Poverty and Executive Functions

A Latent Variable Study of Children Growing Up in Enriched And Deprived Conditions in Brazil

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1. BACKGROUND

Growing up in underprivileged conditions is associated with reduced academic achievement but little is known about the underlying cognitive mechanisms responsible for this effect. This study explores the effects of poverty on children's executive function (EF) development. The objectives were: (1) to specify how the executive system is organized in young children from a wide range of socioeconomic status groups (SES); (2) to explore the impact of SES on different EFs.

2. METHOD

Participants

Children were recruited from Year 1 and Year 2 of 17 schools from different SES neighborhood around the cities of São Paulo and Salvador in Brazil. Exclusion criteria included: maternal alcohol or drug use during pregnancy; severe pregnancy or birth complications; history of head injury, epilepsy, or hearing problems; stunting or wasting; severe health problems or developmental delays; special educational needs; and bilingualism. The data of 121 was excluded and for 13 children testing was discontinued. Complete data on 355 children was obtained and constitute the subjects in the analyses presented below.

Children had a mean chronological age of 89.11 months (SD = 7.84). 51% were girls and: 10% of the children lived in extreme poverty; 5% in poverty; 19% were low income; 2% were median income; and 64% wealthy.

Measures

Short term memory
digit recall (DR) & dot matrix (DM)

Working memory
counting recall (CR), odd one out (OOO), & Mr X

Cognitive Control
map mission (MM); sky search (SS); Simon task

Switching
duck task; opposite world (OW)

Motor inhibition
Go-no/go (GNG); Simon says (SSays)

Simple storage of material

Simultaneously store and process information

Control for competing responses in a misleading context

Move back and forth between multiple tasks

Suppress a prepotent motor response

Analyses
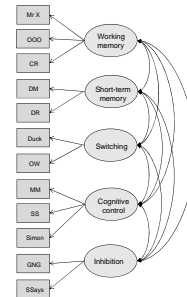
Latent variable analyses

Confirmatory Factor Analyses to explore the structure of EFs in young children and links with SES
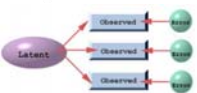
3. RESULTS - Structure of executive functions in young children

Hypothetical model

Preferred model

Model	x^2	df	p	CFI	RMSEA	AIC
Hypothetical model	70.80	44	.01	.97	.04	138.84
Preferred model	**59.20**	**44**	**.06**	**.98**	**.03**	**127.20**
Alternative models						
1-factor model (general executive control)	116.65	54	.00	.93	.06	164.65
2-factor model: measures with and without verbal response	108.37	53	.00	.94	.05	158.37
2-factor model: measures with and without time constrain	104.74	53	.00	.94	.05	154.74
2-factor model: computerized and not computerized	104.24	53	.00	.94	.05	154.24
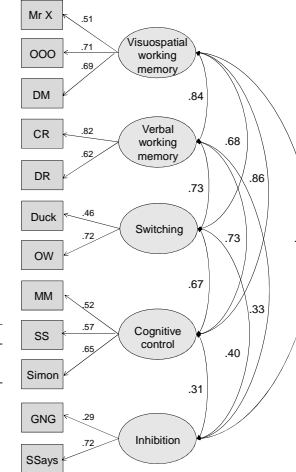
Performance of children from poor and wealthy families

Variables	Poverty (N = 123)		Wealthy (N = 160)	
	Mean	SD	Mean	SD
Age (months)	90.68	7.54	89.83	7.83
Socioeconomic status				
Parental education (years)	8.15	3.65	16.86	2.27
Parental occupation (SIOPS)	32.57	9.61	62.82	10.68
Annual disposable household income (USD)	2,015	882	23,621	9,024
Visuospatial working memory				
Mister X	5.67	3.18	7.39	3.45
Odd one out	12.67	3.79	15.45	4.51
Dot matrix	15.76	3.31	19.43	4.11
Verbal working memory				
Counting recall	11.99	3.76	15.41	4.67
Digit recall	21.35	4.59	24.89	4.49
Switching				
Duck task	77.61	20.24	91.77	11.93
Opposite worlds	89.38	3.91	92.44	2.81
Cognitive control				
Map mission	20.31	6.03	24.14	6.53
Sky search (s)	9.42	4.88	6.34	2.17
Teddy task (RTs in ms)	938	181	832	169
Inhibition				
Go/no-go	46.54	23.03	45.66	21.30
Simon says	18.13	5.13	18.89	4.37

Note: Wealthy = families earning more than 50% above the median income; Poor = below median equivalised income

➢ No organizational differences in EF as a function of SES

4. RESULTS - SES and EF
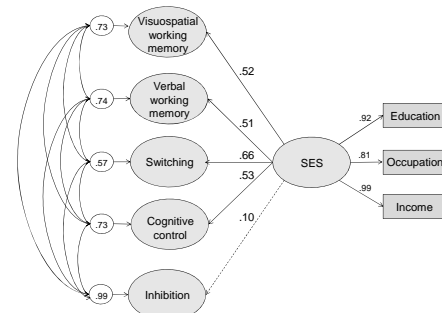
5. CONCLUSION

✓ EFs are clearly distinguishable but also share some underlying commonality in 7-year-old children from poor and wealthy backgrounds.

✓ Some EFs are more sensitive to SES than others: in contrast to working memory, switching, and cognitive control, motor inhibition did not seem to be influenced by SES.

✓ SES and some EF are strongly related sharing approximately 30% of their variance.

✓ Growing up in underprivileged socioeconomic conditions constitutes a serious risk factor for children's EF development.