Achievement Gaps Before School in Singapore: Family SES, Parenting and Young Children’s Delay of Gratification

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Importance of Early Childhood Development

• Child development in the first few years of life is characterized as rapid development, great susceptibility and malleability.

• Development during early childhood has a long-lasting influence on children’s life chances in their adulthood (Duncan, et al., 1998; Piek, Dawson, Smith, & Gasson, 2008; Yoshikawa, 1995).

• There are great individual differences in cognitive development among preschool children due to various social and family factors (Duncan et al., 1998; Yeung et al., 2002).
Objectives and research questions

• To what extent there are gaps in Singaporean children’s achievement gaps before they start formal schooling?

• What contribute to these gaps in early cognitive development?

• What are the mediating pathways?
Singapore context of intergenerational roots of achievement gap

• Singapore is a **culturally** (multi-racial) and **socioeconomically diverse society** (wealthy with an increasing income inequality).

  • among the world’s wealthiest countries with a per capita GDP of around US$65,000 in 2019. Increasingly high income inequality with GINI coefficients of 0.45 in 2019 (Singapore Department of Statistics, 2021). Around 10.4% of Singapore households have ever suffered from insufficient food in the past 12 months, (Nagpaul, Sidhu, & Chen, 2020).

• Singaporeans have **high value in education and family** (Seng, 1994; Tan and Yates, 2011, Göransson’s, 2015)

• Concerns for a vicious cycle of the **intergenerational transmission of (dis)advantages** if children grow up poor are more likely to be low achievers than their better-off counterparts
Mediating mechanisms of family SES on child development

**family investment model**
- parental material and non-material investment

**family stress model**
- The caregiver’s depressive affect, parenting style

**parental beliefs and expectations**
- E.g., parental values and educational aspirations on their children

**Gaps in the literature**
- young children are usually regarded as passive recipients of environmental influences.
- The associations between parental beliefs, parenting behavior, and, subsequently, children’s agency, have not been well examined.
- insufficient attention on Asian context such as Singapore.
Singapore Longitudinal Early Development Study

Kajian Perkembangan Awal Longitudinal Singapura

Principal Investigator:
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https://www.fas.nus.edu.sg/cfpr/research/sgleads.html
Phase I: Wave 1 (age 0-6), Wave 2 (age 2-8)
Phase II: Wave 3 (age 4-11), Wave 4 (age 6-13)

Research & Policy Questions:

- What is the state of Singaporean children’s development in multiple domains?
- How family, childcare/early education institutions, community, and the state interact to shape the developmental trajectory of Singapore’s children?
- How early environment and development affect a child’s early & middle childhood development?
- How these investments affect intergenerational mobility and social inclusiveness in Singapore?
Multiple Disciplines Team:
Sociology, Psychology, Economics, Communication, Anthropology, Geography

Theoretically driven and culturally relevant to Singapore

Integrated Multiple Methods:
How do we collect data?
- In-home surveys and child assessments
- In-depth interviews
- Lab observations in NUS, EEG, Eye-tracking

CORE PANEL SURVEY
Wave 1  Wave 2
(Age 0-6)  (Age 2-8)
2018 - 2019  2020 - 2021

Language Development
Cross-cultural Families
Social Skills
Successful Completion of Core National Survey

Wave 1: 2018-19
Wave 2: 2021 (87% RR)

Who are the SG LEADS Families?
A nationally representative sample of 5,000+ Singaporean children under the age of 7 in 3,483 households across the nation in W1
Data and sample

• First nationally representative sample of families with children aged 0-6 in Singapore.
• The survey adopted a multi-stage stratified probability sampling and oversampled low-income groups.
• Face-to-face in-home interviews with the child’s primary caregiver (mostly the mother) were conducted.
• **Analytic Sample:** SG LEADS wave 1 children aged 3 to 6 (N=2,951).
• Sampling weights are used to adjust the selection probability.
Measures

Dependent variables

Children's achievement is measured by an international standardized test: Woodcock-Johnson Test of Achievement IV (WJ-ACH IV).

- **Applied problems z-score** (SG-Normed)
- **Letter-word identification z-score** (SG-Normed)

Independent variables

- **log transformed total family income**
- **parental education** (the highest educational level of biological/adoptive father and mother).
## Mediators

<table>
<thead>
<tr>
<th>Family investment</th>
<th>parental beliefs, aspirations, and parenting practices</th>
<th>Children’s Delay of gratification</th>
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</table>
| • Economic pressure (Can’t make ends meet at the end of the month)  
• physical home environment (e.g., clean, cluttered)  
• have savings for children’s education (1=yes)  
• children have access to computer (1=yes)  
• Shared activities (e.g., shared book-reading, library visits)  | • value of children (score of emotional value (e.g., bring love and companionship), minus score of instrumental value (e.g., old-age security) )  
• primary caregiver’s educational expectation on their children  
• rule settings on children’s homework and afterschool activities | • 9 test-trials adopted from Prencipe and Zelazo’s (2005) delay of gratification choice paradigm  
• Children choose between getting a small reward immediately (0 score) and getting a large reward later at the end of the game (1 score) |
Delay of Gratification develops rapidly during age 3-7 with girls showing a small advantage over boys.
Why is Delay of Gratification important?

• Delay of Gratification in preschoolers - the ability to postpone a smaller, immediate gratification in order in order to attain a more valuable delayed reward (Mischel, Shoda, & Rodriguez, 1989) - predicts positive later developmental outcomes: fewer behaviour problems and better academic achievement (Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990; Watts, Duncan, & Quan, 2018).

• Delay of Gratification is linked to children’s self-control in daily lives and correlated with the cognitive aspect of Executive Function such as working memory (Mischel & Metzner, 1962; Olson, Hooper, Collins, & Luciana, 2007; Shamosh et al., 2008; Shamosh & Gray, 2008), and other cognitive capacities such as selective attention, cognitive representation (e.g., Peake et al., 2002; Sethi et al., 2000).

• Delay of Gratification buffers the negative impacts of family socioeconomic disadvantages on children’s behavioural development – provide opportunity for early intervention (Chen & Yeung, 2021).
Delay of Gratification by SES

• Family socioeconomic status (such as education level and poverty) influences young children’s development of DoG.

• At age 3-4, the difference by SES is not significant, but by age 5 & above, the negative impacts of low parental education level and poverty on children’s DoG became significant.
The influence of family SES on DoG is more significant at an older age.
Control variables

- Child’s age
- Gender (1=boy)
- Ethnicity (Chinese(ref.), Malay, Indian and others)
- The primary caregiver’s cognitive ability (Woodcock Johnson-IV-ACH passage comprehension subset).
- The child’s primary language is not English
- The child does not attend school
- The child has at least one chronic condition
- Number of Siblings
- Household size
Analytical strategy

We used structural equation modeling (SEM) with the full information maximum-likelihood (FIML) method.

We applied clustered standard errors to account for the unobserved household effect for households with more than one child participated in this study.
Achievement gap by family income

*Denotes the difference between that group and incomeQ4 is statistically significant. Group difference presented here do not control for other variables.
Achievement gap by parental education

*Denotes the difference between that group and University and above is statistically significant. Group difference presented here do not control for other variables.
Variation by family income for selected mediators

**Instrumental VOC**
- Income Q4 (highest): 2.76
- Income Q3: 3.19*
- Income Q2: 3.29*
- Income Q1 (lowest): 3.43*

**Educational expectation**
- Income Q4 (highest): 96%
- Income Q3: 90%
- Income Q2: 80%*
- Income Q1 (lowest): 65%*

**Can't make ends meet**
- Income Q4 (highest): 0%
- Income Q3: 1%
- Income Q2: 4%
- Income Q1 (lowest): 21%*
Variation by family income for selected mediators

**Home environment**

IncomeQ4 (highest) > IncomeQ3 > IncomeQ2 > IncomeQ1 (lowest)

**Shared activities (zscore)**

IncomeQ4 (highest) > IncomeQ3 > IncomeQ2 > IncomeQ1 (lowest)

**Delay of gratification**

IncomeQ4 (highest) > IncomeQ3 > IncomeQ2 > IncomeQ1 (lowest)
Variation by parental education for selected variables

Instrumental VOC
- university and above: 3.00
- post-secondary: 3.35*
- secondary and below: 3.50*

Educational expectation (university and above)
- university and above: 0.94
- post-secondary: 0.70*
- secondary and below: 0.58*

can't make ends meet
- university and above: 0.02
- post-secondary: 0.12*
- secondary and below: 0.17*
Variation by parental education for selected variables

- **Home environment (1-5)**
  - University and above: 4.22
  - Post-secondary: 4.10*
  - Secondary and below: 3.86*

- **SD**
  - University and above: 0.32
  - Post-secondary: 0.05*
  - Secondary and below: -0.26*

- **Delay of gratification (0-9)**
  - University and above: 6.03
  - Post-secondary: 5.22*
  - Secondary and below: 5.05*
Letter-word Identification score

Notes: standardized coefficients are present in solid lines ($p<.05$). Lines start from Income are highlighted in red, lines start from parental education are highlighted in blue. $\chi^2/df=24.4$, CFI=.97, TLI=.91, RMSEA=.03, SRMR=.02
Direct, indirect and total effects of selected variables (standardized coefficients)

<table>
<thead>
<tr>
<th>Model</th>
<th>Applied Problems</th>
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<th>Letter-word Identification</th>
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<tbody>
<tr>
<td></td>
<td>Direct effect</td>
<td>Indirect effect</td>
<td>Total effect</td>
<td>Direct effect</td>
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<tr>
<td>Income (log-transformed)</td>
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<tr>
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<td>.11*</td>
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<td>Family economic pressure and investment</td>
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<td>-.06*</td>
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<td>Shared activities</td>
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<td>no path</td>
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<td>PCG's values, educational aspiration, and parenting</td>
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<td>Emotional value of children</td>
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<td>Educational expectation</td>
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<td>Rules</td>
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* Denotes $p<0.05$
### Direct, indirect and total effects of covariates (standardized coefficients)

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<tr>
<th>Covariates</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
<th>Direct effect</th>
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<td><strong>PCG’s cognitive ability</strong></td>
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* Denotes $p<0.05$
Summary

- We find a large achievement gap among preschool children.
- **parental education** has a larger impact than income on children’s test score, it works both directly and indirectly.
- The three different mediating pathways are all significant including the parental beliefs and values. They explain the impact of family SES on children’s test scores.
- For numeracy scores, children’s delay of gratification has the largest total effect, While for verbal scores, home environment and shared activities show the largest total effect.
- **Family economic deprivation**, which is affected by family income and parental education, is detrimental to children’s test scores net of family SES.
- Parents’ executive function – organized home, planning saving for college, rule setting, PCG’s cognitive skills
Discussion

• We shed light on three different mediating pathways of family SES on children’s achievement, and their associations.

• This study Incorporates children’s agency in early childhood research.

• Parents setting rules for children and providing an organized and stimulating home environment are related to a child’s Delay of gratification.

• Culture matters – value and expectations, racial differences – subculture differences

• This study underscores the intergenerational roots of disadvantages shown in early childhood. *It will cause a vicious cycle of transmission of disadvantages if left unattended.*
Thank you for your attention!
A continuous form of Income and education are use in SEM models

Note: standardized coefficients are present in solid lines (p<.05). Lines start from Income are highlighted in red, lines start from parental education are highlighted in blue. \( \chi^2/df=25.5, \ CFI=.97, \ TLI=.92, \ RMSEA=.03, \ SRMR=.02 \)