3D. Education Policy Symposium
A Unified Conceptual and Empirical Approach
to Understanding Treatment Heterogeneity
Irvine Network on Interventions in Development

NICHD 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  Thurston Domina
Margaret Burchinal  AnneMarie Conley
Sara Wakefield  Andrew Penner
Tim Bruckner  Candice Odgers
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.
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

<table>
<thead>
<tr>
<th>Key features</th>
<th>Matches and mismatches</th>
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<tr>
<td>• Critical thinking and problem solving supports growth in academic skills</td>
<td>• In later grades, too much focus on basic skills rather than critical thinking</td>
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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.

## 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
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?
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