Beliefs about the development of mental life

Supplemental materials

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Contents

In a series of large-scale studies we assessed how US adults conceptualize the development of the human mind over the first five years of life. We identified four distinct suites of mental capacities that are perceived by US adults to develop over human infancy and early childhood, *bodily sensations*, *negative affect*, *social connection*, and *cognition and control* (Study 1); charted how these different aspects of mental life are perceived to change over the first five years of a child's life (Studies 2-3); and explored the lay theories that underlie the observed differences in the perceived developmental trajectories of these four aspects of mental life (Study 3).

In these Supplemental Materials, we provide extended information about the results presented in the main paper, present additional results, and provide an item-by-item comparison of the capacity items used here to items used in previous work on mind perception.[4]

Note: This is a fully reproducible manuscript, written in RMarkdown using the "knitr" package for R.[5] The full, editable script for all analyses, figures, and tables (here and in the main text) is available in the .Rmd file that generated this document, which can be found in the following GitHub repository: [removed to preserve anonymity].

1 Extended results

1.1 Study 1

As described in the main text, we began with an expansive exploration of US adults' attributions of mental life to infants and young children of different ages. We included a wide range of 60 capacities in this initial exploration, from basic physiological sensations, to capacities for perception, cognition, and emotion, to abilities for self-regulation and social interaction. We asked participants to assess these capacities at three different ages (at birth, 9 months, and 5 years), with the goal of characterizing the conceptual structure underlying participants' reasoning about the development of mental life. Our primary analysis for this preregistered study was an exploratory factor analysis (EFA) of participants' capacity ratings. This analysis allowed us to examine which capacities tend to "hang together" in participants' assessments of the mental lives of infants and young children. Following previous work on mind perception, we argue that the suites of capacities revealed by EFA offer a meaningful approximation of the latent conceptual structure underlying participants' reasoning about the developing human mind.

In the main text, we presented the four-factor EFA solution suggested by parallel analysis. Here, we present extended results for this EFA and the alternative EFA solutions suggested by minimizing BIC and by Weisman et al.'s factor retention criteria,[2] as well as a visualization of perceptions of development in these mental capacities.

1.1.1 Exploratory factor analyses (EFAs)

In order to determine how many factors to retain, we examined the results of three factor retention protocols:

(1) Parallel analysis (presented in the main text), which compares the observed correlation structure to the correlation structure arising from random datasets of the same size;
(2) Minimizing the Bayesian Information Criterion (BIC), which is one method of optimizing both goodness of fit and parsimony; and
(3) A set of factor retention criteria that have been used in Weisman et al.'s previous work,[2] in which they retained factors with eigenvalues greater than 1.0, which individually accounted for greater than 5% of the shared variance before transformation or rotation, and which were the "dominant" factor (the factor with the strongest absolute factor loading) for at least one mental capacity after transformation. (In this protocol, a factor had to meet all three of these criteria in order to be retained).

Our interpretation of how best to characterize our dataset (i.e., how many factors we observe) was guided by the degree of consensus among these three protocols and the interpretability of the retained factors under each protocol. Here we present these three factor retention protocols separately.

All factor analyses were conducted using ordinary least squares to find the minimum residual solution via the "fa" function in the "psych" package for R.[6]

1.1.1.1 Parallel analysis

As reported in the main text, parallel analysis suggested retaining 4 factors. We call these factors *cognition and control*, *social connection*, *bodily sensations*, and *negative affect*. Factor loadings, item complexity, and uniqueness are shown in Supplementary Table 1; see also Figure 1 (main text). The amount of total and shared variance accounted for by these factors is shown in Supplementary Table 2.

Table 1: Study 1, factor solution suggested by parallel analysis: Factor loadings, complexity, and uniqueness.

Capacity	Cog. Ctrl.	Soc. Conn.	Bod. Sens.	Neg. Afft.	Complexity	Uniqueness
planning	**1.01**	-0.11	-0.01	-0.04	1.03	0.14
having self control	**0.96**	-0.02	-0.01	-0.05	1.01	0.14
thinking before they act	**0.96**	-0.03	0.03	-0.04	1.01	0.15
having goals	**0.95**	-0.08	0.00	0.02	1.01	0.17
reasoning about things	**0.94**	0.00	-0.01	-0.05	1.01	0.16
controlling their emotions	**0.92**	-0.01	-0.02	-0.06	1.01	0.21
telling right from wrong	**0.91**	0.00	0.03	0.01	1.00	0.14
understanding what somebody else is thinking	**0.90**	-0.05	-0.04	0.03	1.01	0.22
focusing on a goal	**0.90**	0.02	0.00	-0.02	1.00	0.19
feeling guilty	**0.89**	-0.04	0.06	0.09	1.03	0.16
feeling embarrassed	**0.83**	0.04	0.01	0.09	1.03	0.17
feeling pride	**0.83**	0.07	-0.05	0.09	1.04	0.17
making choices	**0.69**	0.32	-0.04	-0.02	1.43	0.18
calming themselves down	**0.68**	0.25	-0.01	-0.05	1.27	0.30
detecting danger	**0.67**	0.07	0.10	0.12	1.14	0.32
feeling hopeless	**0.67**	0.01	0.01	0.28	1.34	0.28
remembering things	0.52	0.49	0.01	-0.10	2.07	0.23
imagining things	0.51	0.42	-0.01	0.03	1.94	0.26
recognizing others emotions	0.50	0.41	-0.04	0.03	1.95	0.32
feeling worried	0.42	0.24	0.05	0.35	2.64	0.25
getting hurt feelings	0.41	0.40	0.00	0.19	2.40	0.27
having wants and desires	0.29	0.26	0.17	0.27	3.62	0.40
feeling excited	0.00	**0.85**	-0.01	0.06	1.01	0.24
finding something funny	0.06	**0.84**	-0.02	0.00	1.01	0.25
loving somebody	0.05	**0.83**	-0.10	0.09	1.06	0.27
learning from other people	0.12	**0.80**	-0.02	0.01	1.05	0.24
feeling happy	-0.12	**0.79**	0.16	0.01	1.13	0.30
feeling loved	-0.05	**0.77**	0.04	0.07	1.03	0.35
recognizing somebody else	0.06	**0.76**	0.17	-0.10	1.14	0.27
getting pleasure from music	0.10	**0.62**	0.17	0.04	1.20	0.34
being afraid of somebody	0.02	**0.62**	0.11	0.26	1.41	0.26
listening to somebody	0.18	**0.61**	0.14	-0.03	1.29	0.36
having thoughts	0.26	0.59	0.10	0.02	1.45	0.29
feeling sad	0.00	0.58	0.15	0.24	1.50	0.31
feeling safe	0.02	0.54	0.24	0.13	1.51	0.37
feeling textures (for example, smooth, rough)	0.06	0.54	0.36	-0.05	1.81	0.34
getting angry	0.09	0.53	0.05	0.34	1.78	0.28
feeling pleasure	0.06	0.47	0.28	0.16	1.91	0.36
being angry at somebody	0.38	0.42	0.00	0.25	2.62	0.21
feeling lonely	0.16	0.42	0.10	0.35	2.38	0.31

Table 1: Study 1, factor solution suggested by parallel analysis: Factor loadings, complexity, and uniqueness. *(continued)*

Capacity	Cog. Ctrl.	Soc. Conn.	Bod. Sens.	Neg. Afft.	Complexity	Uniqueness
feeling bored	0.32	0.42	0.04	0.27	2.67	0.25
feeling confused	0.16	0.41	0.10	0.36	2.42	0.29
feeling scared	-0.06	0.41	0.37	0.27	2.79	0.31
being aware of things	0.30	0.34	0.33	0.03	2.97	0.36
getting hungry	-0.06	-0.13	**0.90**	0.01	1.05	0.31
feeling pain	0.00	-0.07	**0.90**	0.03	1.01	0.25
feeling tired	0.00	-0.06	**0.88**	0.02	1.01	0.28
feeling thirsty	0.01	0.02	**0.84**	-0.04	1.01	0.28
feeling too hot or too cold	0.03	0.09	**0.77**	0.02	1.03	0.28
feeling physically uncomfortable	0.05	-0.02	**0.76**	0.18	1.12	0.29
hearing sounds	-0.04	0.21	**0.75**	-0.13	1.23	0.31
being comforted by physical touch	-0.03	0.17	**0.72**	-0.09	1.15	0.37
feeling distressed	0.07	0.00	0.49	0.45	2.03	0.34
seeing	0.01	0.46	0.47	-0.22	2.41	0.43
feeling calm	0.09	0.35	0.36	0.12	2.36	0.44
feeling helpless	0.34	0.13	0.12	0.43	2.30	0.33
feeling overwhelmed	0.22	0.25	0.12	0.42	2.38	0.35
feeling frustrated	0.12	0.37	0.19	0.39	2.65	0.27
feeling annoyed	0.24	0.37	0.07	0.38	2.74	0.25
feeling neglected	0.16	0.26	0.25	0.36	3.16	0.36

Note:
Factor loadings with absolute values >0.60 are in bold.

Table 2: Study 1, factor solution suggested by parallel analysis: Variance accounted for.

	Cognition and control	Social connection	Bodily sensations	Negative affect
SS loadings	16.45	14.29	8.47	4.25
Proportion Var	0.27	0.24	0.14	0.07
Cumulative Var	0.27	0.51	0.65	0.72
Proportion Explained	0.38	0.33	0.19	0.10
Cumulative Proportion	0.38	0.71	0.90	1.00

1.1.1.2 Minimizing BIC

Minimizing BIC suggested retaining 6 factors. (Note, however, that this solution does not converge.) Factor loadings, item complexity, and uniqueness are shown in Supplementary Table 3. The amount of total and shared variance accounted for by these factors is shown in Supplementary Table 4.

Table 3: Study 1, factor solution suggested by minimizing BIC: Factor loadings, complexity, and uniqueness.

Capacity	MR1	MR2	MR5	MR4	MR6	MR3	Complexity	Uniqueness
planning	**1.00**	-0.04	-0.05	0.02	0.00	-0.11	1.03	0.13
having self control	**0.96**	-0.01	0.01	-0.04	0.00	-0.04	1.01	0.14
thinking before they act	**0.96**	0.01	0.01	-0.02	0.00	-0.06	1.01	0.15
reasoning about things	**0.94**	-0.01	0.01	-0.03	0.02	-0.03	1.01	0.16
having goals	**0.94**	-0.05	0.00	0.08	-0.02	-0.10	1.04	0.16
controlling their emotions	**0.93**	0.00	0.06	-0.09	-0.04	-0.02	1.03	0.21
telling right from wrong	**0.91**	0.07	-0.04	-0.05	-0.02	0.11	1.05	0.14
focusing on a goal	**0.89**	-0.05	0.01	0.07	0.07	-0.11	1.06	0.18
understanding what somebody else is thinking	**0.89**	-0.04	-0.03	0.02	-0.02	0.02	1.01	0.22

Table 3: Study 1, factor solution suggested by minimizing BIC: Factor loadings, complexity, and uniqueness. *(continued)*

Capacity	MR1	MR2	MR5	MR4	MR6	MR3	Complexity	Uniqueness
feeling guilty	**0.87**	0.10	-0.04	-0.01	-0.08	0.17	1.12	0.14
feeling embarrassed	**0.82**	0.05	-0.04	0.00	-0.03	0.20	1.14	0.15
feeling pride	**0.82**	-0.05	0.03	0.07	0.00	0.08	1.04	0.17
calming themselves down	**0.71**	0.00	0.18	-0.02	0.08	-0.02	1.17	0.29
making choices	**0.70**	-0.04	0.06	0.04	0.22	0.07	1.24	0.17
detecting danger	**0.65**	0.08	-0.02	0.13	0.04	0.11	1.18	0.32
feeling hopeless	**0.64**	-0.02	0.09	0.22	-0.13	0.12	1.47	0.28
remembering things	0.56	0.04	0.16	-0.05	0.28	0.10	1.75	0.23
imagining things	0.53	0.04	0.17	0.00	0.15	0.19	1.67	0.25
recognizing others emotions	0.52	-0.04	0.16	0.08	0.19	0.09	1.64	0.32
getting hurt feelings	0.41	0.06	0.21	0.07	0.03	0.32	2.56	0.25
feeling worried	0.39	0.03	0.14	0.29	-0.03	0.26	3.02	0.25
having thoughts	0.30	0.10	0.27	0.09	0.27	0.09	3.65	0.28
getting hungry	-0.05	**0.94**	0.01	-0.09	-0.16	0.08	1.10	0.24
feeling pain	-0.01	**0.86**	-0.02	0.05	-0.02	0.03	1.01	0.24
feeling thirsty	0.01	**0.85**	-0.01	-0.03	0.03	0.06	1.02	0.26
feeling tired	0.00	**0.83**	0.05	0.05	-0.05	-0.02	1.02	0.27
hearing sounds	-0.02	**0.72**	-0.01	0.00	0.25	0.00	1.24	0.30
feeling too hot or too cold	0.03	**0.68**	0.02	0.18	0.14	-0.07	1.25	0.28
being comforted by physical touch	0.01	**0.66**	0.29	0.01	0.03	-0.20	1.60	0.34
feeling physically uncomfortable	0.01	**0.61**	-0.08	0.37	0.11	-0.06	1.79	0.27
seeing	0.06	0.49	0.06	-0.10	0.39	0.04	2.09	0.41
feeling loved	0.02	0.06	**0.89**	-0.03	-0.04	0.01	1.02	0.19
loving somebody	0.12	-0.06	**0.66**	0.02	0.11	0.16	1.25	0.23
feeling safe	0.05	0.17	0.57	0.21	0.06	-0.09	1.57	0.31
feeling happy	-0.06	0.13	0.50	0.13	0.30	0.01	2.01	0.29
feeling sad	0.02	0.16	0.39	0.20	0.07	0.24	2.71	0.30
feeling excited	0.05	0.01	0.38	0.11	0.35	0.20	2.77	0.24
feeling lonely	0.15	0.04	0.38	0.35	-0.02	0.14	2.65	0.29
getting pleasure from music	0.13	0.12	0.33	0.17	0.29	0.02	3.16	0.32
feeling calm	0.10	0.25	0.33	0.27	0.11	-0.11	3.65	0.40
feeling distressed	0.00	0.29	0.01	**0.65**	0.00	0.00	1.39	0.30
feeling overwhelmed	0.17	-0.01	0.14	0.54	0.06	0.10	1.44	0.33
feeling helpless	0.30	0.03	0.20	0.44	-0.11	0.11	2.52	0.33
feeling confused	0.13	0.02	0.09	0.44	0.19	0.24	2.28	0.28
feeling frustrated	0.10	0.11	0.17	0.44	0.09	0.22	2.23	0.26
feeling neglected	0.14	0.16	0.35	0.38	-0.09	0.06	2.84	0.33
feeling scared	-0.07	0.31	0.17	0.33	0.15	0.19	3.69	0.31
having wants and desires	0.27	0.10	0.13	0.33	0.07	0.12	2.93	0.40
feeling pleasure	0.06	0.18	0.28	0.32	0.22	-0.02	3.50	0.33
feeling textures (for example, smooth, rough)	0.08	0.31	0.15	0.13	0.38	0.01	2.65	0.32
learning from other people	0.17	0.00	0.31	0.09	0.38	0.17	2.94	0.23
recognizing somebody else	0.12	0.22	0.29	-0.05	0.38	0.18	3.37	0.26
finding something funny	0.11	0.06	0.29	-0.02	0.37	0.33	3.19	0.22
being aware of things	0.30	0.24	-0.02	0.23	0.36	0.01	3.58	0.32
listening to somebody	0.21	0.14	0.19	0.07	0.35	0.12	3.05	0.36
being angry at somebody	0.37	0.05	0.10	0.16	0.10	0.40	2.63	0.17
getting angry	0.08	0.08	0.23	0.25	0.09	0.40	2.71	0.25
feeling annoyed	0.21	0.06	0.09	0.35	0.08	0.37	2.87	0.23
feeling bored	0.31	0.07	0.11	0.20	0.11	0.36	3.13	0.22
being afraid of somebody	0.02	0.13	0.26	0.24	0.19	0.32	3.89	0.24

Note:
Factor loadings with absolute values >0.60 are in bold.

Table 4: Study 1, factor solution suggested by minimizing BIC: Variance accounted for.

	MR1	MR2	MR5	MR4	MR6	MR3
SS loadings	16.56	7.47	7.04	5.69	4.08	3.67
Proportion Var	0.28	0.12	0.12	0.09	0.07	0.06
Cumulative Var	0.28	0.40	0.52	0.61	0.68	0.74
Proportion Explained	0.37	0.17	0.16	0.13	0.09	0.08
Cumulative Proportion	0.37	0.54	0.70	0.83	0.92	1.00

We consider the first of these factors ("MR1") to resonate with the construct we have called *cognition and control*, the second ("MR2") to resonate with the construct we have called *bodily sensations*, the third ("MR5") to resonate with the construct we have called *social connection*, and the fourth ("MR4") to resonate with the construct we have called *negative affect*. The fifth factor ("MR6") appears to pick out capacities particularly relevant to social interaction (e.g., social learning, person recognition, humor, listening), and the sixth factor ("MR3") appears to pick out negative emotions (e.g., anger, annoyance, boredom, social fear); however, there were no capacities that loaded strongly on either of these capacities.

1.1.1.3 Weisman et al.'s (2017) factor retention criteria

Weisman et al.'s (2017) factor retention criteria suggested retaining 2 factors. Factor loadings, item complexity, and uniqueness are shown in Supplementary Table 5. The amount of total and shared variance accounted for by these factors is shown in Supplementary Table 6.

Table 5: Study 1, factor solution suggested by Weisman et al.'s (2017) factor retention criteria: Factor loadings, complexity, and uniqueness.

Capacity	MR1	MR2	Complexity	Uniqueness
planning	**0.97**	-0.18	1.07	0.18
having self control	**0.96**	-0.13	1.04	0.18
reasoning about things	**0.94**	-0.11	1.03	0.19
having goals	**0.94**	-0.12	1.03	0.20
thinking before they act	**0.94**	-0.10	1.02	0.19
telling right from wrong	**0.93**	-0.04	1.00	0.17
feeling pride	**0.93**	-0.05	1.01	0.18
understanding what somebody else is thinking	**0.93**	-0.14	1.05	0.24
controlling their emotions	**0.92**	-0.13	1.04	0.24
focusing on a goal	**0.92**	-0.08	1.01	0.22
feeling guilty	**0.91**	-0.01	1.00	0.19
feeling embarrassed	**0.91**	-0.01	1.00	0.18
making choices	**0.86**	0.09	1.02	0.19
feeling hopeless	**0.80**	0.05	1.01	0.32
calming themselves down	**0.80**	0.07	1.02	0.31
detecting danger	**0.75**	0.13	1.06	0.34
imagining things	**0.74**	0.22	1.18	0.27
remembering things	**0.72**	0.23	1.20	0.27
recognizing others emotions	**0.72**	0.18	1.13	0.33
being angry at somebody	**0.69**	0.32	1.42	0.23
getting hurt feelings	**0.68**	0.29	1.35	0.28
feeling worried	**0.67**	0.29	1.37	0.29
feeling bored	**0.62**	0.37	1.64	0.27
feeling annoyed	0.56	0.43	1.87	0.30
feeling helpless	0.56	0.34	1.65	0.41
having thoughts	0.52	0.45	1.96	0.31
learning from other people	0.51	0.47	1.99	0.31
loving somebody	0.50	0.44	1.97	0.36
having wants and desires	0.48	0.41	1.95	0.42

Table 5: Study 1, factor solution suggested by Weisman et al.'s (2017) factor retention criteria: Factor loadings, complexity, and uniqueness. *(continued)*

Capacity	MR1	MR2	Complexity	Uniqueness
feeling confused	0.48	0.48	2.00	0.33
feeling overwhelmed	0.48	0.42	1.96	0.42
feeling lonely	0.48	0.48	2.00	0.35
feeling pain	-0.24	**0.88**	1.14	0.35
feeling tired	-0.22	**0.87**	1.13	0.37
feeling thirsty	-0.20	**0.86**	1.11	0.37
hearing sounds	-0.17	**0.85**	1.08	0.37
feeling too hot or too cold	-0.10	**0.85**	1.03	0.34
getting hungry	-0.33	**0.84**	1.30	0.43
feeling physically uncomfortable	-0.07	**0.82**	1.01	0.37
being comforted by physical touch	-0.16	**0.81**	1.07	0.42
feeling scared	0.15	**0.74**	1.09	0.32
seeing	0.03	**0.69**	1.00	0.51
feeling textures (for example, smooth, rough)	0.20	**0.69**	1.17	0.37
feeling happy	0.22	**0.68**	1.20	0.37
feeling distressed	0.14	**0.66**	1.09	0.46
feeling pleasure	0.28	**0.64**	1.36	0.36
feeling safe	0.26	**0.63**	1.34	0.38
feeling calm	0.22	**0.63**	1.24	0.43
feeling sad	0.34	**0.61**	1.56	0.33
recognizing somebody else	0.33	**0.60**	1.56	0.34
being afraid of somebody	0.38	**0.60**	1.70	0.29
getting pleasure from music	0.37	0.57	1.71	0.36
feeling loved	0.33	0.56	1.63	0.42
feeling frustrated	0.41	0.56	1.85	0.32
feeling excited	0.42	0.54	1.89	0.33
feeling neglected	0.37	0.54	1.78	0.40
being aware of things	0.40	0.54	1.84	0.37
finding something funny	0.46	0.50	1.99	0.34
getting angry	0.47	0.50	1.99	0.32
listening to somebody	0.42	0.50	1.94	0.40

Note:
Factor loadings with absolute values >0.60 are in bold.

Table 6: Study 1, factor solution suggested by Weisman et al.'s (2017) factor retention criteria: Variance accounted for.

	MR1	MR2
SS loadings	23.33	17.58
Proportion Var	0.39	0.29
Cumulative Var	0.39	0.68
Proportion Explained	0.57	0.43
Cumulative Proportion	0.57	1.00

We consider the first of these factors ("MR1") to resonate most strongly with the construct we have called *cognition and control*, and the second ("MR2") to resonate most strongly with the construct we have called *bodily sensations*. These factors are also quite similar to the constructs of "agency" and "experience" in Gray et al.'s original studies of mind perception.[1]

1.1.2 Capacity ratings: Developmental trajectories

Study 1 also offered a first glimpse into US adults' perceptions of the development of mental life. Supplementary Figure 1 provides a visualization of mean "scores" for each domain of mental life. To calculate these scores, we sorted each of the 60 mental capacities included in this study into on of the four domains (*bodily sensations*, *negative affect*, *social connection* or *cognition and control*) according to the factor on which it loaded the most strongly and positively (see Supplementary Table **??**); for each participant, we then took the average of their responses to capacities in each domain at each target age. As we go on to confirm in Studies 2-3, this visualization suggests that participants perceived capacities for *bodily sensations* to be substantial at birth and to develop relatively little over the first five years of life; in contrast, they perceived capacities for *negative affect*, *social connection*, and in particular *cognition and control* to be much more limited at birth and to development dramatically over the first five years of life.

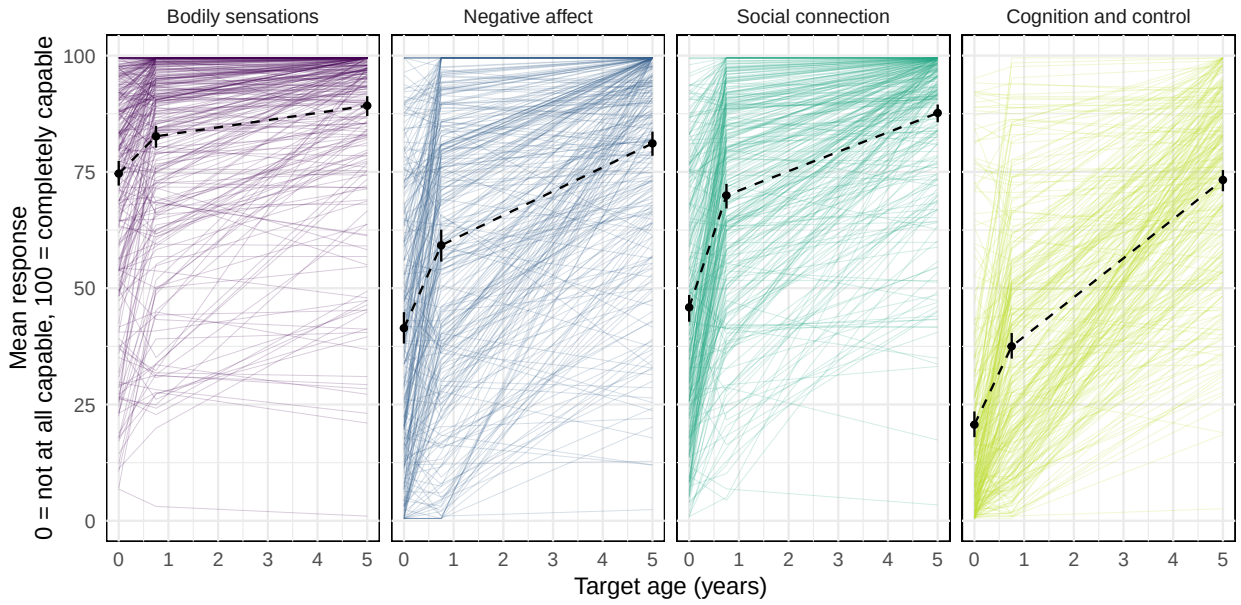

Figure 1: Perceived developmental trajectories for four domains of mental life (Study 1). Lighter lines represent individual participants' scores, black points correspond to mean scores across the sample, and error bars are bootstrapped 95% confidence intervals.

1.2 Study 2

As described in the main text, in Study 2 we replicated the conceptual structure identified by Study 1 and then used it to chart how different aspects of mental life are perceived to change over development. The design of Study 2 was nearly identical to Study 1, except that instead of assessing 60 capacities for 3 target ages, each participant assessed 20 capacities for 13 target ages.

In the main text, we briefly described the four-factor EFA solution suggested by parallel analysis, and presented the results of a generalized additive model (GAM) predicting participants' responses as a function of target age, domain, and interactions between them. Here, we present the full results for the EFA mentioned in the main text, an alternative EFA solutions suggested by minimizing BIC, and the full results of the GAM.

1.2.1 Exploratory factor analyses (EFAs)

As in Study 1, we examined the results of three factor retention protocols (parallel analysis, presented in the main text; minimizing BIC; and Weisman et al.'s factor retentia criteria),[2] and our interpretation of how best to characterize our dataset was guided by the degree of consensus among these three protocols and the interpretability of the retained factors under each protocol. Here we present these three factor retention protocols separately.

1.2.1.1 Parallel analysis As reported in the main text, parallel analysis suggested retaining 4 factors, and these factors were very similar to those found in Study 1 (*bodily sensations*, *negative affect*, *social connection*, and *cognition and control*); each item loaded most strongly on the factor it was selected to represent. Factor loadings, item complexity, and uniqueness are shown in Supplementary Table 7; see also Figure 1 (main text). The amount of total and shared variance accounted for by these factors is shown in Supplementary Table 8.

Table 7: Study 2, factor solution suggested by parallel analysis: Factor loadings, complexity, and uniqueness.

Capacity	Cog. Ctrl.	Neg. Afft.	Soc. Conn.	Bod. Sens.	Complexity	Uniqueness
having self control	**0.96**	-0.02	-0.01	0.01	1.00	0.11
controlling their emotions	**0.94**	-0.04	0.01	-0.01	1.00	0.15
telling right from wrong	**0.93**	-0.03	0.04	0.00	1.01	0.12
planning	**0.90**	0.07	-0.05	0.00	1.02	0.18
reasoning about things	**0.89**	0.05	0.02	0.00	1.01	0.14
feeling overwhelmed	0.02	**0.84**	0.10	-0.06	1.04	0.23
feeling distressed	-0.01	**0.81**	-0.09	0.19	1.14	0.25
feeling frustrated	0.03	**0.80**	0.08	0.03	1.03	0.22
feeling helpless	0.08	**0.77**	0.09	-0.05	1.06	0.30
feeling lonely	0.05	**0.60**	0.27	0.03	1.41	0.30
feeling happy	-0.07	0.05	**0.85**	0.09	1.05	0.22
finding something funny	0.09	-0.01	**0.83**	0.02	1.03	0.22
feeling excited	-0.01	0.16	**0.79**	-0.01	1.09	0.22
loving somebody	0.15	0.07	**0.66**	0.01	1.13	0.37
learning from other people	0.31	0.03	0.48	0.05	1.74	0.45
getting hungry	-0.01	-0.06	0.02	**0.88**	1.01	0.27
feeling pain	0.03	0.04	-0.01	**0.86**	1.01	0.22
feeling tired	-0.01	0.16	0.02	**0.72**	1.10	0.31
hearing sounds	0.01	-0.12	0.29	**0.67**	1.45	0.43
feeling physically uncomfortable	0.02	0.41	-0.12	0.56	1.95	0.36

Note:
Factor loadings with absolute values >0.60 are in bold.

Table 8: Study 2, factor solution suggested by parallel analysis: Variance accounted for.

	Cognition and control	Negative affect	Social connection	Bodily sensations
SS loadings	4.64	3.74	3.42	3.15
Proportion Var	0.23	0.19	0.17	0.16
Cumulative Var	0.23	0.42	0.59	0.75
Proportion Explained	0.31	0.25	0.23	0.21
Cumulative Proportion	0.31	0.56	0.79	1.00

1.2.1.2 Minimizing BIC Minimizing BIC suggested retaining 8 factors. (Note, however, that this solution does not converge.) Factor loadings, item complexity, and uniqueness are shown in Supplementary

Table 9. The amount of total and shared variance accounted for by these factors is shown in Supplementary Table 10.

Table 9: Study 2, factor solution suggested by minimizing BIC: Factor loadings, complexity, and uniqueness.

Capacity	MR2	MR3	MR4	MR1	MR5	MR6	MR7	MR8	Complexity	Uniqueness
having self control	**0.98**	0.02	0.01	0.00	-0.01	-0.04	-0.04	-0.01	1.01	0.10
controlling their emotions	**0.96**	0.01	0.03	-0.03	0.00	-0.06	-0.04	-0.01	1.02	0.14
telling right from wrong	**0.92**	0.00	0.01	0.00	-0.02	0.04	-0.01	0.00	1.01	0.12
planning	**0.88**	-0.03	-0.04	0.04	0.03	0.03	0.05	0.00	1.02	0.18
reasoning about things	**0.86**	-0.02	-0.01	0.00	0.04	0.08	0.08	0.02	1.04	0.14
getting hungry	-0.01	**0.94**	-0.05	-0.02	-0.01	0.02	-0.05	0.04	1.02	0.23
feeling pain	0.02	**0.76**	0.02	-0.02	0.10	-0.04	0.12	-0.08	1.12	0.22
feeling tired	0.01	**0.71**	0.02	0.19	0.02	-0.02	-0.03	-0.02	1.16	0.30
hearing sounds	0.00	**0.63**	0.24	-0.06	-0.04	0.08	0.06	-0.02	1.37	0.43
feeling physically uncomfortable	-0.01	0.38	0.01	0.30	0.08	0.00	0.30	-0.08	3.07	0.30
feeling excited	0.04	0.00	**0.90**	0.04	0.02	-0.05	0.02	0.06	1.03	0.14
feeling happy	-0.03	0.05	**0.76**	0.06	0.06	0.07	-0.05	-0.12	1.12	0.20
finding something funny	0.08	0.03	**0.63**	-0.05	0.06	0.23	0.03	0.02	1.35	0.23
feeling distressed	0.02	0.05	-0.01	**0.84**	0.02	0.02	0.04	-0.11	1.05	0.18
feeling frustrated	0.06	0.05	0.17	**0.66**	0.07	-0.01	0.01	0.12	1.27	0.20
feeling overwhelmed	0.02	0.00	0.09	0.57	0.21	0.08	0.01	0.19	1.62	0.22
feeling lonely	0.01	0.02	0.04	-0.02	**0.88**	0.02	0.00	-0.07	1.02	0.17
feeling helpless	0.06	0.04	0.01	0.17	**0.63**	-0.01	0.04	0.18	1.36	0.25
learning from other people	0.19	0.04	0.11	0.08	0.03	0.52	0.06	0.03	1.49	0.36
loving somebody	0.10	0.05	0.21	0.07	0.22	0.40	-0.18	-0.08	3.11	0.30

Note:
Factor loadings with absolute values >0.60 are in bold.

Table 10: Study 2, factor solution suggested by minimizing BIC: Variance accounted for.

	MR2	MR3	MR4	MR1	MR5	MR6	MR7	MR8
SS loadings	4.55	2.91	2.55	2.29	1.90	0.94	0.28	0.18
Proportion Var	0.23	0.15	0.13	0.11	0.09	0.05	0.01	0.01
Cumulative Var	0.23	0.37	0.50	0.61	0.71	0.76	0.77	0.78
Proportion Explained	0.29	0.19	0.16	0.15	0.12	0.06	0.02	0.01
Cumulative Proportion	0.29	0.48	0.64	0.79	0.91	0.97	0.99	1.00

We consider the first of these factors ("MR2") to resonate with the construct we have called *cognition and control*, the second ("MR3") to resonate with the construct we have called *bodily sensations*, the third ("MR4") to resonate with the construct we have called *social connection*, and the fourth and fifth ("MR1" and "MR5") to resonate with the construct we have called *negative affect*. The sixth factor ("MR6") appears to pick out capacities particularly relevant to social interaction (e.g., social learning, love). We have no strong intuitions about how to interpret the seventh and eighth factors ("MR7" and "MR8").

1.2.1.3 Weisman et al.'s (2017) factor retention criteria

Weisman et al.'s (2017) factor retention criteria suggested retaining 4 factors—i.e., the same 4-factor solution suggested by parallel analysis. (See Supplementary Tables 7 and 8.)

1.2.2 Capacity ratings: Developmental trajectories

Our primary goal in Study 2 was to chart perceptions of the development of mental life over the first five years. As described in the main text, we preregistered two hypotheses about the perceived developmental trajectories we anticipated to observe in Study 2:

(1) We predicted that, on average, participants' perception of children's mental capacities would increase as a function of the target child's age, with participants generally attributing more and greater abilities to older children.
(2) We predicted that, in the domains of *cognition and control* and *social connection*, participants would perceive relatively more dramatic developmental changes extending later into childhood (i.e., lower intercepts and steeper slopes), whereas in the domains of *bodily sensations* and *negative affect* participants would perceive relatively smaller changes across development (i.e., higher intercepts and shallower slopes).

To test these hypotheses, we conducted a multilevel beta regression via a generalized additive model, regressing item-level responses onto the domain (i.e., which of the four "factors" this capacity was selected to represented) and a spline-based smooth of the target age of the child fitted separately for each domain, including the maximal random effects structure that would allow the model to converge. Using the "mgcv" package for R,[7] we specified this model as follows: gamm(response ~ s(target age in years, by = domain) + domain, random = list(subject ID = ~1, capacity = ~1). Attempting to model random slopes for domain or for target age resulted in model convergence problems. Responses were rescaled to range from 0.005 to 0.995 in order to satisfy the constraints of the beta distribution. Domain was dummy-coded with *cognition and control* as the baseline. The full results of this model are presented in Supplementary Tables 11 and 12; see Figure 2, Panel A (main text) for a visualization of these perceived trajectories.

In brief, we view these results as confirming our hypotheses that US adults would rate older children as more capable across the board, but that perceptions of the development of children's capacities would differ across domains. (See main text for extended interpretation.)

Table 11: Study 2, GAM results: Parametric coefficients (fixed effects).

Parameter	Coefficient (log-odds)	95% CI	SE	z	p
Cognition and control (intercept)	-1.26	[-1.41, -1.11]	0.08	-16.41	<0.001
Bodily sensations vs. Cognition and control	4.82	[4.72, 4.93]	0.05	90.92	<0.001
Negative affect vs. Cognition and control	3.05	[2.96, 3.15]	0.05	61.04	<0.001
Social connection vs. Cognition and control	3.13	[3.03, 3.23]	0.05	62.74	<0.001

Table 12: Study 2, GAM results: Approximate significance of smooth terms.

Parameter	z	Estimated df	p
Target year: Bodily sensations	364.84	6.07	<0.001
Target year: Negative affect	1535.93	7.70	<0.001
Target year: Social connection	2351.32	8.63	<0.001
Target year: Cognition and control	3396.88	8.13	<0.001

1.3 Study 3

As described in the main text, Study 3 was designed with two goals in mind: First, we aimed to provide a more direct assessment of the differences in perceived developmental trajectories surfaced by Study 2. Second, we aimed to probe the lay theories that might underlie the differentiation of the four factors surfaced by Studies 1-2 and the perceived developmental trajectories surfaced by Study 2 (and the current study).

In the main text, we presented the results of a generalized additive model (GAM) predicting participants' capacity ratings as a function of target age, domain, and interactions between them; briefly described the dimensionality reduction analyses we used to group developmental mechanisms into two types ("intrinsic" and "extrinsic"); presented the results of a multilevel linear regression model predicting participants' ratings of developmental mechanisms as a function of mechanism type, domain, and an interaction between them; briefly mentioned additional models of each domain separately; and provided visualizations of participants' selections of the "most important" mechanism for each capacity, by domain. Here, we present the full results

of all of these models, as well as the results of a multilevel logistic regression model of the selection of "most important" mechanism.

1.3.1 Capacity ratings: Developmental trajectories

We preregistered two hypotheses about the perceived developmental trajectories we anticipated to observe in Study 3 (identical to our hypotheses for Study 2):

(1) We predicted that, on average, participants' perception of children's mental capacities would increase as a function of the target child's age, with participants generally attributing more and greater abilities to older children.
(2) We predicted that, in the domains of *cognition and control* and *social connection*, participants would perceive relatively more dramatic developmental changes extending later into childhood (i.e., lower intercepts and steeper slopes), whereas in the domains of *bodily sensations* and *negative affect* participants would perceive relatively smaller changes across development (i.e., higher intercepts and shallower slopes).

Following Study 2, to test these hypotheses we conducted a multilevel beta regression via a generalized additive model, regressing item-level responses onto the domain and a spline-based smooth of the target age of the child fitted separately for each domain, including the maximal random effects structure that would allow the model to converge. Using the "mgcv" package for R,[7] we specified this model as follows: gamm(responses ~ s(target age in years, by = domain) + domain, random = list(subject ID = ~1, capacity = ~1). Again, attempting to model random slopes for domain or for target age resulted in model convergence problems. Again, responses were rescaled to range from 0.005 to 0.995, and domain was dummy-coded with *cognition and control* as the baseline. The full results of this model are presented in Supplementary Tables 13 and 14; see Figure 2, Panel B (main text) for a visualization of these perceived trajectories.

In brief, we view these results as confirming our hypotheses that US adults would rate older children as more capable across the board, but that perceptions of the development of children's capacities would differ across domains. (See main text for extended interpretation.)

Table 13: Study 3, GAM results: Parametric coefficients (fixed effects).

Parameter	Coefficient (log-odds)	95% CI	SE	z	p
Cognition and control (intercept)	-1.46	[-1.64, -1.28]	0.09	-15.69	<0.001
Bodily sensations vs. Cognition and control	6.00	[5.78, 6.22]	0.11	52.73	<0.001
Negative affect vs. Cognition and control	3.49	[3.27, 3.70]	0.11	32.18	<0.001
Social connection vs. Cognition and control	3.15	[2.94, 3.36]	0.11	29.28	<0.001

Table 14: Study 3, GAM results: Approximate significance of smooth terms.

Parameter	z	Estimated df	p
Target year: Bodily sensations	175.99	8.13	<0.001
Target year: Negative affect	748.53	8.35	<0.001
Target year: Social connection	1744.70	8.85	<0.001
Target year: Cognition and control	1782.20	8.45	<0.001

1.3.2 Developmental mechanisms: Ratings

As a first step in assessing the lay theories underlying these perceptions of the development of human mental life, we asked participants to assess the importance of a variety of possible developmental mechanisms for each of the capacities included in this study. We assessed a wide range of potential developmental mechanisms

for children's capacities. We applied a variety of dimensionality reduction approaches in order to sort these developmental mechanisms into meaningful categories, and then modeled participants' ratings of the importance of these mechanism as a function of domain (*bodily sensations*, *negative affect*, *social connection*, and *cognition and control*).

1.3.2.1 Dimensionality reduction Here we present two dimensionality reduction approaches: EFA via parallel analysis (analogous to the EFAs of mental capacity attributions from Studies 1-2) and hierarchical clustering.

1.3.2.1.1 EFA (via parallel analysis) Parallel analysis suggested retaining 4 factors, which we labeled *extrinsic (passive)*, *extrinsic (active)*, *intrinsic (after birth)*, and *intrinsic (before birth)*. Factor loadings, item complexity, and uniqueness are shown in Supplementary Table 15; the amount of total and shared variance accounted for by these factors is shown in Supplementary Table 16.

Table 15: Study 3, factor solution suggested by parallel analysis: Factor loadings, complexity, and uniqueness.

Capacity	Extrinsic (passive)	Extrinsic (active)	Intrinsic (after birth)	Intrinsic (before birth)	Complexity	Uniqueness
observes people	**0.98**	-0.01	-0.02	0.03	1.00	0.07
interacts people	**0.89**	0.08	-0.02	-0.01	1.02	0.13
observes objects	**0.63**	0.00	0.32	0.01	1.48	0.28
people teach	-0.03	**0.95**	-0.03	0.01	1.00	0.15
experiments	0.14	**0.65**	0.14	0.00	1.20	0.29
senses improve	0.10	0.02	**0.73**	0.01	1.04	0.35
body grows	-0.12	0.12	0.57	0.27	1.64	0.47
brain changes	0.24	0.14	0.46	-0.16	2.00	0.52
womb experiences	0.06	0.02	0.00	**0.82**	1.01	0.33
preprogrammed	-0.19	-0.28	0.12	0.37	2.64	0.67

Note:
Factor loadings with absolute values >0.60 are in bold.

Table 16: Study 3, factor solution suggested by parallel analysis: Variance accounted for.

	Extrinsic (passive)	Extrinsic (active)	Intrinsic (after birth)	Intrinsic (before birth)
SS loadings	2.60	1.68	1.50	0.97
Proportion Var	0.26	0.17	0.15	0.10
Cumulative Var	0.26	0.43	0.58	0.68
Proportion Explained	0.39	0.25	0.22	0.14
Cumulative Proportion	0.39	0.63	0.86	1.00

1.3.2.1.2 Hierarchical clustering In addition to the EFA just described, we also conducted a hierarchical cluster analysis, using Euclidean distance and Ward's agglomeration method. The resulting dendrogram is presented in Supplementary Figure 2. We view this as providing further support for the idea that these mechanisms can be sorted into two high-level categories: "extrinsic" mechanisms (left) and "intrinsic" mechanisms (right).

1.3.2.2 Regression models To assess which developmental mechanisms were considered to be the most or least important in the development of each of the individual mental capacities included in this study (*bodily sensations*, *negative affect*, *social connection*, and *cognition and control*), we conducted a multilevel linear regression regressing responses to this question onto type of developmental mechanism (extrinsic vs. intrinsic), domain, and an interaction between them, including the maximal random effects structure that allowed the

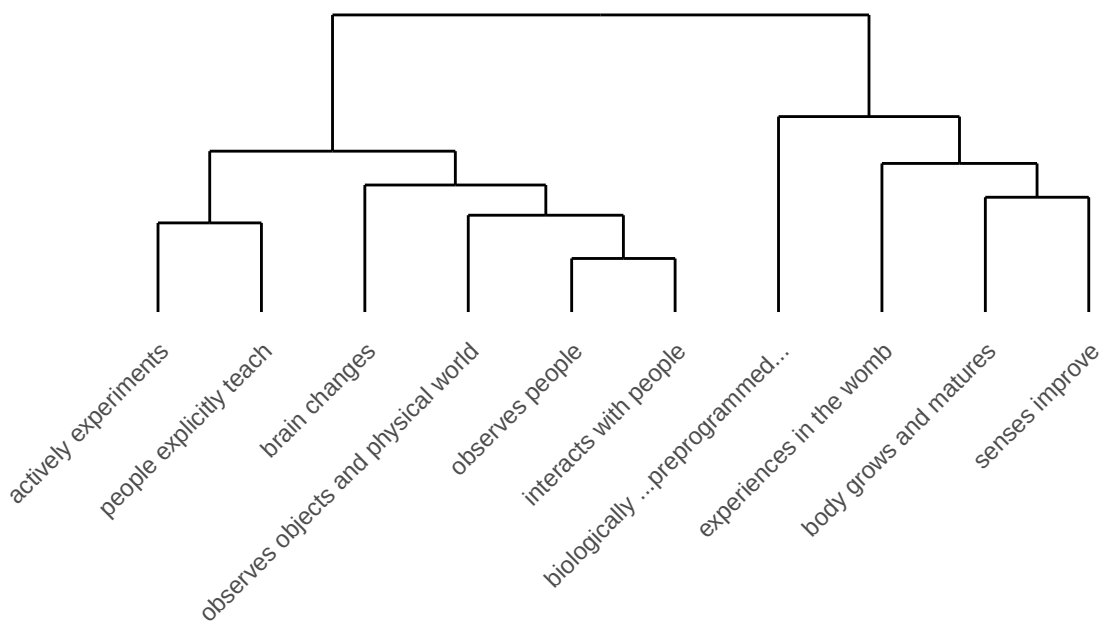

Figure 2: Hierarchical cluster analysis of importance ratings of developmental mechanisms (Study 3).

model to converge. Using the "lme4" package for R,[8] we specified this model as follows: lmer(response ~ mechanism type * domain + (1 + mechanism type + domain | participant) + (1 | developmental mechanism) + (1 | capacity). We also conducted separate, analogous regression analyses for each domain separately. In these analyses, mechanism type and domain were effect-coded for comparisons to the grand mean collapsing across mechanism types and domains. (Note that these analyses omitted the mechanism "the child's brain changes […]", because it was the only mechanism that was difficult to classify as either intrinsic or extrinsic via EFA and clustering analyses; see previous section.)

The full results of these models are presented in Supplementary Tables 17 (all domains), 18 (*bodily sensations*), 19 (*negative affect*), 20 (*social connection*), and 21 (*cognition and control*); see also Figure 3 (main text).

1.3.2.2.1 All domains In brief, this analysis suggested that, collapsing across domains, intrinsic and extrinsic mechanisms were rated as equally important, but that the difference between intrinsic and extrinsic mechanisms varied across domains (see interaction terms).

Table 17: Study 3, multilevel linear model results (all domains): Fixed effects.

Parameter	Coefficient	95% CI	SE	t	df	p
Grand mean (GM) (intercept)	-0.01	[-0.24, 0.21]	0.12	-0.12	21646	0.902
Mechanism type	0.13	[-0.07, 0.33]	0.10	1.24	21646	0.215
Bodily sensations (vs. GM)	-0.26	[-0.43, -0.10]	0.09	-3.11	21646	0.002
Social connection (vs. GM)	0.26	[0.10, 0.43]	0.08	3.12	21646	0.002
Cognition and control (vs. GM)	0.11	[-0.06, 0.27]	0.08	1.28	21646	0.199
Mechanism type x Bodily sensations (vs. GM)	-0.50	[-0.52, -0.48]	0.01	-59.06	21646	<0.001
Mechanism type x Social connection (vs. GM)	0.16	[0.14, 0.18]	0.01	19.04	21646	<0.001
Mechanism type x Cognition and control (vs. GM)	0.40	[0.38, 0.41]	0.01	46.60	21646	<0.001

1.3.2.2.2 Bodily sensations For capacities in the domain of *bodily sensations*, this analysis suggested that participants rated intrinsic mechanisms as more important drivers of development than extrinsic mechanisms; see also Figure 3, panels A-B (main text).

Table 18: Study 3, multilevel linear model results (bodily sensations): Fixed effects.

Parameter	Coefficient	95% CI	SE	t	df	p
Grand mean (GM) (intercept)	0.04	[-0.24, 0.32]	0.14	0.28	5410	0.781
Mechanism type	-0.36	[-0.63, -0.08]	0.14	-2.57	5410	0.010

1.3.2.2.3 Negative affect For capacities in the domain of *negative affect*, this analysis suggested that participants rated intrinsic and extrinsic mechanisms as equally important drivers of development; see also Figure 3, panels A-B (main text).

Table 19: Study 3, multilevel linear model results (negative affect): Fixed effects.

Parameter	Coefficient	95% CI	SE	t	df	p
Grand mean (GM) (intercept)	-0.01	[-0.28, 0.26]	0.14	-0.06	5410	0.952
Mechanism type	0.07	[-0.19, 0.34]	0.14	0.55	5410	0.584

1.3.2.2.4 Social connection For capacities in the domain of *social connection*, this analysis suggested that participants rated extrinsic mechanisms as more important drivers of development than intrinsic mechanisms; see also Figure 3, panels A-B (main text).

Table 20: Study 3, multilevel linear model results (social connection): Fixed effects.

Parameter	Coefficient	95% CI	SE	t	df	p
Grand mean (GM) (intercept)	-0.03	[-0.48, 0.41]	0.23	-0.15	5410	0.881
Mechanism type	0.31	[0.06, 0.56]	0.13	2.40	5410	0.016

1.3.2.2.5 Cognition and control For capacities in the domain of *cognition and control*, this analysis suggested that participants rated extrinsic mechanisms as much more important drivers of development than intrinsic mechanisms; see also Figure 3, panels A-B (main text).

Table 21: Study 3, multilevel linear model results (cognition and control): Fixed effects.

Parameter	Coefficient	95% CI	SE	t	df	p
Grand mean (GM) (intercept)	-0.06	[-0.32, 0.20]	0.13	-0.46	5410	0.642
Mechanism type	0.56	[0.35, 0.76]	0.11	5.27	5410	<0.001

1.3.3 Developmental mechanisms: Selection of "most important"

As described in the main text, we also assessed participants' responses to forced-choice questions about the "most important" factor driving the development of each of these capacities. In the main text, we presented a visualization of these choices (Figure 3, Panel C). Here, we present multilevel generalized linear model (logistic regressions) to predict the likelihood of selecting extrinsic vs. intrinsic mechanisms by domain. Using the "lme4" package for R,[8] we specified this model as follows: glmer(choice of extrinsic mechanism ~ domain + (1 | participant) + (1 | capacity). We also conducted separate, analogous regression analyses

for each domain separately. In these analyses, domain was effect-coded for comparisons to the grand mean collapsing across domains. (As in the previous section, these analyses omitted the mechanism "the child's brain changes […]", because it was the only mechanism that was difficult to classify as either intrinsic or extrinsic via EFA and clustering analyses.)

The full results of these models are presented in Supplementary Tables 22 (all domains), 23 (*bodily sensations*), 24 (*negative affect*), 25 (*social connection*), and 26 (*cognition and control*); see also Figure 3 (main text).

1.3.3.0.1 All domains This analysis suggested that participants' choice of extrinsic vs. intrinsic mechanisms as the "most important" driver of development varied by domain (see interaction terms).

Table 22: Study 3, multilevel generalized linear model results (all domains): Fixed effects.

Parameter	Coefficient (log-odds)	95% CI	SE	z	p
Grand mean (GM) (intercept)	-0.69	[-1.22, -0.17]	0.27	-2.59	0.010
Bodily sensations (vs. GM)	-3.73	[-4.65, -2.81]	0.47	-7.92	<0.001
Social connection (vs. GM)	1.23	[0.39, 2.07]	0.43	2.86	0.004
Cognition and control (vs. GM)	2.70	[1.83, 3.57]	0.44	6.10	<0.001

1.3.3.0.2 Bodily sensastions For capacities in the domain of *bodily sensations*, this analysis suggested that participants were much more likely to select intrinsic mechanisms than extrinsic mechanisms as the most important drivers of development; see also Figure 3, panel C (main text).

Table 23: Study 3, multilevel generalized linear model results (bodily sensations): Fixed effects.

Parameter	Coefficient (log-odds)	95% CI	SE	z	p
Grand mean (GM) (intercept)	-9.07	[-10.51, -7.62]	0.74	-12.31	<0.001

1.3.3.0.3 Negative affect For capacities in the domain of *negative affect*, this analysis suggested that participants were equally likely to select intrinsic and extrinsic mechanisms as the most important drivers of development; see also Figure 3, panel C (main text).

Table 24: Study 3, multilevel generalized linear model results (negative affect): Fixed effects.

Parameter	Coefficient (log-odds)	95% CI	SE	z	p
Grand mean (GM) (intercept)	-0.8	[-2.03, 0.43]	0.63	-1.28	0.200

1.3.3.0.4 Social connection For capacities in the domain of *social connection*, this analysis suggested that participants were equally likely to select intrinsic and extrinsic mechanisms as the most important drivers of development; see also Figure 3, panel C (main text).

Table 25: Study 3, multilevel generalized linear model results (social connection): Fixed effects.

Parameter	Coefficient (log-odds)	95% CI	SE	z	p
Grand mean (GM) (intercept)	0.52	[-0.78, 1.83]	0.67	0.78	0.434

1.3.3.0.5 Cognition and control For capacities in the domain of *cognition and control*, this analysis suggested that participants were much more likely to select extrinsic mechanisms than intrinsic mechanisms as the most important drivers of development; see also Figure 3, panel C (main text).

Table 26: Study 3, multilevel generalized linear model results (cognition and control): Fixed effects.

Parameter	Coefficient (log-odds)	95% CI	SE	z	p
Grand mean (GM) (intercept)	8.36	[6.73, 10.00]	0.83	10.03	<0.001

2 Selection of capacities: Comparison to previous studies

Supplementary Table 1 provides an item-by-item comparison of the capacities included in this study to capacities included in previous studies of mind perception.[1–4]

Current studies	Previous studies				
Study 1	Weisman et al. (2017a)	Weisman et al. (2017b)	Gray et al. (2007)	Malle (2019, Study 1)	Malle (2019, Study 2)
Bodily sensations					
getting hungry*†	getting hungry	get hungry	hunger	can feel hunger	being hungry
feeling pain*†	experiencing pain	feel pain	pain	can be in physical pain	feeling pain
feeling tired*	feeling tired	feel tired	-	has a need for sleep	-
feeling thirsty	-	-	-	-	can feel thirsty
feeling too hot or too cold	-	-	-	-	-
feeling physically uncomfortable*	-	-	-	-	-
hearing sounds*	detecting sounds	hear sounds	-	[similar to "can see or hear things"]	[similar to "seeing and hearing the world around them"]
being comforted by physical touch	-	-	-	-	-
feeling distressed*†	-	-	-	-	-
seeing	seeing things	see things	-	[similar to "can see or hear things"]	[similar to "seeing and hearing the world around them"]
feeling calm	feeling calm	feel calm	-	-	-
Negative affect					
feeling helpless*†	-	-	-	-	-
feeling overwhelmed*	-	-	-	-	-
feeling frustrated*	-	-	-	-	-
feeling annoyed	-	-	-	-	-
feeling neglected	-	-	-	-	-
Social connection					
feeling excited*	-	-	-	-	-
finding something funny*	-	-	-	-	-
loving somebody*	-	-	-	-	loving specific people
learning from other people*†	-	-	-	-	[similar to "learning by imitation"]

(continued)

Study 1	Weisman et al. (2017a)	Weisman et al. (2017b)	Gray et al. (2007)	Malle (2019, Study 1)	Malle (2019, Study 2)
feeling happy*†	feeling happy	feel happy	[similar to "joy"]	-	feeling happy
feeling loved	feeling love	feel love	-	-	-
recognizing somebody else	recognizing someone	recognize somebody else	-	-	-
getting pleasure from music	-	-	-	-	-
being afraid of somebody	-	-	-	-	[similar to "disliking people"]
listening to somebody	-	-	-	-	-
having thoughts	having thoughts	have thoughts	thought	-	-
feeling sad	[similar to "feeling depressed"]	feel sad	-	-	-
feeling safe	feeling safe	feel safe	-	-	-
feeling textures (for example, smooth, rough)	-	-	-	-	-
getting angry	getting angry	get angry	rage	can be angry	getting angry
feeling pleasure	experiencing pleasure	feel pleasure	pleasure	can experience pleasure	feeling pleasure
being angry at somebody	-	-	-	-	[similar to "disliking people"]
feeling lonely*	-	-	-	-	-
feeling bored	-	-	-	-	-
feeling confused	-	-	-	-	-
feeling scared	experiencing fear	feel scared	fear	-	-
being aware of things	[similar to "being conscious"]	be aware of things	[similar to "consciousness"]	[similar to "can perceive things"]	-
Cognition and control					
planning*	[similar to "working toward a goal"]	[similar to "have goals"]	planning	can plan for the future	planning for the future
having self-control*	[similar to "exercising self-restraint"]	have self-control	self-control	can exercise self-control	excersing self-control
thinking before they act	-	-	-	can deliberate	deliberating before acting
having goals	working toward a goal	have goals	[similar to "planning"]	-	setting goals
reasoning about things*†	reasoning about things	[similar to "figure out how to do things"]	-	can reason logically	reasoning logically
controlling their emotions*†	-	-	-	-	-
telling right from wrong*	telling right from wrong	[similar to "know what's nice and what's mean"]	morality	[similar to "may deserve praise or blame" and "may deserve punishment"]	[similar to "upholding moral values"]
understanding what somebody else is thinking	-	-	-	-	understanding others' minds
focusing on a goal	-	-	-	-	-
feeling guilty	experiencing guilt	feel guilty	-	[similar to "can feel shame or pride"]	-

(continued)

Study 1	Weisman et al. (2017a)	Weisman et al. (2017b)	Gray et al. (2007)	Malle (2019, Study 1)	Malle (2019, Study 2)
feeling embarrassed	feeling embarrassed	feel embarrassed	embarrassment	[similar to "can feel shame or pride"]	-
feeling pride	experiencing pride	feel proud	pride	can feel shame or pride	-
making choices	making choices	make choices	-	can choose freely	-
calming themselves down	-	-	-	-	-
detecting danger	-	-	-	-	-
feeling hopeless	-	-	-	-	-
remembering things	remembering things	remember things	memory	can remember things	-
imagining things	-	-	-	can vividly imagine things	vividly imagining things
recognizing others' emotions	understanding how others are feeling	understand how somebody else is feeling	emotion recognition	[similar to "can have empathy for others"]	[similar to "feeling compassion"]
feeling worried	-	-	-	-	-
getting hurt feelings	[similar to "feeling disrespected"]	get hurt feelings	-	-	-
having wants and desires	having desires	have desires	desire	can want certain things	having desires
Not included					
-	being conscious	-	consciousness	-	-
-	being self-aware	be aware of itself	-	-	-
-	communicating with others	communicate with somebody else	communication	can communicate with others	communicating verbally
-	detecting odors	-	-	-	-
-	doing computations	-	-	-	-
-	exercising self-restraint	-	-	-	-
-	experiencing joy	feel joy	joy	can feel joy	-
-	feeling depressed	-	-	-	-
-	feeling disrespected	-	-	-	-
-	feeling nauseated	-	-	-	-
-	having a personality	have a personality	personality	-	-
-	having free will	-	-	-	-
-	having intentions	-	-	-	-
-	holding beliefs	-	-	can believe certain things	-
-	perceiving depth	-	-	-	-
-	sensing temperatures	sense temperatures	-	-	-
-	-	decide what to do	-	-	-
-	-	do math	-	-	-
-	-	feel sick	-	-	-

(continued)

Study 1	Weisman et al. (2017a)	Weisman et al. (2017b)	Gray et al. (2007)	Malle (2019, Study 1)	Malle (2019, Study 2)
-	-	figure out how to do things	-	-	-
-	-	have beliefs	-	-	-
-	-	know what's nice and what's mean	-	-	-
-	-	make plans	-	-	-
-	-	sense whether someting is close by or far away	-	-	-
-	-	smell things	-	can taste or smell things	can taste or smell things
-	-	-	-	can have empathy for others	-
-	-	-	-	can have values	upholding moral values
-	-	-	-	can imitate others	-
-	-	-	-	can know certain things	-
-	-	-	-	can perceive things	-
-	-	-	-	has moral obligations	-
-	-	-	-	may deserve praise or blame	-
-	-	-	-	may deserve punishment	-
-	-	-	-	-	communicating non-verbally
-	-	-	-	-	disapproving of immoral actions
-	-	-	-	-	disliking people
-	-	-	-	-	explaining their decisions to others
-	-	-	-	-	feeling compassion
-	-	-	-	-	feeling gratitude
-	-	-	-	-	feeling panic
-	-	-	-	-	feeling sexual arousal
-	-	-	-	-	feeling stress
-	-	-	-	-	feeling temperature, touch, etc.
-	-	-	-	-	following norms
-	-	-	-	-	having emotions
-	-	-	-	-	having intense urges
-	-	-	-	-	inferring what a person is thinking

(continued)

Study 1	Weisman et al. (2017a)	Weisman et al. (2017b)	Gray et al. (2007)	Malle (2019, Study 1)	Malle (2019, Study 2)
-	-	-	-	-	learning by imitation
-	-	-	-	-	moving on their own
-	-	-	-	-	praising moral actions
-	-	-	-	-	providing reasons for their actions
-	-	-	-	-	taking a person's visual point of view
-	-	-	-	-	understanding a person's goals

Notes: * Also used in Study 2; † Also unsed in Study 3

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