

Does unsatisfactory subjective well-being of school children decrease their cognitive development skill?

Evidence from Peru

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THE UNIVERSITY



- 1 Motivation
- 2 Contribution of the study
- 3 Identification Strategy
- 4 Data Source
- 5 Empirical Results

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Facts

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Relevant studies

- The impact of school shootings on educational performances and well-being of school shooting survivors (Levine and McKnight 2021)
- North et al. 2013; North et al. 2013; Lowe and Galea 2017; Bharadwaj et al. 2021) assessed the mental health of school children and shooting survivors.

Definition of Subjective Well-being

According to Diener et al. 1999, subjective well-being includes high life satisfaction, experiencing many pleasant emotions, and experiencing few unpleasant emotions. Also, psychologists often replace happiness with the term 'subjective well-being' (Zelenski 2019).

Empirical Literature

① Socioeconomic background

- Household income and poverty (Lopez Boo 2013)

② Health and medical background

- Fetus brain development and pregnant women vitamin (B6 and B12) intake (Guilarte 1993; Rathod, Kale, and Joshi 2016)
- Mother's folic acid intake and neurodevelopment of their fetus (Gao et al. 2016)
- Early life nutrition (Stein et al. 2008)

③ Educational background

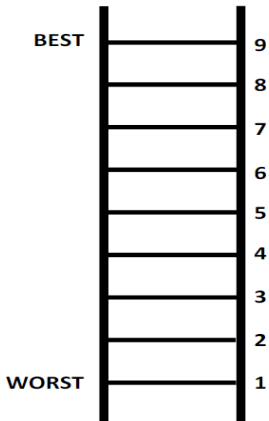
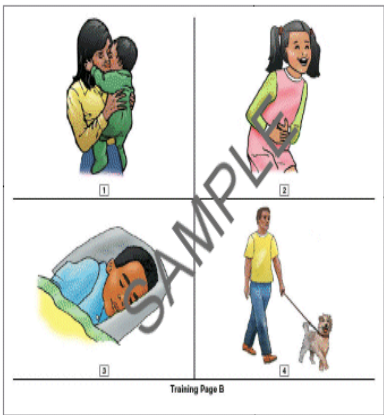
- School children's wellbeing and national exam scores (L. Gutman et al. 2009; Leslie Morrison Gutman and Vorhaus 2012)
- School readiness and early childhood language development (Long 2012; Paxson and Schady 2007; Schady 2011; Vogel et al. 2006)
- The effects of surviving the school shootings (North et al. 2013)

Research Question

Does unsatisfactory subjective well-being of school children decrease their cognitive development skill?

- Our outcome variable is the cognitive development skill (S_{it})
- A main covariate is unsatisfactory subjective well-being ($USBW_{it}$)

Interest variables



Peabody Picture Vocabulary Test (PPVT)(Paxson and Schady 2007; Schady 2011; Vogel et al.

Subjective Wellbeing (Cantril et al. 1965)

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The paper contributes to the existing literature in the 4 main ways

- We use a panel setting
- Robust PPVT scores were employed
- An instrumental variable as a carer's SWB score
- We apply quantiles

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Challenges in Estimation

- The relationship between cognitive development scores of school children and their subjective well-being is endogenous.
- The solution is to employ instrumental variable regression to correct endogeneity issues.

Panel Fixed effects model

$$S_{it} = \alpha_i + \beta_0 + \beta_1 USWB_{it} + \beta_2 IND_{it} + \beta_3 PAR_{it} + \beta_4 HH_{it} + \phi_t + \phi_r + \epsilon_{it} \quad (1)$$

- S_{it} represents percentage scores of the PPVT test for a YL child i at round t
- $USWB_{it}$ is a dummy if =1 YL child i at round t chose scores from 1-4.
- IND_{it} is a combined individual characteristics of YL child i at round t
- PAR_{it} is combined parents' attributes on a YL child i at round t
- HH_{it} is a combined household factors on a YL child i at round t
- α_i is individual fixed effect
- ϕ_r is regional fixed effect
- ϕ_t is round fixed effect
- ϵ_{it} is the error term

2SLS equation

$$S_{it} = \alpha_i + \beta_0 + \beta_1 USWB_{it} + \beta_2 IND_{it} + \beta_3 PAR_{it} + \beta_4 HH_{it} + \phi_t + \phi_r + \epsilon_{it} \quad (2)$$

$$USWB_{it} = \gamma_i + \rho_0 + \rho_1 CSWB_{it} + \rho_3 IND_{it} + \rho_4 PAR_{it} + \rho_5 HH_{it} + \mu_{it} \quad (3)$$

- $CSWB_{it}$ represents subjective well-being scores for carers' of YL child i at round t reported scales between 1 and 9.
- μ_{it} is the error term

Exclusion restriction diagnostics

Variables	FE
Full Sample	-0.066 (0.082)
Boys	0.059 (0.119)
Girls	-0.183 (0.114)
Urban	0.031 (0.098)
Rural	-0.157 (0.156)
Private	-0.258 (0.293)
Public	-0.038 (0.088)

First Stage IV diagnostics

Variables	Child-Unsatisfactory subjective well-being							
	First stage	Full Sample	Gender		Location		Schooling	
			Girls	Boys	Urban	Rural	Private	Public
Parent's SWB	-0.029*** (0.004)	-0.033*** (0.007)	-0.026*** (0.006)	-0.025*** (0.005)	-0.033*** (0.009)	-0.020** (0.009)	-0.030*** (0.005)	
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Round FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Regional FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Observations	5447	2624	2823	3977	1397	852	4439	
R-squared	0.775	0.763	0.779	0.794	0.753	0.715	0.779	
Individual ID	1428	691	737	1050	386	255	1200	
Weak identification test								
Craig-Donald statistic	79.82	48.691	32.514	42.085	25.630	4.184	70.046	
Kleibergen-Paap statistic	40.67	26.123	16.353	22.580	14.790	2.067	36.154	
Stock-Yogo critical values								
10\% maximal IV relative bias	16.38							
15\% maximal IV relative bias	8.96							
20\% maximal IV relative bias	6.66							
25\% maximal IV relative bias	5.53							

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Data



- 5 Rounds (2002,2006,2009,2013,and 2015)
- 4 countries (Ethiopia, Parts of India,Peru and Vietnam)
- 2 Cohorts (Young and Old)
- Peruvian young cohort round 3-5 was chosen

Descriptive Statistics-1

Variables	Full		Unsatisfactory		Satisfactory		Mean difference
	Mean	SD	Mean	SD	Mean	SD	
PPVT score	65.23	17.79	59.88	18.16	66.06	17.55	-6.18***
YL child related variables							
Female	0.5	0.5	0.54	0.5	0.49	0.5	0.05***
Urban	0.73	0.44	0.61	0.49	0.75	0.43	-0.14***
Region1	0.39	0.49	0.28	0.45	0.41	0.49	-0.13***
Region2	0.44	0.5	0.57	0.5	0.43	0.49	0.14***
School Enrolment	0.97	0.16	0.98	0.15	0.99	0.09	-0.01***
Type of school	0.17	0.38	0.11	0.31	0.18	0.39	-0.07***
Time to travel school	14.97	15.45	16.23	14.28	14.79	15.6	1.44***
Child-Age	11.58	2.53	11.37	2.49	11.6	2.53	-0.23***
Child-Age2	140.45	57.2	135.38	55.54	141.03	57.35	-5.65***
Child-health score	3.73	0.62	3.64	0.59	3.74	0.61	-0.1***

Descriptive Statistics-2

Variables	Full		Unsatisfactory		Satisfactory		Mean difference
	Mean	SD	Mean	SD	Mean	SD	
PPVT score	65.23	17.79	59.88	18.16	66.06	17.55	-6.18***
Parental variables							
Mother-education	7.53	4.59	6.05	4.47	7.76	4.54	-1.71***
Father-education	8.66	4.18	7.51	4.13	8.84	4.14	-1.33***
Mother-age	37.67	7.31	37.59	7.52	37.62	7.25	-0.03
Father-age	41.76	8.13	41.1	7.75	41.78	8.16	-0.68**
Mother-lives	0.95	0.23	0.93	0.25	0.95	0.22	-0.02*
Father-lives	0.88	0.33	0.85	0.35	0.88	0.32	-0.03**

Descriptive Statistics-3

Variables	Full		Unsatisfactory		Satisfactory		Mean difference
	Mean	SD	Mean	SD	Mean	SD	
Household related variables							
Household size	5.28	1.85	5.4	1.86	5.27	1.86	0.13**
Juntos program	0.22	0.41	0.33	0.47	0.2	0.4	0.13***
Expenditure	5.5	2.87	4.97	2.83	5.59	2.87	-0.62***
PCE (ln)	0.17	0.89	0.29	0.9	0.16	0.89	0.13***
Dependency ratio	57.32	56.27	62.81	63.07	56.63	55.17	6.18**
Wealth index	0.59	0.2	0.52	0.2	0.6	0.19	-0.08***
Housing quality	0.47	0.25	0.4	0.24	0.48	0.25	-0.08***
Electricity	0.93	0.26	0.89	0.32	0.93	0.25	-0.04***
Water access	0.8	0.4	0.76	0.43	0.81	0.39	-0.05***
Toilet	0.94	0.24	0.92	0.27	0.94	0.24	-0.02**
Cooking	0.64	0.48	0.49	0.5	0.66	0.47	-0.17***
Instrument							
Parent's SWB score	5.56	1.76	4.84	1.89	5.68	1.71	-0.84***

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OLS, FE, and FE with IV estimation

Variables	OLS	FE	FE IV
Full Sample	-1.198*** (0.456)	-1.323*** (0.380)	0.888 (3.614)
Boys	-0.847 (0.681)	-1.329** (0.556)	-3.584 (6.129)
Girls	-1.443** (0.603)	-1.371*** (0.520)	4.334 (4.406)
Urban	-1.196** (0.568)	-0.435 (0.455)	-1.541 (4.397)
Rural	-0.900 (0.763)	-2.637*** (0.715)	2.010 (5.880)
Private	-4.114*** (1.284)	-3.699*** (1.229)	8.769 (20.658)
Public	-0.876* (0.489)	-0.918** (0.411)	0.358 (3.816)

Quantile model

$$Q_{(S_{it})}(\tau_j | USWB_{it}, IND_{it}, PAR_{it}, HH_{it}) = \beta(\tau_j)USWB_{it} + \gamma_1 IND_{it}(\tau_j) + \gamma_2 PAR_{it}(\tau_j) + \gamma_3 HH_{it}(\tau_j) + \mu_i(\tau_j) + \mu_t(\tau_j) + \mu_s(\tau_j) \quad (4)$$

- for all quantiles $\tau_j \in (0, 1)$. The effect of unsatisfactory subjective well-being of school children on the cognitive developmental score of a child i in round t is observed by $\beta(\tau_j)$ and $\gamma(\tau_j)$ captures the effects of other explanatory variables on the school children's cognitive development score using quantiles as a function.

The estimates of the USWB on PPVT scores

	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel A- Pooled QR				
Unsatisfactory SWB	-1.993** (0.811)	-1.164* (0.668)	-1.681** (0.671)	-0.438 (0.825)
Observations	4166	4166	4166	4166
Individual FE	No	No	No	No
Year FE	No	No	No	No
	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel B-QRFE				
Unsatisfactory SWB	-1.486** (0.723)	-1.334*** (0.496)	-1.190* (0.708)	-1.127 (0.879)
Observations	4166	4166	4166	4166
Individual FE	No	No	No	No
Year FE	No	No	No	No

	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel C- Without IV				
Unsatisfactory SWB	-2.072*** (0.532)	-2.013*** (0.457)	-1.501*** (0.275)	0.567 (0.832)
Observations	2754	2754	2754	2754
Number of groups	1519	1519	1519	1519
Individual FE	Yes	Yes	Yes	Yes
Regional FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel D-With IV				
Unsatisfactory SWB	-1.896*** (0.500)	-0.970** (0.386)	-1.417** (0.634)	-0.081 (0.628)
Observations	2754	2754	2754	2754
Number of groups	1519	1519	1519	1519
Individual FE	Yes	Yes	Yes	Yes
Regional FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Gender Heterogeneity in the Powell QR

	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel A- Boys				
Unsatisfactory SWB	-2.091*** (0.332)	-1.986*** (0.102)	-1.509*** (0.165)	0.231 (0.410)
Observations	2146	2146	2146	2146
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel B-girls				
Unsatisfactory SWB	-2.779*** (0.147)	-0.756*** (0.283)	0.241 (0.229)	-1.991*** (0.343)
Observations	2692	2692	2692	2692
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Urban vs Rural heterogeneity in the Powell QR

	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel A- rural				
Unsatisfactory SWB	-1.241*** (0.184)	-2.268*** (0.303)	-0.126 (0.258)	-3.682*** (0.111)
Observations	1099	1099	1099	1099
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel B-urban				
Unsatisfactory SWB	-0.856** (0.366)	-0.749*** (0.049)	-1.236*** (0.077)	0.715*** (0.173)
Observations	3060	3060	3060	3060
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Schooling type heterogeneity in the Powell QR

	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel A- Public				
Unsatisfactory SWB	-0.836*** (0.304)	-0.863*** (0.120)	-0.954*** (0.129)	-0.512*** (0.159)
Observations	3457	3457	3457	3457
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
	0.25 quantile	0.50 quantile	0.75 quantile	0.90 quantile
Panel B-Private				
Unsatisfactory SWB	-3.900*** (0.190)	-3.925*** (0.379)	-0.501 (0.332)	-2.154*** (0.027)
Observations	952	952	952	952
Individual FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Preliminary Findings

Our findings highlight that unsatisfactory SWB decreases the PPVT score by 1.9 percentage points in the 25th quantile. Similarly, to those children in the median and 75th quantile of distribution, unsatisfactory SWB decreases their PPVT score 0.97 and 1.4 percentage points respectively

- Bharadwaj, Prashant et al. (2021). “Surviving a mass shooting”.
In: *Journal of Public Economics* 201, p. 104469.
- Cantril, Hadley et al. (1965). “Pattern of human concerns”. In.
Diener, Ed et al. (1999). “Subjective well-being: Three decades of
progress.”. In: *Psychological bulletin* 125.2, p. 276.
- Gao, Yunfei et al. (2016). “New perspective on impact of folic acid
supplementation during pregnancy on
neurodevelopment/autism in the offspring children—a
systematic review”. In: *PloS one* 11.11, e0165626.
- Guilarte, Tomás R (1993). “Vitamin B6 and cognitive
development: recent research findings from human and animal
studies”. In: *Nutrition reviews* 51.7, pp. 193–198.
- Gutman, Leslie Morrison and John Vorhaus (2012). “The impact
of pupil behaviour and wellbeing on educational outcomes”. In.
- Gutman, LM et al. (2009). “Well-being from childhood to
adolescence: Risk and protective factors”. In: *London: DCSF*.

- Levine, Phillip B and Robin McKnight (2021). *Exposure to a school shooting and subsequent well-being*. Tech. rep. National Bureau of Economic Research.
- Long, Yanjie (2012). “The Impact of Parental Involvement on Preschool Childrens Later Language Development in Low-income Hispanic English Language Learners”. In.
- Lopez Boo, Florencia (2013). *Intercontinental evidence on socioeconomic status and early childhood cognitive skills: is Latin America different?* Tech. rep. IDB Working Paper Series.
- Lowe, Sarah R and Sandro Galea (2017). “The mental health consequences of mass shootings”. In: *Trauma, Violence, & Abuse* 18.1, pp. 62–82.
- North, Carol S et al. (2013). “Psychiatric disorders among survivors of the Oklahoma City bombing”. In: *The Science of Mental Health: Stress and the Brain*. Taylor and Francis, pp. 159–167.

- Paxson, Christina and Norbert Schady (2007). “Cognitive development among young children in Ecuador the roles of wealth, health, and parenting”. In: *Journal of Human resources* 42.1, pp. 49–84.
- Rathod, Richa, Anvita Kale, and Sadhana Joshi (2016). “Novel insights into the effect of vitamin B 12 and omega-3 fatty acids on brain function”. In: *Journal of biomedical science* 23.1, pp. 1–7.
- Schady, Norbert (2011). “Parents education, mothers vocabulary, and cognitive development in early childhood: Longitudinal evidence from Ecuador”. In: *American Journal of public health* 101.12, pp. 2299–2307.
- Stein, Aryeh D et al. (2008). “Nutritional supplementation in early childhood, schooling, and intellectual functioning in adulthood: a prospective study in Guatemala”. In: *Archives of pediatrics & adolescent medicine* 162.7, pp. 612–618.

Vogel, Cheri A et al. (2006). "Relation between father connectedness and child outcomes". In: *Parenting* 6.2-3, pp. 189–209.

Zelenski, John (2019). "Positive psychology: The science of well-being". In.

Thank You