

# Extended Data

## **The effect of cumulative early life adversities, and their differential mediation through hair cortisol levels, on childhood growth and cognition: Three-year follow-up of a birth cohort in rural India**










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**(Extended Data) Fig. 1. Summary of games on Developmental Assessment on an E-Platform (DEEP) to test cognition in preschool children**

DEEP comprises 9 games to test various components of cognition such as processing speed, manual coordination, response inhibition, divided attention, reasoning, visual form perception, visual integration and working memory. This figure lists the game names, example screenshots and main instructions for gameplay on DEEP.

	<p><b>Single tap</b></p> <p>Child to tap a single stationary target as fast as they can</p>		<p><b>Hidden objects</b></p> <p>Child to remember where the multiple characters hide together</p>
	<p><b>Alternate tap</b></p> <p>Child to tap two stationary targets alternately as fast as they can</p>		<p><b>Odd one out</b></p> <p>Child to touch the object that is different from the other three</p>
	<p><b>Popping balloons</b></p> <p>Child to tap moving targets as fast as they can</p>		<p><b>Matching shapes</b></p> <p>Child to drag the objects to their matching shadow</p>
	<p><b>Grow your garden</b></p> <p>Child to touch the target while not touching the distractor</p>		<p><b>Jigsaw</b></p> <p>Child to drag the parts of the animal to its shadow to make a whole</p>
		<p><b>Location recall</b></p> <p>Child to remember where the moon hid while playing another game</p>	

**(Extended Data) Table 1: Association between cumulative adversity (total score and quintiles) measured at 12 months and growth and cognition (DEEP) measured at 3-years (N = 1124)**

\*represents that some participant data was imputed (see Supplementary Table 1 for details).

Total Adversity Score	n*	DEEP z-score		Anthropometry z-score			
		Mean score	95% CI	Weight-for-age	95% CI	Height-for-age	95% CI
0	102	0.30	(0.09, 0.52)	-0.95	(-1.13, -0.77)	-1.15	(-1.34, -0.97)
1	180	0.21	(0.03, 0.38)	-1.17	(-1.31, -1.03)	-1.29	(-1.44, -1.15)
2	194	0.07	(-0.11, 0.24)	-1.33	(-1.46, -1.19)	-1.49	(-1.63, -1.34)
3	178	0.13	(-0.05, 0.31)	-1.33	(-1.48, -1.19)	-1.48	(-1.64, -1.33)
4	154	-0.07	(-0.25, 0.12)	-1.49	(-1.64, -1.33)	-1.65	(-1.82, -1.49)
5	108	-0.17	(-0.38, 0.05)	-1.64	(-1.82, -1.46)	-1.88	(-2.08, -1.68)
6	83	-0.32	(-0.57, -0.08)	-1.69	(-1.89, -1.49)	-1.96	(-2.17, -1.74)
7	44	-0.27	(-0.60, 0.07)	-1.72	(-2.00, -1.44)	-1.91	(-2.21, -1.61)
8+	80	-0.43	(-0.66, -0.20)	-2.00	(-2.20, -1.80)	-2.16	(-2.38, -1.95)
<b>Decrease per adversity</b>		<b>-0.08</b>	<b>(-0.11, -0.06)</b>	<b>-0.11</b>	<b>(-0.13, -0.09)</b>	<b>-0.12</b>	<b>(-0.14, -0.09)</b>
p-trend		<0.001		<0.001		<0.001	
Adversity factors PCA (quintiles)	1	0.20	(0.03, 0.37)	-1.07	(-1.19, -0.95)	-1.25	(-1.38, -1.12)
	2	0.21	(0.04, 0.37)	-1.25	(-1.37, -1.13)	-1.36	(-1.49, -1.23)
	3	0.05	(-0.11, 0.20)	-1.39	(-1.51, -1.27)	-1.57	(-1.70, -1.44)
	4	-0.08	(-0.24, 0.08)	-1.52	(-1.64, -1.40)	-1.70	(-1.83, -1.57)
	5	-0.36	(-0.52, -0.20)	-1.83	(-1.95, -1.71)	-2.05	(-2.18, -1.92)
<b>Decrease per quintile (linear)</b>		<b>-0.14</b>	<b>(-0.18, -0.10)</b>	<b>-0.2</b>	<b>(-0.2, -0.1)</b>	<b>-0.2</b>	<b>(-0.2, -0.2)</b>
p-trend		<0.001		<0.001		<0.001	

**(Extended Data) Table 2: Association between domain specific adversity scores and child outcomes (N = 1124)**

Association estimates were computed from mixed-effects linear regression models adjusted for gender and age at 36-month assessment, with cluster as the random effect and intervention allocation arm as the fixed effect.

Adversity type	No. factors	Range		DEEP	36m WAZ	36m HAZ
SES	6	0-6	Mean with 0 factors	-0.01	-1.20	-1.32
			(95% CI)	(-0.25, 0.23)	(-1.29, -1.11)	(-1.42, -1.21)
			<b>Change with increasing factors (95% CI)</b>	<b>-0.19</b> <b>(-0.24, -0.14)</b>	<b>-0.17</b> <b>(-0.22, -0.13)</b>	<b>-0.21</b> <b>(-0.26, -0.17)</b>
			p for slope	<0.001	<0.001	<0.001
Maternal stress	6	0-4	Mean with 0 factors	-0.09	-1.28	-1.47
			(95% CI)	(-0.35, 0.16)	(-1.38, -1.18)	(-1.59, -1.35)
			<b>Change with increasing factors (95% CI)</b>	<b>-0.09</b> <b>(-0.16, -0.03)</b>	<b>-0.14</b> <b>(-0.21, -0.08)</b>	<b>-0.09</b> <b>(-0.16, -0.02)</b>
			p for slope	0.007	<0.001	0.008
Relationship	4	0-3	Mean with 0 factors	0.06	-1.13	-1.32
			(95% CI)	(-0.20, 0.32)	(-1.24, -1.03)	(-1.45, -1.20)
			<b>Change with increasing factors (95% CI)</b>	<b>-0.18</b> <b>(-0.25, -0.10)</b>	<b>-0.25</b> <b>(-0.32, -0.18)</b>	<b>-0.22</b> <b>(-0.29, -0.15)</b>
			p for slope	<0.001	<0.001	<0.001
Child	6	0-5	Mean with 0 factors	-0.13	-1.29	-1.42
			(95% CI)	(-0.39, 0.12)	(-1.40, -1.18)	(-1.55, -1.29)
			<b>Change with increasing factors (95% CI)</b>	<b>-0.01</b> <b>(-0.07, 0.05)</b>	<b>-0.10</b> <b>(-0.15, -0.04)</b>	<b>-0.14</b> <b>(-0.19, -0.08)</b>
			p for slope	0.767	<0.001	<0.001

**(Extended Data) Table 3: Association between chronic stress as measured by log hair cortisol levels at 12 months and growth and cognition measured at 3-years (N = 607)**

Association estimates were computed from mixed-effects linear regression models adjusted for gender and age at 36-month assessment, with cluster as the random effect and intervention allocation arm as the fixed effect.

<b>Log hair cortisol</b>	<b>DEEP-z-score</b>	<b>WAZ</b>	<b>HAZ</b>
<b>β-coef (95% CI)</b>	-0.09 (-0.16, -0.01)	-0.078 (-0.15, - 0.004)	-0.12 (-0.20, - 0.04)
p-value	0.04	0.142	0.005