Talk presented at the Ministry of Citizenship, Brasilia, Brazil, 15 August 2019

Introduction to the Bucharest Early Intervention project: Background and Summary of Findings

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Outline

- Conceptual framework of and Introduction to the *Bucharest Early Intervention Project* (BEIP)
- Select findings from the Bucharest Early Intervention Project – IQ, EEG, Stress

Role of Experience (brief review)

- Brain development after birth is dependent on experience.
- Some experiences are universal to all members of the species.
  - For example: hearing sounds and voices, seeing faces, having a caregiver .
  - These experiences help ensure survival.
- Others may optimize development.
  - For example: hearing age-appropriate language and having a caregiver who is sensitive and responsive to the child's needs.
- As you heard from Professor Fox, in many cases both classes of experience must occur during a "critical" or "sensitive" period
- If the experiences that occur during a critical period are adverse OR if the experiences that are expected to occur do not occur (e.g., no caregiving), then development can be derailed.

Psychosocial Neglect

- Neglect is the most common form of child maltreatment.
- A particularly extreme form of neglect is being raised in conditions of profound psychosocial deprivation.
- This is common among the 8 million children around the world being raised in institutions (orphanages).
  - Note that there are 140 million parentless children around the world.

Early Institutionalization:
A particularly egregious form of neglect

Political and Sociocultural Background to Bucharest Early Intervention Project

Ceausescu's legacy to Romania: An experiment in social engineering

Communist Policy: 1966 decree

- Raise production by increasing population.
  - Belief that greater population = greater power
- Establishment of the MENSTRUAL POLICE - State gynecologists who conducted monthly checks of women of childbearing age who had not borne at least 5 children.
- Establishment of CELIBACY TAX - families received a stipend for having more than 2 children; were levied tax for having fewer than 5 children.
- OUTLAWED all contraception and abortion.

The Results of Ceausescu's 1966 Policy

- Child abandonment became a national disaster, as families could not afford to keep their children and were encouraged to turn them over to the state. This destroyed the family unit and led to thousands of children being raised in institutions.

1989: The fall of the Ceausescu regime: the aftermath….

170,000 children "warehoused" in state institutions

- Poverty #1 reason for child abandonment.
- International media brought the plight of these children to the attention of the world.
- Large numbers of children adopted internationally, often by Western families unprepared for challenges that lay ahead.

What we found in 1999, 10 years after fall of Ceausescu

Why institutional rearing might be bad for the brain

- Regimented daily schedule
- Non-individualized care
- Sensory, social-emotional, cognitive, and linguistic deprivation
- No response to distress
- Unchecked aggression
- Lack of psychological investment by caregivers
- High child/caregiver ratio
- Rotating shifts of caregivers

Children reared in institutions…

…are at dramatically increased risk for a variety of cognitive, social, and behavioral problems:

- disturbances of social relatedness and attachment
- externalizing behavior problems (e.g., disruptive behavior)
- Attention deficit/hyperactivity disorder
- deficits in IQ and executive functions
- syndrome that mimics autism
- growth stunting (next slide)

Effects of institutionalization on growth

17 year old girl

14 year old girl

Institutionalized children lose ~1 month of linear growth for every ~1 month in an institution
(pictures courtesy of Dana Johnson, MD, Ph.D)

Bucharest Early Intervention Project: Study Design

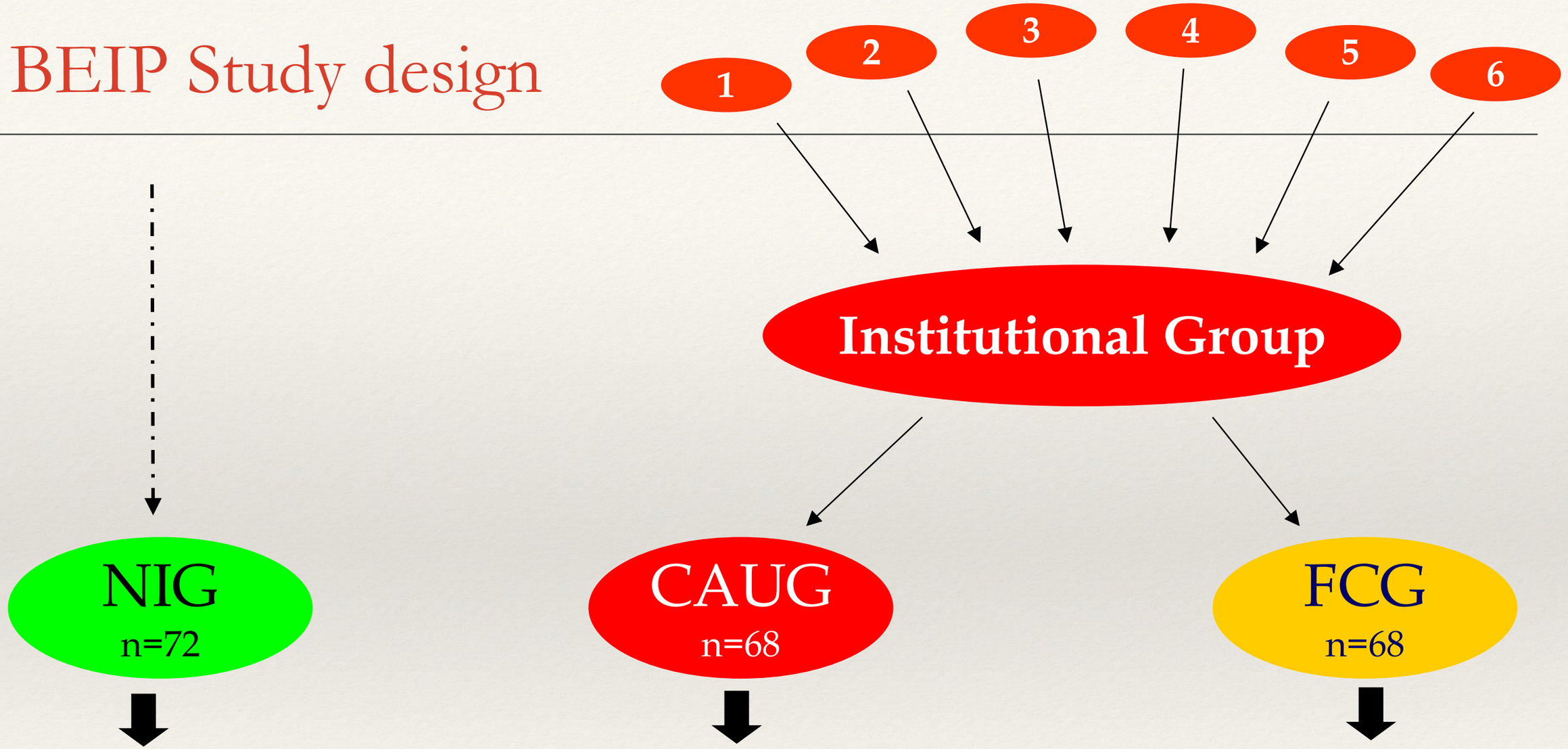
First ever randomized controlled trial of foster care as intervention for social deprivation associated with institutionalization

- >180 children screened by pediatric/neuro exam;

Dana Johnson, M.D., Ph.D.

- 136 institutionalized children between 6 and 31 months initially assessed at baseline (Mean Age=20 months)
  - 68 randomly assigned to remain in institution (Care As Usual Group; CAUG); 68 randomly assigned to foster care (FCG);
- 72 never-institutionalized children (NIG) matched on age and gender serve as controls
- Following baseline assessment, children assessed comprehensively at 9, 18, 30, and 42 months…a limited 54 month assessment was performed…extensive assessments were then performed at ages 8, 12, and 16; and another is planned for age 21.

BEIP Study design



After baseline assessment (pre-group assignment), comprehensive follow up performed at 30, 42, 54 months, 8, 12, and 16 years

Domains of assessment

- Physical development
- Language
- Social Functioning/Social-Emotional Development
- Carefully characterize caregiving environment
- Cognition
- Temperament
- Attachment
- Brain Function (EEG, ERP)
- Brain Anatomy (MRI)
- Genetics/Epigenetics
- Psychopathology

Ethical Considerations

- Informed consent -- 3 US University IRBs, local authorities in Bucharest, parents/caregivers/guardians
- Randomization
  - Inherent bias possible in all extant studies
  - Policy debate about which intervention is preferred
  - Without the study, all children get care as usual (i.e., continued institutional care)
- No more than minimal risk of participation.
- Policy of non-interference.
- Provided outcome data to government as soon as it became available.

Miller FG (2009) The randomized controlled trial as a demonstration project: An ethical perspective. Am J Psychiatry. 166:743Y745.
Millum, J. & Emanuel, E.J. (2007). *Science, 318*, 1874-1875.
Rid, A. (2012). *The Journal of Nervous and Mental Disease, 200*, 248-249.

The Intervention: High quality foster care

- Families received monthly stipend equivalent to average per capita income in Romania at the time.
- Close monitoring (social workers visited the families every 10 days).
- Social workers/psychologists consulted with BEIP team every 7 days.
- All material support.
- 24 hour on-call pediatrician.
- Romanian law required one parent to stay home with child.
- All families licensed.

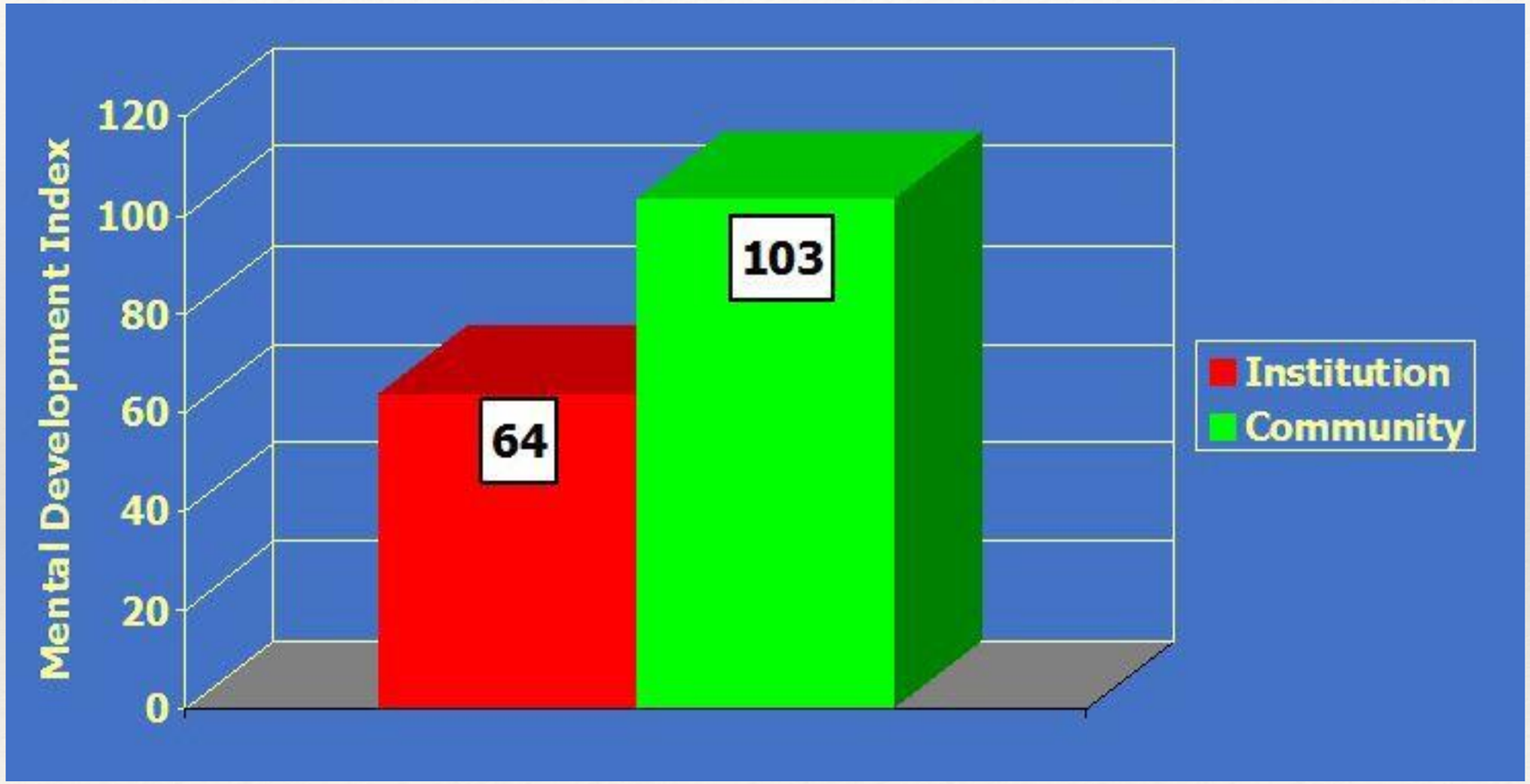
BEIP: A Child-Centered Model on Foster Care

- Orchestrated around needs of child for a stable, consistent emotionally available caregiver.
- Foster parent becomes emotionally invested in child and advocates as if it were her own.
- Social worker supports, monitors and intervenes with foster parent as needed, with frequent contact.
- Weekly consultation from clinicians (based at Tulane University) throughout the trial.

A few examples of our findings

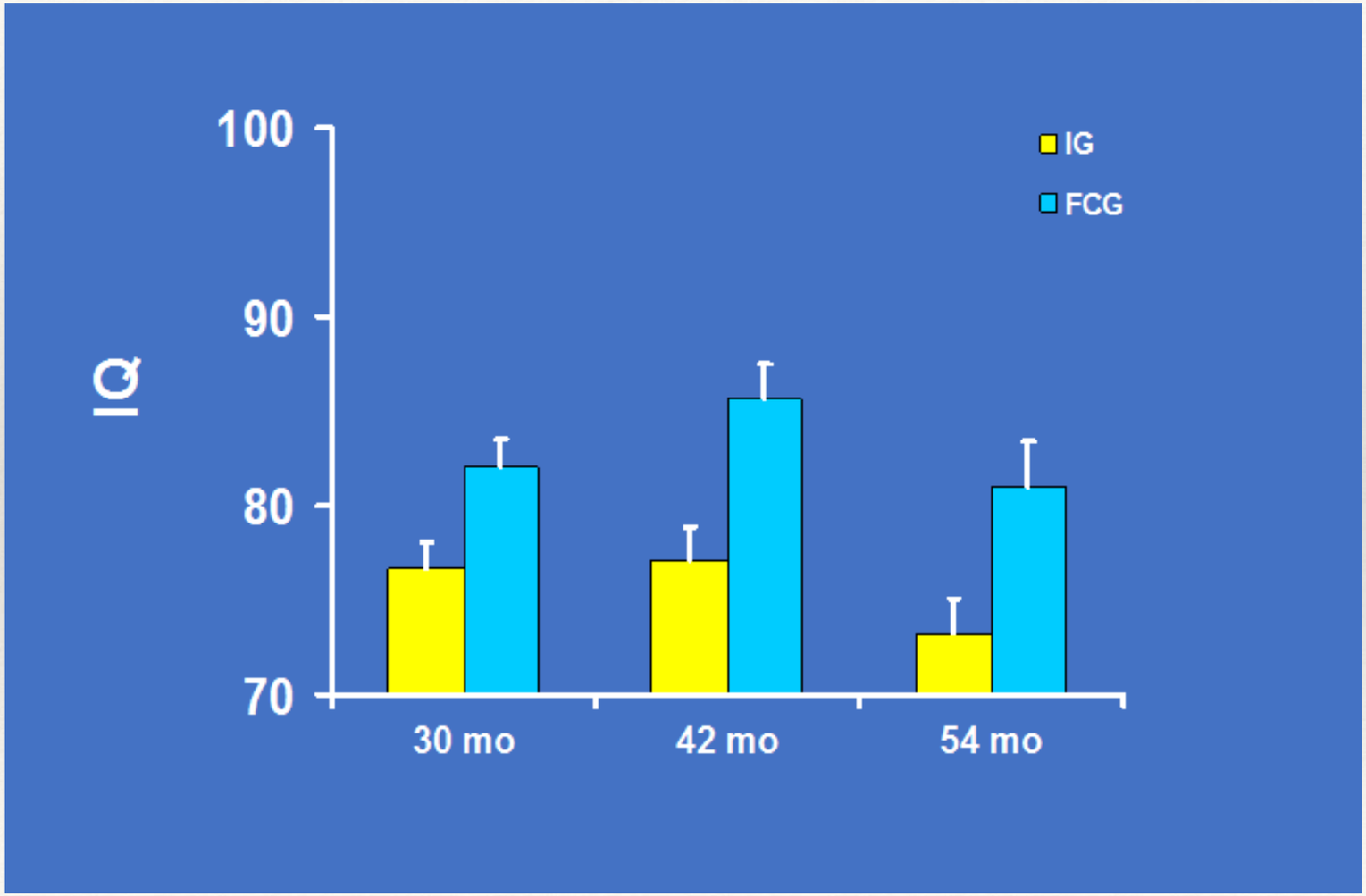
IQ across first 12 years

Bayley Scales of Infant Development (MDI) (at baseline)

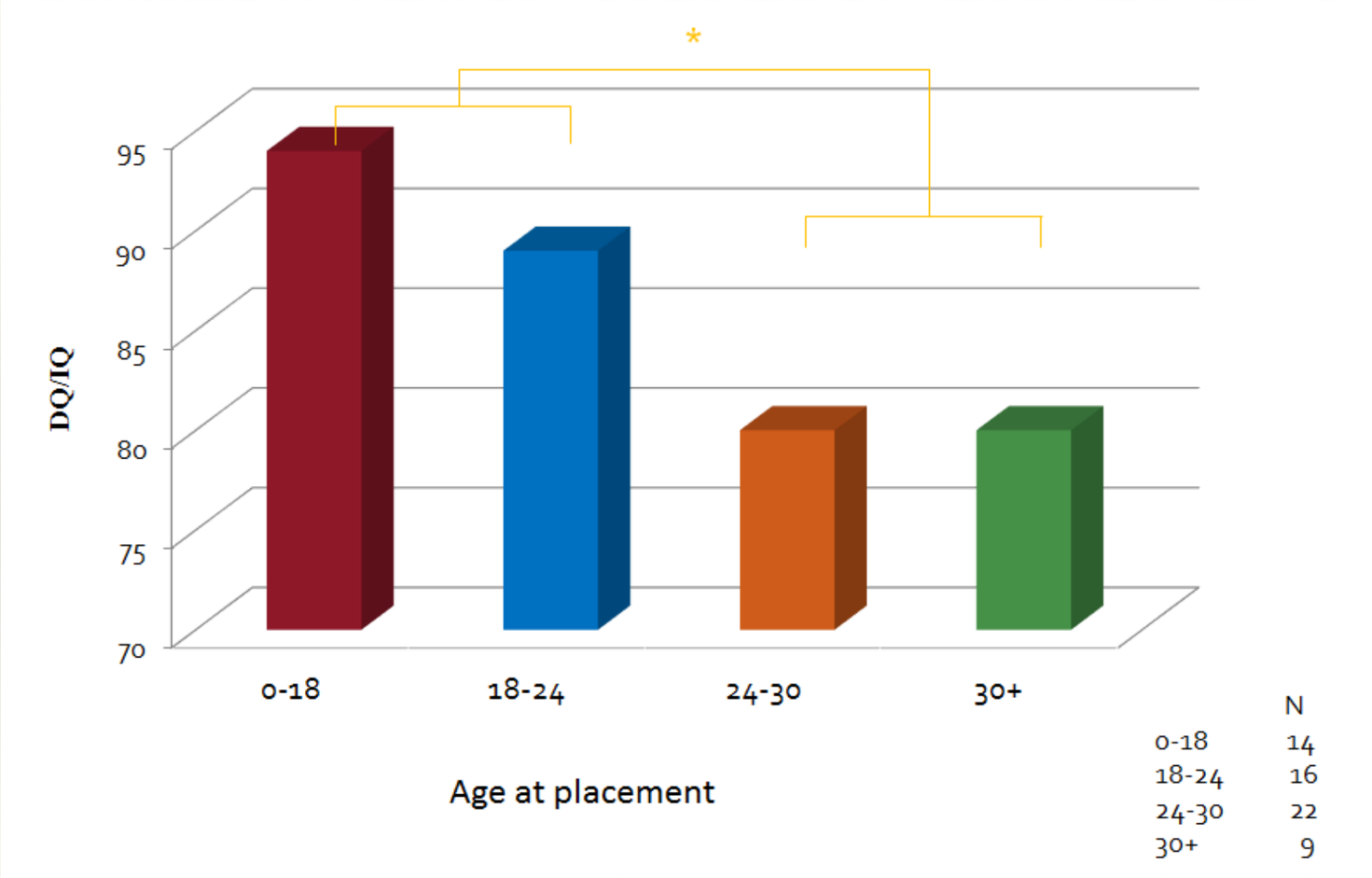


Smyke AT, Koga SF, Johnson DE, Fox NA, Marshall PJ, Nelson CA, Zeanah CH, & the BEIP Core Group (2007). Journal of Child Psychology and Psychiatry, 48, 210-218.

IQ Scores of Foster Care and Institutionalized Groups at Follow-up

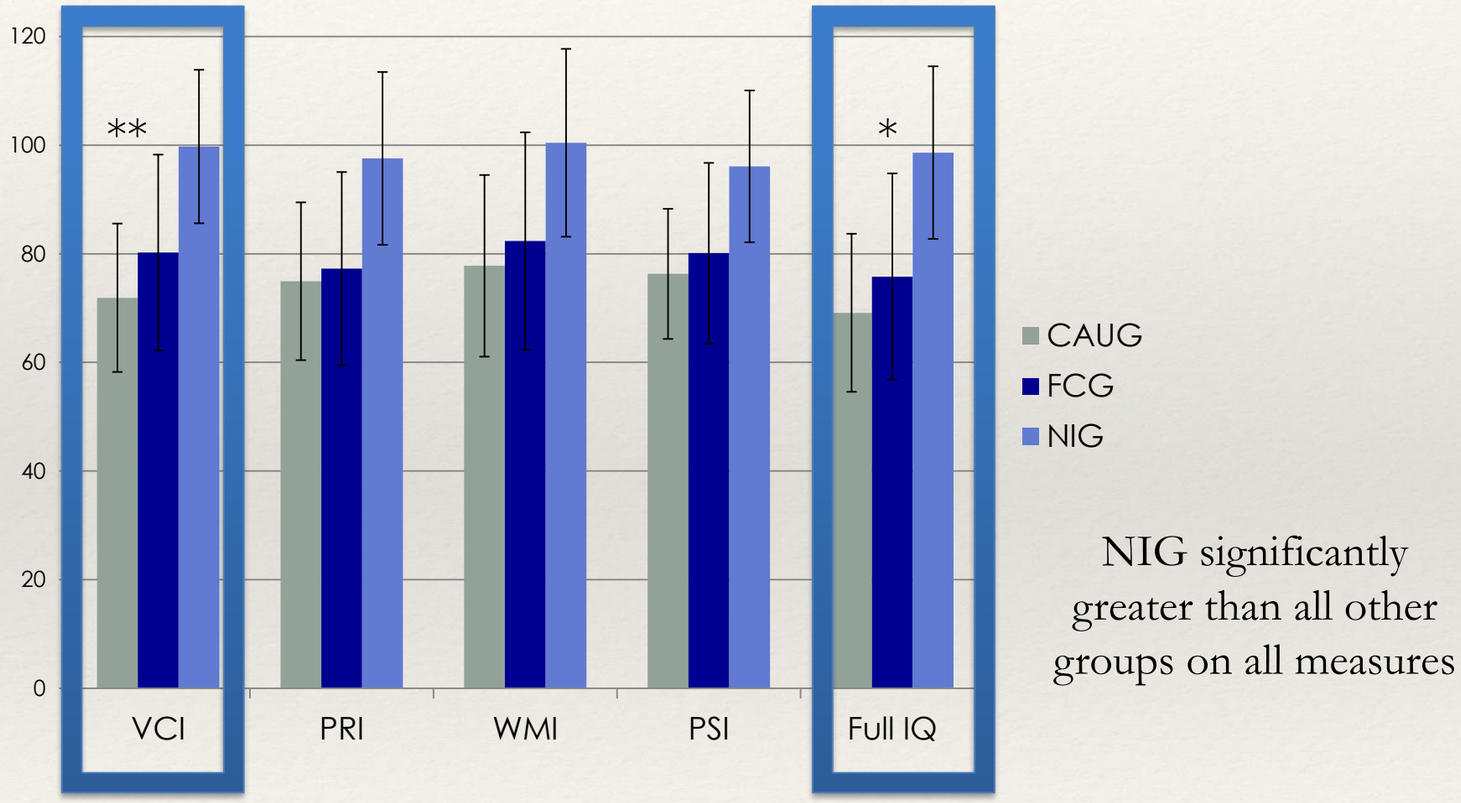


How does DQ/IQ differ for children in foster care as a function of age of entry?



Nelson CA, Zeanah CH, Fox NA, Marshall PJ, Smyke AT, & Guthrie D (2007).. Science, 318, 1937-1940.

12-year IQ by group



NIG significantly greater than all other groups on all measures

Almas AN, Degnan KA, Nelson CA, & Zeanah CH (2016). Developmental Psychology, 52(11):1858-1866.

Summary of IQ findings

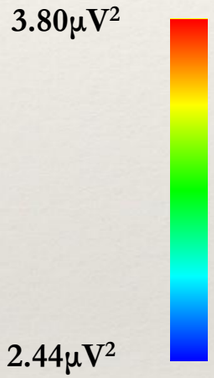
- Young children living in institutions show significant delays in IQ
- Removal from institutions, particularly prior to 24 months of age, and placement into families remediates IQ deficits
- Remarkably, 10 years after the intervention began there are still positive effects on IQ (although sensitive period no longer observed)

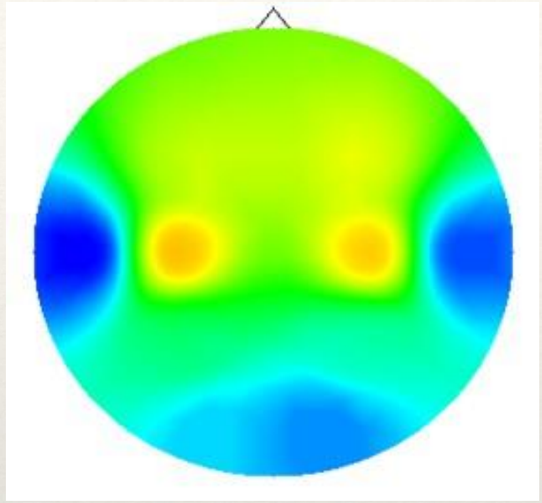
What about the brain?

- Assume that the behavioral phenotype of the institutionalized child reflects alterations in underlying neural substrate; thus,

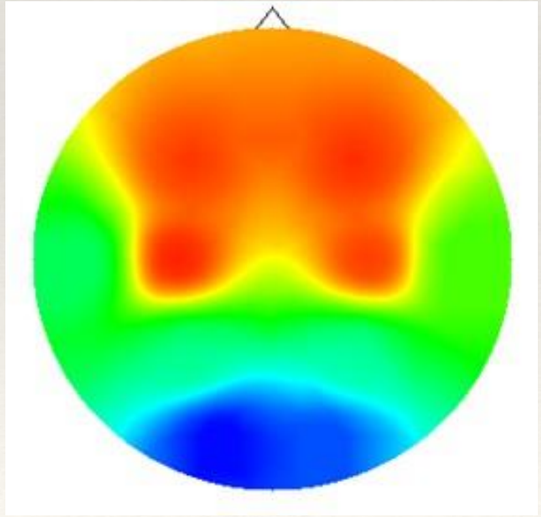
  …turned to EEG and MRI (will only discuss EEG

EEG activity at baseline (average age = 22 months)





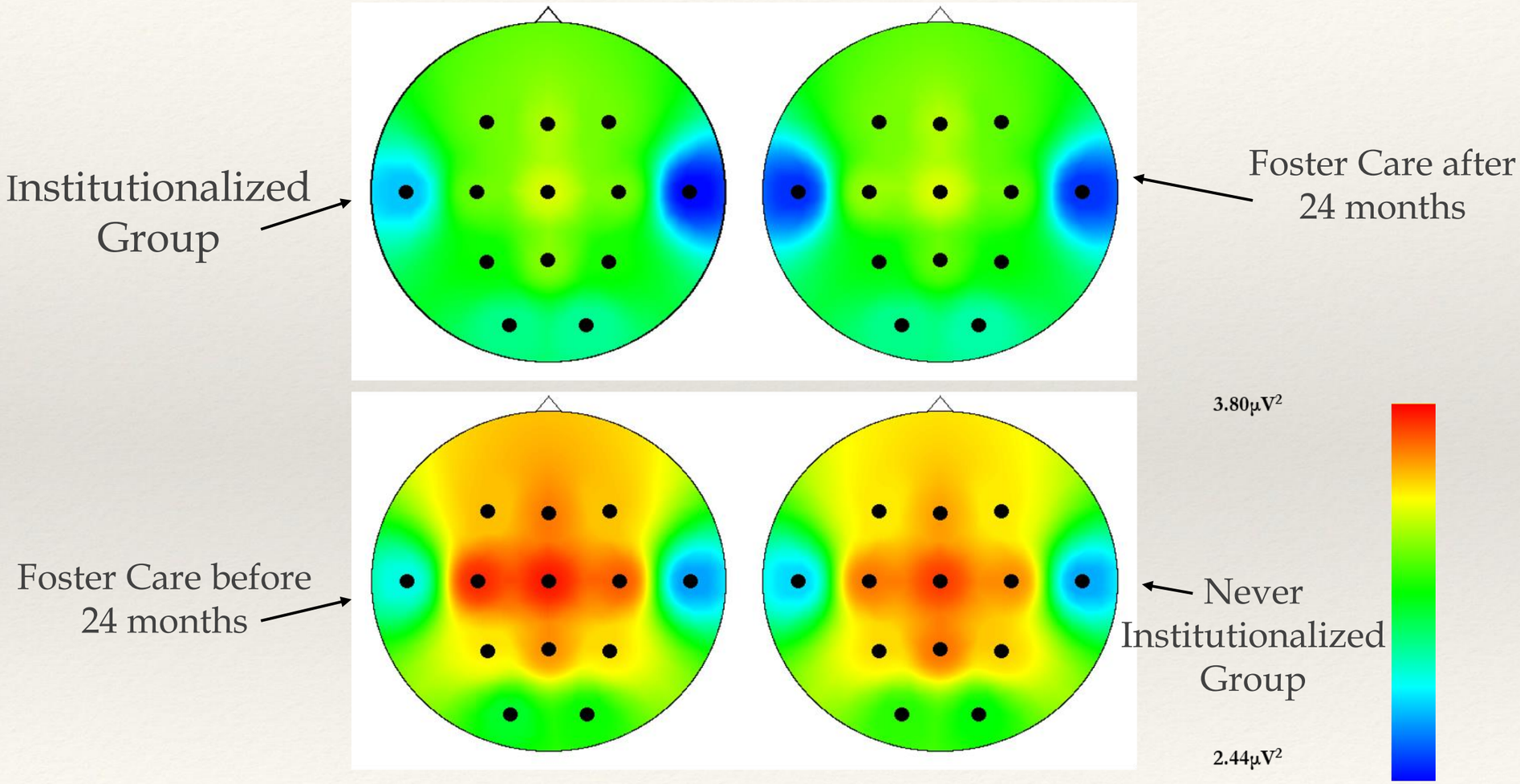
Institutionalized Group



Never Institutionalized Group

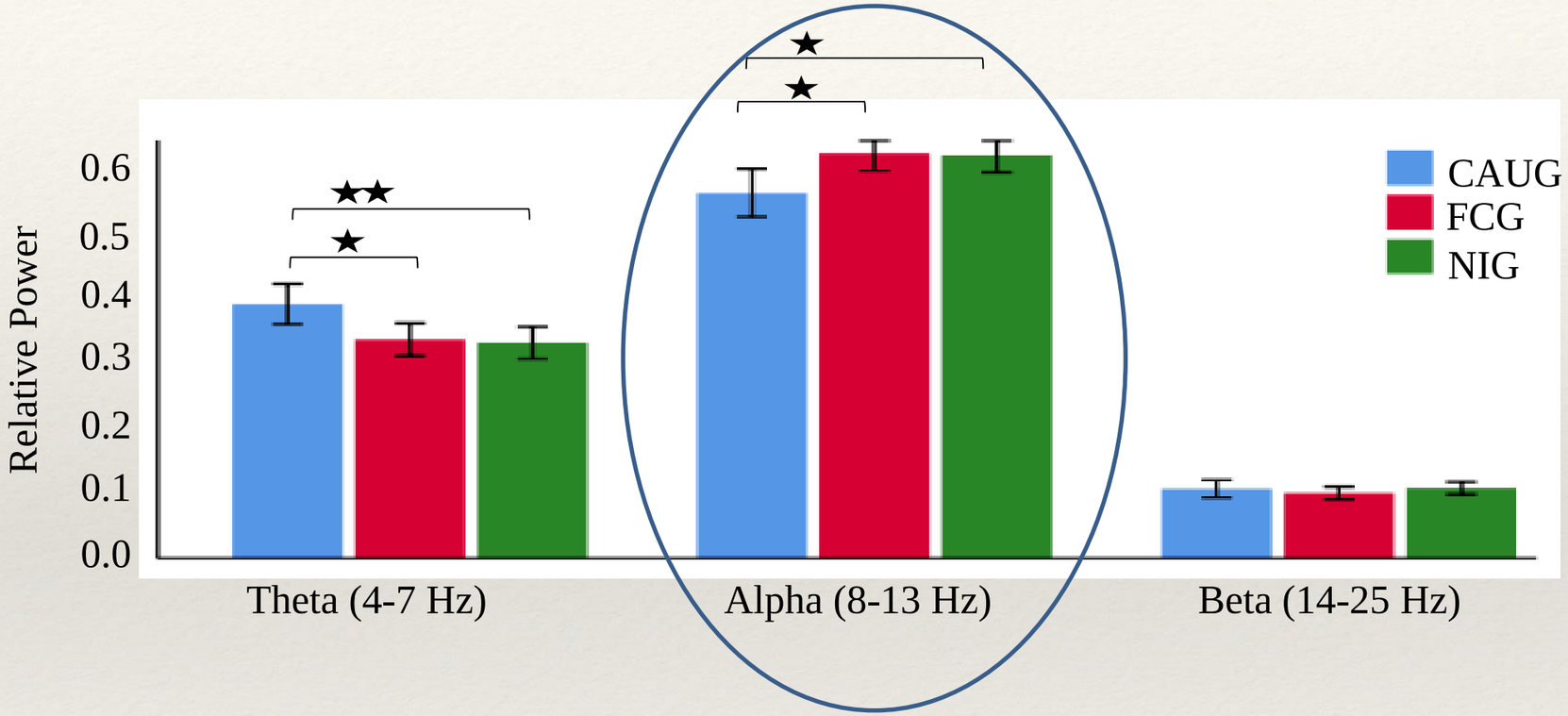
Marshall, et al (2004) J. of Cog Neuro

Does brain activity (EEG) change as a function of intervention and timing? - Age 8



Vanderwert et al (2010) PLoS One

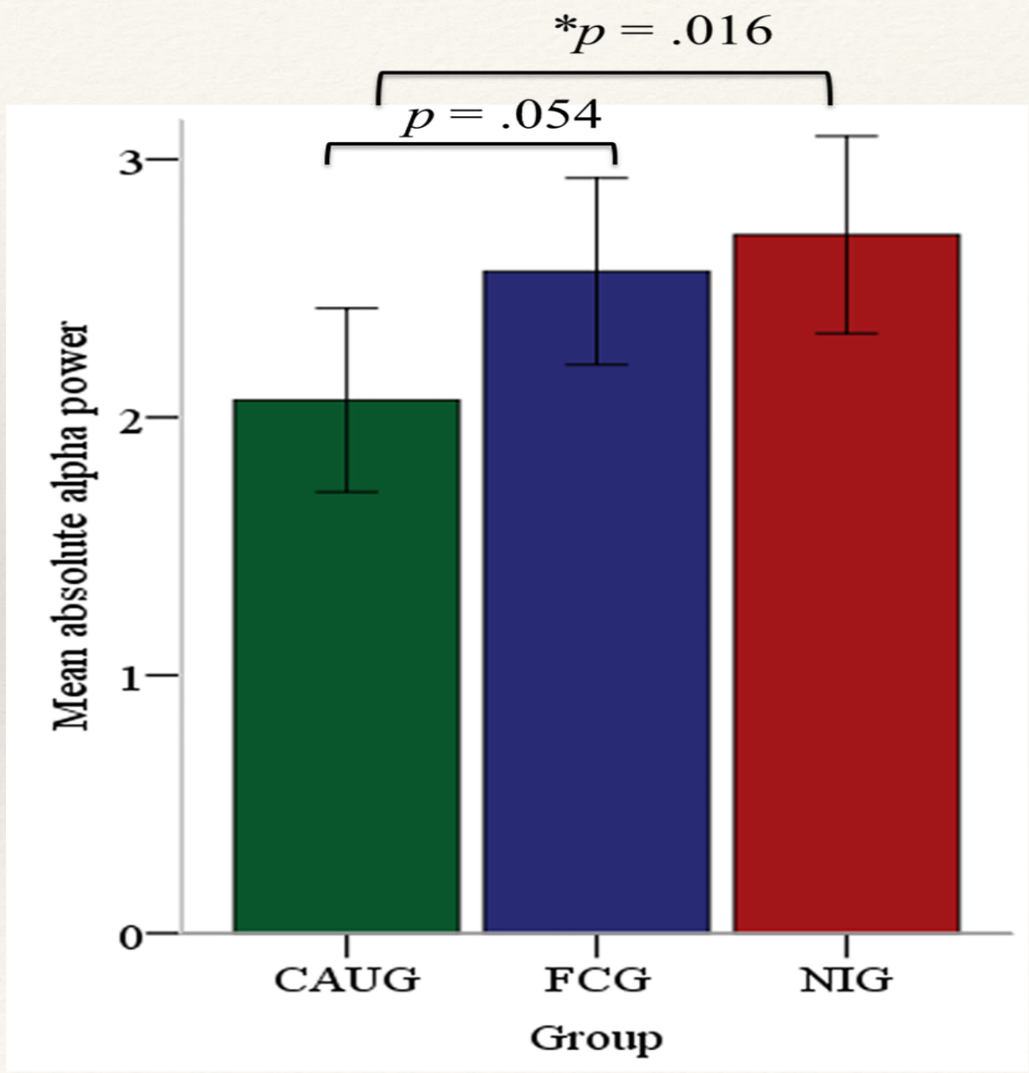
12 Year Outcomes



Mean relative power in theta, alpha and beta frequency band for the care-as-usual group (CAUG), foster care group (FCG) and never-institutionalized group (NIG). Error bars indicate +/– 2 standard error. * $p < .05$, ** $p < .005$.

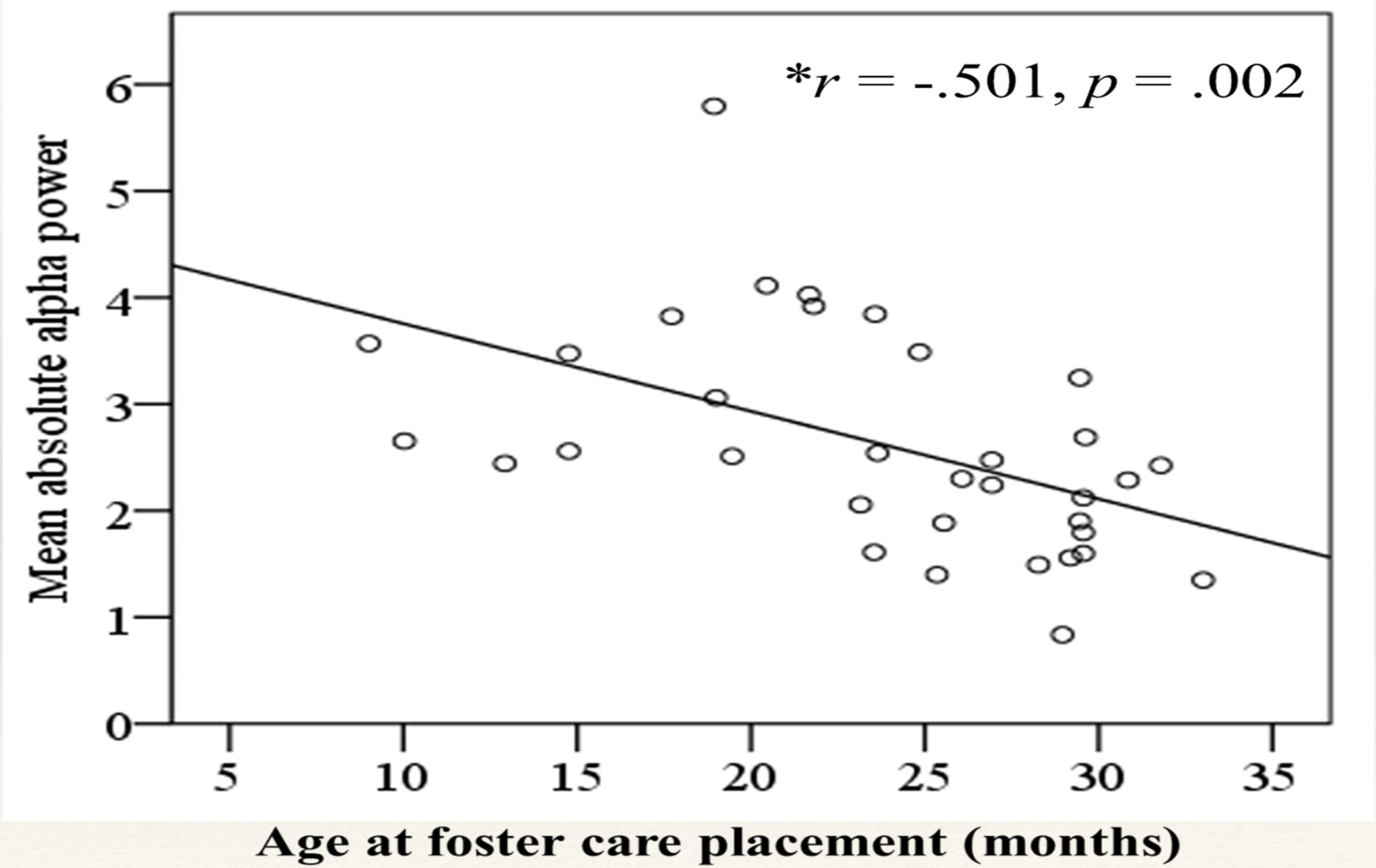
16 Year Outcomes

Mean absolute alpha power (8–13 Hz). Foster care intervention increased alpha power.



16 Year Outcomes – Effects of Timing

Timing of foster care intervention is associated with alpha power. Earlier foster care placement yields greater alpha power.



Summary of EEG findings

- At ages 8, 12, and 16, children who received care as usual (CAUG) displayed deficits in brain electrical activity compared to the children randomized to foster care intervention (FCG)

- The age of placement into foster care was associated with an increase in EEG activity.

- At 8 and again at 16, foster care placement before 24 months resulted in more robust improvements in brain activity.

Marshall PJ, Fox NA, Bucharest Early Intervention Project Core Group (2004). A comparison of the electroencephalogram between institutionalized and community children in Romania. Journal of Cognitive Neuroscience, 16, 1327-1338.

Marshall P, Reeb BC, Fox NA, BEIP Core Group (2008). Effects of early intervention on EEG power and coherence in previously institutionalized children in Romania. Development and Psychopathology. 20, 845-859.

Vanderwert, R.E., Marshall, P.J., Nelson, C.A., Zeanah, C.H., & Fox, N.A. (2010). Timing of intervention affects brain electrical activity in children exposed to severe psychosocial neglect. PlosONE, , 5(7): 1-5.

Vanderwert R+, Fox NA, Nelson CA, & Zeanah CH (2016). Normalization of EEG activity among previously institutionalized children placed into foster care: A 12-year follow-up of the Bucharest Early Intervention Project. Developmental Cognitive Neuroscience, 17: 68-75.

Debnath R, Tang A, Zeanah CH, **Nelson** CA, & Fox NA. Long-term effects of institutional rearing, foster care intervention and disruptions in care on brain electrical activity in adolescence. Developmental Science.

How neglect impacts the stress response system

Why look at how the body responds to stress?

- There is extensive evidence from both animals (e.g., rats) and humans that early adversity, including early neglect, can cause the body's stress response system to develop atypically.
  - Not having a normative (healthy) response to a stressor could, in turn, lead to the development of health problems.

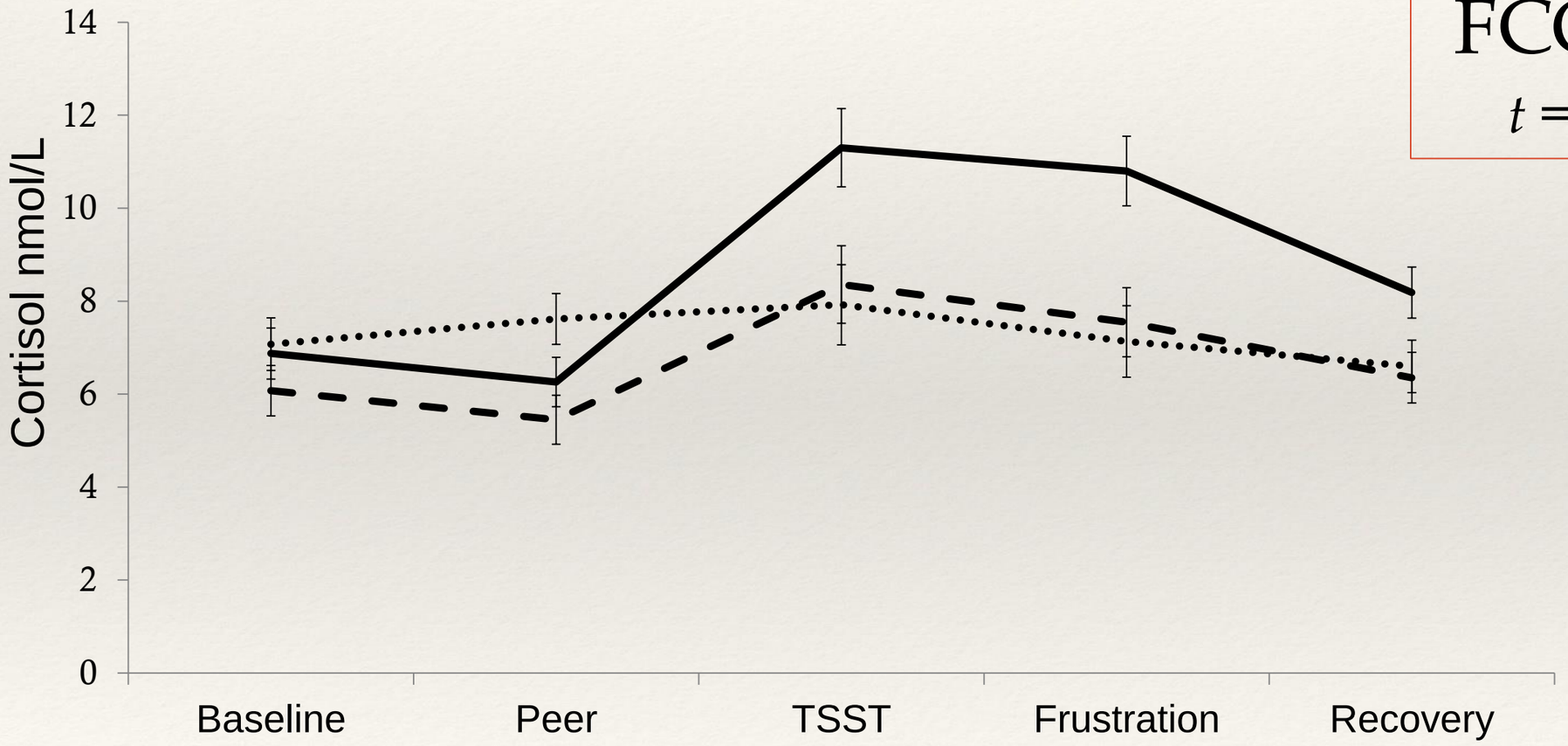
- What is a typical response? When stressed, the body reacts by:
  - Increasing heart rate and blood pressure ("fight or flight response")
  - Releasing more stress hormones (e.g., cortisol).

Trier Social Stress Test

- Asked to deliver a speech about what makes a good friend in front of two teachers that they had never met before
  - Preparation
  - Negative and neutral feedback
  - Speech
  - Math
  - With feedback and accuracy

McLaughlin KA, Sheridan M+, Tibu F, Fox NA, Zeanah CH, & Nelson CA (2015). Proceedings of the National Academy of Sciences, 112 (8), 5637-5642

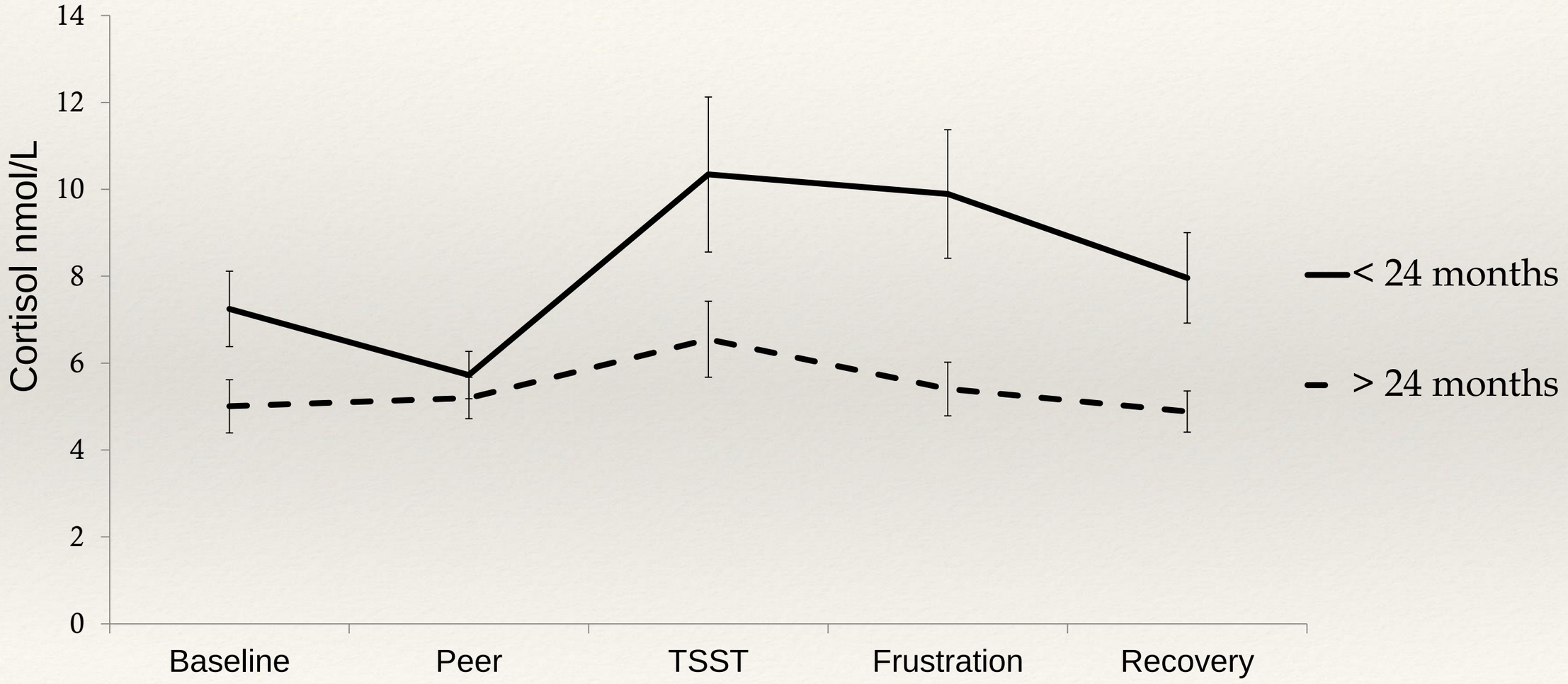
Cortisol reactivity



FCG vs CAUG

$t = 2.58$, p = .010

Timing of placement (FCG only)



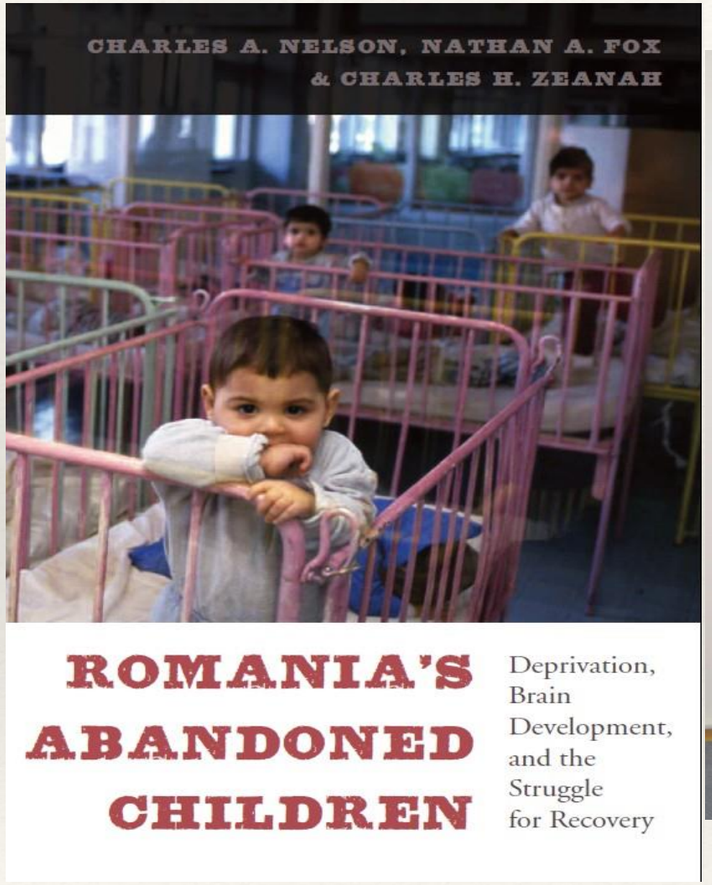
Summary

- Children randomly assigned to continued institutional care show an atypical (flattened) cortisol response – that is, they do not respond as expected when they are stressed.
- By age 8 years, children placed into foster care <2 years show normalized cortisol response.
- In contrast, those placed >2 years show a response similar to the institutionalized children.
- *Thus,* a history of neglect >2 years leads to atypical development of the stress response system

Next

- Professor Zeanah will now share additional findings from the BEIP and describe our EI3 project in Sao Paulo

Thank you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& CHARLES H. ZEANAH
ROMANIA'S ABANDONED CHILDREN
Deprivation, Brain Development, and the Struggle for Recovery