

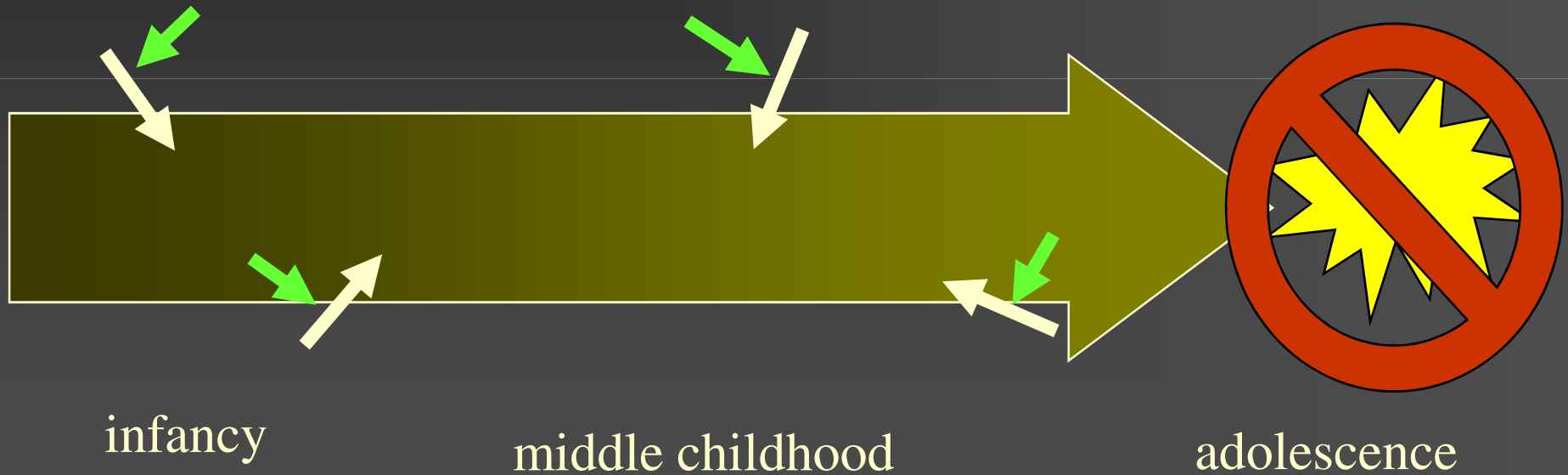


# The Biology and Neurobiology of Prevention

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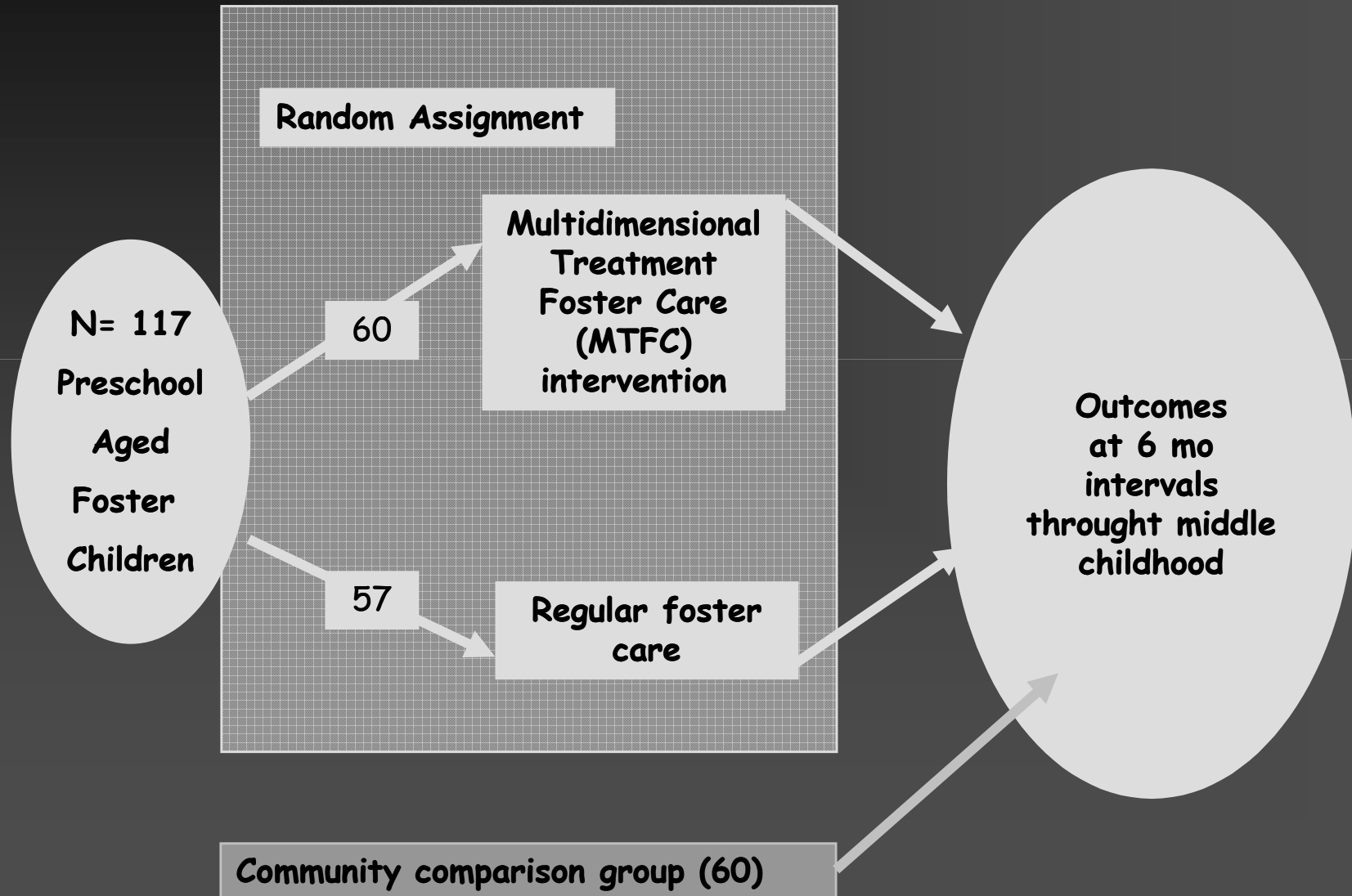
# Targeting precursors of drug abuse



# Four reasons to include biological and neurobiological measures in prevention research

- Examples in this presentation is from studies of abused and neglected children in foster care, but the same approach can be applied to studies of other high risk groups or the general population
- We focus on two neurobiological systems (medial-orbital prefrontal cortex and hypothalamic-pituitary-adrenal (HPA) axis); other systems clearly important

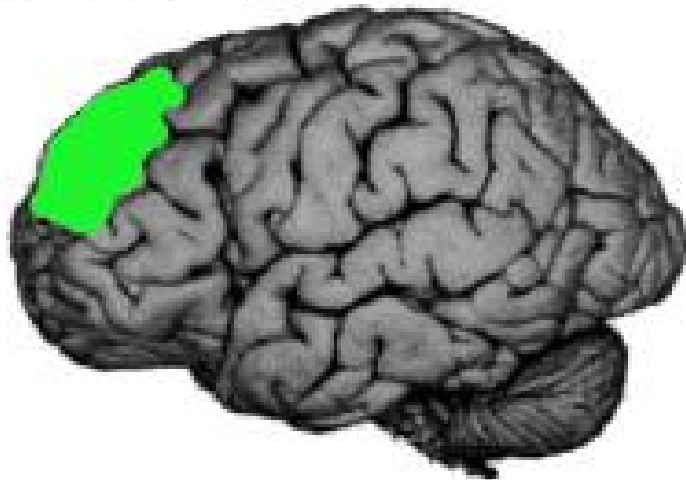
# The Early Intervention Foster Care Study, 1999-



# 1. Neurobiological measures may help to explain underlying risk mechanisms

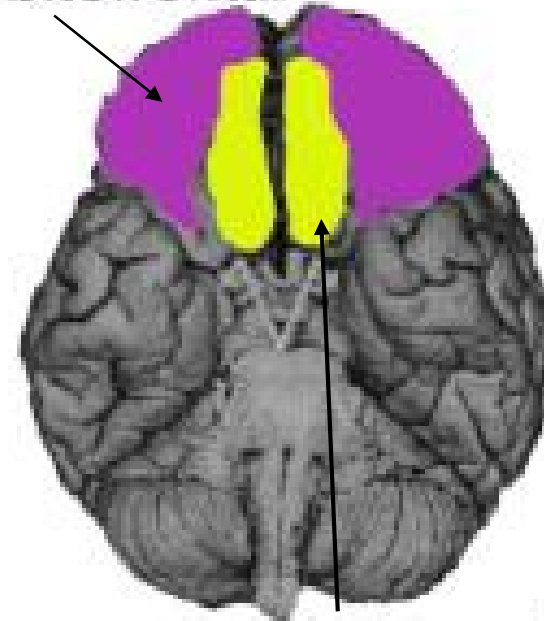
# Prefrontal Cortex Regions

## Dorsolateral



- Inhibitory control
- Working memory
- Planning

## Orbitofrontal



## Ventromedial

- Decision-making in context of rewards and consequences

ADHD  
Drug abuse

# Example: Disinhibited Social Behavior among children with early maltreatment

- Also called ‘indiscriminate friendliness’
- Commonly observed in:
  - Foster children (Albus & Dozier, 1999; Boris et al., 1998, 2004; Hinshaw-Fuselier, Boris, & Zeanah, 1999; Zeanah et al., 2004)
  - Children adopted from institutional “orphanages” in developing countries, particularly in China and Russia (Chisholm et al., 1995; O'Connor et al., 1999; Roy et al., 2004; Tizard, 1977)
- Includes:
  - Approaching unfamiliar adults without hesitation.
  - Making personal comments to and physical contact with unfamiliar adults.
  - Willing to leave with an unfamiliar adult.
- Note: Not really *indiscriminate* or *friendly*
- Many risks associated with these patterns of behavior

# Disinhibited Social Behavior among children with early maltreatment

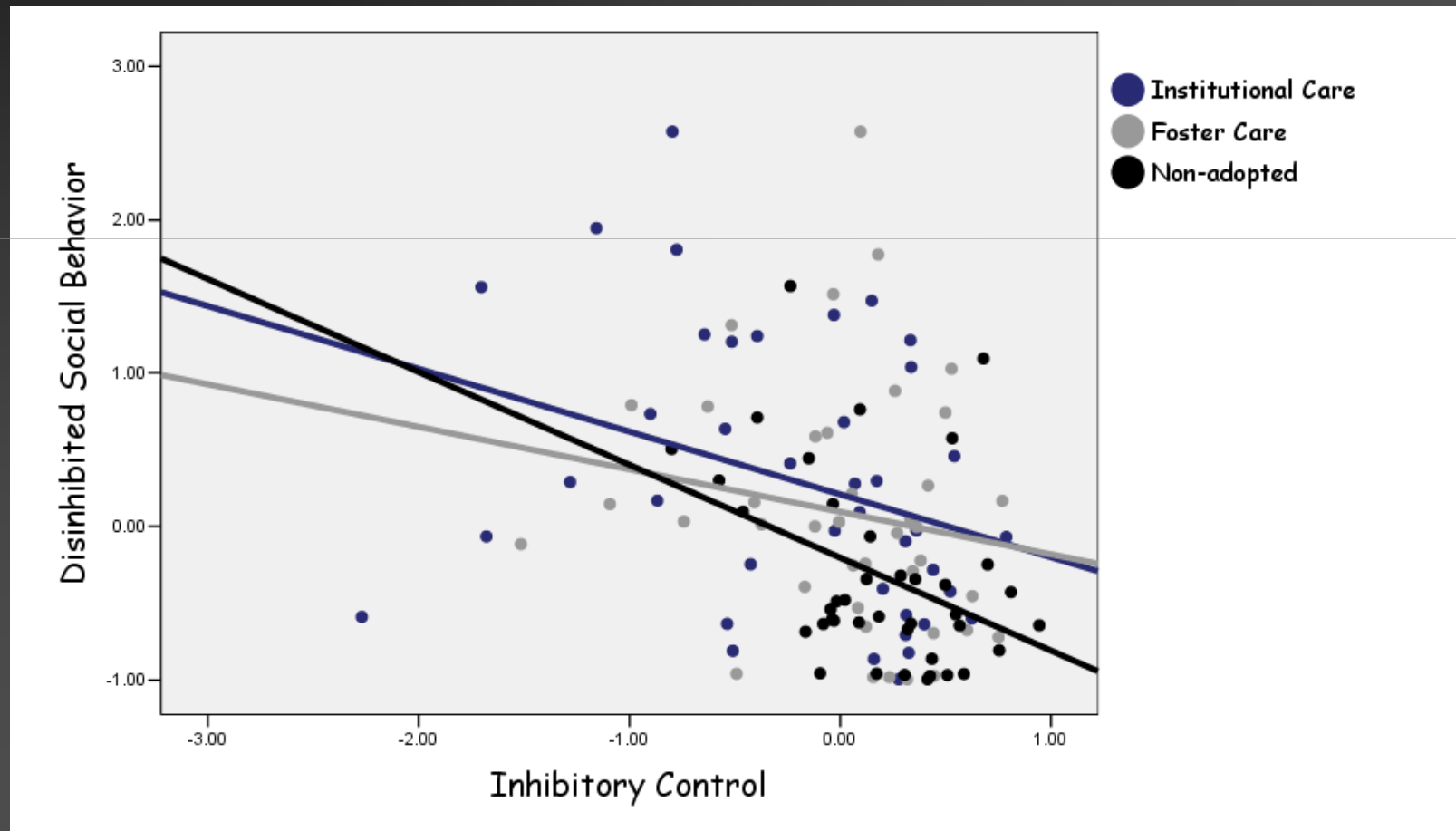
- Has been considered almost exclusively from a psychosocial perspective...
- ...leading many to propose/employ psychosocial interventions & therapies and to address this problem
- Problem: Prior research examining disinhibited social behavior hasn't supported the psychosocial perspective
- Recent work of our team suggests that rather than being a psychosocial problem, it may be a manifestation of underlying neurocognitive deficit reflective of a maturational lag



Two studies (Pears, Bruce, & Fisher, 2007; Bruce, Tarullo, & Gunnar, in press) found:

- Disinhibited social behavior (composite via parent questionnaire, lab stranger response) *was not significantly related to attachment-related behaviors* (via interview).
- However, disinhibited social behavior *was significantly negatively correlated with inhibitory control*,  $r(118) = -.35, p = .001$
- Evidence of behavioral risk phenotype from early neglectful/nonresponsive environments

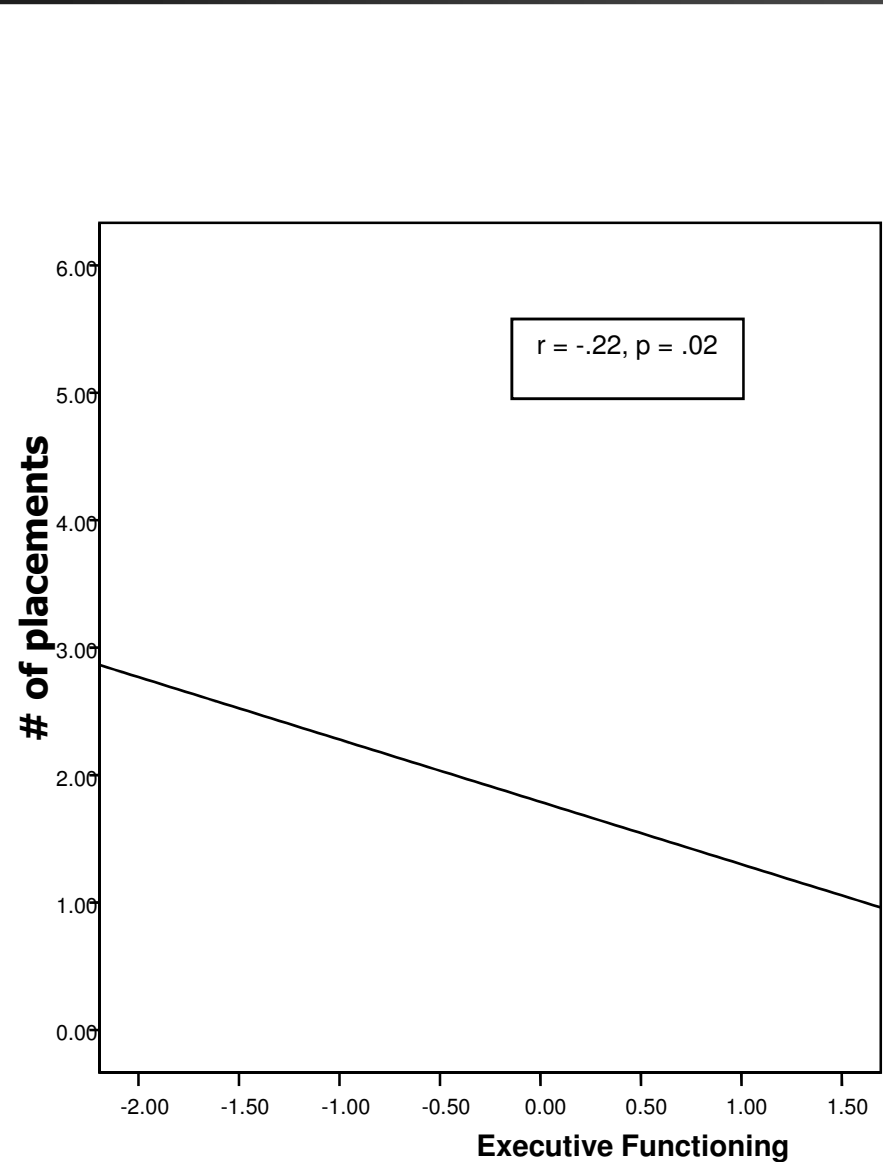
# Disinhibited Social Behavior and Inhibitory Control



## 2. May provide evidence about which forms of early stress most harmful to children

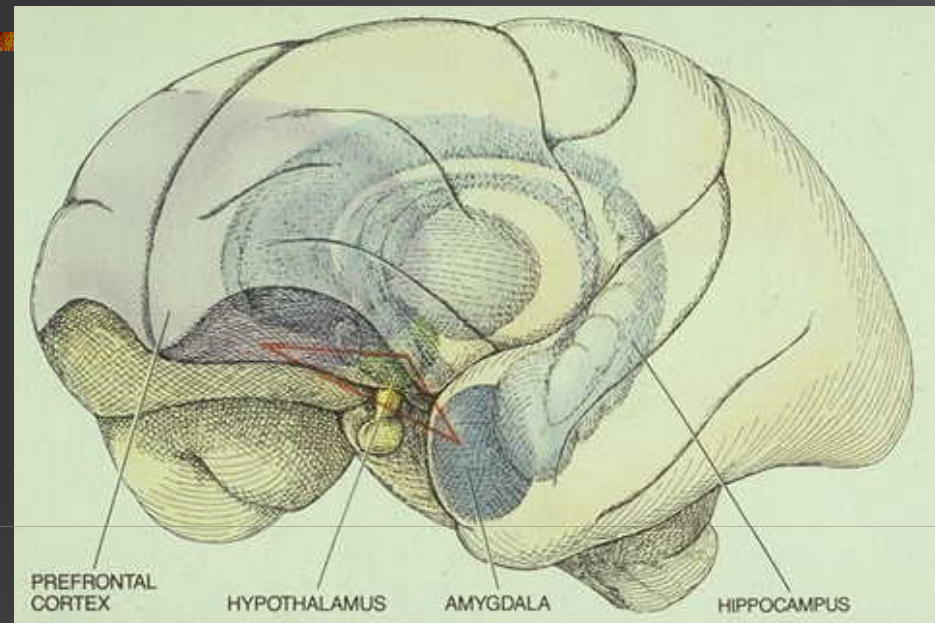
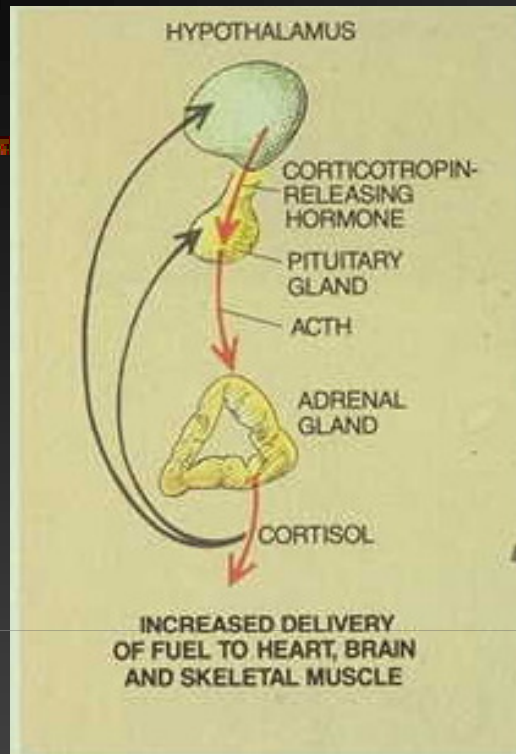


# Association Between # of Out of Home Placements and Executive Functioning



(Pears, Kim, Fisher,  
& Bruce, under  
review)

# HPA Axis

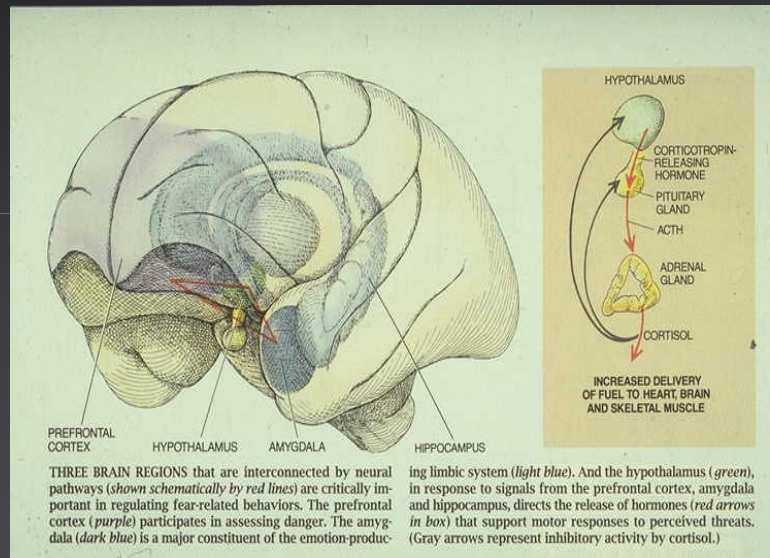
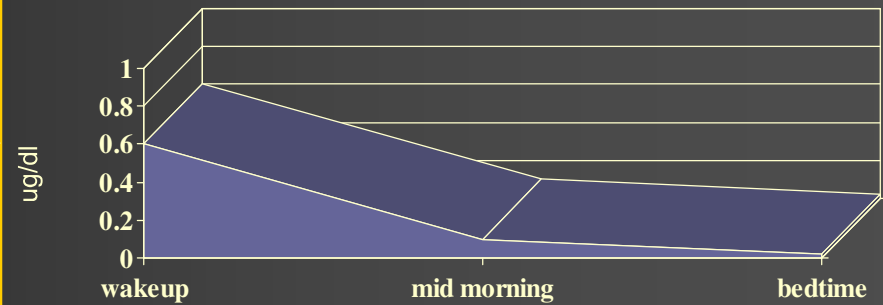


- **Regulatory functions:**
  - Threat response system
  - Circadian rhythm
- **Cortisol is the final product of HPA axis activity**

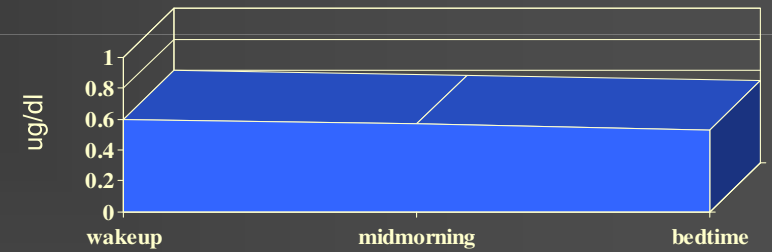
- Cortisol levels are easily measured in saliva
- Atypical levels associated with:
  - Behavior problems
  - Developmental and growth delays

typical development

typical daytime HPA activity



chronically elevated daytime HPA activity



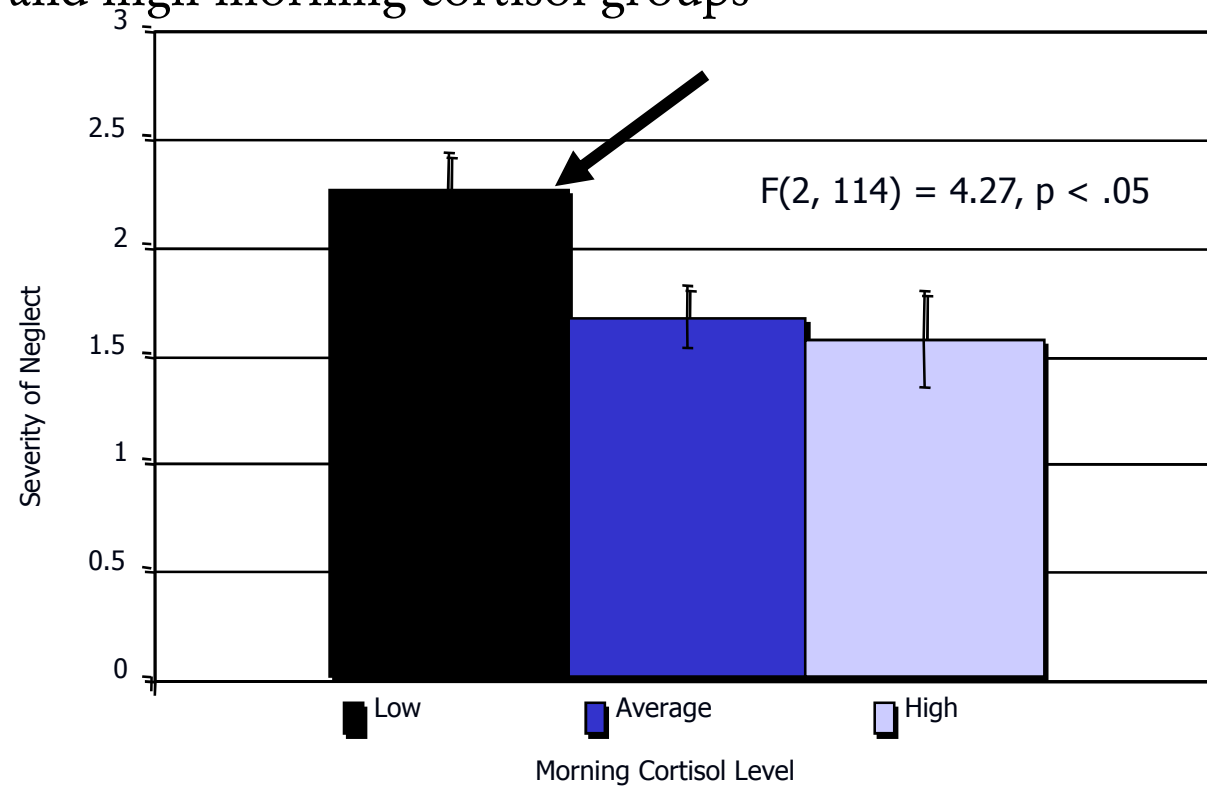
low daytime HPA activity



Anxiety and affective disorders

# Neglect is the primary form of maltreatment associated with HPA dysregulation

Severity neglect in low, average, and high morning cortisol groups



Bruce, Fisher, Pears, & Levine (under review)

### 3. Neurobiological measures may be important indicators of change resulting from prevention programs



# Multidimensional Treatment Foster Care – Prevention (MTFC-P)

Foster Parent Consultant

Family Therapist

'Daily Report' Caller

STAFF

Case Manager

Child Therapist  
Behavioral Skills Trainer

Child Psychiatrist

Caregiver-Child  
Relationship

Case Management

Child Needs

Contexts

Home

Community

Preschool/school

# 5 Key MTFC-P Program Components

- Foster parent support & consultation services

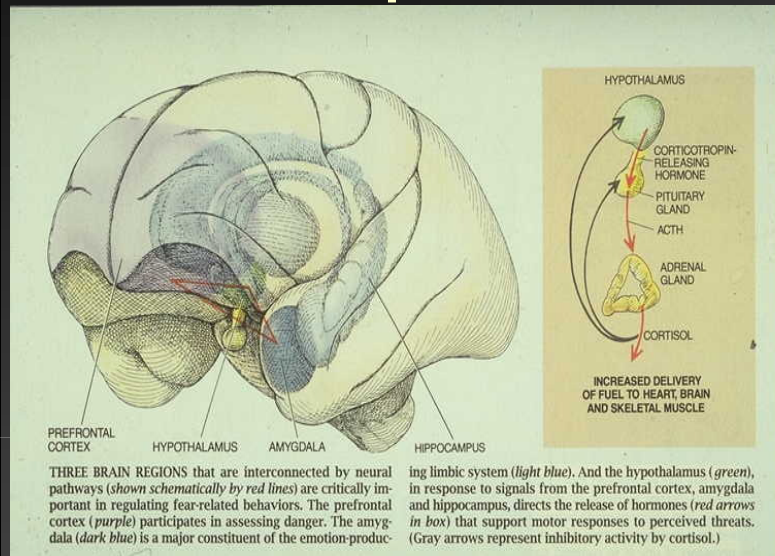
- Pre-placement training
- Weekly group meeting
- 24/7 on call support

- Child treatment services

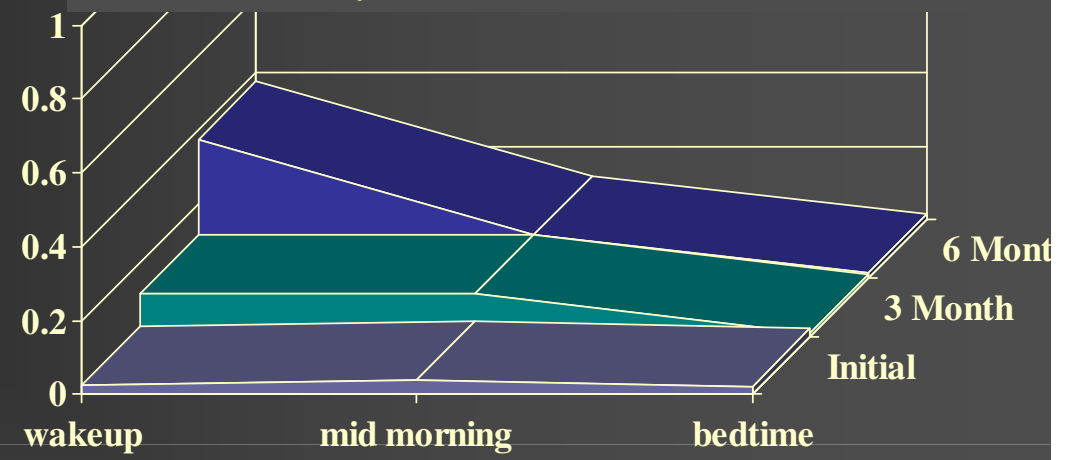
- Parenting support for birth/adoptive families

- Daily Report telephone check-in w/caregiver

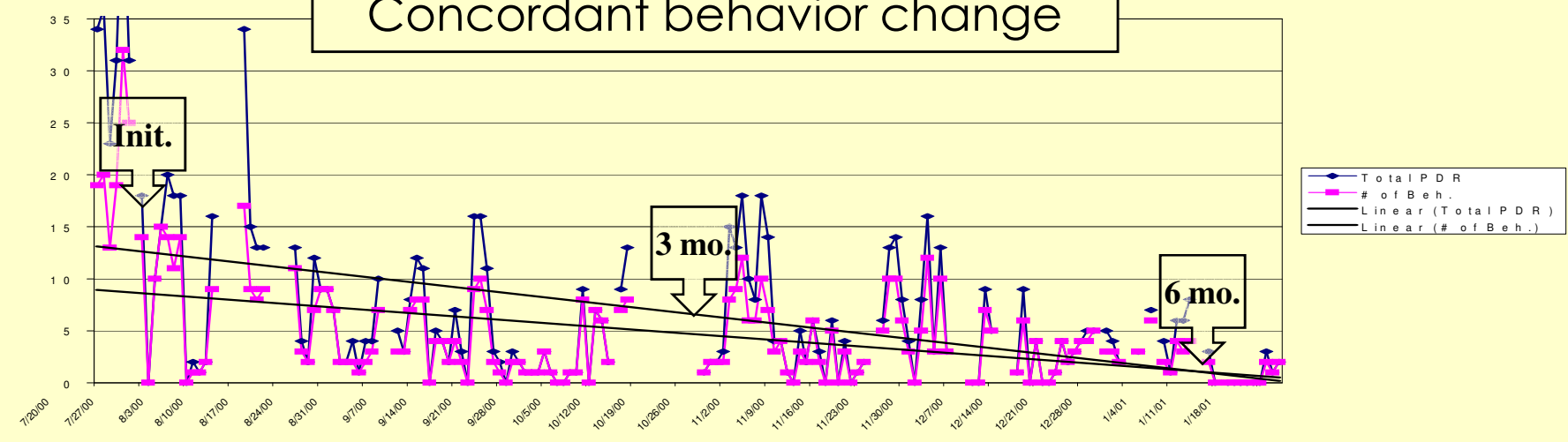
- Clearly specified staff roles & responsibilities



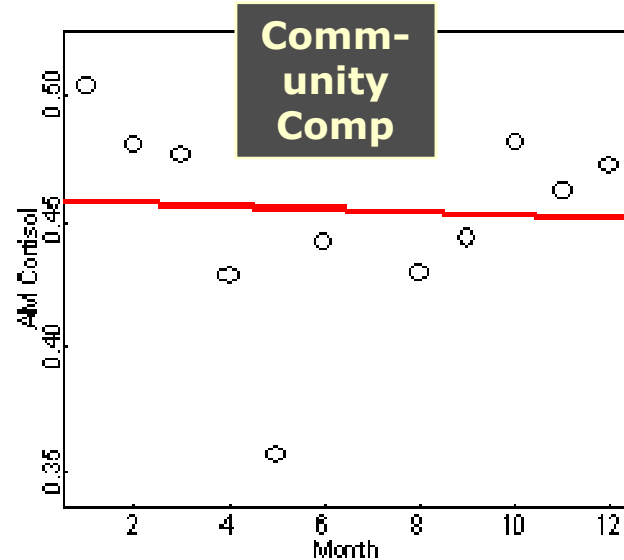
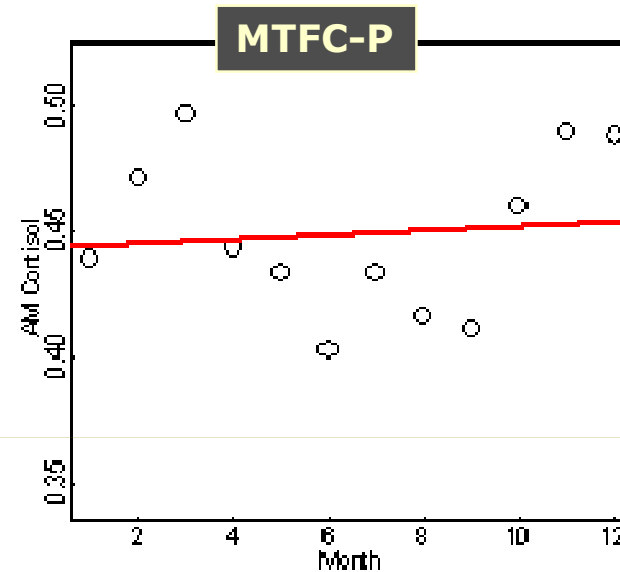
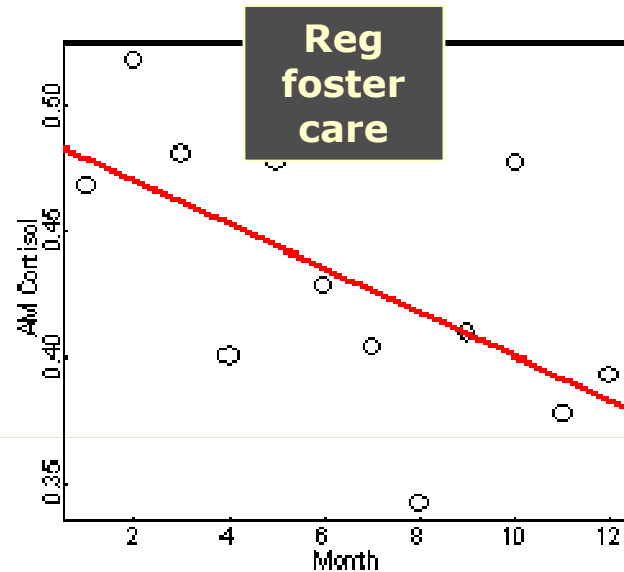
## Therapeutic intervention



## Concordant behavior change



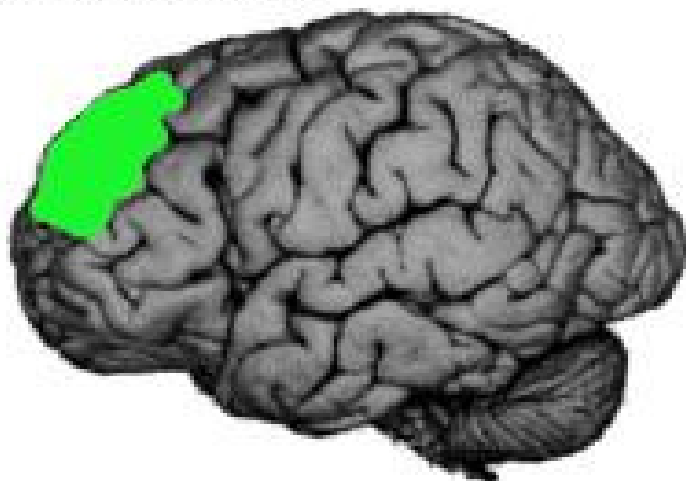
# Group effects on morning cortisol levels across time for all children



Fisher, Gunnar, Dozier, Bruce, & Pears (2007), *Annals NYAS*

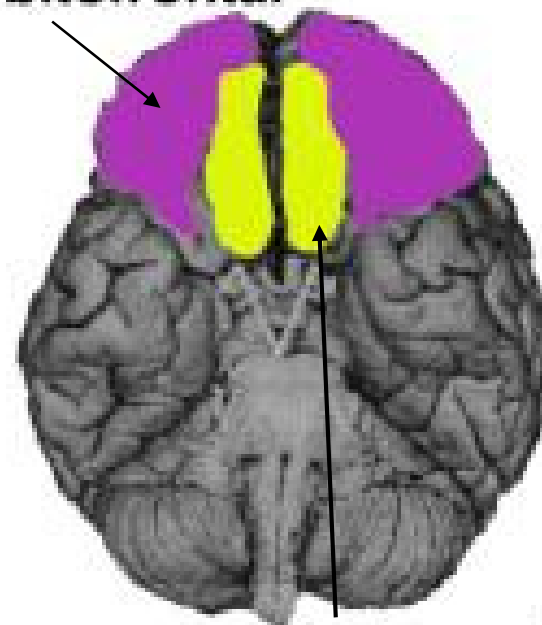
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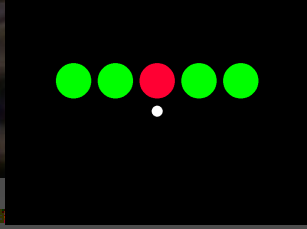
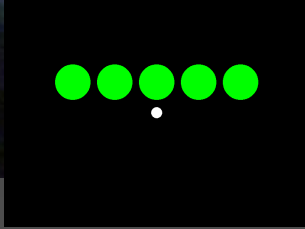
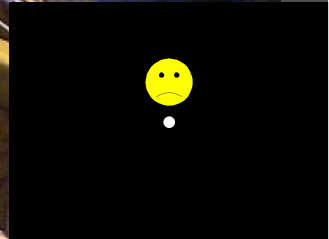
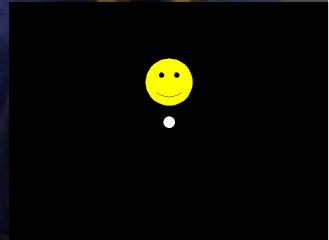
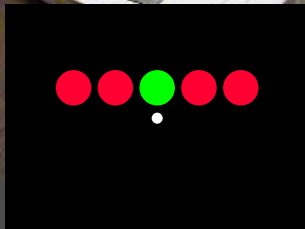
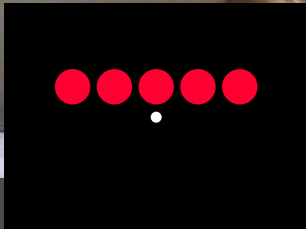
## Orbitofrontal



## Ventromedial

- Decision-making in context of rewards and consequences

ADHD  
Substance abuse

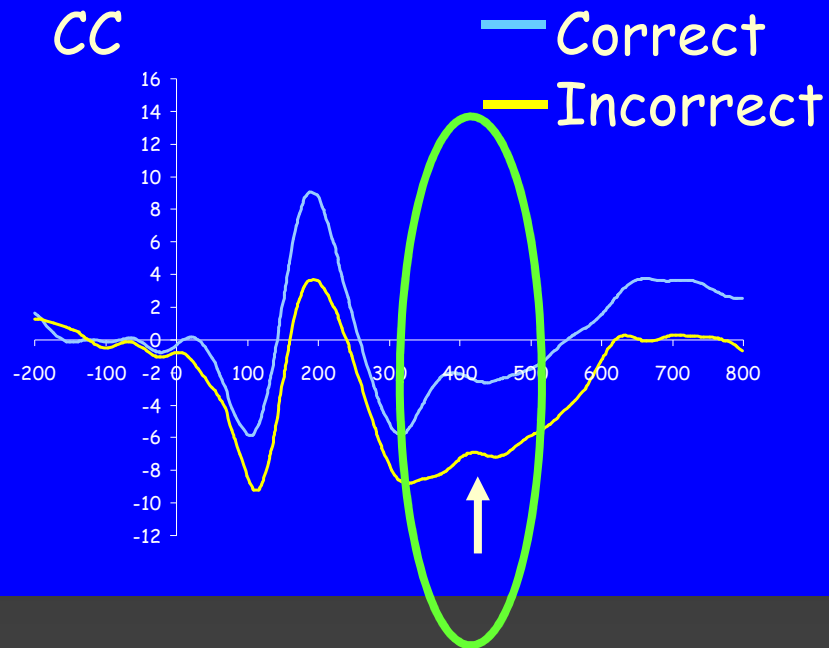




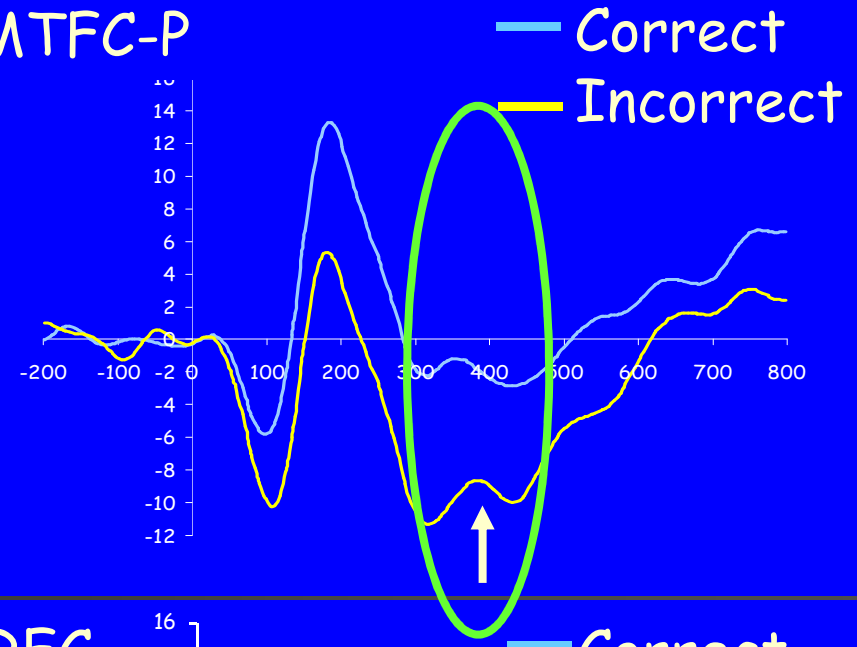
# Intervention effects on executive functioning:

Feedback negativity at Fz (prefrontal center electrode site)

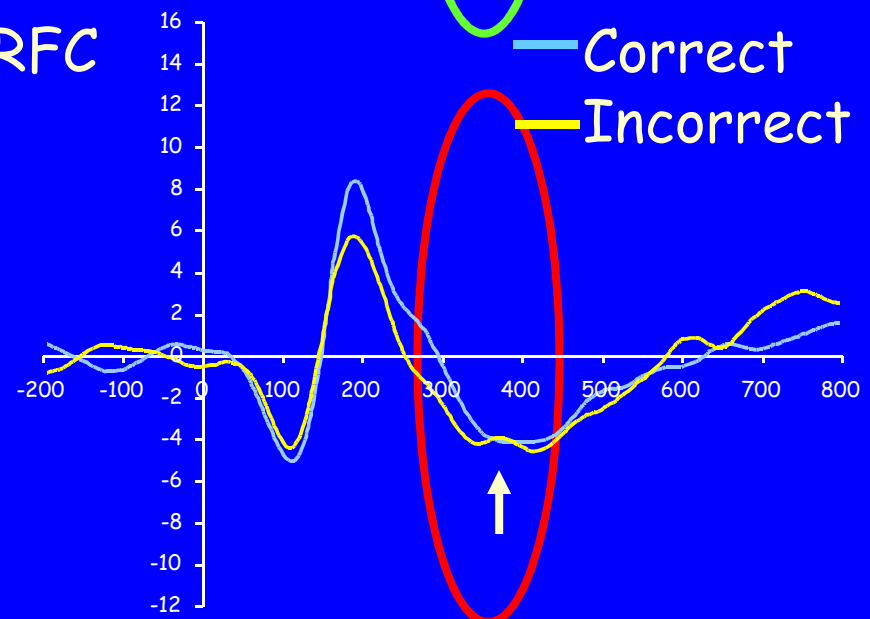
CC



MTFC-P



RFC



Group:

$F(2, 31) = 1.80, ns$

Interaction:

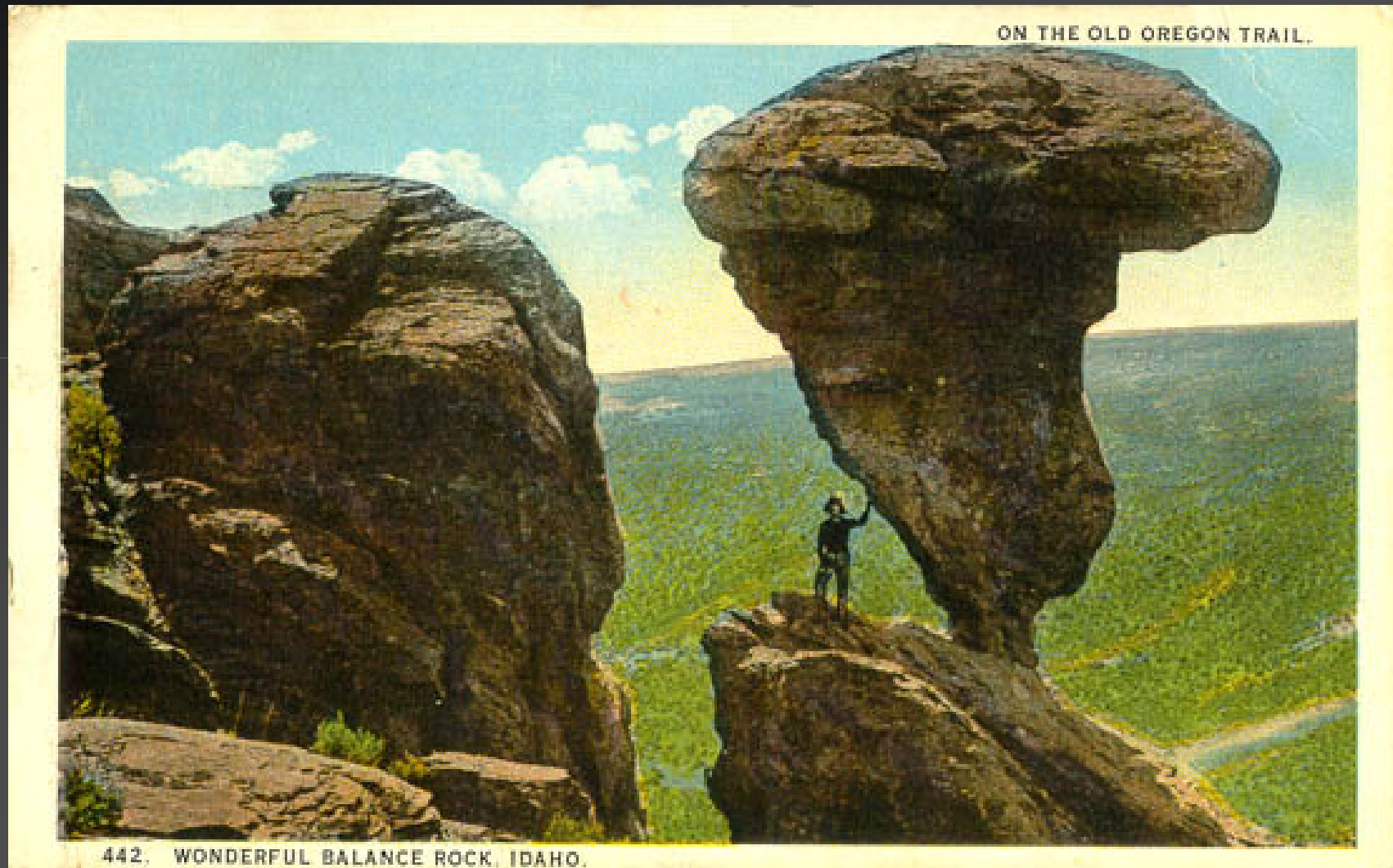
$F(2, 31) = 5.11, p < .05$

Bruce, Martin-McDermott, Fisher, & Fox (*under review*)

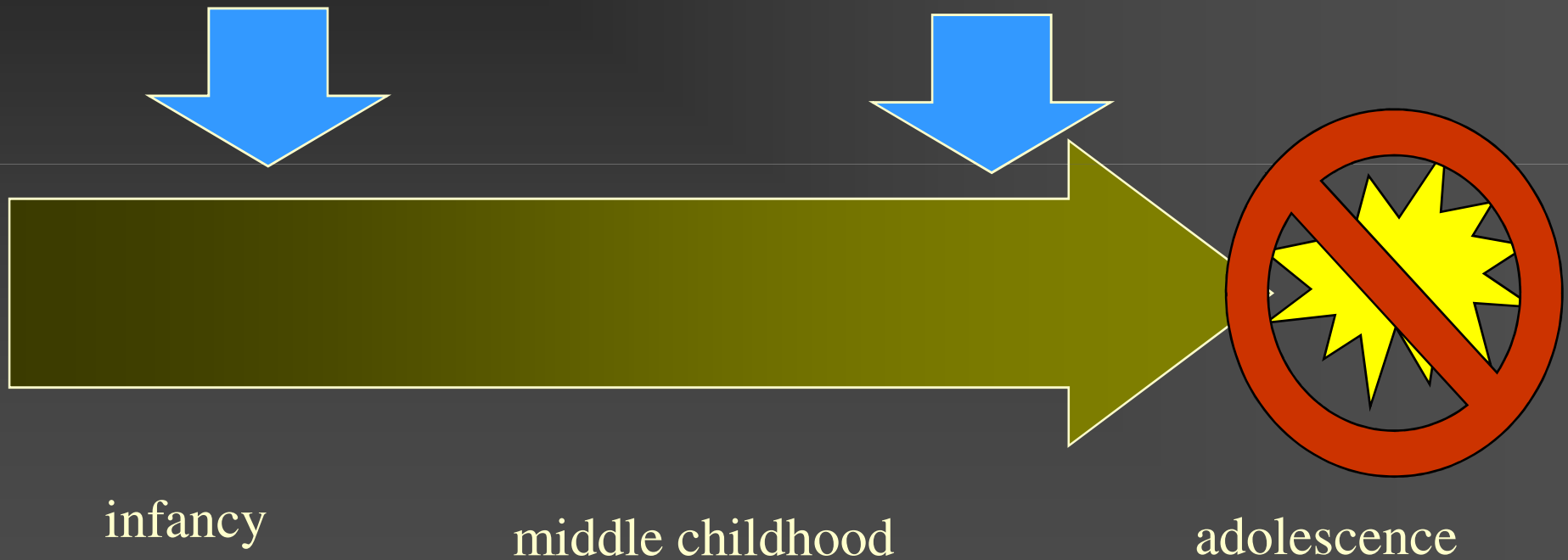
4. May help identify key developmental periods in which intervention is most effective



# Tipping points



# Targeting precursors of drug abuse



# Acknowledgements

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