

Direct and Indirect Effects of Brain Volume, Socioeconomic Status and Family Stress on Child IQ

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Abstract

Background: A large literature documents the detrimental effects of socioeconomic disparities on intelligence and neuropsychological development. Researchers typically measure environmental factors such as socioeconomic status (SES), using income, parent's occupation and education. However, SES is more complex, and this complexity may influence neuropsychological outcomes.

Methods: This study used principal components analysis to reduce 14 SES and 28 family stress indicators into their core dimensions (e.g. community and educational capital, financial resources, marital conflict). Core dimensions were used in path analyses to examine their relationships with parent IQ and cerebral volume (white matter, grey matter and total brain volume), to predict child IQ in a sample of typically developing children.

Results: Parent IQ affected child IQ directly and indirectly through community and educational capital, demonstrating how environmental factors interact with familial factors in neuro-development. There were no intervening effects of cerebral white matter, grey matter, or total brain volume.

Conclusions: Findings may suggest that improving community resources can foster the intellectual development of children.

Keywords: Socioeconomic Status (SES); IQ; Brain Volume; Family Stress

Introduction

Research has consistently shown that socioeconomic status (SES) is a strong predictor of child IQ. SES is a complex construct that encompasses various factors, including income, parental education, and occupation. These factors can influence child IQ through both direct and indirect pathways. For example, higher SES is associated with better access to educational resources, which can lead to higher IQ scores. Additionally, higher SES is associated with lower levels of family stress, which can also lead to higher IQ scores. This study aims to explore the direct and indirect effects of brain volume, socioeconomic status, and family stress on child IQ. We used principal components analysis to reduce 14 SES and 28 family stress indicators into their core dimensions (e.g. community and educational capital, financial resources, marital conflict). Core dimensions were used in path analyses to examine their relationships with parent IQ and cerebral volume (white matter, grey matter and total brain volume), to predict child IQ in a sample of typically developing children. Our findings suggest that improving community resources can foster the intellectual development of children.

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5
; (6)
(8) MRI IRB
D. U1. M C.

102
D. H. C. B. D. S.
T. R. P.
58.3% C. 33% A. A. A. 57.6%
97.9%
S. (M=113.1, SD=14.0).
4.2. 18.6 (M=11.7, SD=3.7).
IQ
52. DI. 53. AH.

Q P .5(P S. -R.)T 188 T T(PPSI-R(8 56 . AH 8 ()T

Family Stress: B... 28...
 F... S... T... 3...
 M...
 K... A... D...
 P... L... (K AD -PL): B...

Variable	Component				
	Marital Conflict-Physical	Depressive Symptoms	Marital Conflict-Verbal	Marital Conflict Resolution	Intrafamily Dyadic Relationships
Respondent slapped or spanked him/her ¹	.991	-.028	-.019	-.022	-.022
Respondent hit or tried to hit with something ¹	.991	-.021	-.058	-.012	-.018
Respondent pushed, grabbed, or shoved him/her ¹	.990	-.026	-.048	-.017	-.016
Respondent beat him/her up ¹	.988	-.018	-.066	-.026	-.019
Respondent threw something at him/her ¹	.988	-.027	-.005	-.003	-.007
Respondent threw or smashed something ¹	.968	-.010	-.007	.038	-.023
Respondent threatened to hit or throw something at him/her ¹	.866	-.068	.193	.043	.003
Feeling blue ²	-.014	.783	.139	.035	.100
Feeling lonely ²	-.021	.777	.093	.121	-.109
Have you felt downhearted and blue? ³	.065	-.762	-.027	.027	-.007
Feeling hopeless about the future ²	-.010	.711	-.017	-.134	-.025
Thoughts of ending your life ²	.015	.623	-.055	-.143	-.055
Feelings of worthlessness ²	-.002	.617	-.117	.192	.107
Respondent called the person a name, insulted or swore at them ¹	.025	-.037	.852	.116	-.088
Respondent did or said something to spite him/her just to be mean ¹	-.024	.011	.799	-.123	-.104
Respondent yelled or screamed at him/her ¹	.015	.041	.782	.259	.067
Respondent sulked and/or refused to talk about it ¹	.094	-.005	.630	-.129	-.057
FES Conflict Scale Index (score/number answered) ⁴	-.086	.054	.489	.303	-.059
Respondent stomped out of room or house (or yard) ¹	.026	-.044	.440	.373	.338
Respondent discussed the issue calmly together ¹	.076	.043	-.059	.610	-.318
Respondent got information to back up their side of things ¹	.018	-.123	.217	.582	-.097

... IQ. ... 10. ...
0.99

O ... IQ. ...
(...) ...
(V ... , M ... R ...) ... A ...
S ... 54.

D ...

C ... **E** ...

P ... 41. ...
74. U ...
75. A ...

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($\beta = .569, SE = .061, p < .001$; $\beta = .207, SE = .070, p = .003$; $\beta = .232, SE = .095, p = .015$).

G. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .099, SE = .050, p = .047$). IQ (1.5-15.9 IQ) via SES ($\beta = .339, SE = .088, p < .001$; $\beta = .222, SE = .084, p = .008$).

T. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .107, SE = .053, p = .044$). IQ (1.5-15.9 IQ) via SES ($\beta = .576, SE = .061, p < .001$; $\beta = .279, SE = .085, p = .001$; $\beta = .198, SE = .078, p = .011$). P IQ ($\beta = .301, SE = .109, p = .006$).

D. Indirect Effects: E. Indirect Effects: IQ (1.5-15.9 IQ) via IQ?

SES: IQ (1.5-15.9 IQ) via SES ($\beta = .112, SE = .054, p = .037$), IQ (1.5-15.9 IQ) via SES ($\beta = .311, SE = .110, p = .005$), IQ (1.5-15.9 IQ) via SES ($\beta = .483, SE = .091, p < .001$), IQ (1.5-15.9 IQ) via SES ($\beta = .245, SE = .112, p = .028$).

C. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .107, SE = .053, p = .044$). IQ (1.5-15.9 IQ) via SES ($\beta = .308, SE = .109, p = .005$).

P. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .308, SE = .109, p = .005$).

A. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .108, SE = .053, p = .042$).

P. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .308, SE = .109, p = .005$).

D. Indirect Effects: E. Indirect Effects: IQ (1.5-15.9 IQ) via IQ?

N. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .216, SE = .094, p = .022$).

($\beta = .313, SE = .089, p < .001$); ($\beta = -.215, SE = .094, p = .023$).

C. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .313, SE = .089, p < .001$); IQ (1.5-15.9 IQ) via SES ($\beta = -.215, SE = .094, p = .023$).

D. Indirect Effects: E. Indirect Effects: IQ (1.5-15.9 IQ) via IQ?

SES: IQ (1.5-15.9 IQ) via SES ($\beta = .313, SE = .089, p < .001$); IQ (1.5-15.9 IQ) via SES ($\beta = -.215, SE = .094, p = .023$).

(1) D. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .313, SE = .089, p < .001$); IQ (1.5-15.9 IQ) via SES ($\beta = -.215, SE = .094, p = .023$).

(2) D. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .313, SE = .089, p < .001$); IQ (1.5-15.9 IQ) via SES ($\beta = -.215, SE = .094, p = .023$).

(3) D. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .313, SE = .089, p < .001$); IQ (1.5-15.9 IQ) via SES ($\beta = -.215, SE = .094, p = .023$).

O. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .313, SE = .089, p < .001$); IQ (1.5-15.9 IQ) via SES ($\beta = -.215, SE = .094, p = .023$).

O. Indirect Effects: IQ (1.5-15.9 IQ) via SES ($\beta = .313, SE = .089, p < .001$); IQ (1.5-15.9 IQ) via SES ($\beta = -.215, SE = .094, p = .023$).

... IQ ...
... IQ ...
... (...) ...
... *in concert* ...
... (...) ...
... 14-18,81-84 . O ...
... IQ ... IQ ...
... S ...
... IQ ... IQ, T ...
... IQ ... IQ ...
... via ...

SES (1) ... (1) ... SES ... (1) ... (1) ... (7) ... (1) ...
SES (1) ... (1) ... (1) ... H (1) ... (1) ... (1) ... (1) ...
SES (1) ... (1) ... (1) ... H (1) ... (1) ... (1) ... (1) ...

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