

The Impact of Childhood Social Skills and Self-Control Training on Economic and non-Economic Outcomes:

Evidence from a randomized experiment using administrative data

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Introduction

- Recent research shows strong association between non-cognitive skills and favorable adult outcomes: social skills labor market returns (Deming 2017), self-control and health/crime (Duckworth et al.)
- Can we boost these non-cognitive skills with specific training during childhood, and what are the long-term causal impact on economic (and non-economic) outcomes ?

What do we do ?

- Montreal Longitudinal Experimental Study
 - Randomized early childhood intervention at age 7-9 years, specifically targeted at non-cognitive skills *deficit*
 - Training in *self-control and social skills solely*
 - Longitudinal data on (non)-cognitive skills at age 10-17 years

Existing evaluation MLES:

School performance and trajectory of violence/aggressivity: Boijoli et. al. 2008; Vitaro et al. 2012

What do we do ?

- **Matching with Administrative Data : (97.5% of the sample)**
 - **Statistic Canada – Tax returns from age 20-39:**
 - **Economics:** Employment, Earnings, Social Transfers, Assets and Investments
 - **Social outcomes:** composition of household, group memb., charitable donations ...
 - **Ministry of Education – Quebec : Secondary school degree**
 - **Ministry of Justice – Quebec: Number of criminal offenses at age 24 for each subject**

Why Admin is key ?

	(1)	(2)	(3)	(4)	(5)
	% Missing				
	Non-disruptive	Control	Treatment	Difference (T-C)	P-value of difference
Adult Social and Economic Outcomes					
Tax data (at least one year)	0%	0%	3%	3%	0.58
Number of Crimes	0%	0%	0%	0%	
Secondary Completion	0%	1%	0%	-1%	0.54
Young adult survey 2001	33%	40%	58%	2%	0.80
Young adult survey 2006	45%	58%	64%	6%	0.37
At least one young adult survey	25%	36%	38%	2%	0.80
Skills: Age 10-13					
Trust	2%	2%	4%	2%	0.36
Friendliness	1%	1%	1%	1%	0.48
Aggression Control	1%	1%	1%	1%	0.48
Attention Control	1%	1%	1%	1%	0.48
Self Esteem	4%	7%	9%	2%	0.57
Altruism	1%	1%	1%	1%	0.48
Grades	7%	13%	10%	-3%	0.58
Held Back	0%	1%	0%	-1%	0.54
Special Education	1%	0%	0%	0%	
Skills: Age 14-17					
Trust	10%	16%	13%	-2%	0.63
Friendliness	10%	16%	13%	-2%	0.63
Aggression Control	10%	16%	13%	-2%	0.63
Attention Control	11%	17%	15%	-2%	0.69
Self Esteem	13%	20%	16%	-4%	0.42
Altruism	13%	21%	19%	-2%	0.71
Grades	10%	14%	13%	-1%	0.79
Held Back	1%	1%	0%	-1%	0.54
Special Education	1%	1%	0%	-1%	0.38

Results

- **Adult outcomes**

- Increase in average yearly income by 20%, decrease in yearly social transfers by 40%
- Increase probability of being married by 15% , and being part of a professional organization
- Increase by 19% in the probability of high-school graduation , and reduction in crime
- 1 \$ invested at age 8 yields 11\$ in benefits at age 39. IRR=17%

- **Adolescent outcomes**

- Self-control and Trust boosted in early adolescent, no impact on other non-cognitive skills/IQ
- Impact on grades and academic achievement in a second phase, late adolescence
- Tentative interpretations on channels: knock-out analysis shows that academic achievement and later adult outcomes are highly correlated with the boost in self-control and trust

Literature review

- Large impacts of preschool childhood development programs targeted mainly at cognitive skills , pyshiological stimulation or combination with non-cognitive skills
 - Surveys: Almlund et al.(2011), Heckman and Kautz(2013)
 - Abecedarian (Campbel et al 2002; Campbel et al., 2014)
 - Perry Preschool (Heckman et al, 2010, 2012.....)
 - Jamaican study (Campbel et al., 2014)
 - Project Star (Krueger 1999, Chetty et al. 2011)

Literature review

- Recent short-term intervention , better designed and with larger samples....but no long-run outcomes
 - Growth mindset and goal-setting (Dobronyi et al. 2019, Alan et al. 2019, Yeager et al. 2019, Huillery et al., 2023), cognitive behavioral therapy (Ludwig et al., 2017)
 - Emotional and social competence (Domitrovich et al. 2007), prosociality (Kosse et al. 2019), cooperation in the classrooms (Algan & Huillery et al., 2023)

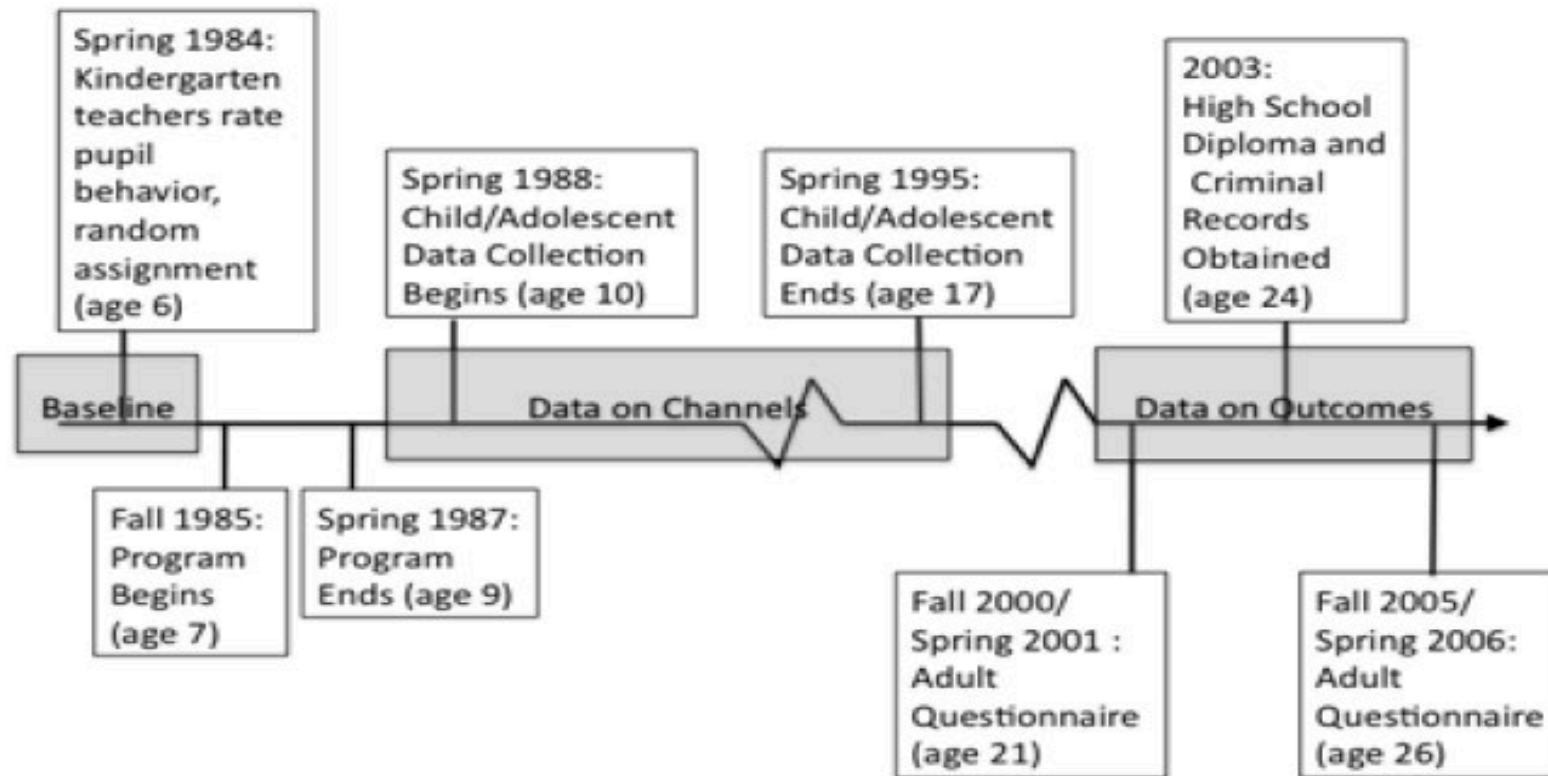
OUTLINE

- ① Introduction
- ② Montreal Longitudinal Experimental Study
- ③ Validity
- ④ Outcomes
 - ① Early Adolescent
 - ② Late Adolescent
 - ③ Parent
 - ④ Adult
- ⑤ Mechanisms
- ⑥ Cost-efficiency and Rate of Return
- ⑦ Conclusion

MLES - Program Content

- Spring 1984: 1037 boys in kindergarten (age 6 years) evaluated by teachers using standardized behavioral inventory
- Randomized trial for the most disruptive: N=250, T=69, C=181
 - Data collected on larger non-disruptive group as well
- Two year intensive program: age 7-9 years
- Followed yearly from 10-17 years old
 - Psychological indicators, activities, behavior, grades (self, teacher)

EXPERIMENTAL DESIGN



Example:

Child component on self-control

- Session format: Example
 - Topic introduction and discussion : Self-Control
 - Example and presentation of strategies:
 - (Facilitator) I got tagged out first
 - Notice: I'm angry and disappointed, my body feels hot, I know an outburst is coming
 - Think why: I got tagged first, other kids will laugh
 - Chose how to avoid an angry outburst: count to ten, move away, tell myself to calm down, breathe
 - Act and praise myself
 - Role playing: Children perform other examples (bumped desk at school, someone turns off TV at home...)
 - "Homework": worksheet sent home to parents to reinforce

Child component on self-control

I identify



I think



I choose



I act and feel good about what I have done



Validity of the experiment

- Validity of the experimental design

- 4 out of 32 variables measured at baseline are different (10%), included in controls (anxiety of father, age of father at birth, mother's employment, nb sisters)

- Attrition rate:

- Little or no attrition in adolescent outcome data
- Attrition rate is nil for criminal record and secondary education completion (admin data)

Table 1. Baseline characteristics and randomization check

	Non-disruptive mean	Control		Disruptive			Difference		
		mean	N	sd	mean	N	sd	C-T	p-value
Age	6.00	6.03	181	0.30	5.97	69	0.29	0.05	0.20
Attended pre-school	0.16	0.21	181	0.41	0.19	69	0.40	0.02	0.71
Age of mother	25.69	23.99	180	4.18	24.01	68	4.71	-0.02	0.97
Age of father	28.67	26.90	161	5.34	28.28	56	5.33	-1.38	0.10
Mother education	10.67	9.97	180	2.23	9.90	68	2.28	0.07	0.83
Father education	10.81	9.70	160	2.45	9.93	60	2.42	-0.24	0.52
# of children in HH	1.14	0.97	181	0.90	1.07	68	0.80	-0.10	0.42
Adversity index	0.30	0.43	181	0.24	0.43	68	0.27	-0.00	0.96
Mother works	1.61	1.73	177	0.45	1.78	68	0.42	-0.05	0.42
Father works	1.12	1.21	148	0.41	1.20	49	0.41	0.01	0.86
Mother job prestige	39.35	36.03	161	11.02	33.16	60	10.13	2.87	0.08
Father job prestige	40.74	35.19	156	9.58	35.22	53	9.83	-0.03	0.99
Initial Aggression	4.00	14.51	181	4.78	14.62	69	4.58	-0.11	0.86
Initial Anxiety	2.65	3.55	181	2.73	4.26	69	2.82	-0.71	0.07
Initial Opposition	1.63	5.62	181	2.19	5.81	69	1.93	-0.19	0.53
Initial Prosociality	8.21	6.52	181	4.79	6.99	69	4.51	-0.47	0.49
Initial Combativeness	0.82	3.53	181	1.59	3.48	69	1.54	0.05	0.83
Initial Inattention	2.23	4.19	181	2.35	4.19	69	2.18	0.01	0.99
Initial Hyperactivity	0.98	2.79	180	1.21	2.96	68	1.19	-0.16	0.35
Initial Antisociality	0.84	0.99	181	1.11	1.21	68	1.23	-0.21	0.20

Data from MLES baseline data collection, 1984 (prior to randomization and program implementation). A joint significance test is not significant ($p=0.34$). The non-disruptive group is composed of those children who scored below the 70th percentile of anti-social behavior on the initial questionnaire in 1984. This non-disruptive group did not participate in the randomized evaluation and serves as a reference group. Those who scored above the 70th percentile were randomized into either the treatment or control groups.

Attrition

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Identification of skills during adolescence

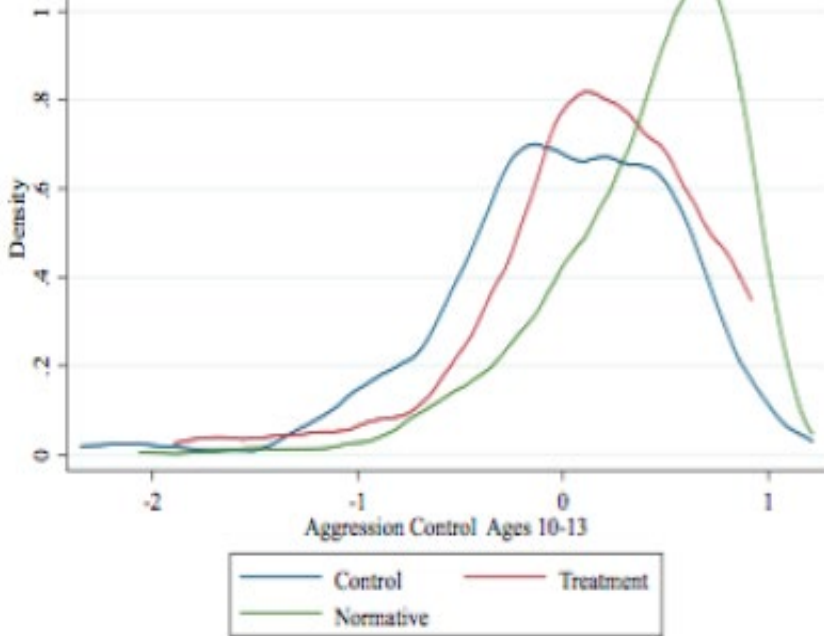
- Yearly data on cognitive and non-cognitive measures, ages 10-17
 - Thousands of observations (psychological scales, behaviors, grades)
 - Teacher and subject reported
 - No attrition and balance sample for most indicators
 - Data (from subject) on parent behavior
- Identify channels using EFA
- Divide into two periods: 10-13 and 14-17 (year where the divergence in “held back” starts), Early and Late Adolescence
- Channel = average of z-scores
 - PCA gives similar results

Adolescent outcomes

- Behavioral Skills
 - Self-control:
 - Attention-Impulse Control: Easily distracted, cannot concentrate,
 - Aggression Control: Bullying, fighting, vandalism
 - Social Skills :
 - Trust: Trust (others, strangers...) + Perspective taking (Angry when bumped by accident ...)
 - Friendship: Interactions with best friends, parents
 - Altruism: Helps others, cleans up messes..
- Cognitive skills and school performance: IQ (age 10/11) yearly grades in Math and French, Held back, Special education
- Group Membership (Late Adolescence only)
- Additional skills: Self-esteem, Emotional well-being....

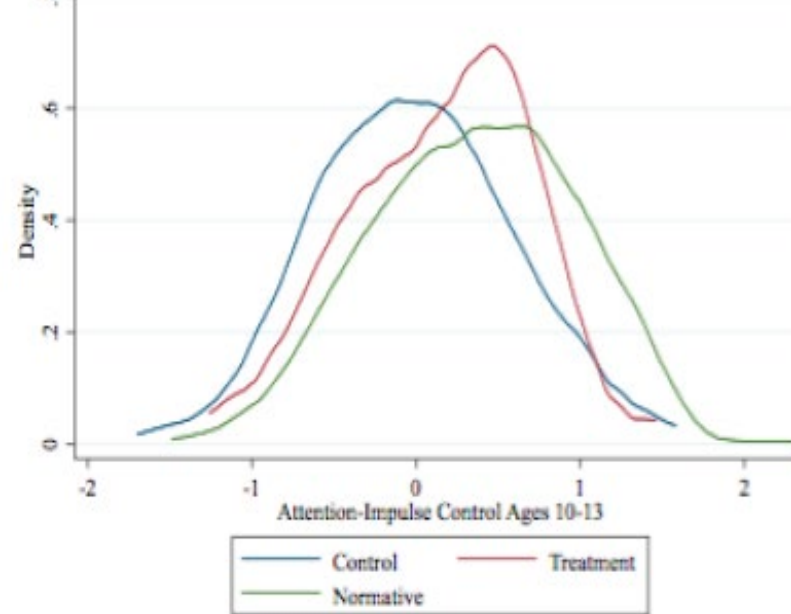
Impact - Early adolescence self-control and trust

Treatment reduced the gap with non-disruptive by 36%



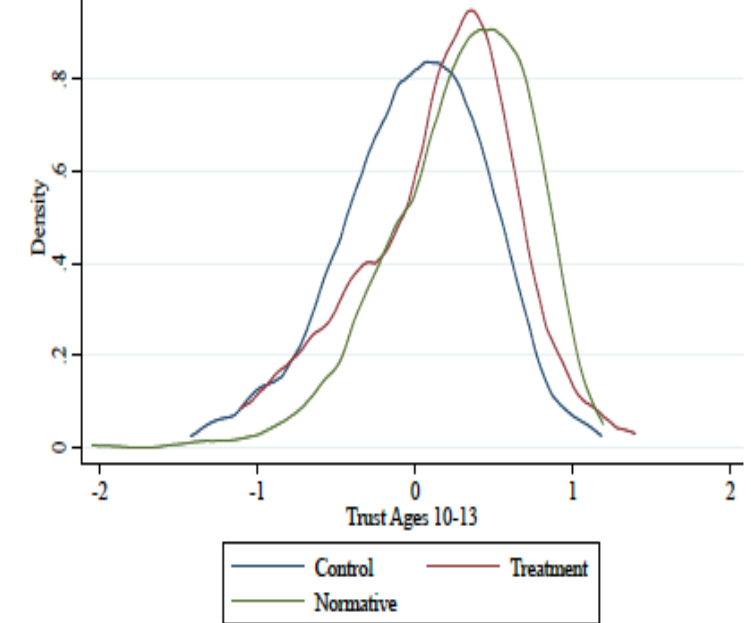
KS p-value=0.04; ttest p-value=0.05
0.15 standard deviations higher in the treatment group

Treatment reduced the gap with non-disruptive by 60%



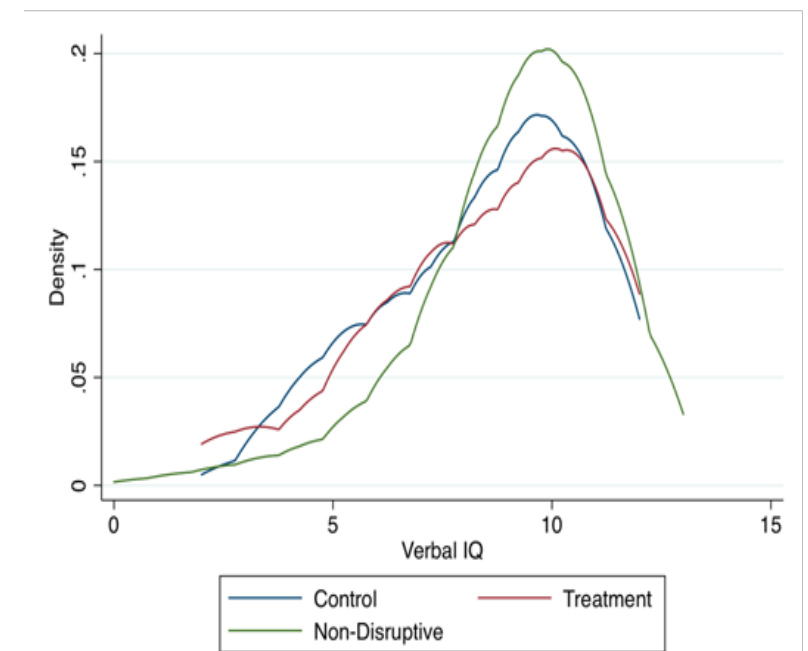
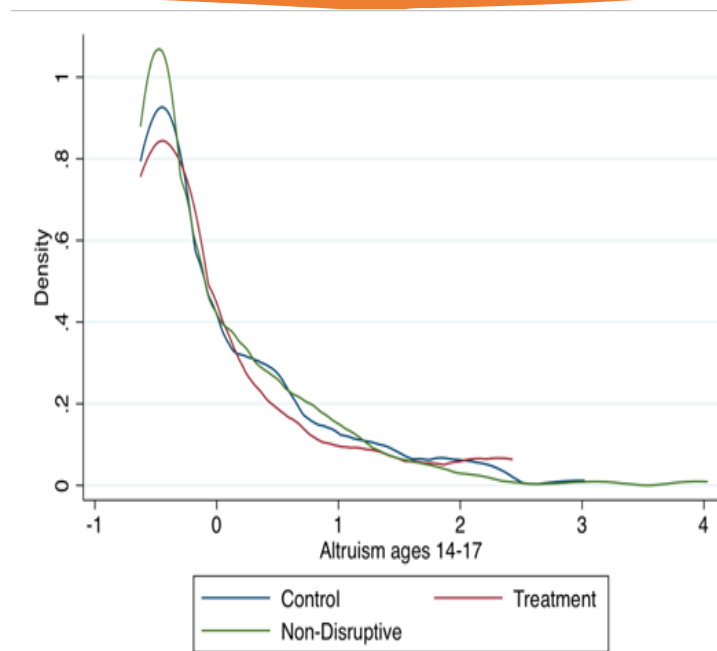
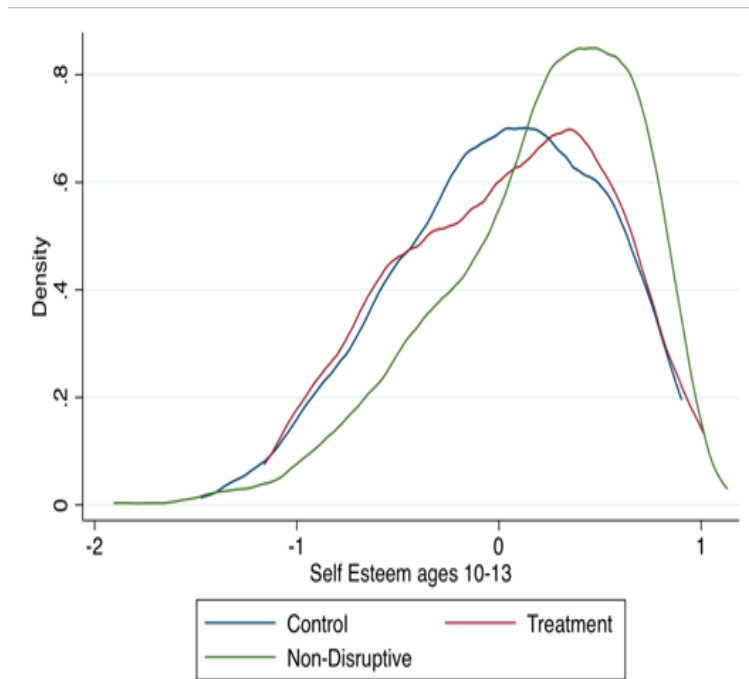
KS p-value=0.02; ttest p-value=0.06
0.16 standard deviations higher in the treatment group

Treatment reduced the gap with non-disruptive by 62%



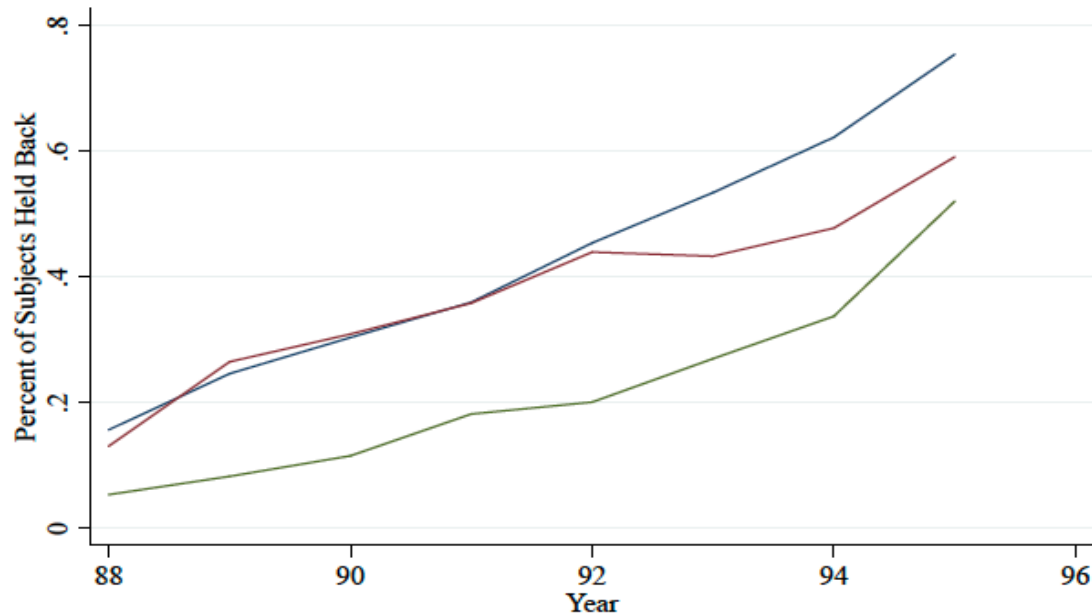
KS p-value=0.003; ttest p-value=0.02
0.16 standard deviations higher in the treatment group

Additional adolescent outcomes: no impact

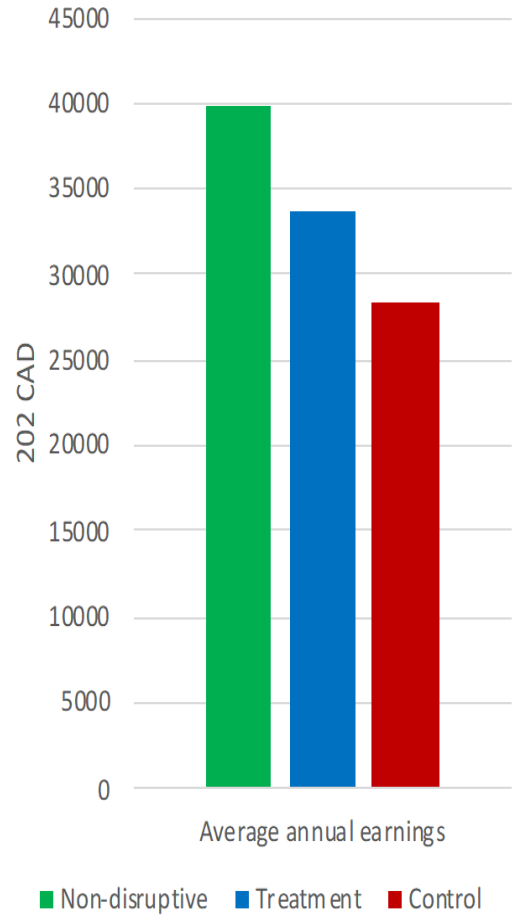
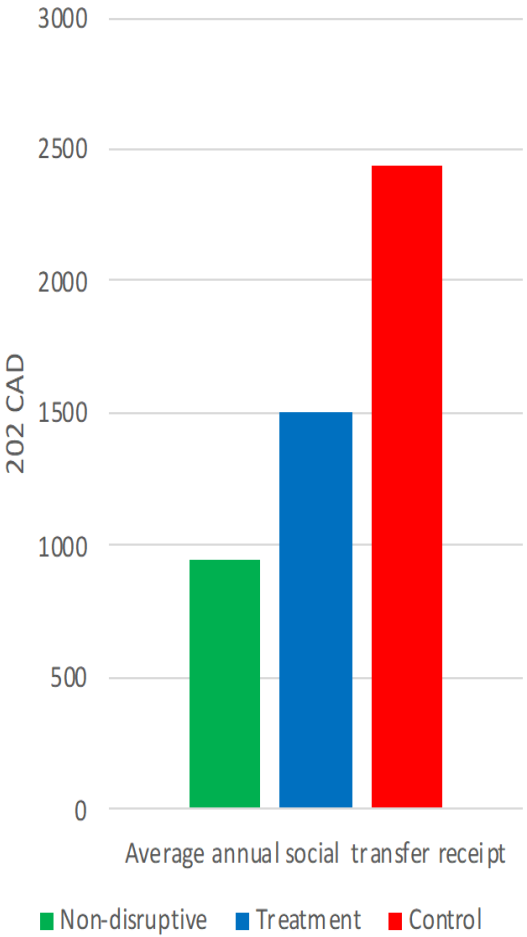
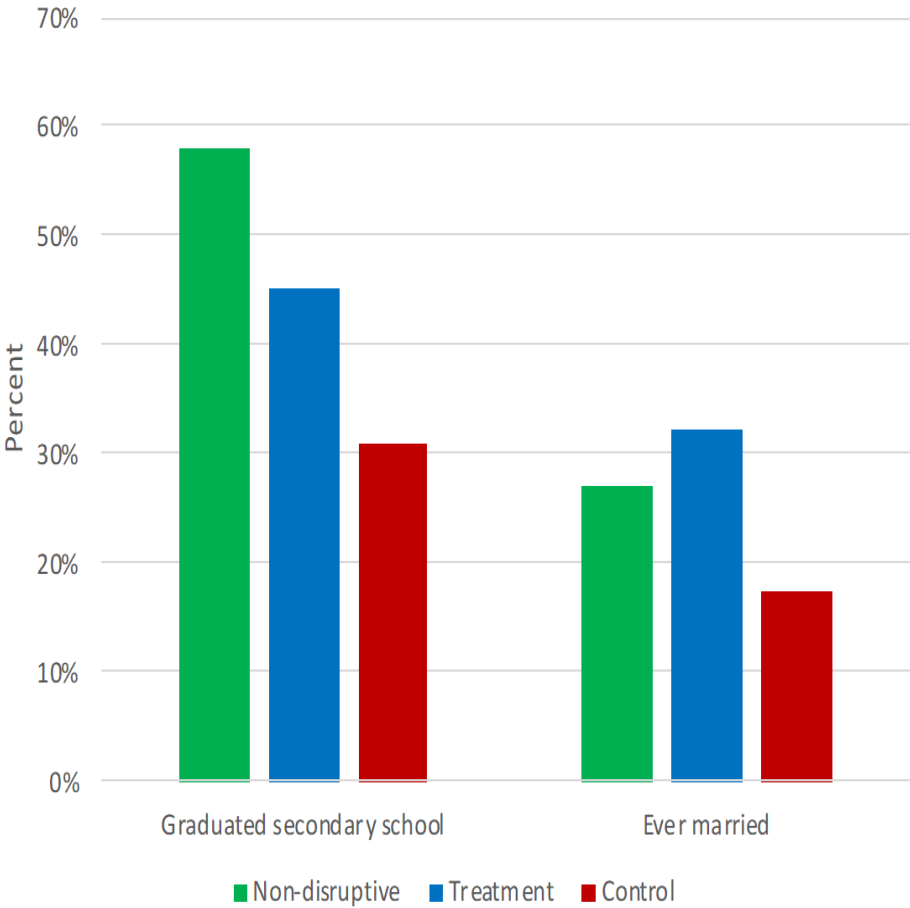


Impact on School performance

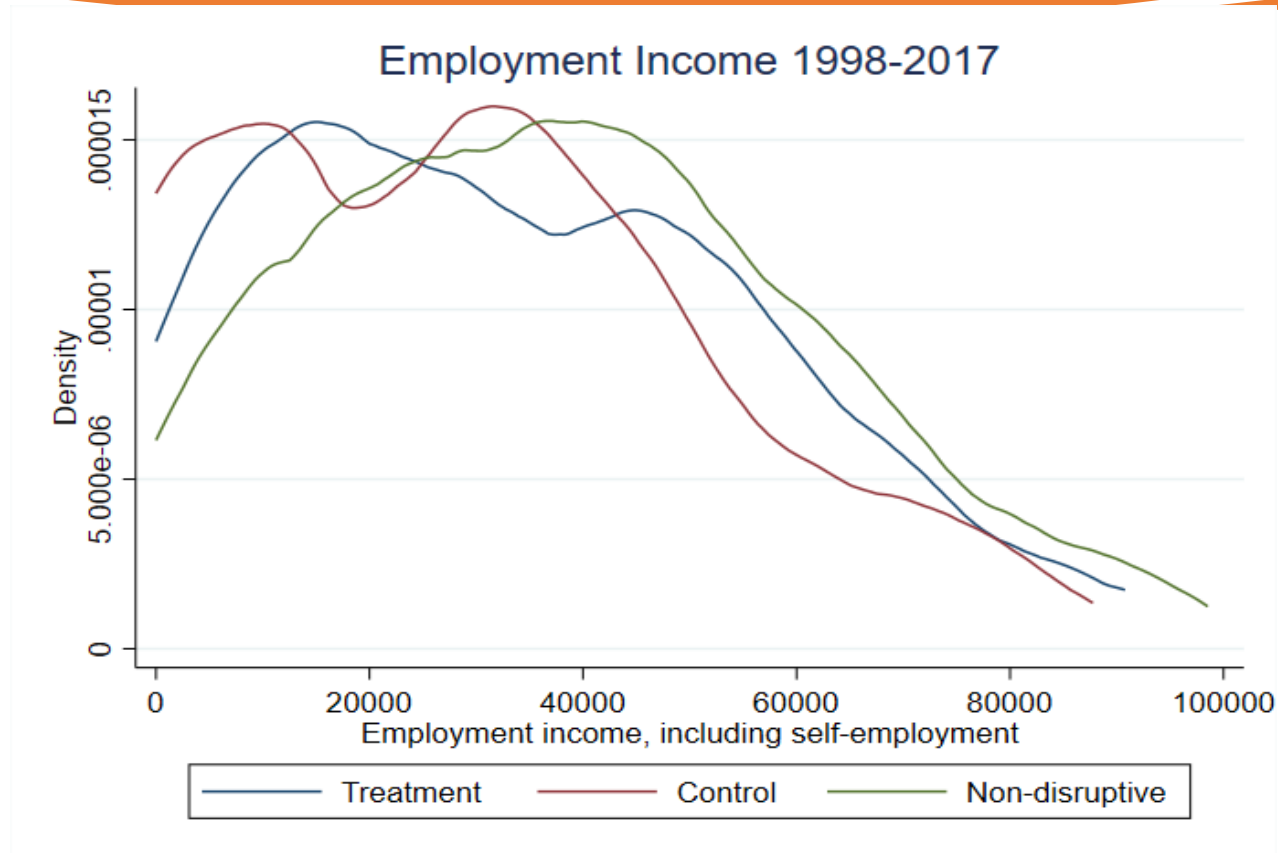
- No initial impact on IQ (age 10-11), grades, held back or special ed in Early Adolescence
- Significant impact in Late Adolescence: Grades (0.30 std dev) , Held Back (16%), Special Ed (15%)



Impact - Adult outcomes

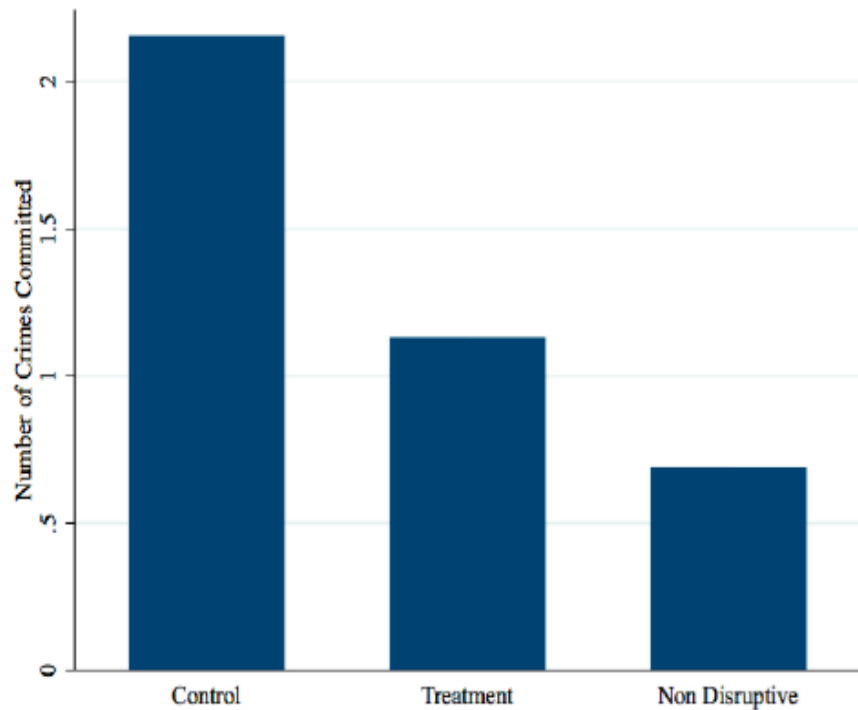


Employment income

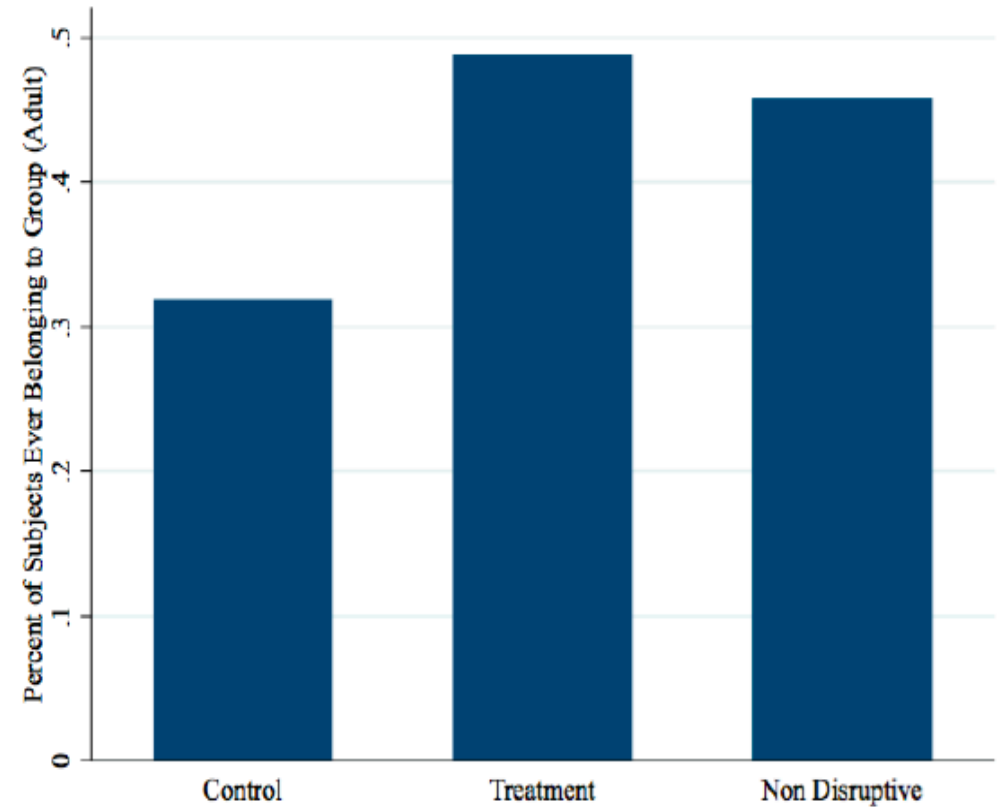


Criminal records and Group Membership

Number of crimes committed at 23 years



Treatment reduces the gap with non-disruptive by 79%





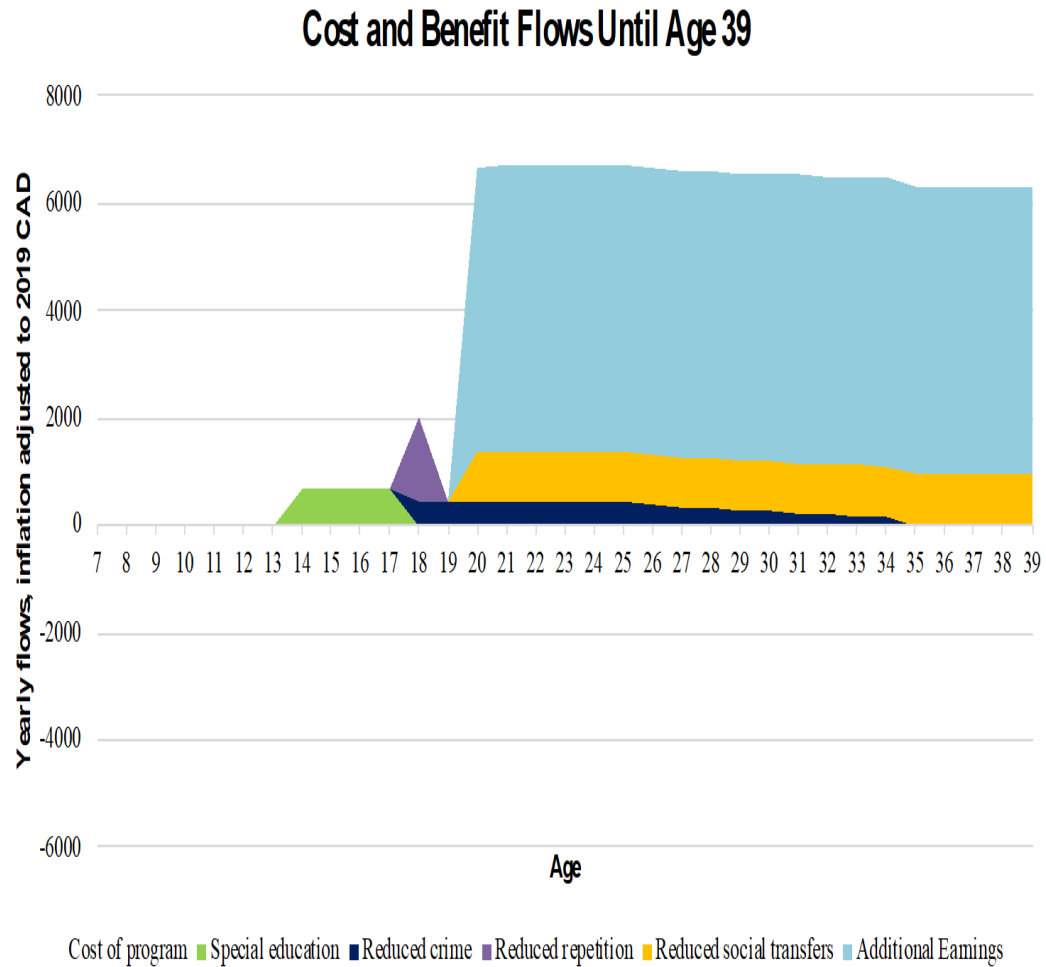
Cost – Benefits



Cost – Benefits analysis

- Initial Cost of the program
 - Team: 1 full time social worker, 2 full time childcare specialists (BA level), 1 psychologist, and 1 half-time program administrator.
 - Additional program costs: 30% of salaries
 - Total cost per person: 9,240 in 2013 USD
- Two ways to compare costs to benefits
 - Cost-efficiency : measure the efficiency of a program in terms of the cost of attaining a desired outcome
 - Benchmark to compare programs with the same goal
 - Rate of Return : monetize benefits to estimate overall rate of return
 - General idea of return to social investment

$$\sum_{t=0}^{t=2} \frac{-C_t}{(1+IRR)^t} + \sum_{t=7}^T \frac{B_t}{(1+IRR)^t} = 0$$



Cost per offer (including time value of money) \$12 814

All benefits, including income, discounted

Benefits		\$141 996
IRR		17%
For every dollar spent, total benefits are		\$11
Breakdown	% from education savings	4%
	% from crime savings	5%
	% from increased earnings	80%
	% from social transfer savings	12%

Taxpayer benefits only, discounted

Benefits		\$28 909
IRR		8%
For every dollar spent, social benefits are		\$2
Breakdown	% from education savings	17%
	% from crime savings	23%
	% from social transfer savings	60%

Table shows comparison of discounted cumulative costs and benefits at age 39. All cost and benefit figures use a 3% discount rate. Overall benefits includes increased earnings, reduced social transfers, reduced schooling costs (repetition and special education) and reduced criminality. Taxpayer benefits exclude increased earnings as a benefit.

Comparison with other programs

- MLES: 230,000 \$CAD increased earnings around the life course, annualized rate of return around 9%,
- STAR: Chetty et al. (2011)
STAR led to a USD \$300,000 increase in total earnings over a student's career.
This is equivalent to USD\$350,780 in 2020, which is equivalent to 441,703 \$CAD in 2020
- Perry Pres-school program: income increased by 20% , with annualized rate of return around 7-10%

ANNEX - TABLES

Early Adolescent Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Non-disruptive mean	Control mean	Treatment mean	Raw diff ND-C	Raw diff T-C (ITT)	Minimum detectable effect (absolute value)	p-value of raw diff	Conditional treatment effect on averages (OLS)	Number of obs. (T and C)
Trust	0.29 (0.02)	0.00 (0.03)	0.15 (0.06)	0.30 (0.04)	0.16 (0.07)	0.11	0.02	0.18 (0.07)	243
Aggression Control	0.40 (0.02)	-0.01 (0.04)	0.14 (0.07)	0.41 (0.04)	0.15 (0.08)	0.13	0.05	0.14 (0.08)	248
Attention Control	0.36 (0.02)	-0.01 (0.04)	0.15 (0.07)	0.37 (0.05)	0.16 (0.08)	0.14	0.06	0.17 (0.08)	248
Sociability	0.14 (0.02)	0.01 (0.03)	-0.07 (0.07)	0.13 (0.04)	-0.08 (0.07)	0.11	0.27	-0.04 (0.07)	248
Self Esteem	0.20 (0.02)	0.00 (0.04)	0.03 (0.06)	0.20 (0.04)	0.03 (0.07)	0.12	0.68	0.04 (0.08)	232
Altruism	0.11 (0.03)	0.00 (0.06)	-0.11 (0.09)	0.11 (0.06)	-0.11 (0.11)	0.18	0.32	-0.09 (0.11)	248
Verbal IQ	9.18 (0.08)	8.57 (0.19)	8.54 (0.35)	0.61 (0.19)	-0.03 (0.37)	0.61	0.95	0.18 (0.39)	204
Grades	0.38 (0.04)	-0.01 (0.07)	0.11 (0.12)	0.39 (0.08)	0.11 (0.14)	0.23	0.42	0.17 (0.15)	220
Special education	0.08 (0.01)	0.21 (0.02)	0.20 (0.04)	-0.12 (0.02)	0.00 (0.05)	0.08	0.96	-0.03 (0.05)	250
Years held back	0.11 (0.01)	0.26 (0.03)	0.26 (0.04)	-0.16 (0.02)	0.00 (0.05)	0.09	0.96	-0.04 (0.05)	250
Ever held back	0.20 (0.01)	0.40 (0.04)	0.39 (0.06)	-0.20 (0.03)	0.01 (0.07)	0.11	1.00	-0.05 (0.07)	250

Standard errors in parentheses. Each cell of column (1) provides the mean for the non-disruptive group, column (2) the mean of the control group, and column (3) the mean of the treatment group. Column (4) provides the raw difference between the non-disruptive and the control group, column (5) the raw difference of the treatment and control group (ITT), column (6) gives the minimum detectable effect using a one-sided t-test (1.65*SE of column 5), column (7) gives the p-value of the T-C difference using a permutation (randomization) test. Column (8) is the conditional treatment effect from an OLS regression controlling for baseline differences between the treatment and control groups, with robust standard errors. Column (9) gives the number of observations in the treatment and control groups. The non-disruptive group is composed of those children who scored below the 70th percentile of anti-social behavior on the initial questionnaire in 1984. This non-disruptive group did not participate in the randomized evaluation and serves as a reference group.

ANNEX - TABLES

Late Adolescent Outcomes

Table 3. Late adolescent outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Non-disruptive mean	Control mean	Treatment mean	Raw diff ND-C	Raw diff T-C (ITT)	Minimum detectable effect (absolute value)	p-value of raw diff	Conditional treatment effect on averages (OLS)	Number of obs. (T and C)
Trust	0.22 (0.02)	-0.04 (0.05)	0.14 (0.07)	0.25 (0.04)	0.18 (0.09)	0.14	0.04	0.19 (0.09)	213
Aggression Control	0.26 (0.02)	-0.01 (0.05)	0.17 (0.07)	0.27 (0.04)	0.19 (0.09)	0.15	0.04	0.15 (0.09)	213
Attention Control	0.25 (0.02)	0.00 (0.05)	0.04 (0.07)	0.25 (0.05)	0.04 (0.09)	0.15	0.65	0.00 (0.09)	210
Sociability	0.12 (0.02)	0.01 (0.04)	0.02 (0.06)	0.12 (0.04)	0.01 (0.07)	0.11	0.83	0.05 (0.07)	213
Self Esteem	0.12 (0.02)	-0.01 (0.03)	-0.01 (0.06)	0.13 (0.04)	0.00 (0.07)	0.11	0.98	0.01 (0.07)	202
Altruism	-0.01 (0.03)	0.00 (0.06)	-0.04 (0.11)	-0.02 (0.07)	-0.04 (0.12)	0.20	0.74	-0.08 (0.13)	199
Grades	0.43 (0.03)	-0.01 (0.07)	0.21 (0.11)	0.44 (0.08)	0.22 (0.13)	0.22	0.10	0.27 (0.13)	215
Special education	0.21 (0.01)	0.46 (0.03)	0.36 (0.05)	-0.25 (0.03)	-0.10 (0.06)	0.10	0.11	-0.14 (0.06)	248
Years held back	0.34 (0.01)	0.60 (0.03)	0.50 (0.06)	-0.26 (0.03)	-0.10 (0.06)	0.10	0.12	-0.14 (0.06)	249
Ever held back	0.54 (0.02)	0.77 (0.03)	0.62 (0.06)	-0.23 (0.04)	-0.15 (0.06)	0.10	0.03	-0.17 (0.07)	249

*Standard errors in parentheses. Each cell of column (1) provides the mean for the non-disruptive group, column (2) the mean of the control group, and column (3) the mean of the treatment group. Column (4) provides the raw difference between the non-disruptive and the control group, column (5) the raw difference of the treatment and control group (ITT), column (6) gives the minimum detectable effect using a one-sided t-test (1.65*SE of column 5), column (7) gives the p-value of the T-C difference using a permutation (randomization) test. Column (8) is the conditional treatment effect from an OLS regression controlling for baseline differences between the treatment and control groups, with robust standard errors. Column (9) gives the number of observations in the treatment and control groups. The non-disruptive group is composed of those children who scored below the 70th percentile of anti-social behavior on the initial questionnaire in 1984. This non-disruptive group did not participate in the randomized evaluation and serves as a reference group.*

ANNEX -

TABLES

Young Adult Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Non-disruptive mean	Control mean	Treatment mean	Raw diff ND-C	Raw diff T-C (ITT)	Minimum detectable effect (absolute value)	p-value of raw diff	Conditional treatment effect on averages (OLS)	Number of obs. (T and C)
Group membership	0.36 (0.02)	0.22 (0.03)	0.38 (0.07)	0.13 (0.04)	0.16 (0.07)	0.11	0.02	0.15 (0.08)	159
Percent of years occupied fulltime	0.83 (0.01)	0.77 (0.03)	0.83 (0.04)	0.06 (0.03)	0.06 (0.05)	0.09	0.25	0.11 (0.06)	153
Percent of years receiving transfers	0.07 (0.01)	0.14 (0.02)	0.10 (0.03)	-0.07 (0.02)	0.04 (0.04)	0.07	0.39	-0.05 (0.04)	153
Post-secondary education	0.27 (0.02)	0.13 (0.03)	0.07 (0.04)	0.14 (0.04)	-0.06 (0.06)	0.09	0.40	-0.04 (0.05)	159
Voted (2001)	0.55 (0.02)	0.49 (0.05)	0.48 (0.08)	0.06 (0.05)	0.01 (0.09)	0.15	1.00	0.01 (0.10)	147
Volunteered (2001)	0.30 (0.02)	0.38 (0.05)	0.45 (0.08)	-0.08 (0.05)	0.07 (0.09)	0.15	0.46	0.07 (0.10)	148
Number of crimes committed by age 24 (administrative data)	0.68 (0.10)	2.15 (0.43)	1.13 (0.36)	-1.47 (0.29)	-1.02 (0.73)	1.21	0.17	-1.09 (0.58)	250
Secondary school diploma (administrative data)	0.58 (0.02)	0.31 (0.03)	0.45 (0.06)	0.27 (0.04)	0.14 (0.07)	0.11	0.05	0.19 (0.08)	250

Standard errors in parentheses. Each cell of column (1) provides the mean for the non-disruptive group, column (2) the mean of the control group, and column (3) the mean of the treatment group. Column (4) provides the raw difference between the non-disruptive and the control group, column (5) the raw difference of the treatment and control group (ITT), column (6) gives the minimum detectable effect using a one-sided t-test ($1.65 \times SE$ of column 5), column (7) gives the p-value of the T-C difference using a permutation (randomization) test. Column (8) is the conditional treatment effect from an OLS regression controlling for baseline differences between the treatment and control groups, with robust standard errors. Column (9) gives the number of observations in the treatment and control groups. The non-disruptive group is composed of those children who scored below the 70th percentile of anti-social behavior on the initial questionnaire in 1984. This non-disruptive group did not participate in the randomized evaluation and serves as a reference group.

ANNEX -

TABLES

Adult Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Non-disruptive mean	Control mean	Treatment mean	Raw diff ND-C	Raw diff T-C (ITT)	Minimum detectable effect (absolute value)	p-value of raw diff	Conditional treatment effect on averages (OLS)
Household income	87015 (1797)	61480 (2611)	69950 (4855)	25534 (3881)	8469 (5193)	8568	0.11	12172 (5532)
Individual income	44598 (885)	35027 (1569)	40050 (2813)	9571 (1963)	5023 (3085)	5090	0.10	7010 (3241)
Years with any employment income	15.8 (0.2)	12.7 (0.5)	14.9 (0.8)	3.1 (0.5)	2.2 (1.0)	1.6	0.03	2.8 (0.9)
Employment income	39932 (936)	28752 (1681)	34459 (2996)	11180 (2079)	5708 (3298)	5442	0.08	8091 (3414)
Years contributing to unemployment insurance	14.8 (0.2)	11.9 (0.5)	13.9 (0.8)	2.9 (0.5)	2.0 (1.0)	1.6	0.04	2.7 (0.9)
Contributions to unemployment insurance	545 (11)	419 (23)	489 (37)	126 (24)	70 (44)	72	0.11	102 (44)
Years receiving social benefits	1.8 (0.1)	3.9 (0.4)	2.8 (0.5)	-2.1 (0.4)	-1.1 (0.8)	1.3	0.16	-1.7 (0.7)
Amount of social benefits	948 (88)	2436 (277)	1507 (333)	-1488 (225)	-929 (495)	817	0.06	-1322 (425)

Number of observations is 245. Each cell of column (1) provides the mean for the non-disruptive group, column (2) the mean of the control group, and column (3) the mean of the treatment group. Column (4) provides the raw difference between the non-disruptive and the disruptive group, column (5) the raw difference of the treatment and control group (ITT), column (6) gives the minimum detectable effect using a one-sided t-test ($1.65 \times SE$ of column 5), column (7) gives the p-value of the T-C difference using a permutation (randomization) test. Column (8) is the conditional treatment effect from an OLS regression controlling for baseline differences between the treatment and control groups, with robust standard errors. The non-disruptive group is composed of those children who scored below the 70th percentile of anti-social behavior on the initial questionnaire in 1984. This non-disruptive group did not participate in the randomized evaluation and serves as a reference group. Those who scored above the 70th percentile were randomized into either the treatment or control groups. Employment income includes self-employment.