Improving Parenting Practices for Early Child Development: Experimental Evidence from Rwanda

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Early childhood

- Critical for shaping development of a child.
- Brain malleable (plasticity) and brain development rapid.
- Early life status manifest impact in the long run on several outcomes.

Risk factors in developing countries

- Children growing up in extreme poverty or exposed to shocks
  - may accumulate gaps in human development from very early years of life
  - at risk of not reaching their development potential
- Accumulated gaps may transmit across generations $\rightarrow$ poverty traps

Interventions in early childhood

- Investing in early child development programs is crucial especially for disadvantaged families
- Prominent role of parenting in shaping child's future.
  - parental inputs: critical in the production of child skills during first stages of development
  - change in parental inputs crucial to produce sustainable impacts.

Knowledge gaps

- Rigorous evidence on effectiveness of ECD programs largely from high and middle income countries.
- Still little knowledge in low-income contexts of **what** ECD intervention may be affordable, scalable and produce sustainable impacts
  - institutional capacity is weaker or not available
  - parents face multiple trade-offs
  - low levels of human capital

This paper

- Investigates impact of a unique ECD parenting program in a low income context (Rwanda).
  - addresses common constraints faced by parents
    - $\Rightarrow$ low literacy, lack of knowledge, resource constraints
  - low-cost and low-intensity
- Examines short term impacts and persistence of results in the medium term.
- Explores potential mechanisms driving changes in child development.
  - role of parental and home environment inputs

First Steps Program: key aspects

- Parent training program
- Targeted parents of children aged 6-24 months.
- Used radio drama: uniform delivery of key parenting messages
  $\rightarrow$ addresses literacy and education constraints
- 17 weekly group sessions at community level
  $\rightarrow$ addresses information constraints + peer-to-peer learning
- Recruited local facilitators provided with basic training.
- Activities centered around family daily routines + use of hh resources as learning tools
  $\rightarrow$ reduce time and budget constraints

Sessions content and approach

- Parenting session key content:
  - Early communication and literacy promotion at home
  - Learning through play
  - Responsive care and bonding
  - Nutrition and health

- Session approaches
  - Radio drama
  - Pre- and post- radio discussion
  - Posters illustrating activities
  - Parent-child practice

Kwiga binyuze mu gukina
Gukina no gukura

Gukina bifasha umwana kunguka ubumenyi bushya

KUVA AVUKA
KUGEZA KU MWAKA 1

Ibibazo byo kuzirikana

- Ni iki mama n'umwana barimo gukina?
- Ni iki gukina muri ubu buryo byigisha umwana?
- Ni iki uyu mukino wigisha umwana mu bijyanye n'imibanire n'abandi? Ni iki yiga kirebana no kumenya ururimi?
- Mbese ubwonko bw'umwana burimo gukura?
- Mbese gukoma mu mashyi byaba bifasha umwana mu mikurire y'umubiri?

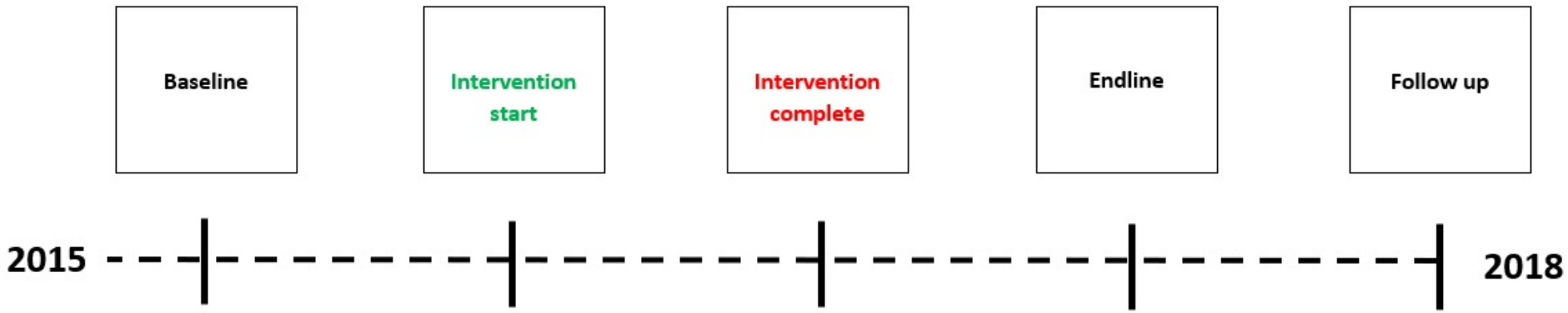
FS sessions

Experimental design

81 villages in Ngororero rural district (Western province)

LIGHT TREATMENT (LT) (3 sectors, 9 cells, 27 villages)	**FULL TREATMENT (FT)** (3 sectors, 9 cells, 27 villages)	**CONTROL** (3 sectors, 9 cells, 27 villages)
17 weekly group-based sessions of radio + facilitated discussions, including illustrated posters and activities	17 weekly group-based sessions of radio + facilitated discussions, including illustrated posters and activities Plus Additional Components of: Additional cell-based facilitator 1 home visit Take-home materials 1 book gifted	No intervention during research period

Timeline



	August 2015	November 2015	April 2016	September 2016	May 2018
Child age:*	6	9	13	18	36

**Minimum age, expressed in months, of children participating to the First Steps programme. Maximum age is the age reported + 18 months.*

Data

- Sample: 1,614 families and children at baseline;
- Attrition rate: 10% (EL) ; 18% (FU)
  - No differential attrition in group assignment and baseline characteristics
  - Results from IPW estimates remain consistent
- Respondent: principal caregiver of the child (93% mothers; 5% fathers).
- Baseline balancing: ▸ Balance

Measurement

Our aim is to estimate impact of program within the framework of a child development production function:

$$\theta_t = f_t\left(\theta_0, T_t, I_t, B_t, S_t^{\tau}, X_0, \eta_t\right)$$

- θ: child development (ASQ)
- I and B: parents investments (time and play material) (HOME-SF)
- S^{τ}: parental influence, self-efficacy beliefs (TOPSE); attitudes, aspirations, locus of control.

Empirical Strategy

- Identify causal impact of the program on child development and parents outcomes:

$$y_{ijt} = \alpha + \beta^L T_j^L + \beta^F T_j^F + \lambda y_{ij0} + \gamma X_{ij0} + e_{ijt}$$

- y_{ijt} : outcome for individual (child or parent) i, in sector j surveyed at time t.
- T_j^L and T_j^F : binary indicators for Light (LT) and Full (FT) treatment sector-level interventions.
- y_{ij0} : baseline level of the outcome for individual i in sector j.
- X_{ij0} : baseline characteristics.

Short-term impacts

(12-months)

Average aggregate index	(1) Child development	(2) Maternal time investment	(3) Maternal influence
Light Treatment (LT)	0.297**	0.473***	0.417**
	(0.094)	(0.022)	(0.048)
Full Treatment (FT)	0.383***	0.623***	0.596**
	(0.098)	(0.038)	(0.061)
WILD p-values LT	0.019	0.001	0.009
WILD p-values FT	0.014	0.004	0.009
t-test $LT = FT$			
p-value	0.059	0.002	0.009
Observations	1299	1299	1300

Medium-term impacts

(33-months)

Average aggregate index	(1) Child development	(2) Maternal time investment	(3) Maternal Self-efficacy	(4) Maternal Attitudes locus, aspirations	(5) Play material
Light Treatment (LT)	0.084	0.211***	0.065	0.101**	0.293**
	(0.087)	(0.010)	(0.055)	(0.038)	(0.118)
Full Treatment (FT)	0.212**	0.210***	0.133*	0.119***	0.285**
	(0.085)	(0.030)	(0.060)	(0.033)	(0.109)
WILD p-values LT	0.422	0.001	0.378	0.034	0.020
WILD p-values FT	0.087	0.013	0.087	0.024	0.078
t-test LT = FT p-value	0.136	0.975	0.117	0.641	0.945
Observations	1090	1103	1105	1105	1105

Mechanisms

- Direct impact of program on child development:
  - weekly interactions with facilitators (investments from T itself)
- Indirect impacts :
  - I: parental time investment
  - B : material investment (play material)
  - S^{τ} : parental attitudes and beliefs

Mediation analysis

	Child development index			
	short term		medium term	
	(1)	(2)	(3)	(4)
Light Treatment (LT)	0.297**	0.184*	0.084	-0.008
	(0.094)	(0.092)	(0.087)	(0.069)
Full Treatment (FT)	0.383***	0.225**	0.212**	0.100
	(0.098)	(0.095)	(0.085)	(0.070)
Maternal time investment		0.181***		0.254***
		(0.040)		(0.031)
Maternal influence/self-efficacy		0.079**		0.039
		(0.032)		(0.022)
Maternal attitudes, locus and aspirations				0.197***
				(0.043)
Play materials				0.106***
				(0.019)
Observations	1299	1299	1090	1073

Mediation analysis

Decomposition of effects

- Short-term:
  - Maternal time investment: $\approx 20\%$
  - Maternal influence: $\approx 10\%$
- Medium-term:
  - Maternal time investment: $\approx 30\%$
  - Play material : $\approx 20\%$
  - Maternal PSE, attitudes, locus and aspirations: $\approx 10\%$

▸ Mediation

Validity and robustness checks

- Imbalance: checked source of imbalance, IPW, RI p-values.
- Small n of clusters: wild-bootstrap procedure + three additional procedures (MacKinnon and Webb 2018; Tyslzler et al., 2017).
- Power: Ex-post MDEs
- Multiple hypothesis testing: Romano-Wolf correction to account for FWER (Romano and Wolf, 2005) and aggregate mean index (Kling et al 2007).
- Social desirability bias
- Weighted mean index: use inverse co-variance weighted index.
- Measurement error: estimate measurement system that links observed measures to latent factors

Conclusions

- We show that in context where parenting inputs are low

  $\Rightarrow$ a low-intensity, low-cost, group based parenting program:

  - shows positive and large effects on child development and on key parental inputs that persisted in longer term
  - effects on child development larger for families that received FT
  - mediating role of parental inputs (mostly maternal time investment), larger in medium term

Conclusions

- Overall findings offer specific entry points to implementing early child development interventions at scale using simple and low-cost activities in Rwanda
- This design could be used in many other low-income countries with weak institutional capacity without the need of integrating into existing large national welfare programs

Scope for scaling up?

- Use of technology: radio, video..
  - uniform delivery message
  - address low literacy and education constraint
  - complement or substitute delivery mechanism?
- Group-based sessions
  - encourage peer-to-peer learning and support
  - potential to modify group norms
  - complemented with few home visits?
- Use of local facilitators
  - less costly
  - more trusted in community
  - supported by trained community workers?

Appendix

Baseline balancing

Child outcomes and characteristics

	Control (CG)	Light Treatment (LT)				Full treatment (FT)					LT=FT	Obs
	Mean	LT - CG Mean diff.	pvalue Unadj.	pvalue Wild	diff. Normal.	FT - CG Mean diff.	pvalue Unadj.	pvalue Wild	diff. Normal.	Mean diff. LT-FT	pvalue Wild	
Panel A: Child												
ASQ communication z-score	-0.00	0.09	0.10	0.15	0.07	0.11	0.18	0.27	0.08	-0.01	0.86	1613
ASQ gross motor z-score	0.00	0.28	0.00	0.01	0.20	0.13	0.36	0.43	0.09	0.15	0.46	1613
ASQ fine motor z-score	-0.00	0.28	0.00	0.00	0.21	0.24	0.03	0.10	0.17	0.04	0.73	1613
ASQ problem solving z-score	-0.00	0.32	0.00	0.01	0.24	0.19	0.17	0.28	0.13	0.13	0.51	1613
ASQ personal social z-score	-0.00	0.27	0.00	0.01	0.20	0.16	0.14	0.19	0.12	0.11	0.35	1613
Child development index	-0.00	0.25	0.00	0.01	0.24	0.17	0.12	0.27	0.15	0.08	0.58	1613
Child is a girl	0.57	-0.08	0.00	0.01	-0.11	-0.06	0.01	0.01	-0.08	-0.02	0.16	1614
Child age in months	14.49	0.48	0.32	0.39	0.06	-0.25	0.58	0.68	-0.03	0.73	0.09	1614

▸ Back

Baseline balancing

Parents outcomes and characteristics

	Control (CG)	Light Treatment (LT)				Full treatment (FT)					LT=FT	Obs
	Mean	LT - CG Mean diff.	pvalue Unadj.	pvalue Wild	diff. Normal.	FT - CG Mean diff.	pvalue Unadj.	pvalue Wild	diff. Normal.	Mean diff. LT-FT	pvalue Wild	
Panel B: Parents												
Maternal time investment	-0.00	0.03	0.32	0.41	0.03	0.10	0.05	0.13	0.15	-0.07	0.30	1504
Maternal influence	-0.00	-0.07	0.51	0.61	-0.07	-0.00	0.98	0.97	-0.01	-0.06	0.35	1506
Respondent is mother	0.93	-0.00	0.96	0.96	-0.00	0.01	0.07	0.12	0.04	-0.02	0.64	1614
Respondent father	0.06	-0.01	0.64	0.67	-0.02	-0.02	0.10	0.17	-0.05	0.01	0.71	1614
Respondent age	29.55	0.99	0.01	0.04	0.10	0.50	0.20	0.30	0.05	0.49	0.39	1614
Number of children in the HH	2.96	-0.23	0.01	0.02	-0.09	0.01	0.85	0.86	0.01	-0.25	0.01	1614
Family asset index (factor variable)	0.08	-0.23	0.51	0.60	-0.10	-0.01	0.96	0.97	-0.01	-0.22	0.61	1614
Mother has at least primary education	0.38	0.17	0.02	0.04	0.25	-0.03	0.64	0.70	-0.05	0.20	0.01	1614
Fatherhas at least primary education	0.40	0.09	0.18	0.29	0.13	-0.02	0.76	0.80	-0.03	0.11	0.01	1614
Respondent is married or cohabitating	0.90	-0.06	0.11	0.17	-0.12	0.02	0.35	0.43	0.05	-0.08	0.07	1614

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Child development

Short-term impact (12-months)

	(1) Communication	(2) Gross motor	(3) Fine motor	(4) Problem solving	(5) Personal social	(6) Child development index
Control group - base						
Light Treatment (LT)	0.319*	0.246**	0.306**	0.354**	0.374***	0.297**
	(0.153)	(0.084)	(0.098)	(0.124)	(0.070)	(0.094)
Full Treatment (FT)	0.449**	0.150	0.413***	0.487***	0.493***	0.383***
	(0.151)	(0.127)	(0.093)	(0.133)	(0.064)	(0.098)
WILD p-values LT	0.062	0.040	0.038	0.057	0.014	0.019
WILD p-values FT	0.024	0.330	0.011	0.028	0.011	0.014
Romano-Wolf p-values LT	0.051	0.015	0.011	0.015	0.000	
Romano-Wolf p-values FT	0.002	0.235	0.000	0.000	0.000	
t-test $LT = FT$						
p-value	0.009	0.361	0.032	0.023	0.030	0.059
Observations	1299	1299	1299	1299	1299	1299
R^2	0.200	0.084	0.096	0.083	0.109	0.172

Maternal time investment

Short-term impact (12-months)

	(1) Learning	(2) Positive discipline	(3) Negative discipline	(4) Maternal time investment index
Control group - base				
Light Treatment (LT)	0.597***	0.358***	0.218*	0.473***
	(0.029)	(0.021)	(0.095)	(0.022)
Full Treatment (FT)	0.766***	0.522***	0.250**	0.623***
	(0.051)	(0.020)	(0.107)	(0.038)
WILD p-values LT	0.002	0.003	0.132	0.001
WILD p-values FT	0.005	0.001	0.101	0.004
Romano-Wolf p-values LT	0.000	0.000	0.011	
Romano-Wolf p-values FT	0.000	0.000	0.010	
t-test $LT = FT$				
p-value	0.006	0.000	0.688	0.002
Observations	1299	1299	1299	1299
R^2	0.278	0.119	0.031	0.269

Maternal influence

Short-term impact (12-months)

	(1) Learning	(2) Development	(3) Nutrition	(4) Care	(5) Discipline	(6) Health	(7) Maternal influence index
Control group - base							
Light Treatment (LT)	0.536***	0.459***	0.434***	0.430***	0.386***	0.246***	0.417***
	(0.058)	(0.060)	(0.047)	(0.034)	(0.068)	(0.067)	(0.048)
Full Treatment (FT)	0.719***	0.645***	0.536***	0.620***	0.560***	0.495***	0.596***
	(0.055)	(0.070)	(0.083)	(0.071)	(0.070)	(0.069)	(0.061)
WILD p-values LT	0.011	0.009	0.008	0.008	0.012	0.021	0.009
WILD p-values FT	0.008	0.006	0.011	0.010	0.011	0.009	0.009
Romano-Wolf p-values LT	0.000	0.000	0.000	0.000	0.000	0.020	
Romano-Wolf p-values FT	0.000	0.000	0.000	0.000	0.000	0.000	
t-test LT = FT							
p-value	0.001	0.008	0.216	0.022	0.004	0.020	0.009
Observations	1300	1300	1300	1300	1300	1300	1300
R^2	0.122	0.082	0.070	0.081	0.062	0.056	0.105

Child development

Medium-term impact (33-months)

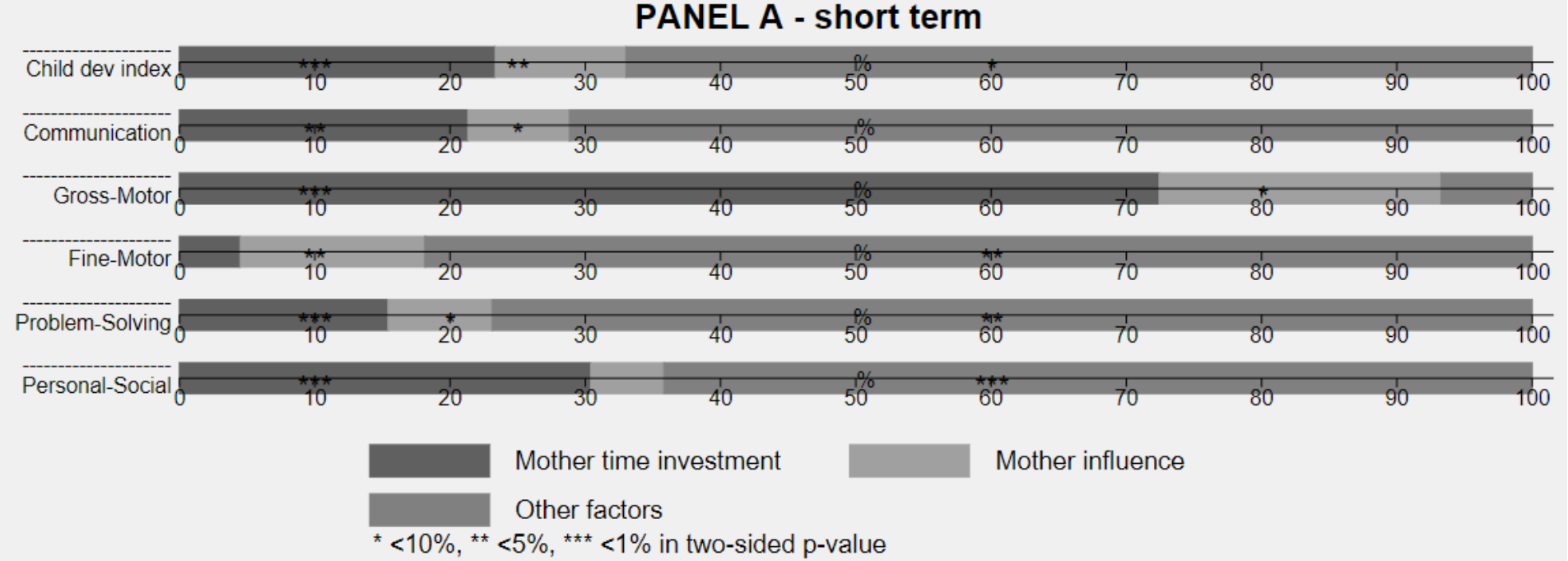
	(1) Communication	(2) Gross motor	(3) Fine motor	(4) Problem solving	(5) Personal social	(6) Child development index
Control group - base						
Light Treatment (LT)	0.148	-0.015	0.158	0.012	0.223	0.084
	(0.105)	(0.093)	(0.131)	(0.067)	(0.122)	(0.087)
Full Treatment (FT)	0.269**	0.244**	0.156	0.166**	0.299**	0.212**
	(0.104)	(0.103)	(0.120)	(0.069)	(0.110)	(0.085)
WILD p-values LT	0.253	0.879	0.439	0.883	0.155	0.422
WILD p-values FT	0.080	0.099	0.278	0.118	0.074	0.087
Romano-Wolf p-values LT	0.317	0.949	0.406	0.949	0.183	
Romano-Wolf p-values FT	0.005	0.019	0.184	0.016	0.005	
t-test $LT = FT$						
p-value	0.124	0.003	0.978	0.101	0.576	0.136
Observations	1090	1090	1090	1090	1090	1090
R^2	0.037	0.038	0.079	0.147	0.053	0.077

Maternal time investment

Medium-term impact (33-months)

	(1) Learning	(2) Positive discipline	(3) Negative discipline	(4) Maternal time investment index
Control group - base				
Light Treatment (LT)	0.264***	0.181***	0.105	0.211***
	(0.035)	(0.021)	(0.075)	(0.010)
Full Treatment (FT)	0.309***	0.126***	0.080*	0.210***
	(0.055)	(0.036)	(0.041)	(0.030)
WILD p-values LT	0.009	0.007	0.287	0.001
WILD p-values FT	0.012	0.039	0.134	0.013
Romano-Wolf p-values LT	0.000	0.000	0.170	
Romano-Wolf p-values FT	0.000	0.014	0.029	
t-test $LT = FT$				
p-value	0.482	0.139	0.773	0.975
Observations	1103	1103	1103	1103
R^2	0.080	0.032	0.019	0.079

Mediation analysis: short-term



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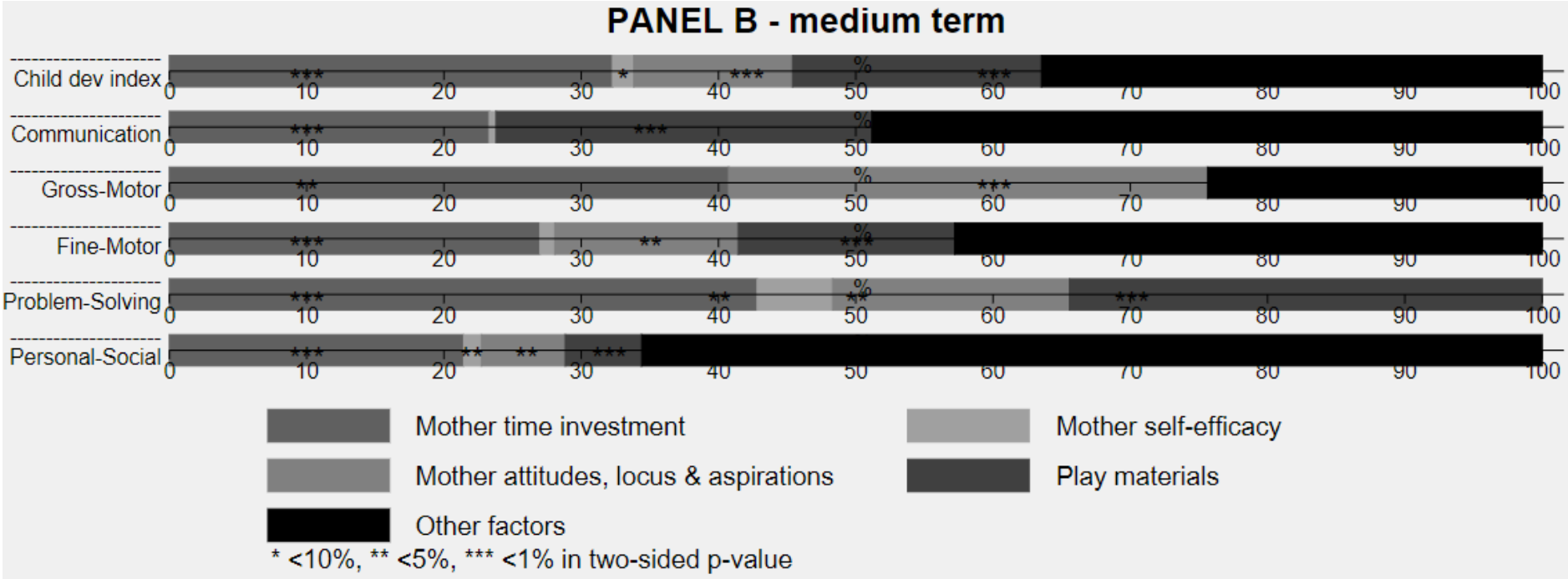
Mediation analysis: medium-term



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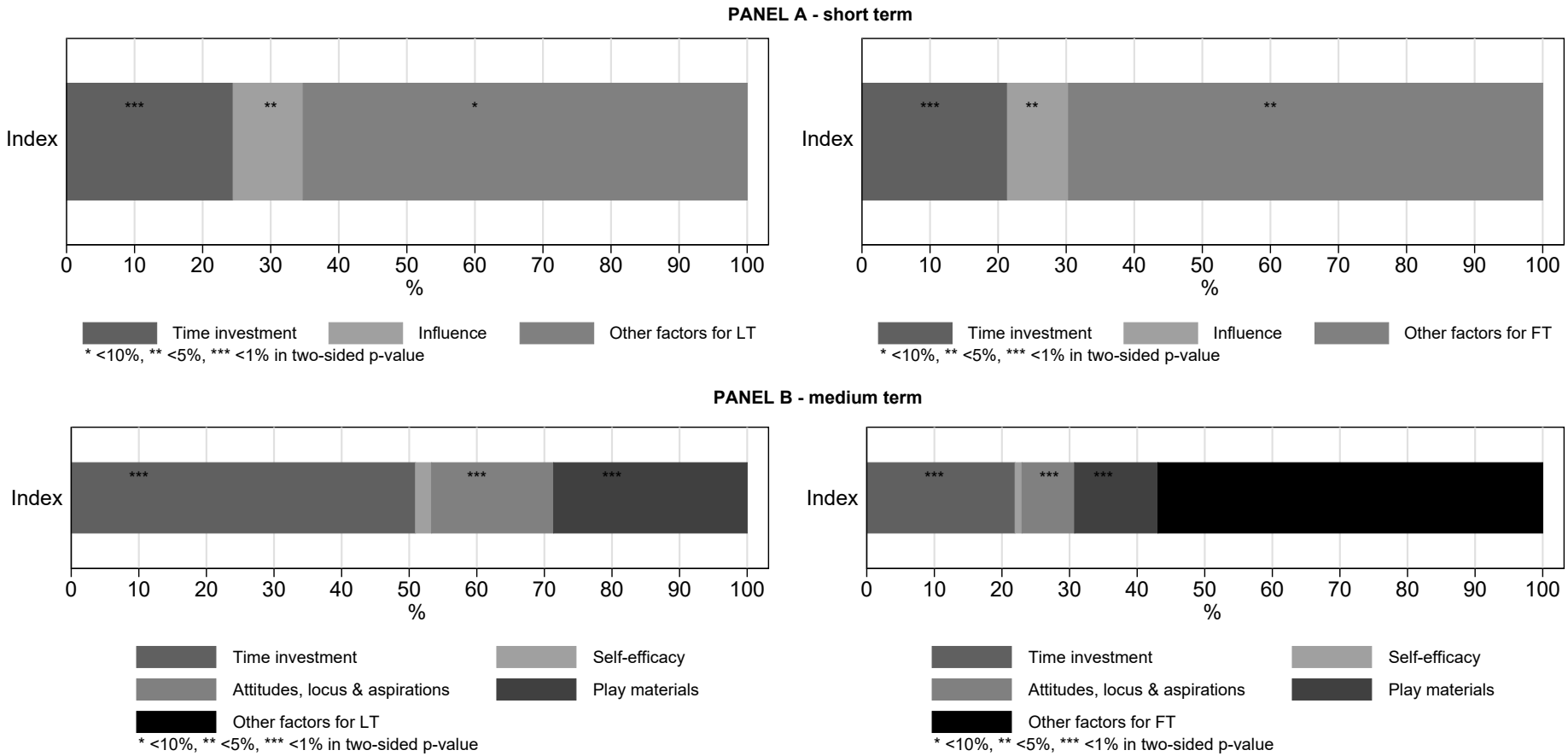
Mediation analysis



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