



## **3D. Education Policy Symposium A Unified Conceptual and Empirical Approach to Understanding Treatment Heterogeneity**



# Irvine Network on Interventions in Development

---

NICHHD program project (HD065704 P01)      <http://inid.gse.uci.edu>

Greg Duncan, Program director

George Farkas, PI

Christopher Carpenter, PI

Marianne Bitler, PI

## Investigators:

Deborah Lowe Vandell

Margaret Burchinal

Sara Wakefield

Tim Bruckner

Thurston Domina

AnneMarie Conley

Andrew Penner

Candice Odgers

# Line-up

---

*A Conceptual Approach to Understanding Treatment Heterogeneity in Human Capital Interventions*

Greg J. Duncan & Deborah L. Vandell

*Preschool Center Quality and Socioemotional Readiness for School: Variation by Demographic and Child Characteristics*

Tran Dang Keys, George Farkas, Margaret R. Burchinal, Weilin Li, & Erik A. Ruzek,

*Distributional Effects of a School Voucher Program: Evidence from New York City*

Marianne Bitler, Thurston Domina, & Emily K. Penner

*Does Detracking Work? Evidence from a Mathematics Curricular Reform*

Thurston Domina, Andrew M. Penner, Emily K. Penner, & AnneMarie Conley,

Discussant: Pamela Morris, New York University



# Understanding Variation in the Impacts of Human Capital Interventions on Children and Youth

Greg J. Duncan  
Deborah Lowe Vandell  
UC Irvine

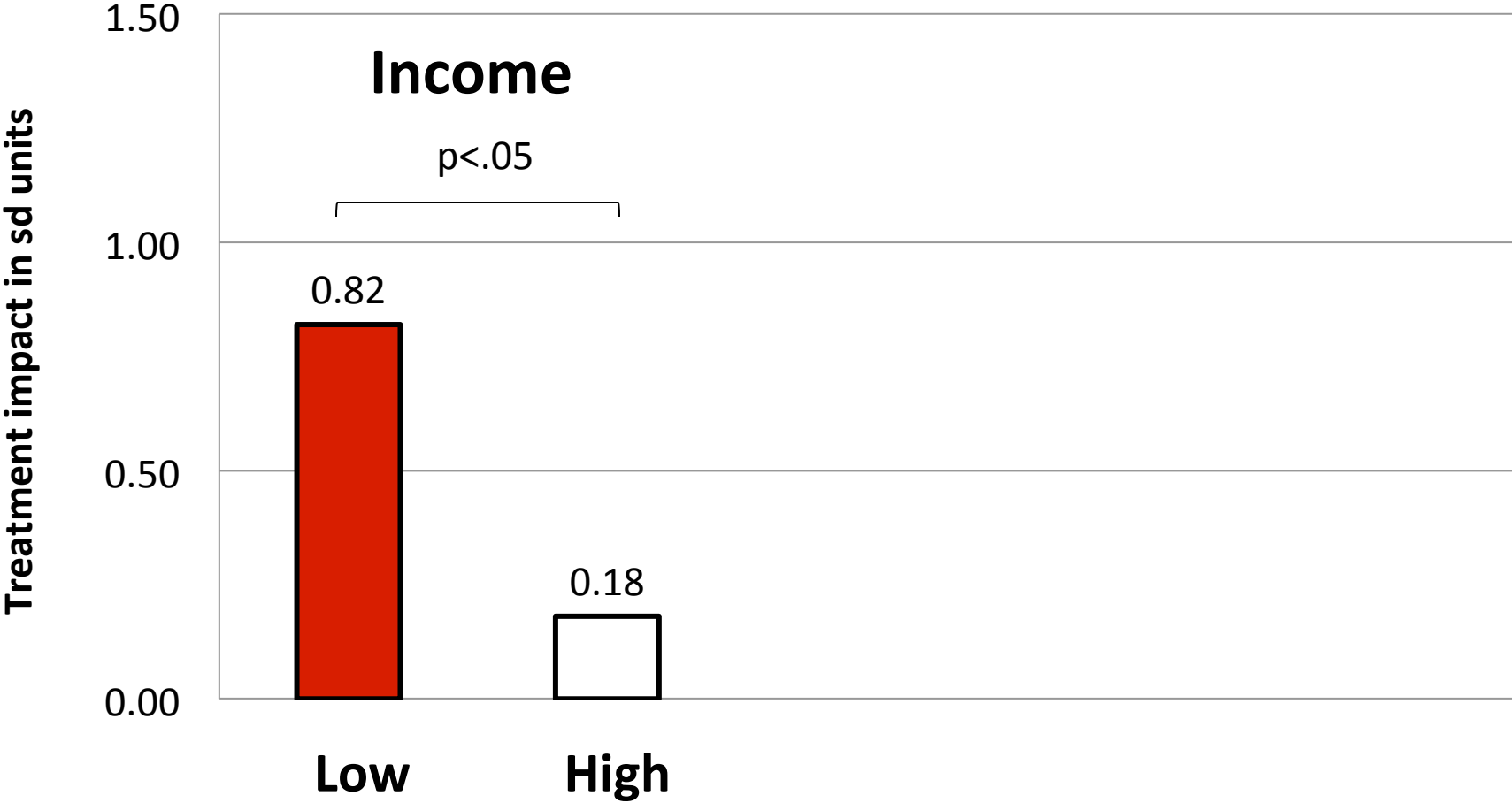
# Treatment effect heterogeneity is pervasive

---

## Example of Infant Health and Development Program (IHDP)

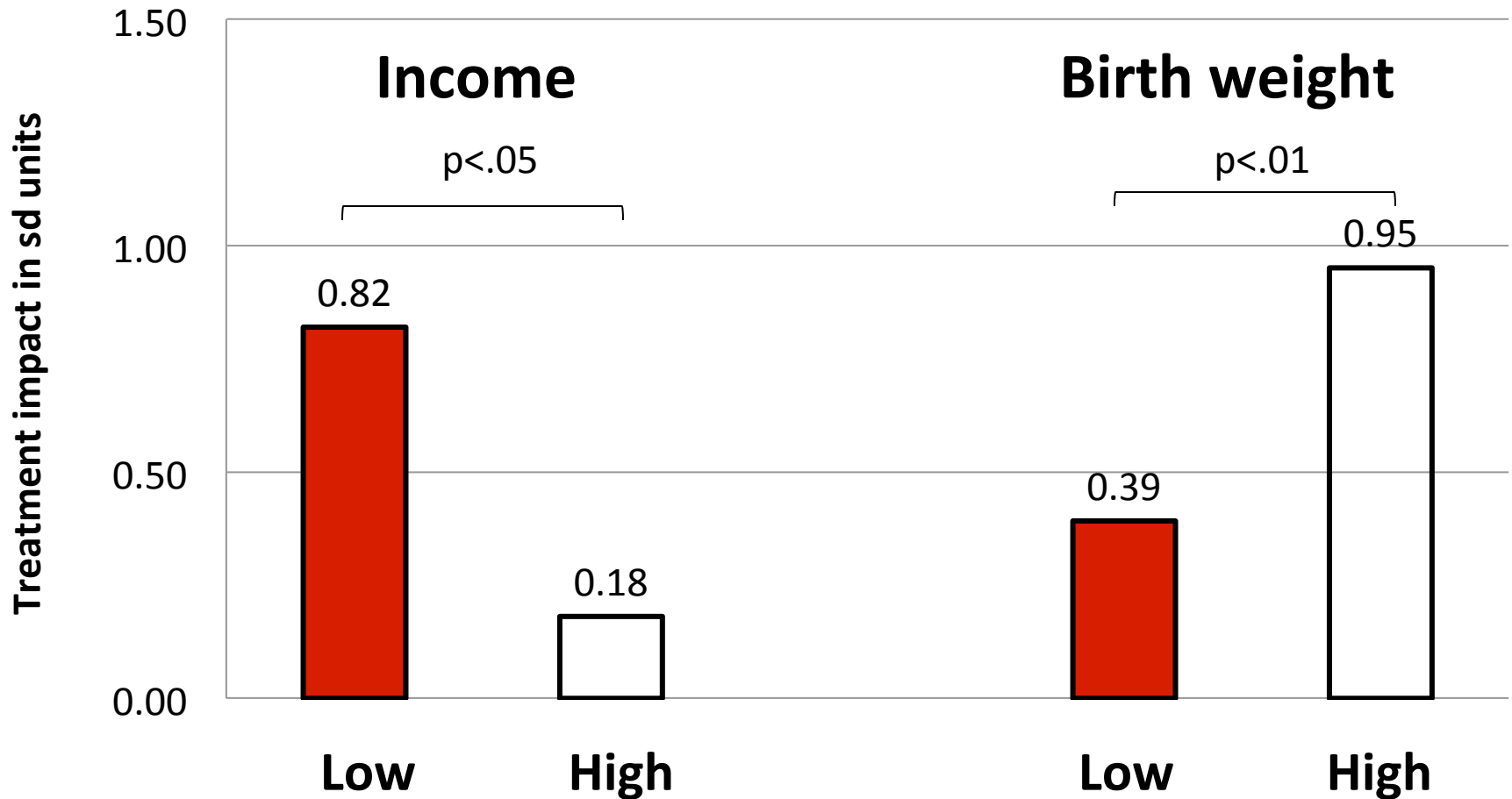
- Intensive services (home visiting + ECE) birth to age 3
- Low birth weight babies only
- 8 sites, random assignment

**Figure 1: Impacts of the IHDP treatment on age-3 IQ by income**



All models also condition on child gender, birth weight, gestational age at birth, neonatal health index and site indicators.

**Figure 1: Impacts of the IHDP treatment on age-3 IQ by income and birth weight**



All models also condition on child gender, birth weight, gestational age at birth, neonatal health index and site indicators.

# Research Question

---

We know that the impacts of human capital programs are heterogeneous

**What conceptual frameworks can account for and predict treatment effect heterogeneity?**

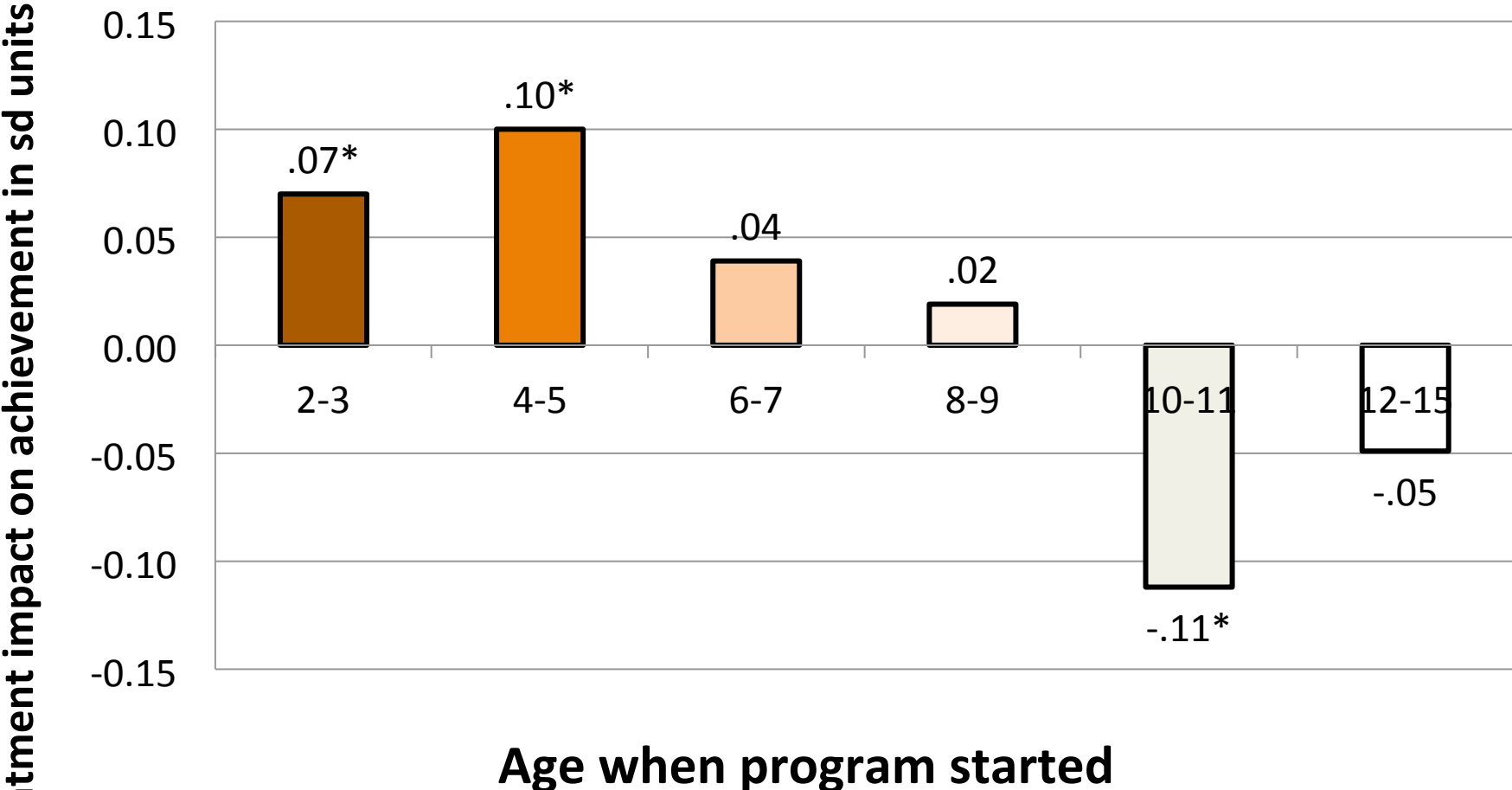


# Developmental framework

---

- Cognitive and socio-emotional development follows a predictable pattern of stages in which windows for profitable interventions widen or narrow.
- *Within* a given stage, predictable variation in the timing of normative development and family circumstances
- Key is the *congruence* (“fit”) between the developmental needs of children and youth and the design and nature of the intervention policies

# Figure 2: Impacts of Earnings Supplement Programs on School Achievement, by Age of Child



Note: \* p<.05; Source: Morris et al. (2005).

# Early childhood

---

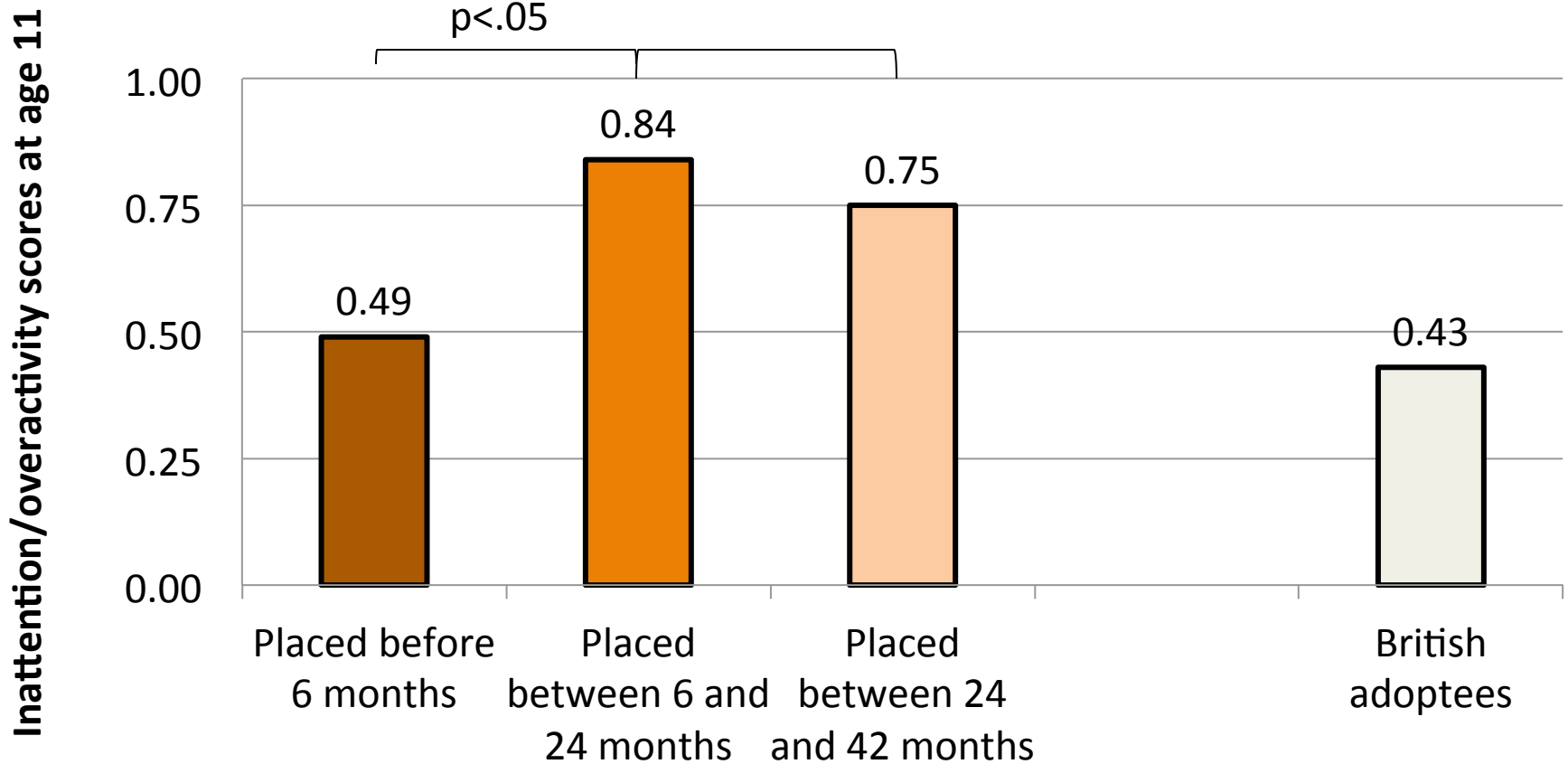
## **Key features**

- Basic systems are wired up; vital attachments from with caregivers

## **Matches and mismatches**

- Cochlear implants best promote speech production and vocabulary among younger children
- Adoptions from orphanages in the first six months of life provide vital caregiver attachment experiences for child

### Figure 3: Age 11 inattention/overactivity scores for adopted Romanian and British children



Note: Scores for “Placed before 6 months” group are statistically different from the other two placement groups, but not statically difference from the British adoptee group. Source: Stevens et al. (2007).

# Middle childhood

---

## **Key features**

- Critical thinking and problem solving supports growth in academic skills

## **Matches and mismatches**

- In later grades, too much focus on basic skills rather than critical thinking

# Adolescence

---

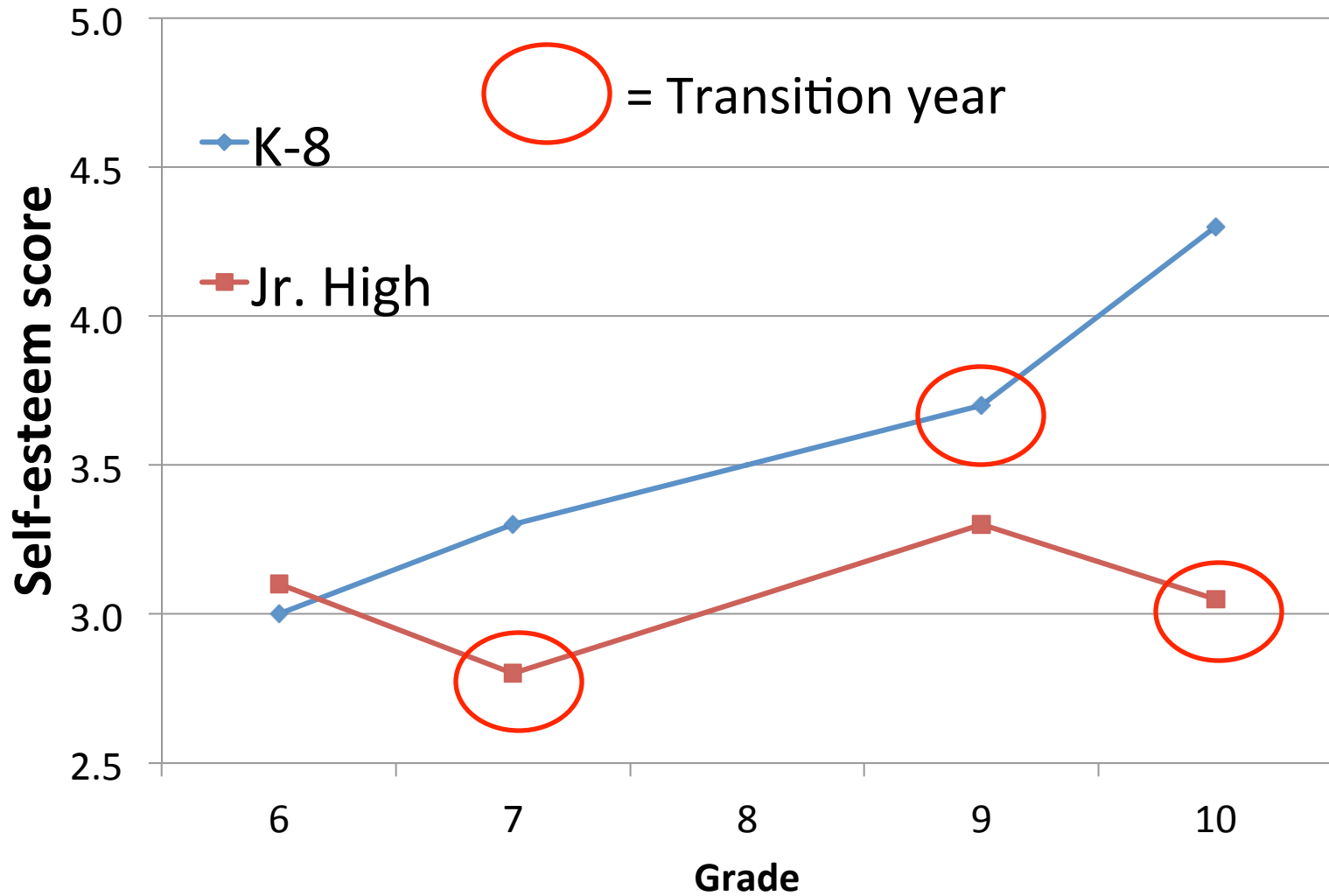
## **Key features**

- All hell breaks loose
- How to balance needs for *autonomy* and *connectedness*?

## **Matches and mismatches**

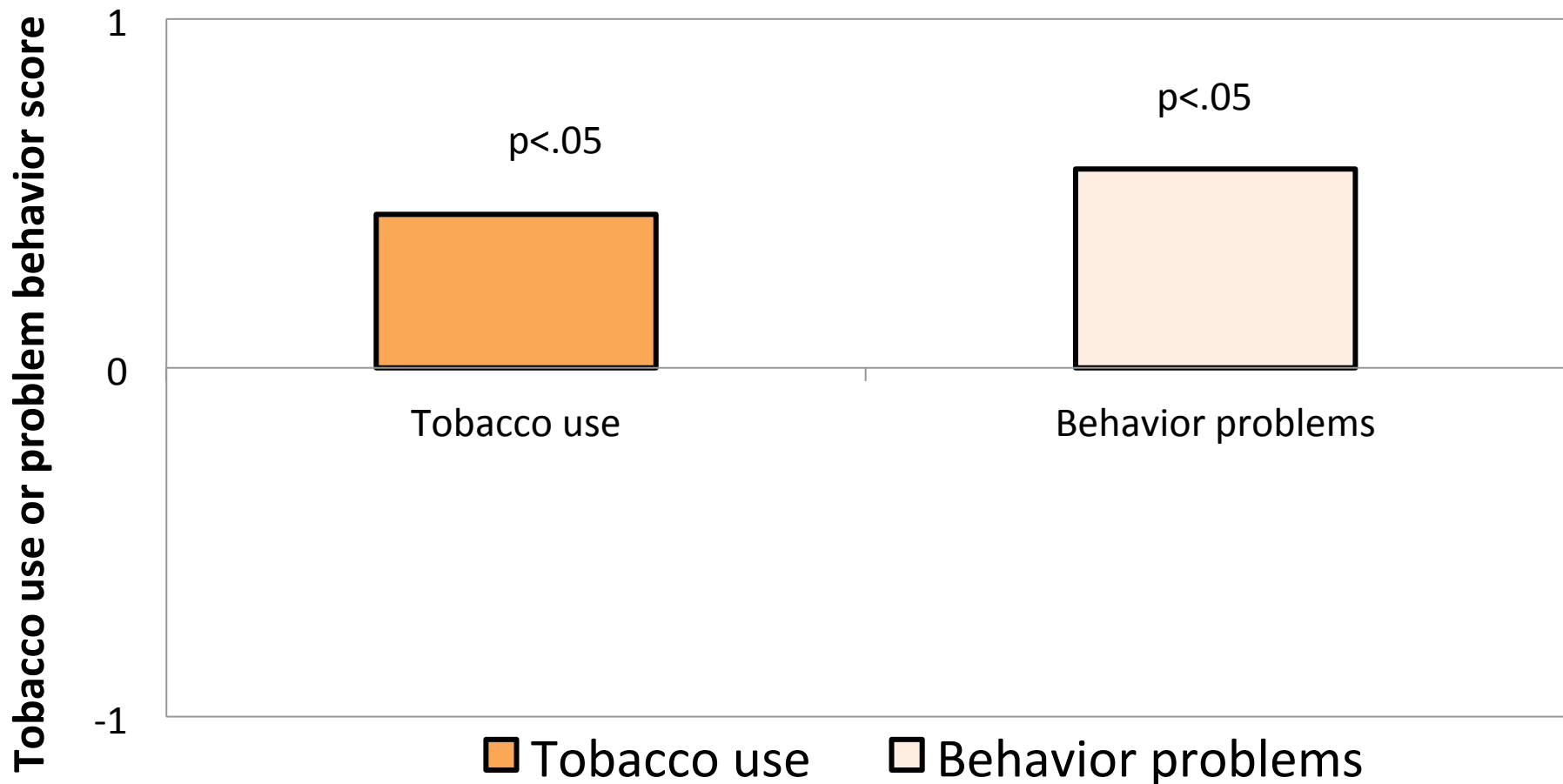
- K-5/middle schools ill-matched to various needs in early adolescence
- Programs that provide group treatment of deviant youth can induce harmful iatrogenic effects

# Self-esteem (females)



Source: Blyth et al. (1983)

**Figure 6: Unexpected impacts of the Adolescent Training Program on deviant youth problem behavior and smoking three years after the end of the program**



Source: Poulin et al., (2011).



# Individual and family differences

---

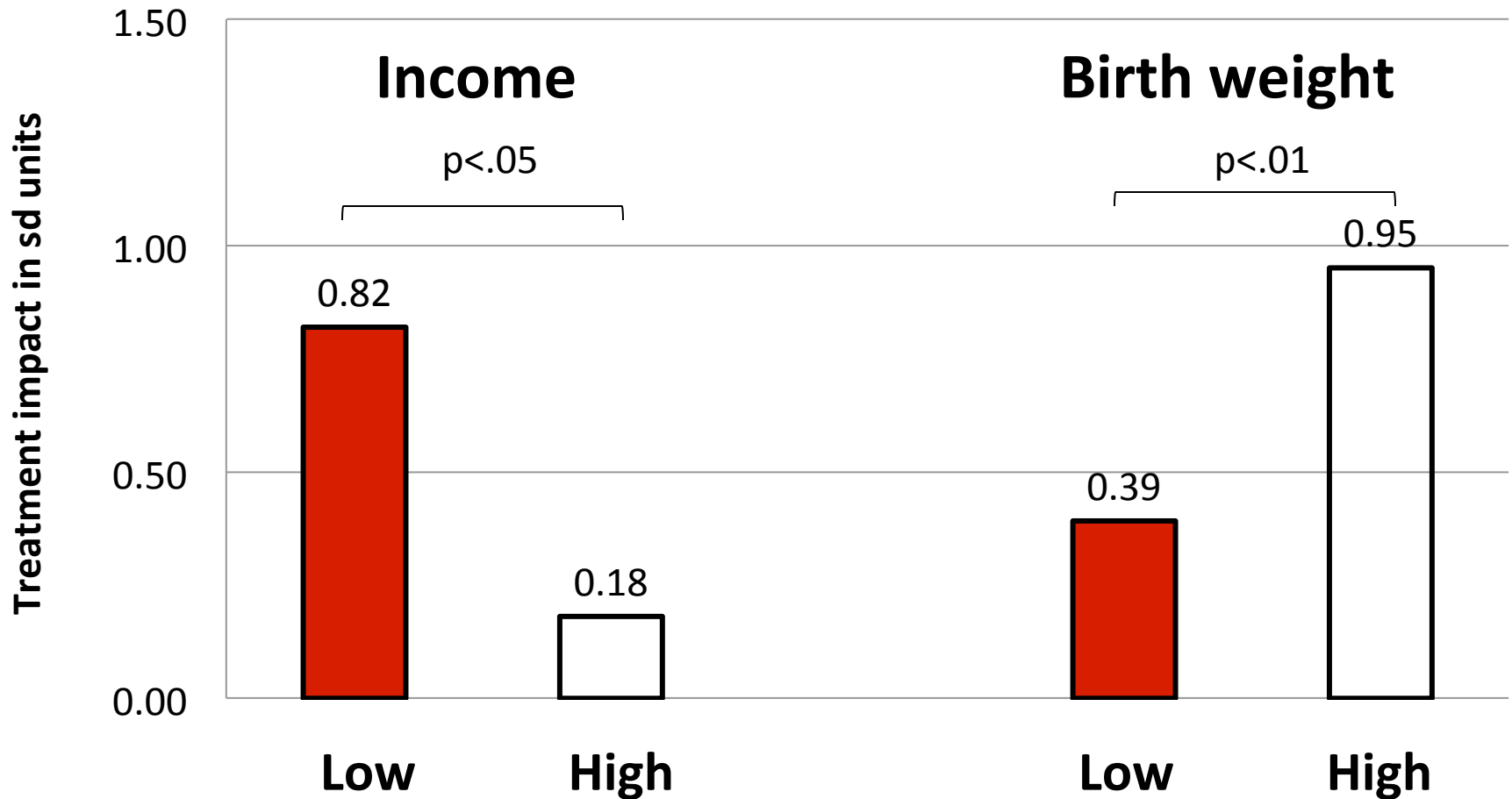
## **Key features**

- Different matches for children in the same developmental stage

## **Matches and mismatches**

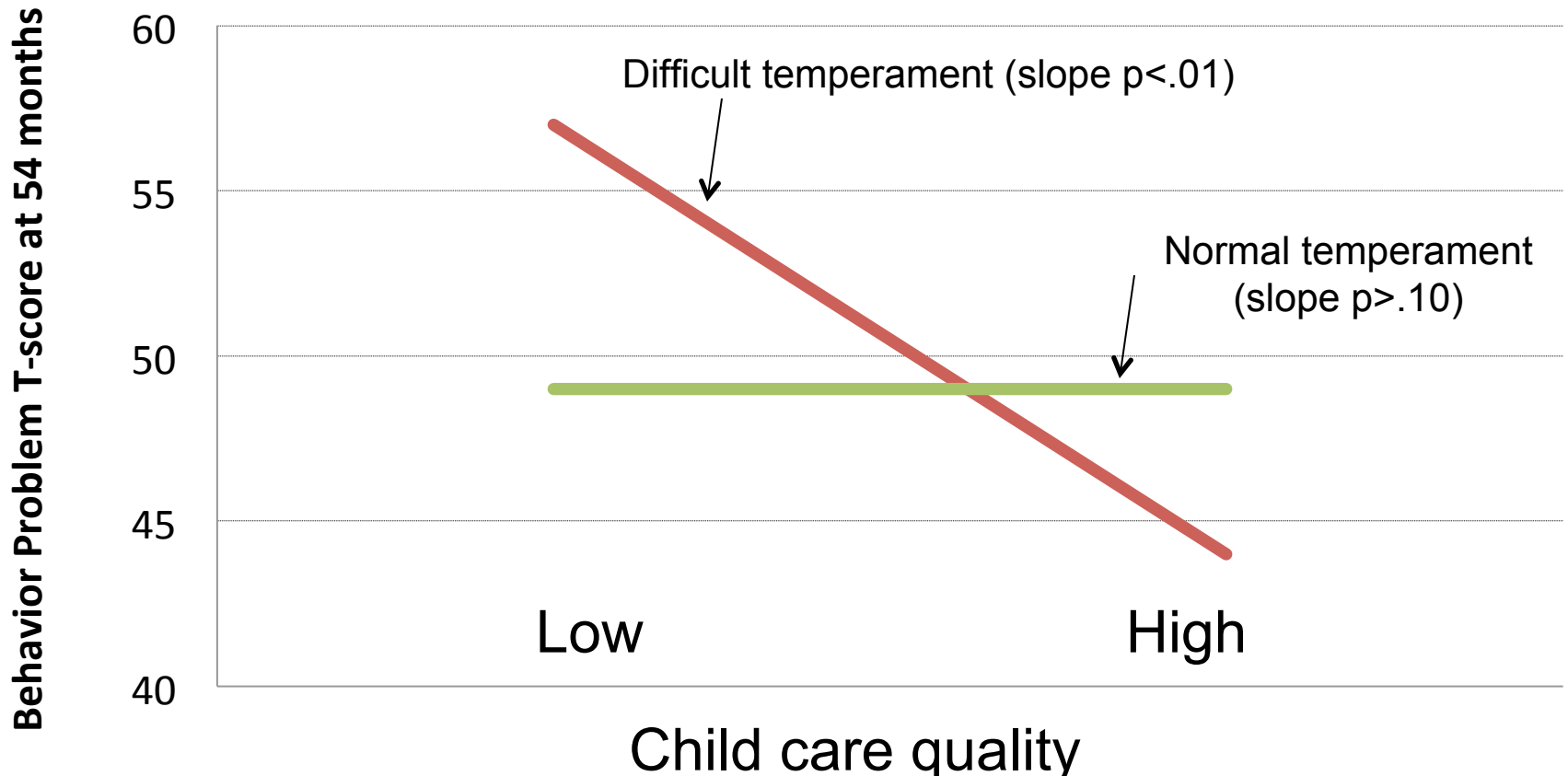
- ECE matched well with low SES but not very low cognitive functioning
- Difficult temperament by quality of treatment interaction

**Figure 1: Impacts of the IHDP treatment on age-3 IQ by income and birth weight**



All models also condition on child gender, birth weight, gestational age at birth, neonatal health index and site indicators.

# Figure 7: Interaction of temperament and child care quality on behavior problems



Models controls for a number of child and parental characteristics, and child care type of hours.  
Source: Pluess and Belsky (2008), Figure 1.

# Some implications

---

## Fit and “skill begets skill”

- Most skills do indeed build on one another
- But higher skills don't always boost the productivity of investments the most

## Fadeout

- How to match in order to build on the gains from earlier programs?

# Some implications

---

## Is earlier better?

- Certainly for some capabilities
- Not when competencies (e.g., impulse control, higher-order thinking) must first be mastered
- Underappreciated adolescent opportunities?

# Some implications

---

## **Tailoring interventions to children's individual circumstances**

- Targeting vs. profiling
- Computer-based individual instruction

## **Implication for intervention design**

- Attention to distribution of treatment effects is costly



gduncan@uci.edu

Project website: [http://  
inid.gse.uci.edu](http://inid.gse.uci.edu)