études supérieures du Canada Vanier
Canada Graduate Scholarships

Outline

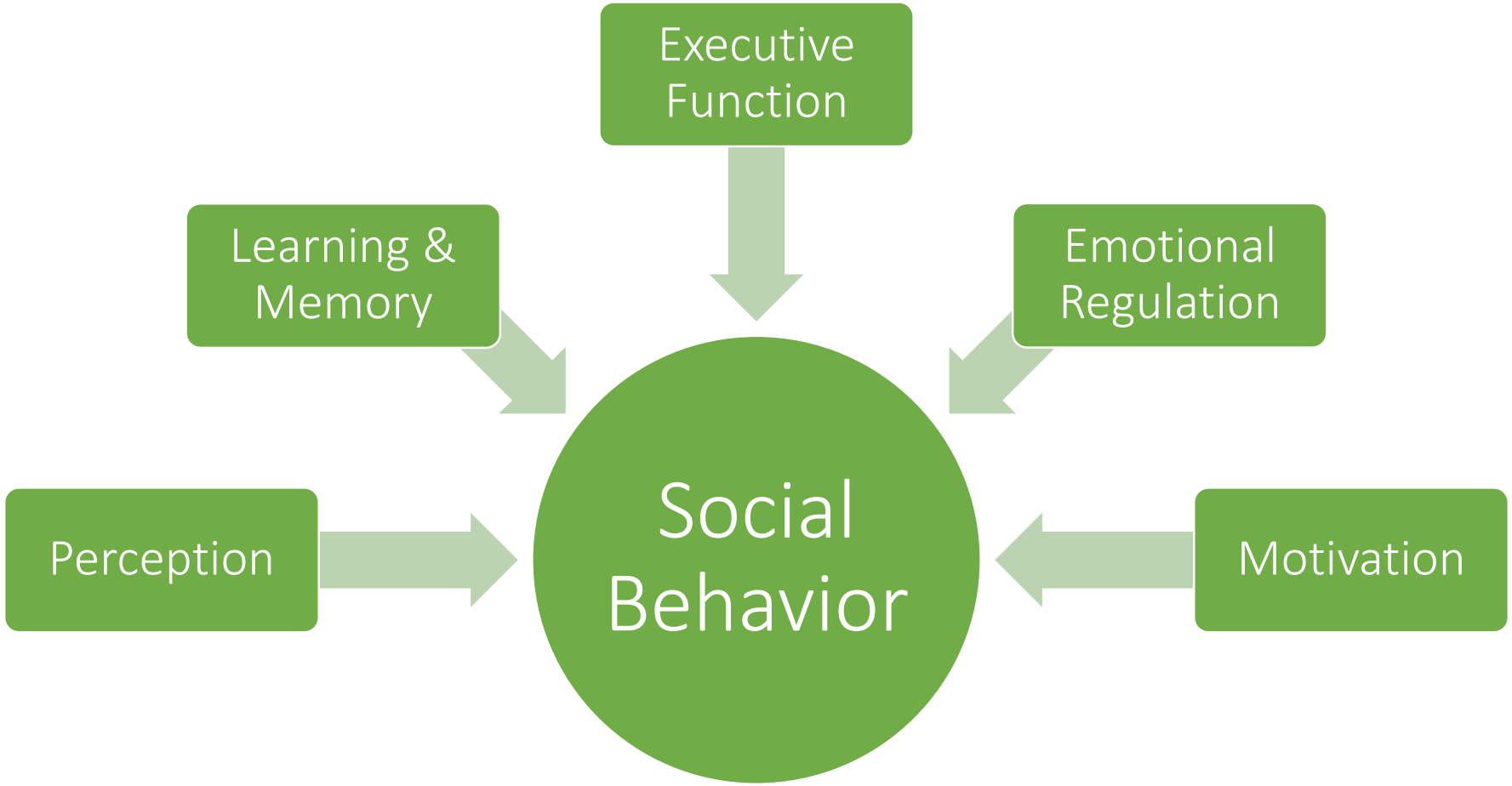
- Provide an overview of how prenatal alcohol exposure (PAE) can alter social cognition and behavior development, with a particular focus on social problem solving skills and social perspective taking
- Discuss findings from an animal model of PAE, including potential neural mechanisms of social behavior dysfunction
- Examine the relationship between resilience, mental health, and social competence in adolescents with FASD

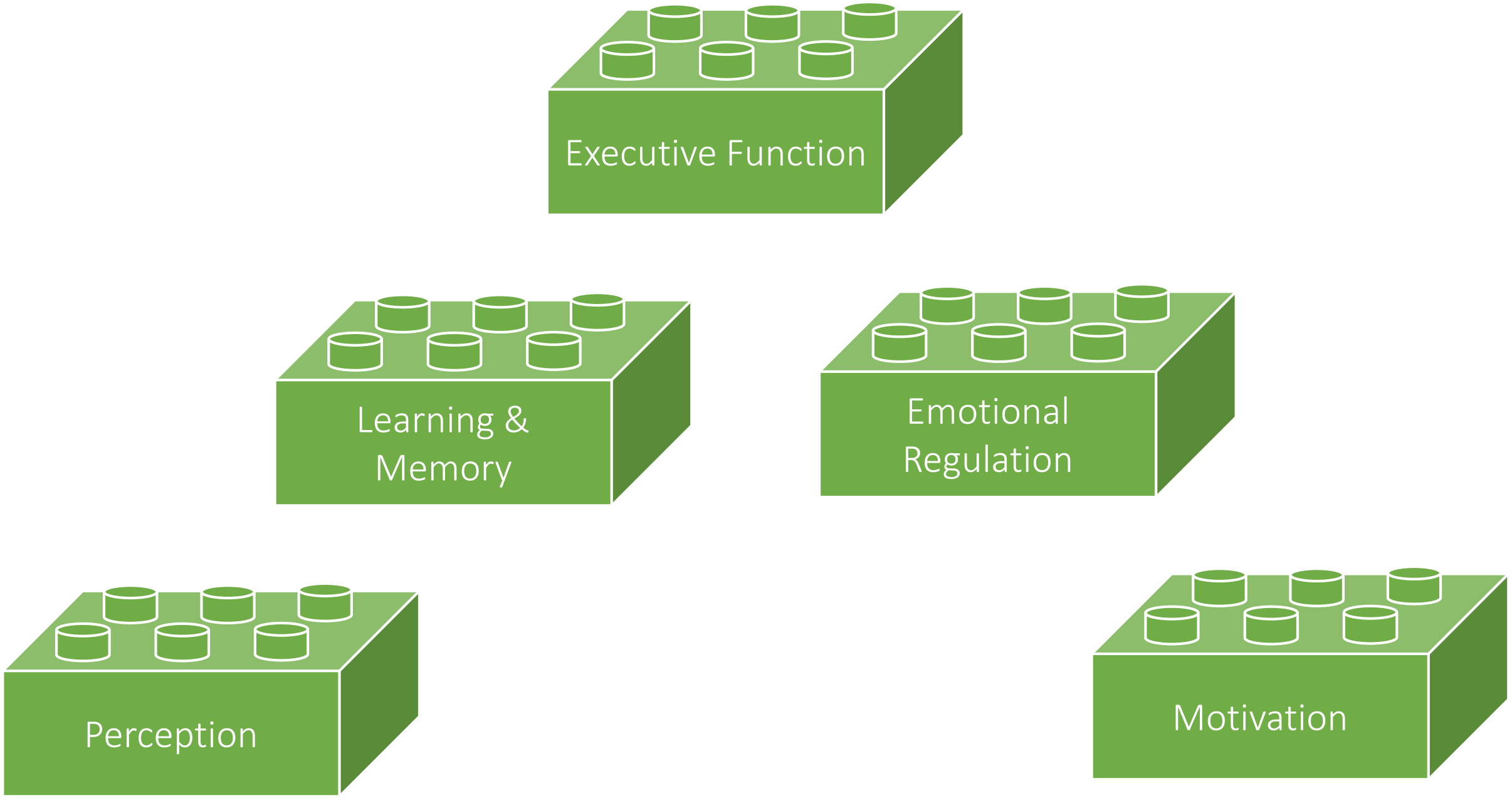
How do we define **Social Behavior**?

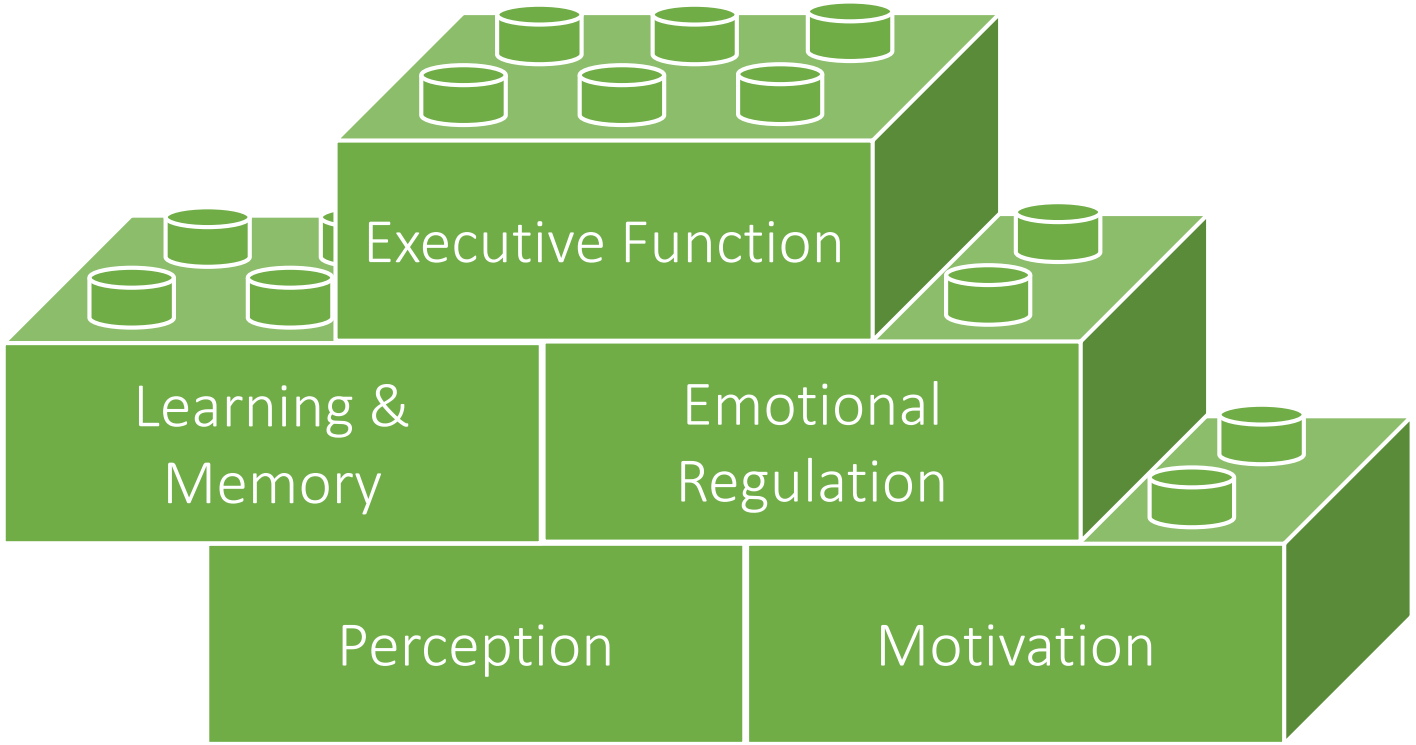
- "Social Skills"
  - Initiate and manage social interactions
  - Establish and maintain friendship(s)
  - Express and interpret emotions
  - Use interpersonal/communication skills
  - Inhibit inappropriate/negative social behaviors

Kully-Martens et al. 2012

How do we define **Social Behavior**?




Executive Function
Learning &
Memory
Emotional
Regulation
Perception
Motivation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Learning & Memory
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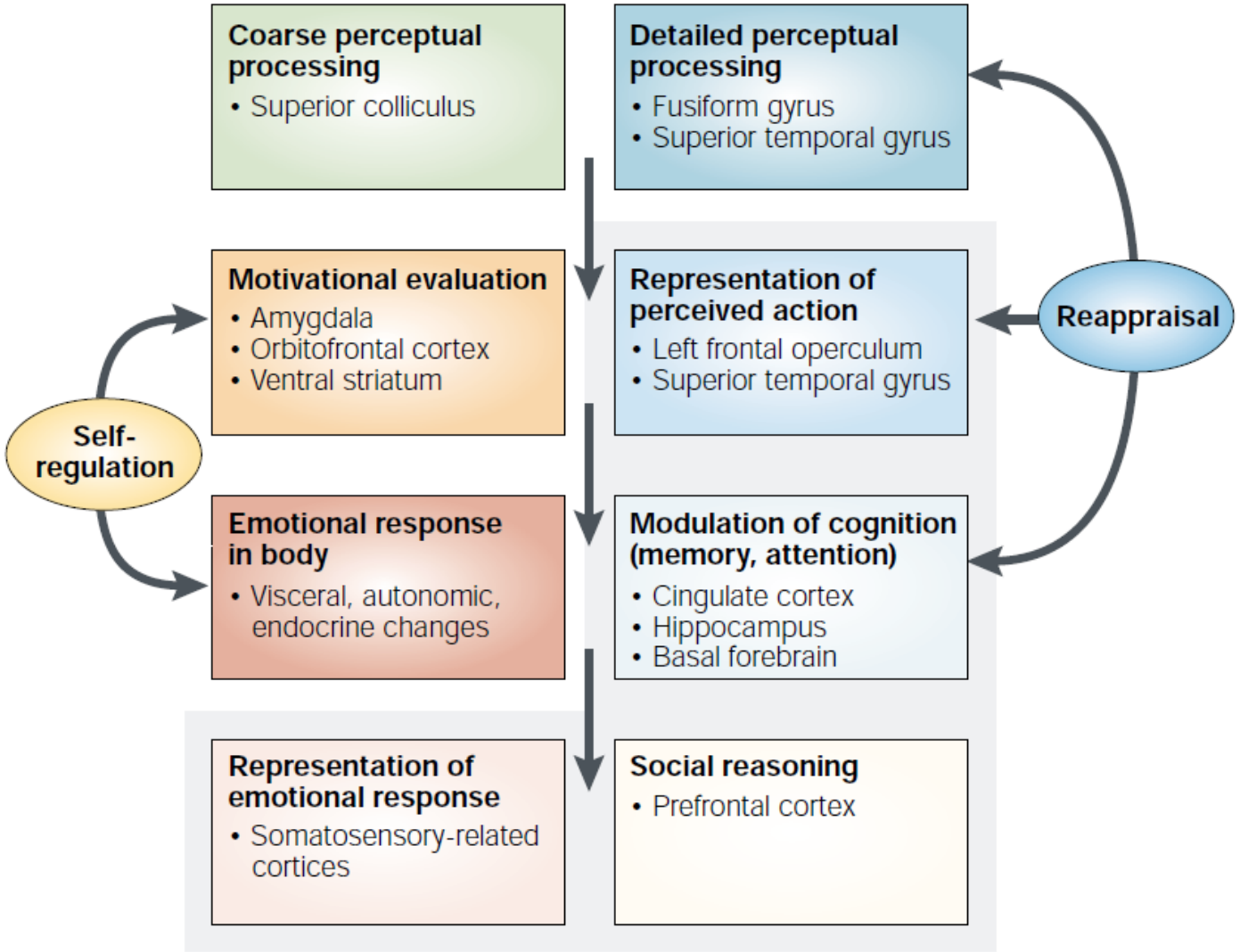
Motivation

Social Behavior

Human Social Cognition



Adolphs 2003

Why study social behavior in FASD?

- Social behavior deficits are a pervasive feature across the entire continuum of FASD

- Deficits also observed in 'sub-clinical' alcohol-exposed groups ('PAE')
- Impact can become more pronounced with age (adolescence)

Kelly, Day, & Streissguth 2000; Kully-Martens et al. 2012

Why study social behavior in FASD?

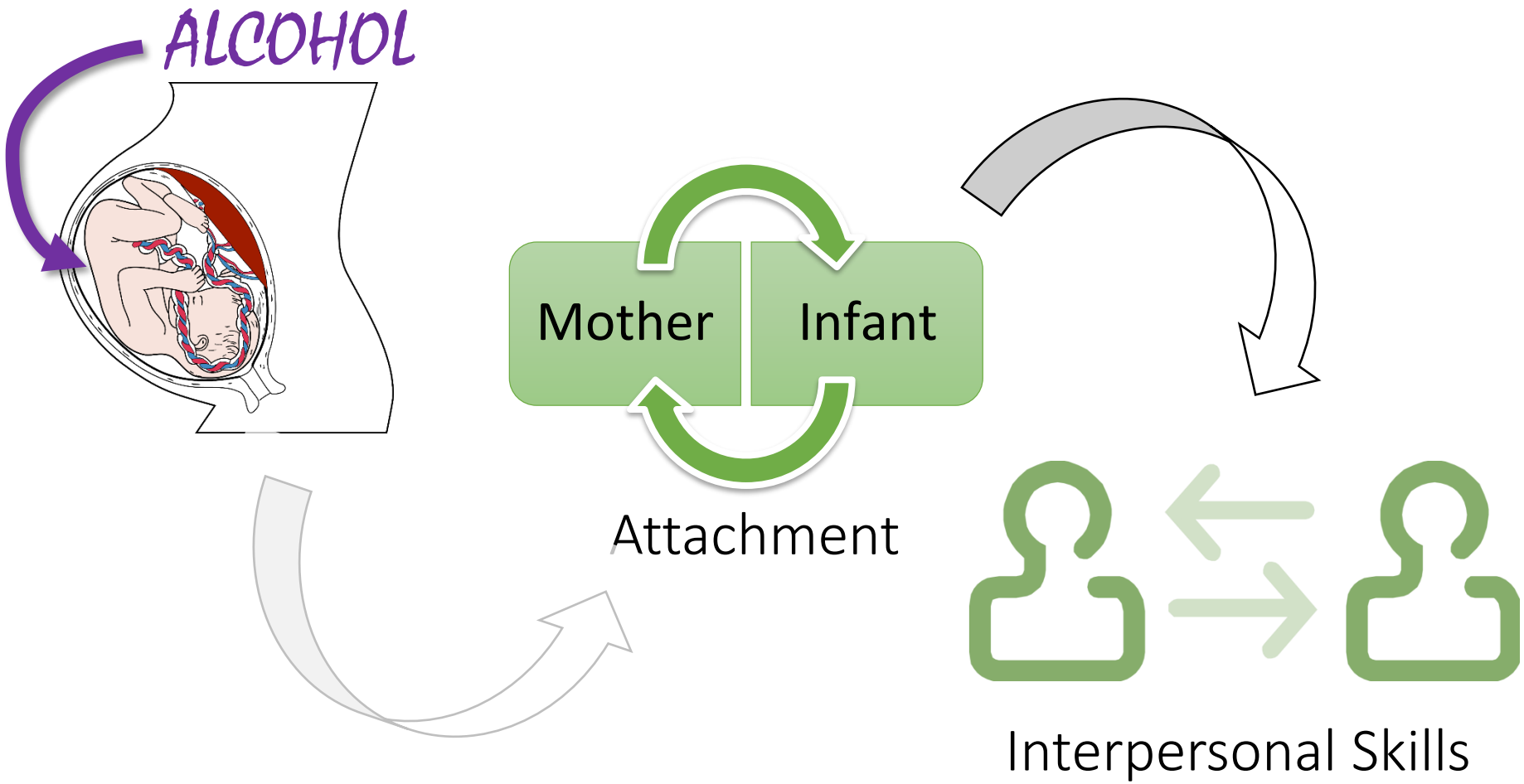
- Impaired social behavior in individuals with FASD has widespread implications for other domains and may contribute to:

  - Difficulties in school
  - Social rejection
  - Trouble with the law
  - Later mental health problems
  - Independent living & work

} **"Secondary Disabilities"**

Kelly, Day, & Streissguth 2000; Kully-Martens et al. 2012

Early environment shapes development of social behavior



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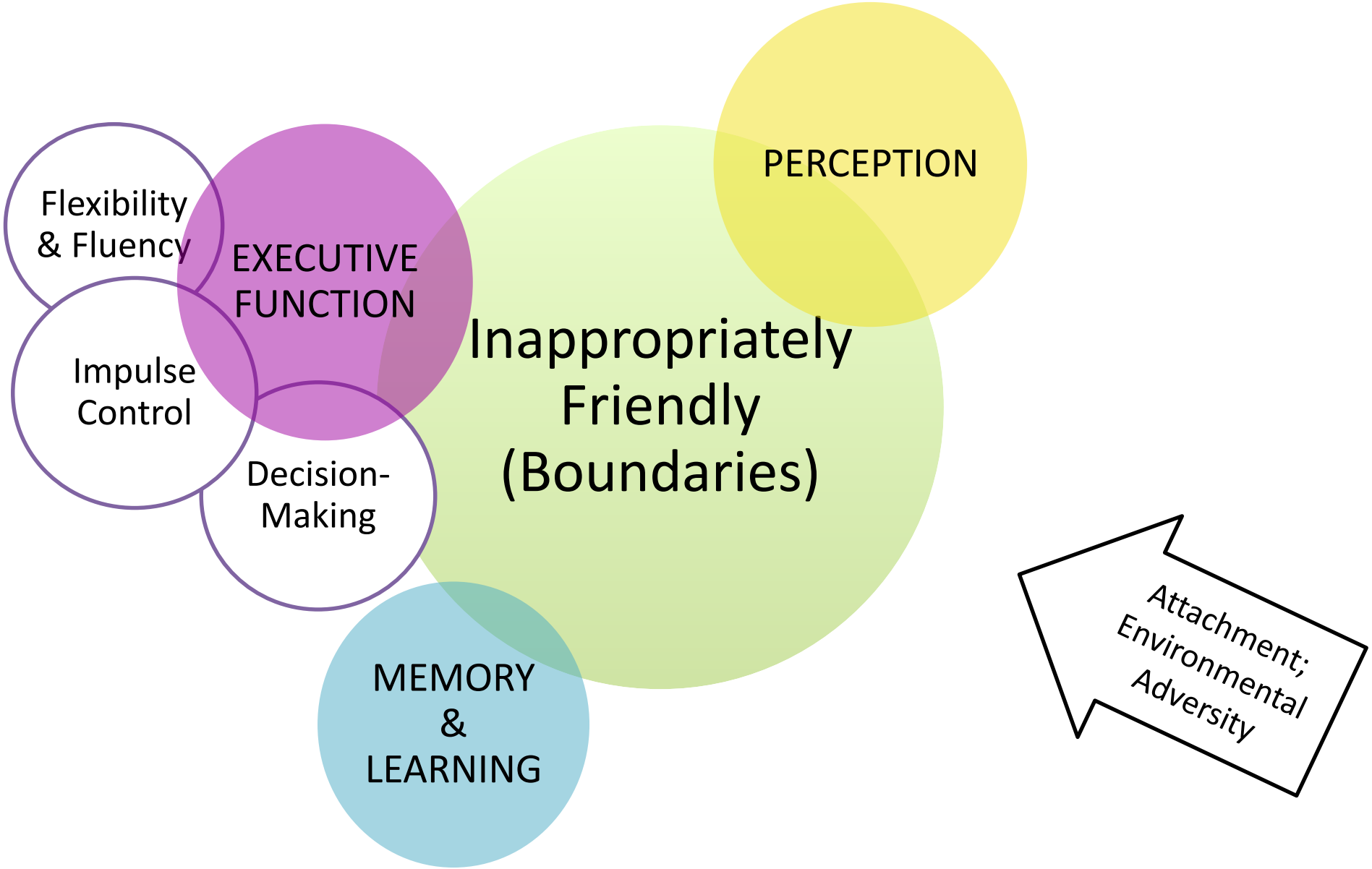

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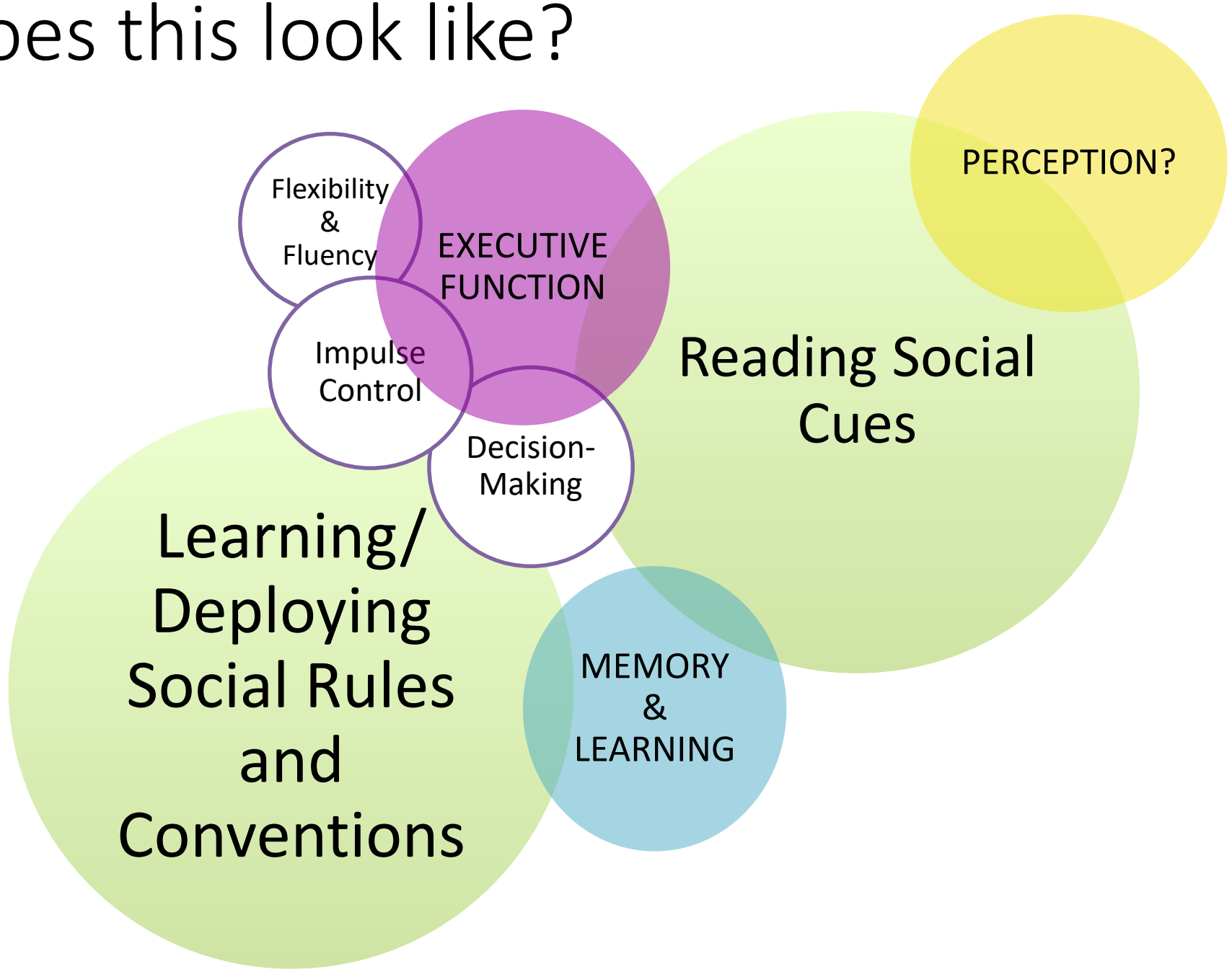

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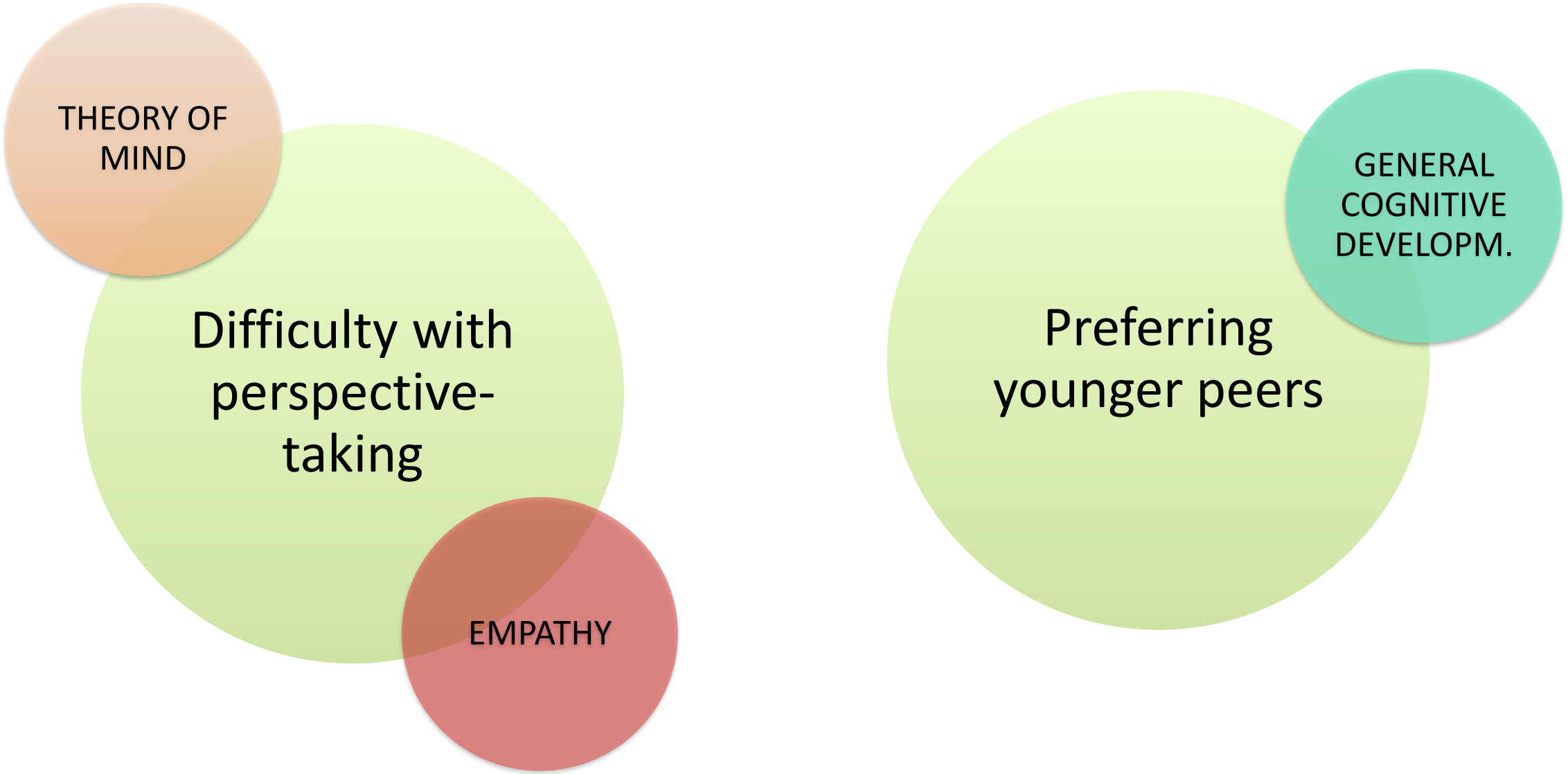

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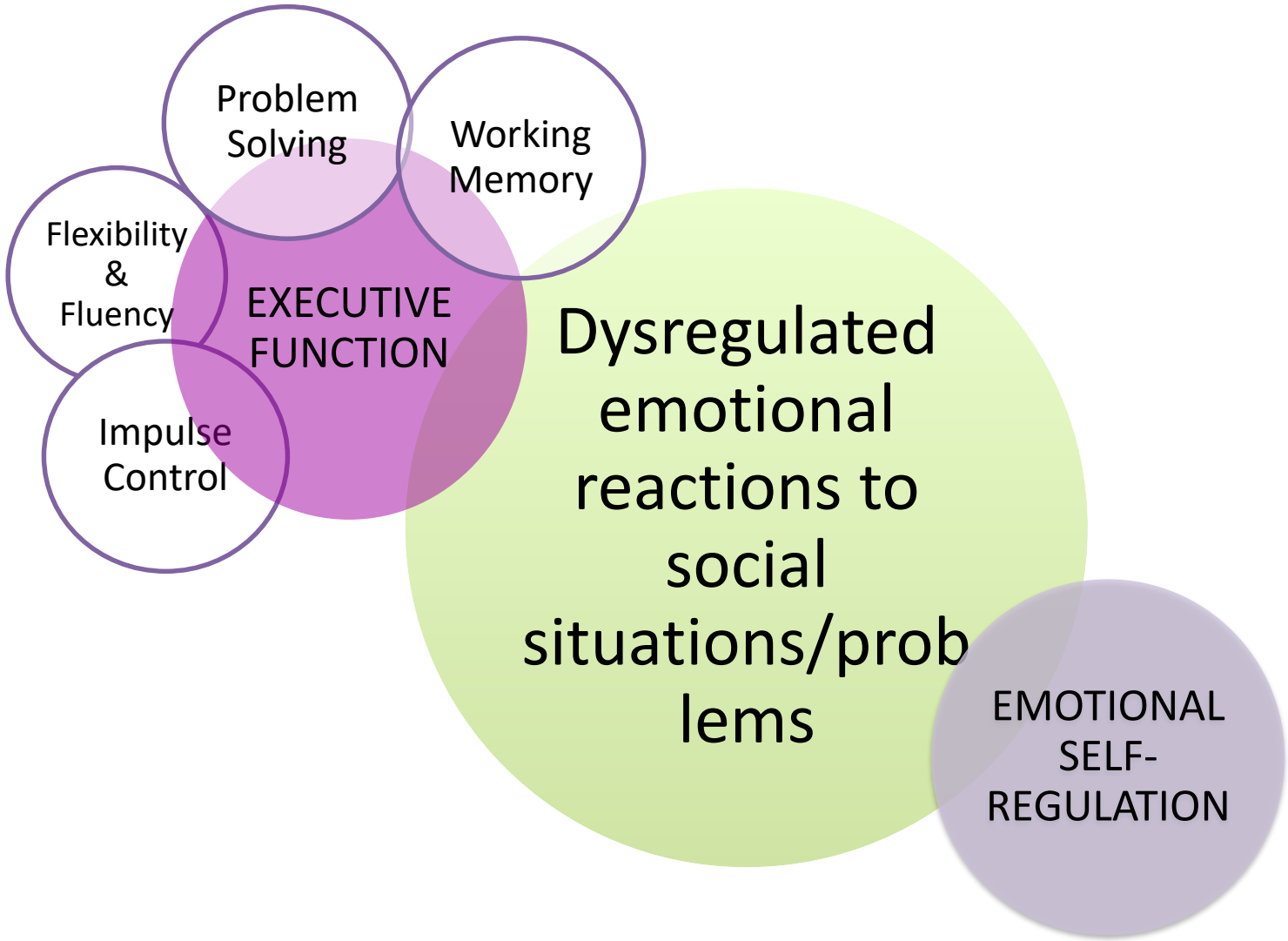
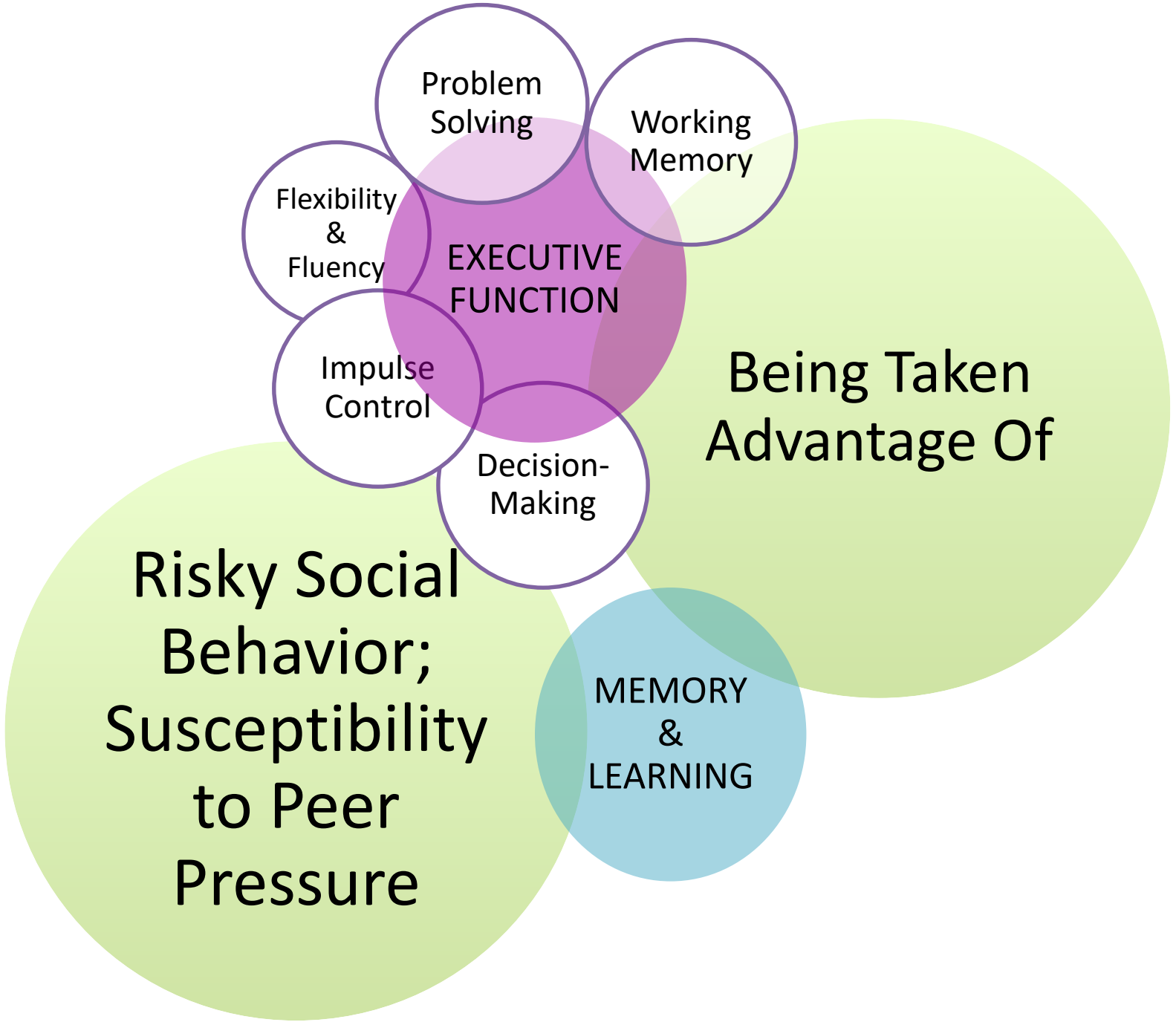
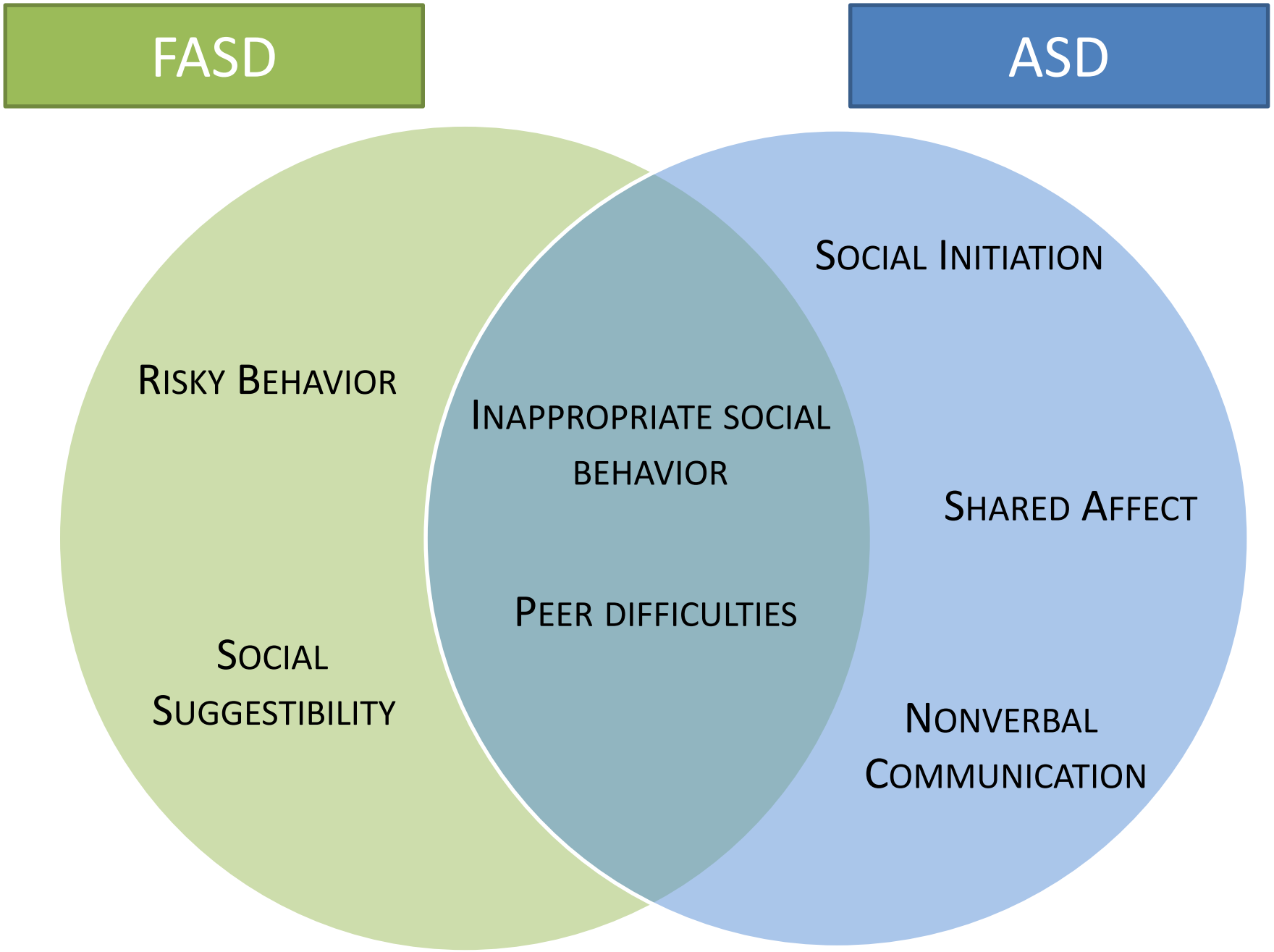



Problem Solving
Working Memory
Flexibility & Fluency
EXECUTIVE FUNCTION
Impulse Control
Decision-Making
Being Taken Advantage Of
Risky Social Behavior; Susceptibility to Peer Pressure
MEMORY & LEARNING

Social Strengths

- Interest in others
  - Enjoy being social (Duquette et al., 2006)
- Caregivers have described their children with FASD as:
  - Being friendly, talkative, and charming (James et al., 2010)
  - Having a loving/caring personality and determination and energy (Breen & Burns, 2012)
- Mean scores in the normative average range on the SSRS: Communication, Assertion, Engagement (Regehr, 2015)



Bishop et al., 2009

Children with FASD show changes in social behaviors across development

Infancy	Periadolescence	Adolescence / Adulthood
• Disruption in Mother-Infant Dyad (O'Connor et al. 1992; 2006) • Disrupted sleeping/feeding rhythms; Increased irritability (Coles & Platzman 1993) • Less "social monitoring" behaviors (Jirikowic et al. 2016)	• Low scores on social behavior assessments (Thomas 1998; O'Connor et al. 2006; Regehr 2015; Stevens et al. 2015) • Impulsivity (McGee et al. 2008) • High scores on "problem behavior" assessments (Stevens et al. 2015)	• Low scores on social behavior assessments (Moore & Riley 2015) • Increased risk for interactions with criminal justice system (Streissguth et al. 1996; MacPherson & Chudly 2007)

For review, see Kelly, Day, & Streissguth 2000; Mattson, Crocker, & Nguyen 2011; Kully-Martens et al. 2012

Animal models corroborate clinical findings

Infancy	Periadolescence	Adolescence / Adulthood
• Increased latency to nipple attach (Subramanian 1992) • Altered suckling behavior (Barron, Kelly, & Riley 1991) • Inability to elicit retrieval by mother (Ness & Franchina 1990) • Altered pattern of ultrasonic vocalizations (Marino et al. 2002)	• Altered play behavior (Hamilton et al. 2010; Lawrence et al. 2008) • Decreased social investigation (Mooney & Varlinskaya 2011)	• Reduced social interactions (Hellemans et al. 2010) • Sexually dimorphic effects of social memory encoding and duration (Kelly, Leggett, & Cronise 2009)

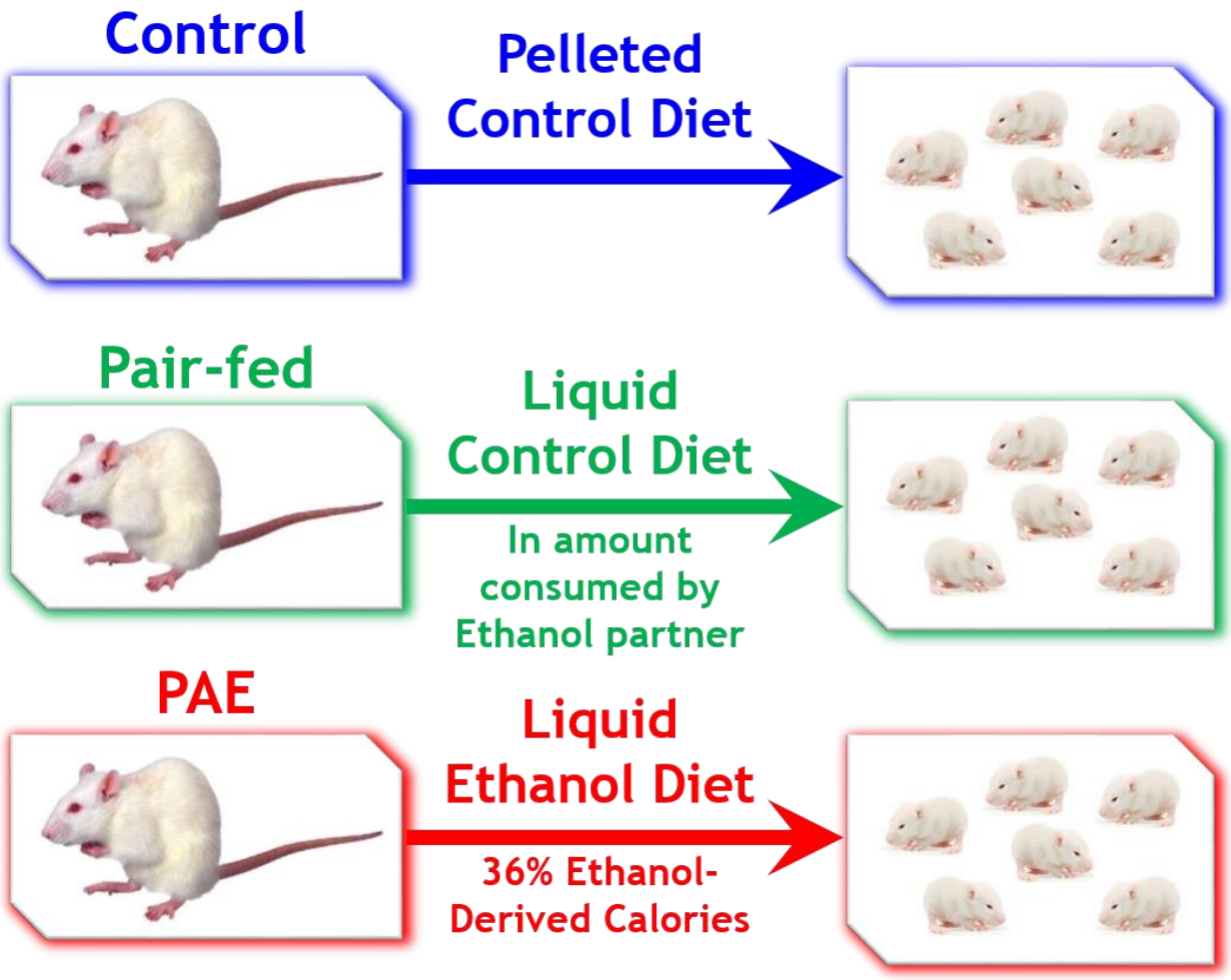
For review, see Kelly, Day, & Streissguth 2000; Marquardt & Brigman 2016

Why use animal models?

- Control for many variables:
  - Dose of alcohol
  - Timing of alcohol exposure
  - Environmental factors
  - Sex of offspring

- Ability to look at mechanism
  - Investigate changes in behavior and correlate with changes in brain

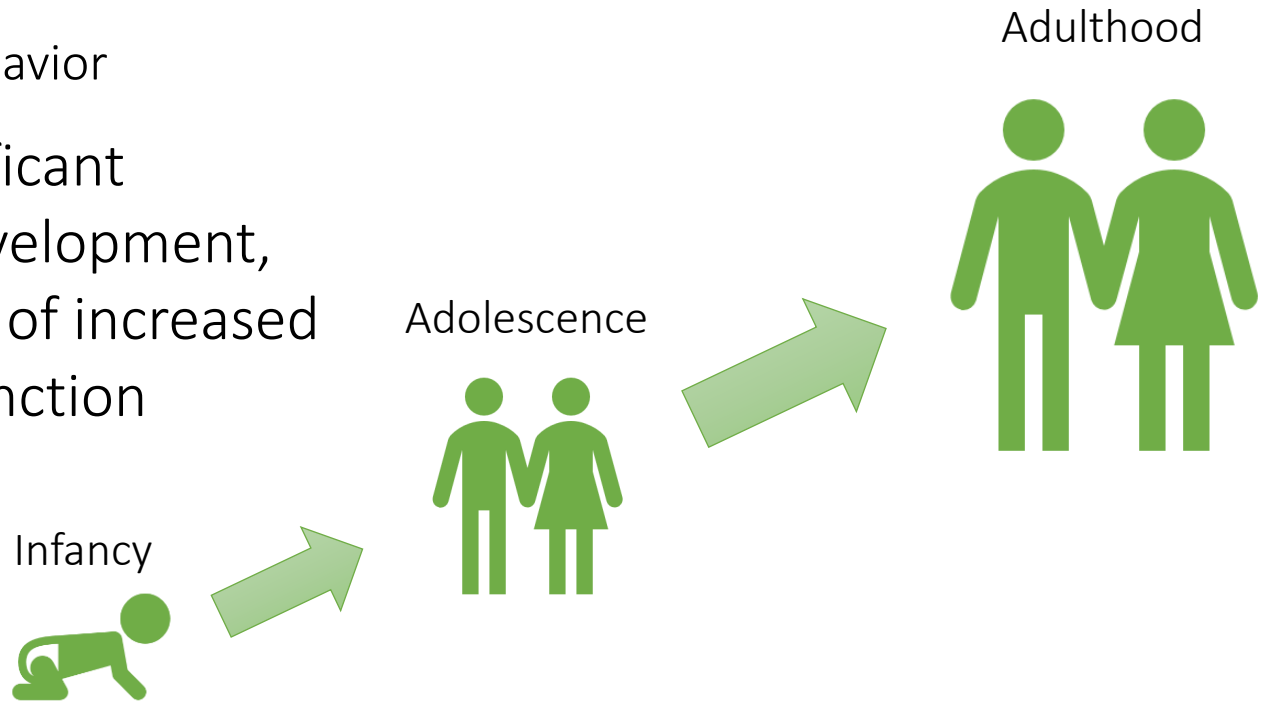
Animal model of prenatal alcohol exposure



- Diets maintained throughout gestation
  (human 1st- and 2nd-trimester equivalent)
- Peak blood alcohol
  ≈150 mg/dL
- Offspring Ages at Testing:
  - Early Adolescence (~P30)
  - Late Adolescence (~P45)

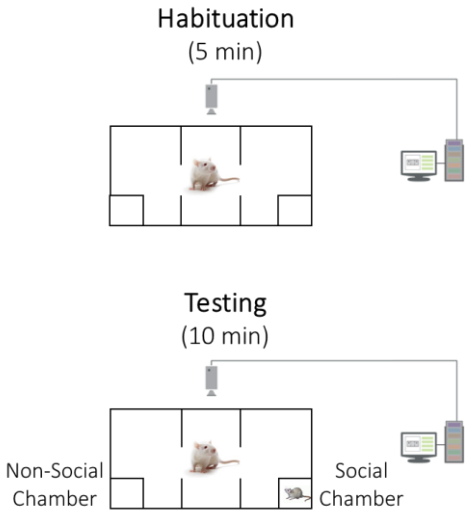
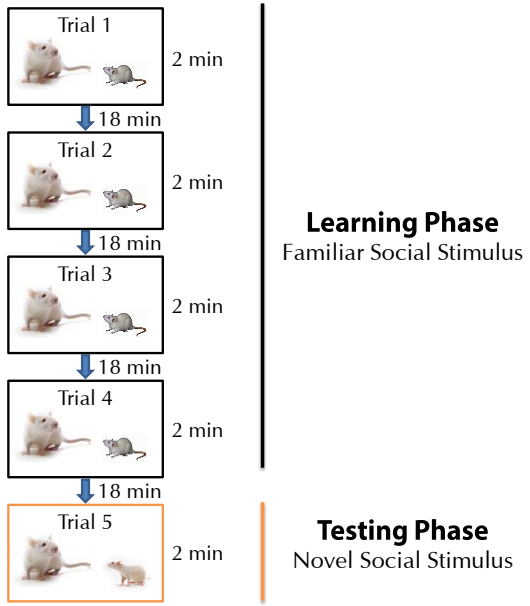
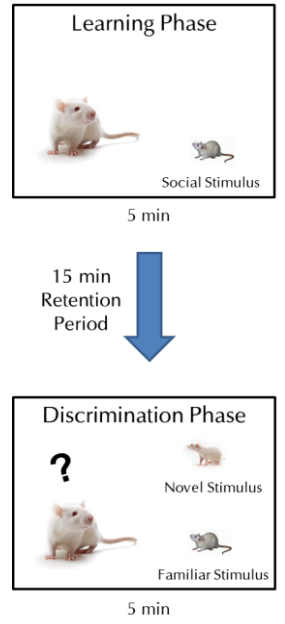
Adolescence and Social Behavior Development

- Adolescence is a critical developmental period in which significant behavioral, cognitive, physiological and neurological changes occur, including sexual maturity (puberty)
  - Sex Hormones – Organize brain and behavior
- Maturational changes can have significant consequences for social behavior development, making adolescence a unique period of increased vulnerability to social behavior dysfunction

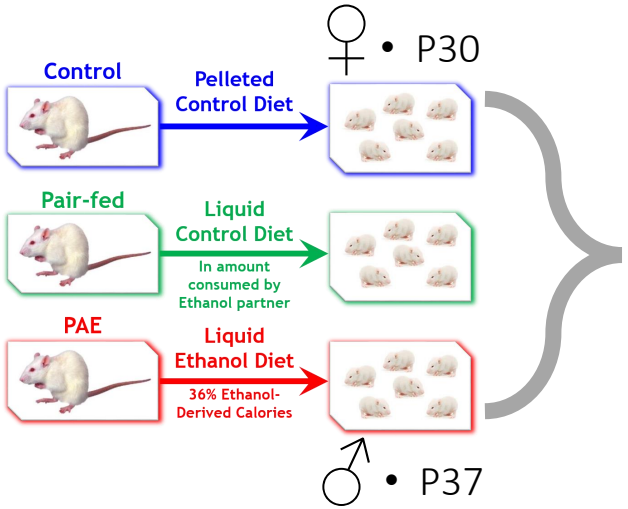



Infancy
Adolescence
Adulthood

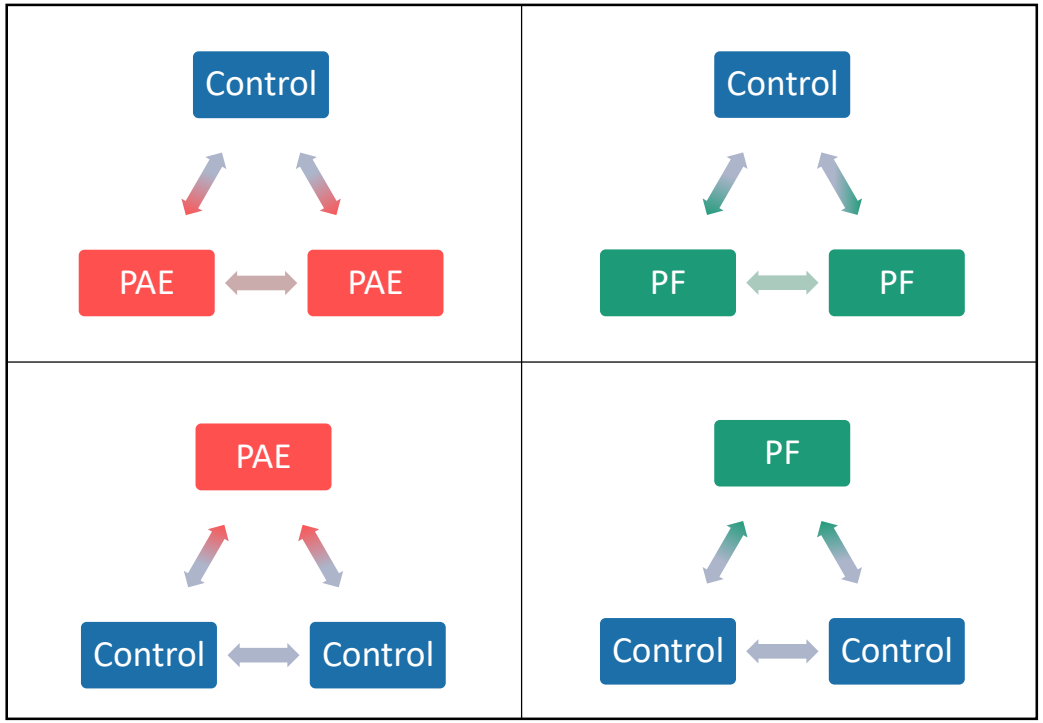
Effects of PAE on social behavior during pre-pubertal and pubertal periods of adolescent development

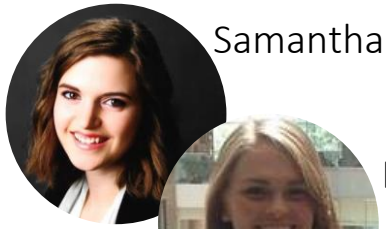
Social Motivation	Social Play	Social Recognition	Social Discrimination
			

Play behavior preferences in adolescent rats with or without prenatal alcohol exposure



Play Behavior – Triads





Samantha Baglot

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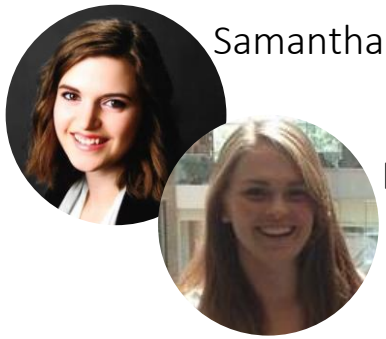
Play behavior preferences in adolescent rats with or without prenatal alcohol exposure



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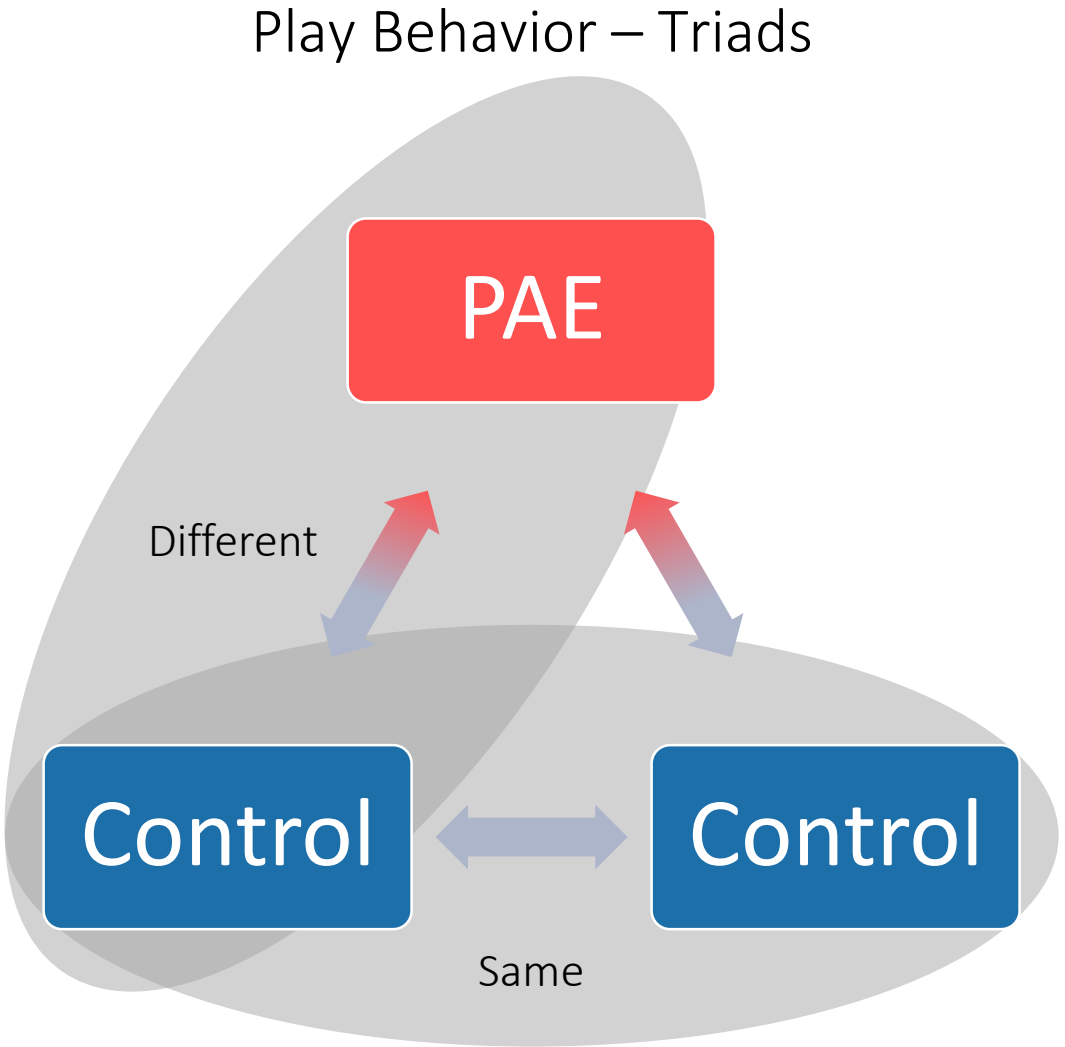

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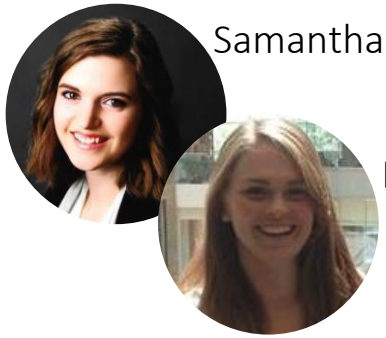

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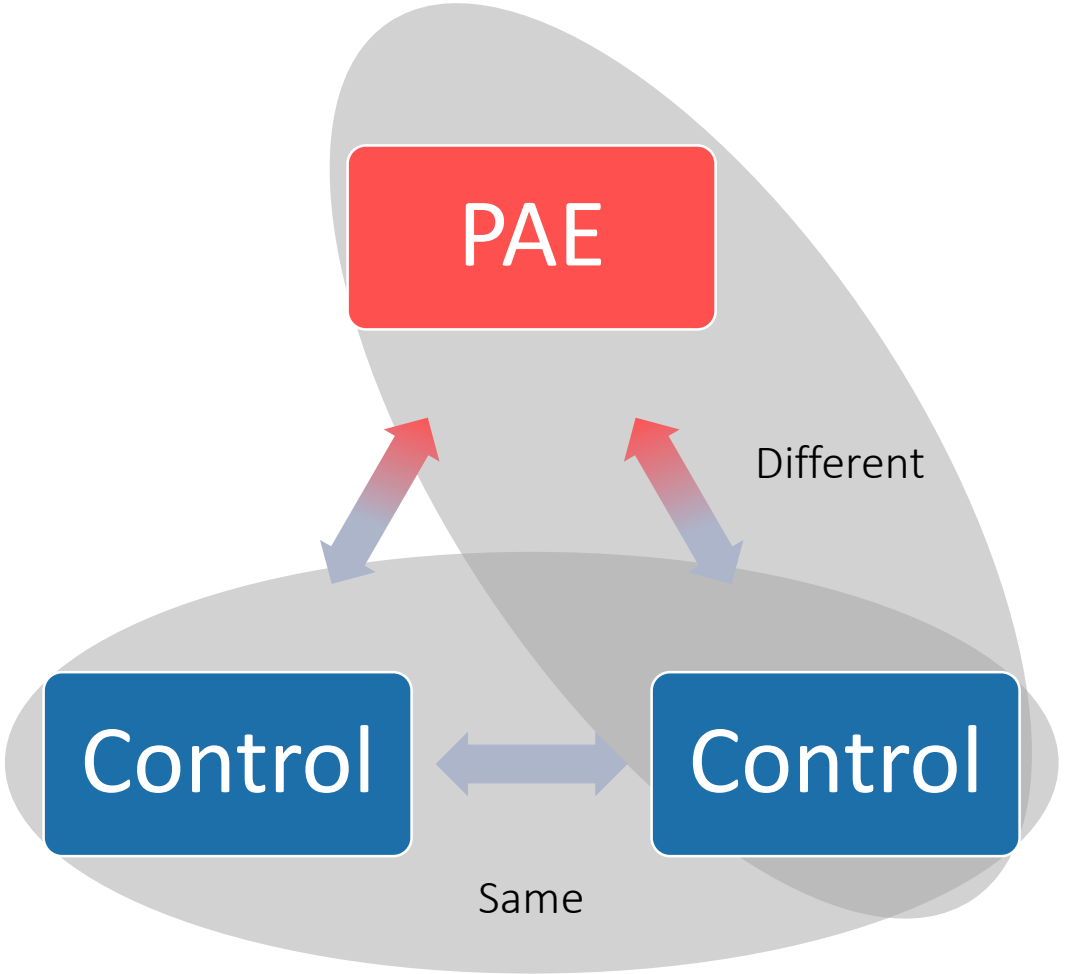


Summary

- Social motivation **not** altered in animals follow prenatal alcohol exposure
- In play triads, control and PAE animals bias their play towards controls in sexually dimorphic ways
- Normal development of social recognition memory is delayed in PAE adolescent males
- Social discrimination is impaired in adolescent males

Social Behavior & Oxytocin

- Oxytocin
  - Uterine contractions
  - Lactation
  - Emotional feelings and responses
  - Social behaviors
  - Maternal behaviors and social bonds

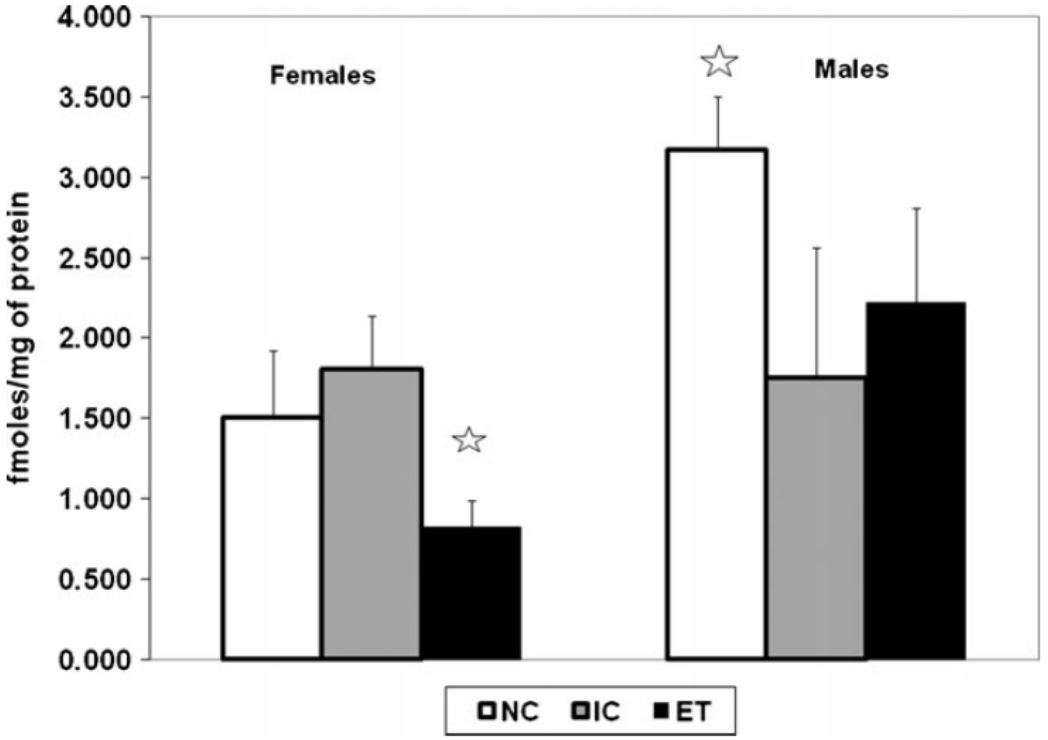
Ostrowski 1998

Oxytocin and Prenatal Alcohol Exposure

- Adult rats show reduced OT receptor binding following PAE in amygdala

- Similar reductions in OT-IR cells observed in PVN & SON of adult female Mandarin voles following PAE
(He, Zhang & Guo 2012)

Mean Oxytocin Receptor Binding in Amygdala

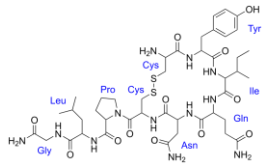


Kelly et al. 2009

Summary

- Prenatal alcohol exposure (PAE) produces long-term changes in social behavior
  - Delays social behavior development
  - Impairs social recognition memory
    - Particularly in complex social context

- PAE effects on social behavior are specific & sexually dimorphic
- PAE alters oxytocin system in the brain



- Next Steps
  - Investigate oxytocin's potential to "rescue" social discrimination deficits following PAE

Questions???

Questions???

Intervention

	Children's Friendship Training Program (Keil et al., 2010; O'Connor et al., 2006; 2012)	Social Skills Intervention System (SSIS) (Regehr, 2015)
Type	Adapted established protocol for FASD	Non-adapted but customized manualized intervention
Target Age	Elementary school	Elementary school
Format	Group (child or parent)	Individual (child only)
Scope	• Child-focused friendship training • Caregiver education	• Direct skill teaching, role playing, video modeling for variety of social skills & problem behaviors
Research	• Delayed treatment control • Significant gains in social knowledge, skills, problem behavior	• Decrease in problem behaviors, but not dissimilar to contrast group
Community Translation	• More effective than a community-based social skills intervention	No

Intervention

- Identify risk factors: Universal and population-specific
- Universal and population-specific factors that lead to more positive outcomes
- How can adverse outcomes be prevented?

Carmichael Olson, 2015

Risk & Resiliency

- Resiliency = *competent* development during the course of negotiating, adapting to, or managing significant sources of stress and trauma
- Requires exposure to risk
- Protective factors
  - Individual, relational, contextual assets that facilitate adaptation
- Two dominant models:
  - Ecological
  - Constructivist

Risk & Resiliency

Key Protective Factors (Universal)

INTERNAL

- Social Competence
- Autonomy
- Problem Solving
- Sense of Purpose
- Self Regulation

External

- Caregiver Relationship
- Peer Relationships
- School Relationships
- High Expectations
- Opportunity

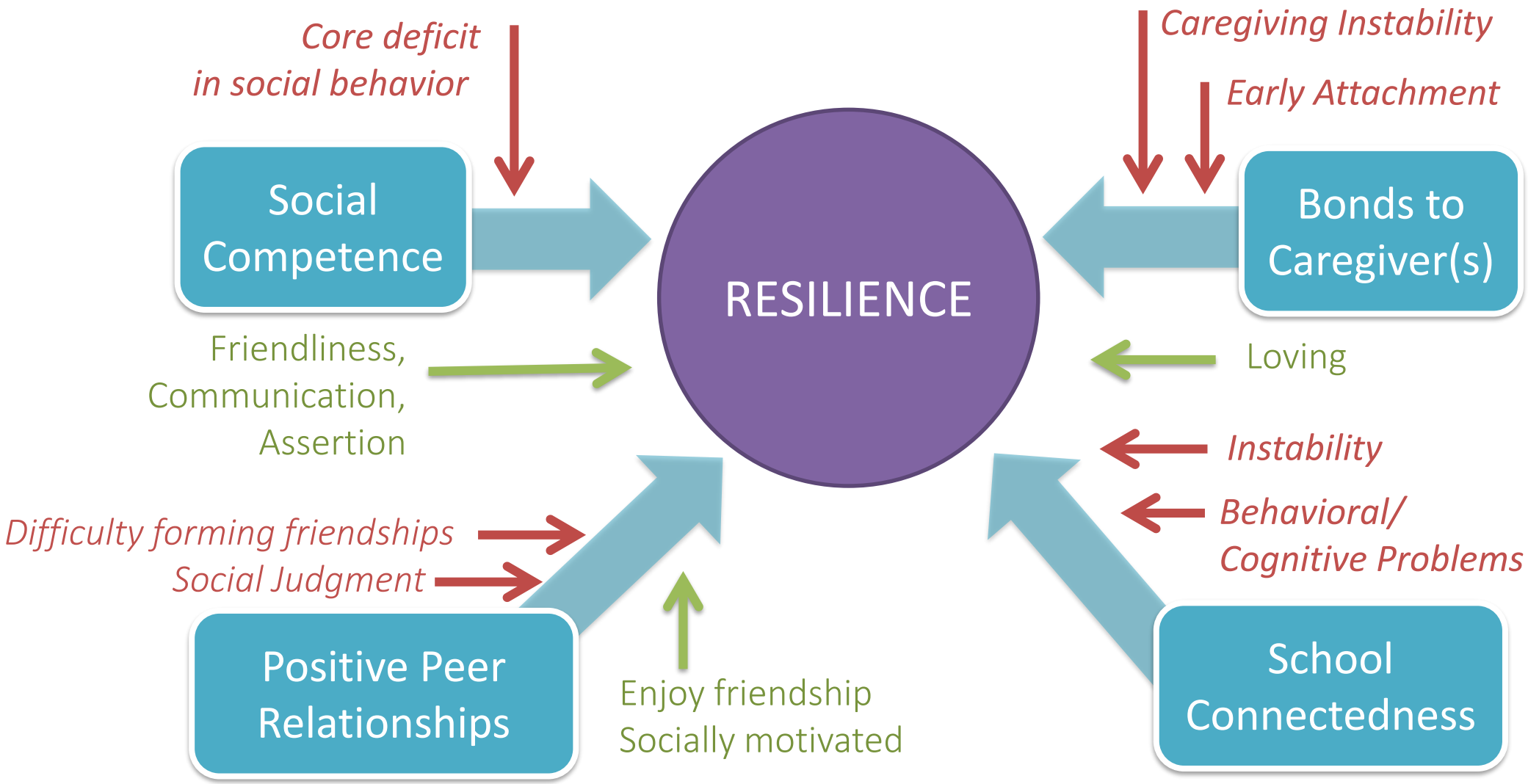
Resiliency: Key Points

- Requires exposure to risk
- Dynamic process, not outcome
  - Varies over lifespan
  - Not something that is necessarily ever ‘achieved’
    - Measurement?
    - Longitudinal research
- Primarily studied in the context of (otherwise) normative development
  - What about psychopathology?

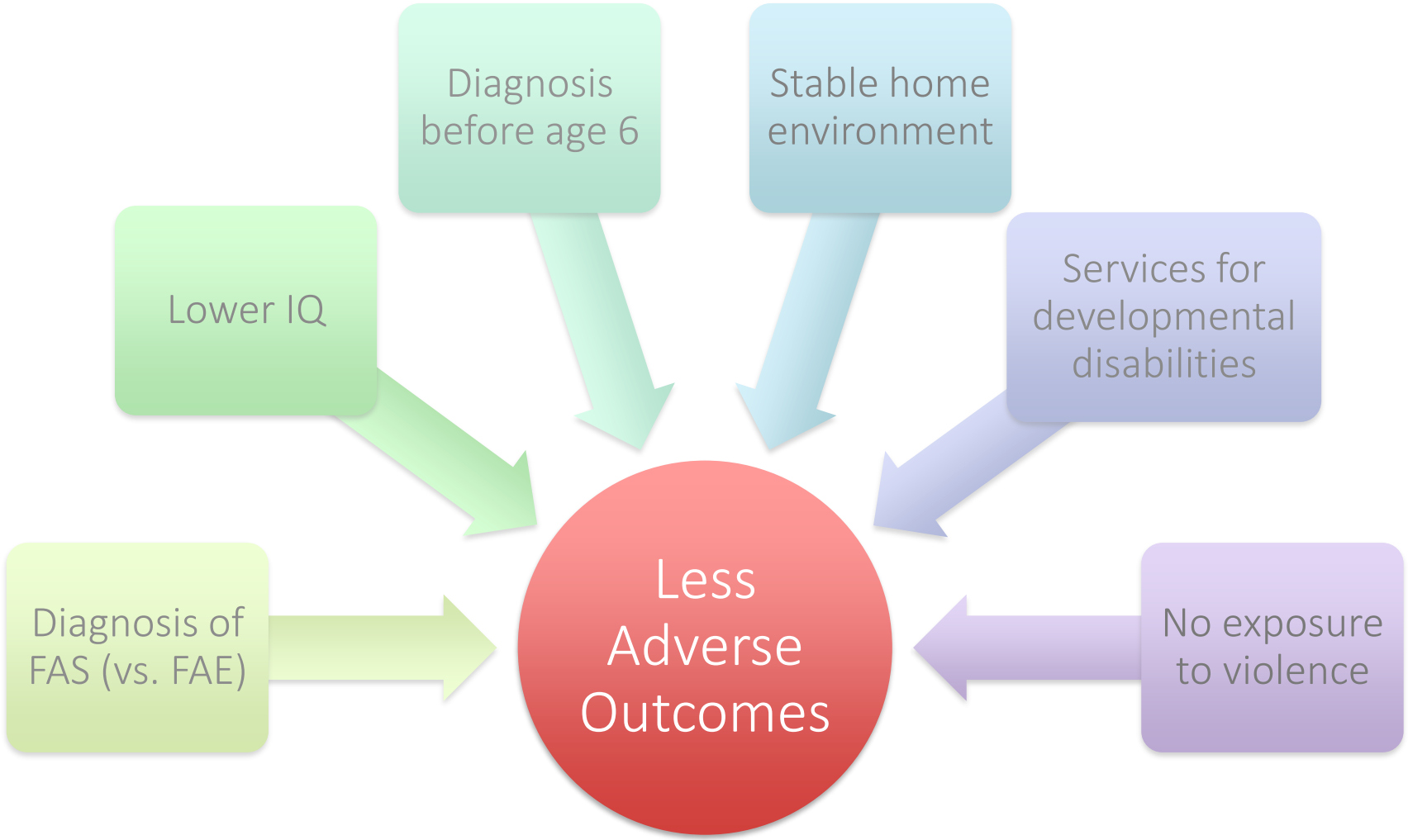
Risk, Resiliency, & FASD

- "Double Jeopardy"
- Heterogeneity suggests resilience operating

Social Protective Factors



Key Protective Factors – FASD Specific



Kully-Martens et al., in review; Streissguth et al., 2004

Conceptualizing Resilience in FASD

- Reconceptualization as a process
- Protective factors → resources (process-oriented)
- Outcomes
  - Point in time
  - What *is* competent development?
    - Within-group analysis of typical trajectories
    - Condition-specific vs. normative
  - Which domains should be considered?

Resilience & FASD

- Cohort of children, youth, and emerging adults assessed for FASD at the Glenrose Rehabilitation Clinic (Edmonton, AB)
- Tracking trajectories: mental health/behavior, adaptive behavior, executive function, working memory, etc.
- Child and Youth Resiliency Measure (CYRM)

From Research to Practice: Assessment

- Explicit consideration/quantification of resources
  - Resilience-informed assessment
- Hidden resilience in case conceptualization
- Consideration of strengths

Ungar, 2006; 2015

From Research to Practice: Intervention

- Carmichael Olson, 2015
  - Identify commonly occurring areas of impairment ✓
  - Adapt existing EBPs
  - Appropriate to developmental stage
    - Social skills intervention for adolescents?
  - Incorporate an understanding of risk and protective factors

From Research to Practice: Intervention

- Key universal protective factor: Peer relationships; School Connectedness
  - E.g., School-based peer-mediated intervention
  - Directly or indirectly target social skills
- Key universal protective factor: Caregiver relationships
  - Prioritizing stability
  - Modified Parent-Child Interaction Therapy?
  - Families Moving Forward

Guiding Questions

- What is ‘competent’ (social) functioning for an individual with FASD? Normative, or ‘better than expected?’ If you work directly with kids with FASD, what are you aiming for?

- If resilience is a process, when does it begin?

- What unanswered questions do you still have?