

LINKS BETWEEN P AND G FACTORS

Table S1

Description, Sample Items, and Item Reliability for Cognitive and Psychomotor Measures in the Texas “Tiny” Twin Project

Domain	Description	Sample Items - TXtT	Reliability -TXtT	Task Description -ECLS-B	Reliability-ECLS-B
Communication /Oral Language	Expressive and receptive languages/Ability to construct grammatically correct story	<i>Does your baby make sounds like "da," "ga," "ka," and "ba"?</i> – For children aged 5-10 months <i>Does your child use endings of words, such as "-s," "-ed," and "-ing"?</i> For example, <i>does your child say things like, "I see two cats," "I am playing," or "I kicked the ball"?</i> – For children aged 39-56 months	.99 ^a (55 items)	Child was told a story by a trained coder using a series of pictures and subsequently asked to retell the story	N/A (1 score)
Gross Motor	Coordination of large muscle groups	<i>While your baby is on his back, does s/he wave his/her arms and legs, wiggle, and squirm?</i> – For children aged 1-2 months <i>Does your child skip using alternating feet?</i> – For children aged 57-71 months	.99 ^a (47 items)	Child caught a bean bag, balance on one foot (right and left; 10 seconds), hop on one foot (right and left; 5 hops), skip, and walk backwards	.75 (7 items) ^b
Fine Motor	Coordination of small muscle groups	<i>Does your baby grab or scratch his/her fingers on a surface in front of him/her, either while being held in a sitting position or when s/he is on his/her tummy?</i> – For children aged 3-4 months <i>Using child-safe scissors, does your child cut a paper in half on a more or less straight line, making the blades go up and down?</i> – For children aged 45-50 months	.98 ^a (50 items)	Child instructed to replicate a drawing of a square, triangle, and asterisk Child asked to build a gate using five wooden blocks	.72 (4 items) ^b

LINKS BETWEEN *P* AND *G* FACTORS

40

Problem -Solving/Math	Learning and using logic and rules to solve problems	<i>After watching you hide a small toy under a piece of paper or cloth, does your baby find it? (Be sure the toy is completely hidden.)</i> – For children aged 9-14 months <i>After a crumb or Cheerio is dropped into a small, clear bottle, does your child turn the bottle upside down to dump out the crumb or Cheerio? (Do not show him/her how.) (You can use a soda-pop bottle or a baby bottle.)</i> – For children aged 21-25 months	.98 ^a (53 items)	Items measured number sense, operations, probability, geometry, and pattern recognition	.89 (45 items; wave 3) .92 (58 items; waves 4 and 5) ^a
Personal -Social	Self-awareness, self-care, and everyday function	<i>When in front of a large mirror, does your baby reach out to pat the mirror?</i> – For children aged 5-8 months <i>Does your child dress or undress him- or her- self without help (except for snaps, buttons, and zippers)?</i> – For children aged 45-50 months	.98 ^a (52 items)	N/A	N/A
Reading	Receptive language, vocabulary, literacy	N/A	N/A	Recognition of simple words, word matching, providing an initial assessment of the story the child read	.84 (85 items; wave 3) .92 (85 items; waves 4 and 5) ^a

Note. ^a 1PL IRT item reliability estimate, with number of items analyzed followed in parentheses. ^b Reliability estimate obtained using

Cronbach's alpha.

LINKS BETWEEN P AND G FACTORS

Table S2
Description, Sample Items, and Item Reliability for Psychopathology in the Texas “Tiny” Twin Project

Domain	Description	Sample Items - TXtT	Item Reliability - TXtT	Sample Items – ECLS-B	Item Reliability- ECLS-B
Self-Regulation Problems	Problems with intrapersonal and interpersonal functioning, including affect regulation and social interaction	<i>When upset, can your child calm down within a half hour?</i> – For children aged 3-13 months <i>Can your child move from one activity to the next with little difficulty, such as from playtime to mealtime?</i> – For children aged 42-53 months	.84 ^a (77 items)	N/A	N/A
Attention-deficit/Hyperactivity	Attentional and regulatory problems	N/A	N/A	<i>My child pays attention well.</i> <i>My child is overly active or unable to sit still.</i>	.66 ^b (3 items)
Internalizing ^c	Problem behaviors that are directed inward or at self	<i>Sudden changes in mood or feelings;</i> <i>Too fearful or anxious</i> <i>Shows little interest in things around him/her</i>	.78 ^b (36 items)	<i>My child seems unhappy.</i> <i>My child worries about things.</i>	.47 ^b (2 items)

LINKS BETWEEN *P* AND *G* FACTORS

42

Externalizing ^c	Problem behaviors that are directed outward or potentially affect others in the child's environment	<i>Disobedient;</i> <i>Easily frustrated</i>	.88 ^b (24 items)	<i>My child gets angry.</i> <i>My child is physically aggressive, for example, hits, kicks, or pushes.</i>	.79 ^b (5 items)
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Note. ^a 1PL Item Response Theory (IRT) item reliability estimate scaled to the minimum number of items administered using the Spearman Brown formula, with number of items analyzed followed in parentheses. ^b Reliability obtained using Cronbach's alpha. ^c All items on the Child Behavior Checklist are appropriate for children aged 1.5-5 years.

LINKS BETWEEN *P* AND *G* FACTORS

Table S3
Model Fit Indices and Comparisons

Model	AIC	BIC	RMSEA	CFI	Model Fit Comparisons
Model 1: sample-specific <i>ACE</i> correlations and <i>ACE</i> loadings	72124.73	72663.70	.029	.978	Model 1 vs. 2: $\Delta\chi^2(3) = 1.86, p = .602$
Model 2: sample-specific <i>ACE</i> loadings; averaged <i>ACE</i> correlations	72122.31	72644.44	.029	.979	Model 2 vs. 3a: $\Delta\chi^2(3) = 10.75, p = .013$ Model 2 vs. 3b: $\Delta\chi^2(3) = 14.78, p = .002$
Model 3a: sample-specific <i>g</i> <i>ACE</i> loadings; averaged <i>ACE</i> correlations and <i>p</i> <i>ACE</i> loadings	72149.22	72654.50	.030	.977	Model 1 vs. 3a: $\Delta\chi^2(6) = 14.67, p = .022$
Model 3b: sample-specific <i>p</i> <i>ACE</i> loadings; averaged <i>ACE</i> correlations and <i>g</i> <i>ACE</i> loadings	72162.06	72667.35	.031	.976	Model 1 vs. 3b: $\Delta\chi^2(6) = 19.69, p = .003$

Note. Models differed only with respect to *p*- and *g*-factor *ACE* estimates and correlations. Indicator level *ACE*

estimates and indicator intercepts were always freely estimated within each sample (ECLS-B and TXtT).

Models were compared using Satorra-Bentler scaled chi-square difference tests. Model 2 is highlighted in **bold**

as it was the preferred model across AIC, BIC, and chi-square difference tests.

LINKS BETWEEN *P* AND *G* FACTORS

44

Table S4

Unstandardized Parameter Estimates from Age Moderation Models

Parameter	Centered at 3 years	Centered at 6 years
<i>p</i>-Factor		
ECLS-B		
Genetic Main Effect (a_p)	.79 (.08)***	.77 (.09)***
Gene \times Age Interaction (a_p')	.01 (.04)	.08 (.11)
Shared Environment (c_p)	.01 (.14)	.29 (.19)
Shared Environment \times Age Interaction (c_p')	.05 (.08)	-.09 (.15)
Non-shared Environment (e_p)	.53 (.11)***	.40 (.09)***
Non-shared Environment \times Age Interaction (e_p')	-.04 (.05)	-.07 (.06)
TXtT		
Genetic Main Effect (a_p)	.55 (.09)***	.69 (.25)**
Gene \times Age Interaction (a_p')	.03 (.06)	.02 (.10)
Shared Environment (c_p)	.54 (.09)***	.76 (.45)
Shared Environment \times Age Interaction (c_p')	.08 (.07)	.10 (.19)
Non-shared Environment (e_p)	.19 (.06)**	.25 (.14)
Non-shared Environment \times Age Interaction (e_p')	.03 (.04)	.03 (.04)
<i>g</i>-Factor		
ECLS-B		
Genetic Effect (a_g)	.29 (.09)**	.69 (.06)***
Gene \times Age Interaction (a_g')	.13 (.04)**	.13 (.05)**
Shared Environment (c_g)	.80 (.08)***	.65 (.08)***
Shared Environment \times Age Interaction (c_g')	-.05 (.04)	-.05 (.05)
Non-shared Environment (e_g)	.22 (.05)***	.19 (.04)***
Non-shared Environment \times Age Interaction (e_g')	-.01 (.03)	-.01 (.03)
TXtT		
Genetic Effect (a_g)	.39 (.08)***	1.12 (.25)***
Gene \times Age Interaction (a_g')	.23 (.08)**	.24 (.07)**
Shared Environment (c_g)	.47 (.12)***	-.05 (.47)
Shared Environment \times Age Interaction (c_g')	-.10 (.08)	.13 (.11)
Non-shared Environment (e_g)	.16 (.03)***	.05 (.07)
Non-shared Environment \times Age Interaction (e_g')	-.04 (.02)	-.04 (.02)
ACE Correlations		
Genetic (r_A)	-.41 (.19)*	-.31 (.14)*
Age moderation of r_A (r_A')	.09 (.09)	.07 (.07)
Shared Environment (r_C)	-.49 (.22)*	-.23 (.45)
Age moderation of r_C (r_C')	-.27 (.18)	-.12 (.27)
Non-shared Environment (r_E)	-.21 (.18)	-.10 (.21)
Age moderation of r_E (r_E')	.22 (.11)*	.06 (.51)

Note. Parameters reported are unstandardized path estimates. Standard errors are given in parentheses. ACE correlations were constrained to be equal across

LINKS BETWEEN *P* AND *G* FACTORS

45

*studies, while ACE factor loadings and their interaction terms with age were freely estimated within ECLS-B and TXtT. *** significantly different than zero at $p < .001$; ** $p < .01$; * $p < .05$.*