**Supplementary Tables**

**The developmental interplay between the p-factor of psychopathology and the g-factor of intelligence from age 7 through 16 years**

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# Table S1. Representativeness of the analysis sample

Sample at first contact (randomly selecting one twin per pair)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | n | mean | sd | median | min | max | range | skew | kurtosis | se |
| Female parent highest qualification | 12682 | 3.64 | 1.96 | 3 | 1 | 8 | 7 | 0.89 | -0.17 | 0.02 |
| Female parent SOC employment level | 5454 | 4.09 | 2.25 | 4 | 1 | 9 | 8 | 0.46 | -0.70 | 0.03 |
| Female parent is employed | 12850 | 1.29 | 0.69 | 1 | 0 | 2 | 2 | -0.46 | -0.87 | 0.01 |
| Male parent highest qualification | 11375 | 3.92 | 2.22 | 3 | 1 | 8 | 7 | 0.50 | -0.99 | 0.02 |
| Male parent SOC employment level | 10514 | 4.00 | 2.60 | 4 | 1 | 9 | 8 | 0.39 | -1.09 | 0.03 |
| Male parent is employed | 11647 | 0.96 | 0.28 | 1 | 0 | 2 | 2 | -1.35 | 8.75 | 0 |
| Maternal age at first birth | 12692 | 28.91 | 5.10 | 28.94 | 13.13 | 45.45 | 32.32 | 0.02 | -0.31 | 0.05 |
| SES composite | 11843 | 0 | 1 | -0.10 | -2.60 | 2.65 | 5.24 | 0.20 | -0.70 | 0.01 |

Analysis sample – those with cognitive ability data available at age 7 (randomly selecting one twin per pair)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | n | mean | sd | median | min | max | range | skew | kurtosis | se |
| Female parent highest qualification | 5075 | 3.82 | 1.98 | 3 | 1 | 8 | 7 | 0.82 | -0.40 | 0.03 |
| Female parent SOC employment level | 2287 | 3.98 | 2.22 | 4 | 1 | 9 | 8 | 0.47 | -0.69 | 0.05 |
| Female parent is employed | 5130 | 1.31 | 0.67 | 1 | 0 | 2 | 2 | -0.46 | -0.77 | 0.01 |
| Male parent highest qualification | 4635 | 4.06 | 2.25 | 3 | 1 | 8 | 7 | 0.42 | -1.12 | 0.03 |
| Male parent SOC employment level | 4352 | 3.88 | 2.59 | 3 | 1 | 9 | 8 | 0.47 | -1.03 | 0.04 |
| Male parent is employed | 4781 | 0.97 | 0.26 | 1 | 0 | 2 | 2 | -1.48 | 10.62 | 0 |
| Maternal age at first birth | 5090 | 29.16 | 4.98 | 29.13 | 15.22 | 44.46 | 29.24 | 0.01 | -0.19 | 0.07 |
| SES composite | 4842 | 0.08 | 0.99 | 0 | -2.60 | 2.65 | 5.24 | 0.12 | -0.71 | 0.01 |

# Table S2a. Factor loadings and 95% CIs for parent rated p at age 7

|  |  |  |  |
| --- | --- | --- | --- |
|  | estimate | lower bound | upper bound |
| Conduct | 0.54 | 0.52 | 0.56 |
| Prosocial behaviour (R) | 0.35 | 0.33 | 0.38 |
| Hyperactivity | 0.41 | 0.39 | 0.44 |
| Peer problems | 0.68 | 0.66 | 0.70 |
| Anxiety | 0.47 | 0.45 | 0.49 |
| ASD | 0.77 | 0.76 | 0.79 |
| Callous | 0.38 | 0.35 | 0.41 |

Model fit: AIC = 146619.147; BIC = 146764.335; CFI = 0.588; RMSEA = 0.231; SRMR = 0.112

# Table S2b. Factor loadings and 95% Cis for teacher rated p at age 7

|  |  |  |  |
| --- | --- | --- | --- |
|  | estimate | lower bound | upper bound |
| Conduct | 0.58 | 0.56 | 0.59 |
| Prosocial behaviour (R) | 0.88 | 0.87 | 0.89 |
| Hyperactivity | 0.53 | 0.51 | 0.55 |
| Peer problems | 0.50 | 0.48 | 0.52 |
| Anxiety | 0.15 | 0.13 | 0.18 |
| ASD | 0.19 | 0.16 | 0.21 |
| Callous | 0.92 | 0.92 | 0.93 |

Model fit: AIC = 114788.202; BIC = 114928.989; CFI = 0.699; RMSEA = 0.257; SRMR = 0.125

# Table S2c. Factor loadings and 95% Cis for p across raters age 7

|  |  |  |  |
| --- | --- | --- | --- |
|  | estimate | lower bound | upper bound |
| Conduct (P) | 0.43 | 0.40 | 0.45 |
| Prosocial behaviour (R)(P) | 0.34 | 0.31 | 0.36 |
| Hyperactivity (P) | 0.39 | 0.37 | 0.42 |
| Peer problems (P) | 0.39 | 0.36 | 0.41 |
| Anxiety (P) | 0.19 | 0.16 | 0.21 |
| ASD (P) | 0.31 | 0.29 | 0.33 |
| Callous (P) | 0.75 | 0.70 | 0.80 |
| Conduct (T) | 0.67 | 0.65 | 0.70 |
| Prosocial behaviour (R) (T) | 0.83 | 0.80 | 0.86 |
| Hyperactivity (T) | 0.64 | 0.61 | 0.66 |
| Peer problems (T) | 0.62 | 0.59 | 0.64 |
| Anxiety (T) | 0.26 | 0.23 | 0.29 |
| ASD (T) | 0.39 | 0.36 | 0.41 |
| Callous (T) | 0.83 | 0.79 | 0.87 |

Model fit: AIC = 265987.249; BIC = 266278.975; CFI = 0.471; RMSEA =0.176; SRMR = 0.126

# Table S2d. Factor loadings and 95% CIs for g age 7

|  |  |  |  |
| --- | --- | --- | --- |
|  | estimate | lower bound | upper bound |
| Similarities | 0.683 | 0.657 | 0.709 |
| Vocabulary | 0.794 | 0.766 | 0.822 |
| Picture completion | 0.386 | 0.364 | 0.408 |
| Conceptual groupings | 0.291 | 0.255 | 0.328 |

Model fit: AIC = 93629.152; BIC = 93716.156; CFI = 0.999; RMSEA =0.015; SRMR =0.007

# Table S3a. Factor loadings and 95% Cis for parent rated p at age 9

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Prosocial behaviour (R) | 0.362 | 0.328 | 0.396 |
| Hyperactivity | 0.606 | 0.580 | 0.632 |
| Conduct | 0.738 | 0.714 | 0.761 |
| Peer problems | 0.549 | 0.518 | 0.579 |
| Anxiety | 0.483 | 0.452 | 0.514 |
| ASD | 0.639 | 0.612 | 0.667 |
| Aggression | 0.654 | 0.628 | 0.679 |
| Callous | 0.454 | 0.422 | 0.486 |

Model fit: AIC = 68747.068; BIC = 68893.646; CFI = 0.739; RMSEA = 0.170; SRMR = 0.082

# Table S3b. Factor loadings and 95% Cis for teacher rated p at age 9

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Prosocial behaviour (R) | 0.676 | 0.652 | 0.701 |
| Hyperactivity | 0.643 | 0.618 | 0.668 |
| Conduct | 0.743 | 0.718 | 0.768 |
| Peer problems | 0.566 | 0.536 | 0.596 |
| Anxiety | 0.260 | 0.222 | 0.298 |
| ASD | 0.691 | 0.665 | 0.717 |
| Aggression | 0.709 | 0.682 | 0.735 |
| Callous | 0.699 | 0.675 | 0.723 |

Model fit: AIC = 61082.453; BIC = 61224.950; CFI = 0.687 ; RMSEA = 0.257; SRMR = 0.125

# Table S3c. Factor loadings and 95% Cis for self-rated p at age 9

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Prosocial behaviour (R) | 0.244 | 0.205 | 0.283 |
| Hyperactivity | 0.570 | 0.538 | 0.601 |
| Conduct | 0.632 | 0.602 | 0.661 |
| Peer problems | 0.557 | 0.525 | 0.589 |
| Anxiety | 0.588 | 0.557 | 0.618 |
| ASD | 0.643 | 0.614 | 0.673 |

Model fit: AIC = 52519.002; BIC = 52628.838; CFI = 0.851; RMSEA = 0.133; SRMR = 0.058

# Table S3d. Factor loadings and 95% Cis for p across raters age 9

|  |  |  |  |
| --- | --- | --- | --- |
|  | estimate | lower bound | upper bound |
| Prosocial behaviour (R) P | 0.317 | 0.280 | 0.354 |
| Hyperactivity P | 0.592 | 0.558 | 0.627 |
| Conduct P | 0.636 | 0.602 | 0.671 |
| Peer problems P | 0.545 | 0.509 | 0.580 |
| Anxiety P | 0.422 | 0.385 | 0.459 |
| ASD P | 0.571 | 0.536 | 0.606 |
| Aggression P | 0.469 | 0.439 | 0.499 |
| Callous P | 0.413 | 0.376 | 0.449 |
| Prosocial behaviour (R) T | 0.574 | 0.536 | 0.612 |
| Hyperactivity T | 0.512 | 0.421 | 0.603 |
| Conduct T | 0.670 | 0.633 | 0.707 |
| Peer problems T | 0.559 | 0.520 | 0.597 |
| Anxiety T | 0.298 | 0.258 | 0.339 |
| ASD T | 0.651 | 0.614 | 0.688 |
| Aggression T | 0.572 | 0.539 | 0.606 |
| Callous T | 0.618 | 0.581 | 0.656 |
| Prosocial behaviour (R) S | 0.218 | 0.180 | 0.256 |
| Hyperactivity S | 0.441 | 0.405 | 0.477 |
| Conduct S | 0.511 | 0.475 | 0.547 |
| Peer problems S | 0.465 | 0.428 | 0.501 |
| Anxiety S | 0.384 | 0.347 | 0.421 |
| ASD S | 0.463 | 0.426 | 0.500 |

Model fit: AIC = 184949.111; BIC = 185359.924; CFI = 0.517; RMSEA =0.123; SRMR = 0.109

# 

# Table S3e. Factor loadings and 95% CIs for g age 9

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Puzzles | 0.728 | 0.700 | 0.755 |
| Vocabulary | 0.543 | 0.515 | 0.572 |
| Shapes | 0.685 | 0.659 | 0.712 |
| General knowledge | 0.494 | 0.465 | 0.523 |

Model fit: AIC = 69991.131; BIC = 70072.764; CFI = 0.876; RMSEA = 0.217; SRMR = 0.058

# Table S4a. Factor loadings and 95% Cis for parent rated p at age 12

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Prosocial behaviour (R) | 0.350 | 0.325 | 0.375 |
| Hyperactivity | 0.804 | 0.792 | 0.816 |
| Conduct | 0.637 | 0.620 | 0.655 |
| Peer problems | 0.496 | 0.474 | 0.518 |
| Anxiety | 0.448 | 0.425 | 0.471 |
| Mood and feelings | 0.511 | 0.489 | 0.533 |
| ASD | 0.606 | 0.587 | 0.625 |
| ADHD | 0.868 | 0.857 | 0.878 |
| Callous | 0.416 | 0.393 | 0.440 |

Model fit: AIC = 132860.376; BIC = 133041.379; CFI = 0.797; RMSEA = 0.145; SRMR = 0.078

# 

# Table S4b. Factor loadings and 95% Cis for teacher rated p at age 12

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Prosocial behaviour (R) | 0.762 | 0.746 | 0.779 |
| Hyperactivity | 0.656 | 0.636 | 0.676 |
| Conduct | 0.667 | 0.647 | 0.687 |
| Peer problems | 0.478 | 0.452 | 0.503 |
| Anxiety | 0.314 | 0.284 | 0.343 |
| ASD | 0.612 | 0.590 | 0.634 |
| Callous | 0.734 | 0.717 | 0.751 |

Model fit: AIC = 85966.838; BIC = 86102.785; CFI = 0.766 ; RMSEA =0.198; SRMR = 0.092

# Table S4c. Factor loadings and 95% Cis for self-rated p at age 12

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Prosocial behaviour (R) | 0.171 | 0.142 | 0.201 |
| Hyperactivity | 0.522 | 0.498 | 0.546 |
| Conduct | 0.599 | 0.576 | 0.621 |
| Peer problems | 0.565 | 0.544 | 0.587 |
| Anxiety | 0.676 | 0.657 | 0.695 |
| Mood and feelings | 0.762 | 0.744 | 0.779 |

Model fit: AIC = 90495.581; BIC = 90615.274; CFI = 0.823 ; RMSEA = 0.162; SRMR = 0.070

# Table S4d. Factor loadings and 95% Cis for p across raters age 12

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Prosocial behaviour (R) P | 0.366 | 0.338 | 0.394 |
| Hyperactivity P | 0.744 | 0.719 | 0.769 |
| Conduct P | 0.672 | 0.646 | 0.697 |
| Peer problems P | 0.553 | 0.526 | 0.580 |
| Anxiety P | 0.477 | 0.450 | 0.504 |
| Mood and feelings P | 0.553 | 0.527 | 0.580 |
| ASD P | 0.607 | 0.581 | 0.633 |
| ADHD P | 0.798 | 0.774 | 0.823 |
| Callous P | 0.431 | 0.403 | 0.458 |
| Prosocial behaviour (R) T | 0.455 | 0.425 | 0.484 |
| Hyperactivity T | 0.558 | 0.529 | 0.586 |
| Conduct T | 0.536 | 0.507 | 0.564 |
| Peer problems T | 0.428 | 0.399 | 0.458 |
| Anxiety T | 0.338 | 0.307 | 0.368 |
| ASD T | 0.443 | 0.413 | 0.473 |
| Callous T | 0.469 | 0.440 | 0.499 |
| Prosocial behaviour (R) S | 0.207 | 0.178 | 0.235 |
| Hyperactivity S | 0.537 | 0.511 | 0.564 |
| Conduct S | 0.568 | 0.541 | 0.594 |
| Peer problems S | 0.441 | 0.413 | 0.469 |
| Anxiety S | 0.422 | 0.394 | 0.450 |
| Mood and feelings S | 0.471 | 0.444 | 0.499 |

Model fit: AIC = 314490.110; BIC = 314939.866; CFI = 0.536; RMSEA = 0.120; SRMR = 0.109

# Table S4e. Factor loadings and 95% CIs for g age 12

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Raven's marices | 0.598 | 0.574 | 0.622 |
| Picture completion | 0.472 | 0.448 | 0.497 |
| General knowledge | 0.646 | 0.623 | 0.669 |
| Vocabulary | 0.686 | 0.662 | 0.709 |

Model fit: AIC = 96983.210; BIC = 97069.179; CFI = 0.975; RMSEA = 0.085; SRMR = 0.023

# Table S5a. Factor loadings and 95% Cis for parent rated p at age 16

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Hyperactivity | 0.743 | 0.727 | 0.758 |
| Conduct | 0.721 | 0.705 | 0.737 |
| Prosocial behaviour (R) | 0.452 | 0.428 | 0.477 |
| Anxiety | 0.551 | 0.528 | 0.573 |
| Mood and feelings | 0.552 | 0.53 | 0.574 |
| ADHD | 0.799 | 0.786 | 0.813 |
| ASD | 0.476 | 0.452 | 0.5 |
| Emotional liability | 0.722 | 0.706 | 0.738 |
| Callous | 0.587 | 0.566 | 0.607 |

Model fit: AIC = 112475.601**;** BIC = 112651.338**;** CFI = 0.757**;** RMSEA = 0.183**;** SRMR = 0.082

# 

# Table S5b. Factor loadings and 95% Cis for self-rated p at age 16

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Hyperactivity | 0.456 | 0.429 | 0.482 |
| Conduct | 0.43 | 0.402 | 0.457 |
| Prosocial behaviour (R) | 0.14 | 0.109 | 0.172 |
| Anxiety | 0.767 | 0.748 | 0.787 |
| Mood and feelings | 0.804 | 0.786 | 0.822 |
| ASD | 0.397 | 0.369 | 0.425 |

Model fit: AIC = 79154.853; BIC = 79271.920; CFI = 0.777 ; RMSEA = 0.174; SRMR = 0.080

# 

# Table S4c. Factor loadings and 95% Cis for p across raters age 16

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | estimate | lower bound | upper bound |
| Hyperactivity P | 0.727 | 0.702 | 0.753 |
| Conduct P | 0.720 | 0.694 | 0.745 |
| Prosocial behaviour (R) P | 0.454 | 0.426 | 0.482 |
| Anxiety P | 0.557 | 0.530 | 0.585 |
| Mood and feelings P | 0.572 | 0.545 | 0.599 |
| ADHD P | 0.772 | 0.748 | 0.797 |
| ASD P | 0.476 | 0.448 | 0.504 |
| Emotional liability P | 0.717 | 0.691 | 0.742 |
| Callous P | 0.578 | 0.551 | 0.605 |
| Hyperactivity S | 0.463 | 0.435 | 0.491 |
| Conduct S | 0.478 | 0.450 | 0.506 |
| Prosocial behaviour (R) S | 0.213 | 0.184 | 0.243 |
| Anxiety S | 0.323 | 0.293 | 0.352 |
| Mood and feelings S | 0.391 | 0.362 | 0.420 |
| ASD S | 0.171 | 0.142 | 0.201 |

Model fit: AIC = 193238.560; BIC = 193531.662; CFI = 0.596; RMSEA = 0.161; SRMR = 0.105

# Table S6. Descriptive statistics for the p and g factors over development

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | n | mean | sd | min | max | skew | kurtosis |
| Parent-rated p age 7 | 7433 | 0 | 0.88 | -1.76 | 5.22 | 1.17 | 2.18 |
| Teacher-rated p age 7 | 6028 | 0 | 0.95 | -1.51 | 3.84 | 0.79 | 0.39 |
| Parent-rated p age 9 | 3319 | 0 | 0.90 | -1.62 | 5.23 | 1.29 | 2.73 |
| Teacher-rated p age 9 | 2800 | 0 | 0.93 | -1.42 | 5.77 | 1.62 | 3.63 |
| Self-rated p age 9 | 3301 | 0 | 0.86 | -1.95 | 3.70 | 0.47 | 0.04 |
| Parent-rated p age 12 | 6026 | 0 | 0.92 | -1.59 | 5.35 | 1.36 | 2.57 |
| Teacher-rated p age 12 | 4787 | 0 | 0.91 | -1.52 | 4.67 | 1.30 | 2.15 |
| Self-rated p age 12 | 5708 | 0 | 0.89 | -1.32 | 4.92 | 1.33 | 2.26 |
| Parent-rated p age 16 | 4958 | 0 | 0.94 | -1.51 | 6.11 | 1.60 | 3.56 |
| Self-rated p age 16 | 4933 | 0 | 0.89 | -1.55 | 4.12 | 1.12 | 1.38 |
| Combined p age 7 | 7676 | 0 | 0.90 | -1.70 | 4.32 | 0.97 | 1.14 |
| Combined p age 9 | 3731 | 0 | 0.93 | -1.86 | 5.88 | 1.29 | 2.79 |
| Combined p age 12 | 6731 | 0 | 0.92 | -1.73 | 5.21 | 1.31 | 2.58 |
| Combined p age 16 | 4981 | 0 | 0.94 | -1.56 | 6.06 | 1.50 | 3.19 |
| g age 7 | 4951 | 0 | 1 | -4.32 | 4.86 | -0.14 | 0.26 |
| g age 9 | 3192 | 0 | 1 | -4.04 | 2.27 | -0.50 | -0.14 |
| g age 12 | 3943 | 0 | 1 | -3.65 | 2.73 | -0.33 | -0.04 |
| g age 16 | 2388 | 0 | 1 | -2.88 | 3.96 | 0.29 | 0.01 |

Note: 1 twin out of each pair was randomly selected.

# Table S7. Proportion of variance in p and g at each age that is accounted for by heritability (h2), shared environment (c2), and nonshared environmental (e2) variance

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | h2 | CI low | CI up | c2 | CI low | CI up | e2 | CI low | CI up |
| P 7 | 0.74 | 0.67 | 0.81 | 0.03 | -0.04 | 0.10 | 0.23 | 0.16 | 0.30 |
| G 7 | 0.38 | 0.31 | 0.45 | 0.30 | 0.23 | 0.37 | 0.32 | 0.25 | 0.39 |
| P 9 | 0.77 | 0.70 | 0.84 | 0.02 | -0.05 | 0.09 | 0.21 | 0.14 | 0.28 |
| G 9 | 0.31 | 0.23 | 0.39 | 0.44 | 0.37 | 0.51 | 0.25 | 0.18 | 0.32 |
| P 12 | 0.72 | 0.65 | 0.79 | 0.07 | 0 | 0.14 | 0.21 | 0.14 | 0.28 |
| G 12 | 0.52 | 0.45 | 0.59 | 0.19 | 0.12 | 0.26 | 0.30 | 0.23 | 0.37 |
| P 16 | 0.75 | 0.68 | 0.82 | 0.06 | -0.01 | 0.13 | 0.19 | 0.12 | 0.26 |
| G 16 | 0.50 | 0.39 | 0.61 | 0.10 | 0.03 | 0.17 | 0.40 | 0.33 | 0.47 |

# Table S8. Standardized ACE paths obtained from the decomposition of the cross-lagged paths between g-factor and combined p-factor scores from age 7 to 16

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Paths | A | A lower-bound CIs | A upper-bound CIs | C | C lower-bound CIs | Cupper-bound CIs | E | E lower-bound CIs | E upper-bound CIs |
| Stability | P 7 à P 9 | 0.69 | 0.65 | 0.72 | 0.95 | -1.00 | 1.00 | 0.20 | 0.15 | 0.25 |
| G 7 à G 9 | 0.90 | 0.81 | 0.99 | 0.56 | 0.55 | 58.80 | -0.01 | -0.06 | 0.04 |
| P 9 à P 12 | 0.78 | 0.74 | 0.84 | 0.11 | -0.30 | 0.38 | 0.27 | 0.21 | 0.32 |
| G 9 à G 12 | 1.00 | 0.97 | 1.00 | 0.32 | -0.02 | 0.57 | 0.04 | -0.02 | 0.10 |
| P 12 à P 16 | 0.73 | 0.69 | 0.76 | 0.03 | 0 | 0.03 | 0.26 | 0.22 | 0.31 |
| G 12 à G 16 | 0.92 | 0.84 | 1.01 | 0.88 | 0.88 | 1.06 | 0.12 | 0.05 | 0.18 |
| Cross-sectional correlations | P 7 ó G 7 | -0.22 | -0.30 | -0.14 | -1.00 | 0 | 0 | -0.06 | -0.11 | -0.01 |
| P 9 ó G 9 | -0.03 | -0.11 | 0.05 | -0.40 | -0.66 | -0.28 | -0.09 | -0.15 | -0.04 |
| P 12 ó G 12 | 0.04 | -0.02 | 0.10 | -0.31 | -0.58 | -0.05 | -0.11 | -0.16 | -0.06 |
| P 16 ó G 16 | -0.09 | -0.19 | 0.00 | 0.42 | 0 | 0.74 | -0.07 | -0.15 | 0.00 |
| Cross-lagged paths | P 7 à G 9 | -0.13 | -0.21 | -0.04 | 0.24 | 0.16 | 0.32 | -0.02 | -0.07 | 0.04 |
| G 7 à P 9 | -0.11 | -0.20 | -0.02 | 0.64 | -0.09 | 6.87 | -0.06 | -0.11 | 0.00 |
| P 9 à G 12 | 0.15 | 0.07 | 0.25 | -0.55 | -0.95 | -0.19 | -0.12 | -0.19 | -0.05 |
| G 9 à P 12 | -0.15 | -0.23 | -0.07 | -0.32 | -0.63 | -0.01 | -0.06 | -0.12 | 0.00 |
| P 12 à G 16 | -0.01 | -0.08 | 0.07 | 0.32 | 0.25 | 0.39 | -0.15 | -0.22 | -0.08 |
| G 12 à P 16 | -0.05 | -0.10 | 0.00 | -0.67 | -0.60 | -0.74 | -0.07 | -0.13 | -0.02 |
| Variances and residual variances | P 7 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| G 7 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| P 9 | 0.48 | 0.43 | 0.52 | 0.91 | 0.00 | 0.99 | 0.95 | 0.93 | 0.97 |
| G 9 | 0.13 | 0.00 | 0.27 | 0.90 | 0.83 | 0.95 | 1.00 | 0.99 | 1.00 |
| P 12 | 0.28 | 0.21 | 0.34 | 0.85 | 0.63 | 0.96 | 0.92 | 0.89 | 0.95 |
| G 12 | 0.01 | 0.00 | 0.12 | 0.41 | 0.08 | 0.64 | 0.98 | 0.96 | 1.00 |
| P 16 | 0.45 | 0.40 | 0.50 | 0.53 | 0.00 | 0.88 | 0.92 | 0.89 | 0.94 |
| G 16 | 0.14 | 0.00 | 0.28 | 0.45 | 0.00 | 0.78 | 0.96 | 0.93 | 0.98 |

# Table S8b. Percentage of the heritability, shared environmental and nonshared environmental variance that is unique to each construct after accounting for the A, C and E variance shared with variables at previous timepoints

|  |  |  |  |
| --- | --- | --- | --- |
| Measure | % of specificity A | % of specificity C | % of specificity E |
| P 7 | 0.74 | 0.03 | 0.23 |
| G 7 | 0.38 | 0.30 | 0.32 |
| P 9 | 0.41 | 0.02 | 0.20 |
| G 9 | 0.04 | 0.37 | 0.24 |
| P 12 | 0.16 | 0.40 | 0.20 |
| G 12 | 0.00 | 0.21 | 0.29 |
| P 16 | 0.34 | 0.04 | 0.18 |
| G 16 | 0.06 | 0.06 | 0.38 |

# Table S9. Cross-lagged phenotypic path estimates between parent-rated p and g from ages 7 through to 16

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Paths | standardized estimate | lower bound CIs | upper bound CIs |
| Stability | P 7 à P 9 | 0.64 | 0.62 | 0.65 |
|  | G 7 à G 9 | 0.43 | 0.41 | 0.46 |
|  | P 9 à P 12 | 0.69 | 0.67 | 0.71 |
|  | G 9 à G 12 | 0.58 | 0.55 | 0.61 |
|  | P 12 à P 16 | 0.65 | 0.63 | 0.67 |
|  | G 12 à G 16 | 0.61 | 0.58 | 0.64 |
| Cross-sectional correlations | P 7 ó G 7 | -0.15 | -0.18 | -0.12 |
|  | P 9 ó G 9 | -0.13 | -0.15 | -0.11 |
|  | P 12 ó G 12 | -0.01 | -0.03 | 0.01 |
|  | P 16 ó G 16 | -0.03 | -0.06 | 0.00 |
| Cross-lagged paths | P 7 à G 9 | -0.14 | -0.17 | -0.11 |
|  | G 7 à P 9 | -0.10 | -0.12 | -0.07 |
|  | P 9 à G 12 | -0.08 | -0.11 | -0.04 |
|  | G 9 à P 12 | -0.13 | -0.15 | -0.10 |
|  | P 12 à G 16 | -0.06 | -0.10 | -0.02 |
|  | G 12 à P 16 | -0.11 | -0.14 | -0.08 |
| Variances and residual variances | P 7 | 1.00 |  |  |
|  | G 7 | 1.00 |  |  |
|  | P 9 | 0.57 | 0.55 | 0.59 |
|  | G 9 | 0.77 | 0.75 | 0.80 |
|  | P 12 | 0.45 | 0.43 | 0.47 |
|  | G 12 | 0.63 | 0.60 | 0.66 |

# Table S10. Cross-lagged phenotypic path estimates between teacher-rated p and g from ages 7 through to 12

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Paths | standardized estimate | lower bound CIs | upper bound CIs |
| Stability | P 7 à P 9 | 0.45 | 0.42 | 0.48 |
|  | G 7 à G 9 | 0.44 | 0.41 | 0.47 |
|  | P 9 à P 12 | 0.44 | 0.41 | 0.47 |
|  | G 9 à G 12 | 0.59 | 0.56 | 0.62 |
| Cross-sectional correlations | P 7 ó G 7 | -0.16 | -0.19 | -0.13 |
|  | P 9 ó G 9 | -0.08 | -0.11 | -0.04 |
|  | P 12 ó G 12 | -0.04 | -0.07 | 0.00 |
| Cross-lagged paths | P 7 à G 9 | -0.05 | -0.08 | -0.01 |
|  | G 7 à P 9 | -0.11 | -0.14 | -0.07 |
|  | P 9 à G 12 | -0.06 | -0.10 | -0.02 |
|  | G 9 à P 12 | -0.09 | -0.13 | -0.05 |
| Variances and residual variances | P 7 | 1.00 | 1.00 | 1.00 |
|  | G 7 | 1.00 | 1.00 | 1.00 |
|  | P 9 | 0.77 | 0.74 | 0.80 |
|  | G 9 | 0.79 | 0.77 | 0.82 |
|  | P 12 | 0.79 | 0.76 | 0.82 |
|  | G 12 | 0.64 | 0.61 | 0.67 |

# Table S11. Cross-lagged phenotypic path estimates between self-rated p and g from ages 7 through to 16

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Paths | standardized estimate | lower bound CIs | upper bound CIs |
| Stability | P 9 à P 12 | 0.43 | 0.40 | 0.46 |
|  | G 9 à G 12 | 0.59 | 0.56 | 0.62 |
|  | P 12 à P 16 | 0.37 | 0.34 | 0.40 |
|  | G 12 à G 16 | 0.62 | 0.59 | 0.64 |
| Cross-sectional correlations | P 9 ó G 9 | -0.30 | -0.33 | -0.26 |
|  | P 12 ó G 12 | -0.07 | -0.10 | -0.04 |
|  | P 16 ó G 16 | -0.02 | -0.05 | 0.02 |
| Cross-lagged paths | P 9 à G 12 | 0.01 | -0.02 | 0.05 |
|  | G 9 à P 12 | -0.09 | -0.12 | -0.06 |
|  | P 12 à G 16 | -0.02 | -0.06 | 0.01 |
|  | G 12 à P 16 | 0.03 | -0.01 | 0.06 |
| Variances and residual variances | P 9 | 1.00 | 1.00 | 1.00 |
|  | G 9 | 1.00 | 1.00 | 1.00 |
|  | P 12 | 0.78 | 0.75 | 0.81 |
|  | G 12 | 0.65 | 0.62 | 0.69 |
|  | P 16 | 0.87 | 0.85 | 0.89 |
|  | G 16 | 0.61 | 0.58 | 0.65 |

# Table S12. Standardized ACE paths obtained from the cross-lagged models of parent-rated p and g from ages 7 to 16

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Paths | std. A | std. C | std. E | A% | C% | E% |
| Stability | P 7 à P 9 | 0.74 | 0.65 | 0.29 | 0.73 | 0.18 | 0.08 |
|  | G 7 à G 9 | 0.95 | -0.47 | -0.02 | 0.64 | 0.35 | 0.01 |
|  | P 9 à P 12 | 0.80 | 0.39 | 0.33 | 0.83 | 0.08 | 0.09 |
|  | G 9 à G 12 | 0.93 | 0.66 | 0.05 | 0.67 | 0.31 | 0.02 |
|  | P 12 à P 16 | 0.75 | 0.56 | 0.29 | 0.86 | 0.06 | 0.08 |
|  | G 12 à G 16 | 0.96 | 0.55 | 0.12 | 0.81 | 0.12 | 0.07 |
| Cross-sectional correlations | P 7 ó G 7 | -0.05 | -0.65 | -0.03 | 0.17 | 0.78 | 0.05 |
|  | P 9 ó G 9 | 0.03 | -0.05 | -0.10 | 0.22 | 0.38 | 0.40 |
|  | P 12 ó G 12 | -0.01 | 0.48 | -0.07 | 0.07 | 0.69 | 0.24 |
|  | P 16 ó G 16 | -0.08 | 0.04 | -0.07 | 0.69 | 0.06 | 0.25 |
| Cross-lagged paths | P 7 à G 9 | 0.05 | -1.24 | -0.04 | 0.07 | 0.89 | 0.03 |
|  | G 7 à P 9 | -0.18 | 0.14 | -0.03 | 0.64 | 0.32 | 0.05 |
|  | P 9 à G 12 | -0.15 | -0.05 | -0.07 | 0.76 | 0.11 | 0.13 |
|  | G 9 à P 12 | -0.11 | -0.72 | -0.14 | 0.27 | 0.58 | 0.15 |
|  | P 12 à G 16 | 0.06 | -0.14 | -0.13 | 0.44 | 0.15 | 0.42 |
|  | G 12 à P 16 | -0.02 | -0.52 | -0.06 | 0.13 | 0.70 | 0.17 |
| Variances and residual variances | P 7 | 1.00 | 1.00 | 1.00 | 0.68 | 0.11 | 0.21 |
|  | G 7 | 1.00 | 1.00 | 1.00 | 0.36 | 0.31 | 0.32 |
|  | P 9 | 0.40 | 0.68 | 0.91 | 0.41 | 0.35 | 0.24 |
|  | G 9 | 0.09 | 0.00 | 1.00 | 0.10 | 0.00 | 0.90 |
|  | P 12 | 0.32 | 0.00 | 0.86 | 0.61 | 0.00 | 0.39 |
|  | G 12 | 0.08 | 0.52 | 0.99 | 0.10 | 0.19 | 0.70 |
|  | P 16 | 0.43 | 0.31 | 0.91 | 0.63 | 0.05 | 0.32 |
|  | G 16 | 0.12 | 0.64 | 0.97 | 0.11 | 0.14 | 0.75 |

Model fit: CFI = .99; TLI = .99; RMSEA = .01; diffLL (224) = 485.89, p < .001.

# Table S13. Standardized ACE paths obtained from cross-lagged model of teacher-rated p and g from ages 7 to 12

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Paths | std. A | A lower-bound CIs | A upper-bound CIs | std. C | C lower-bound CIs | C upper-bound CIs | std. E | E lower-bound CIs | E upper-bound CIs | A% | C% | E% |
| Stability | P 7 à P 9 | 0.63 | 0.58 | 0.70 | 0.15 | 0.00 | 1.87 | 0.13 | 0.06 | 0.20 | 0.92 | 0.00 | 0.08 |
|  | G 7 à G 9 | 0.90 | 0.79 | 1.00 | 0.37 | -1.00 | 1.00 | 0.00 | -0.05 | 0.06 | 0.68 | 0.32 | 0.00 |
|  | P 9 à P 12 | 0.67 | 0.58 | 0.78 | -0.47 | -1.00 | 1.00 | 0.01 | -0.06 | 0.09 | 0.92 | 0.07 | 0.01 |
|  | G 9 à G 12 | 1.00 | 0.90 | 1.03 | 0.51 | 0.20 | 0.73 | 0.05 | -0.01 | 0.11 | 0.73 | 0.24 | 0.02 |
| Cross-sectional correlations | P 7 ó G 7 | -0.22 | -0.32 | -0.13 | -1.00 |  | 1.00 | -0.04 | -0.09 | 0.01 | 0.83 | 0.09 | 0.08 |
|  | P 9 ó G 9 | -0.06 | -0.18 | 0.00 | -0.18 | -0.37 | -0.01 | -0.02 | -0.09 | 0.05 | 0.36 | 0.56 | 0.08 |
|  | P 12 ó G 12 | 0.10 | -0.04 | 0.20 | -0.59 | -0.77 | -0.44 | -0.10 | -0.15 | -0.04 | 0.42 | 0.34 | 0.23 |
| Cross-lagged paths | P 7 à G 9 | -0.04 | -0.13 | 0.06 | 0.02 | 0.00 | 1.00 | 0.01 | -0.05 | 0.07 | 0.89 | 0.01 | 0.10 |
|  | G 7 à P 9 | 0.00 | -0.18 | 0.16 | -0.17 | -0.30 | 0.09 | -0.10 | -0.17 | -0.03 | 0.00 | 0.52 | 0.48 |
|  | P 9 à G 12 | 0.12 | 0.02 | 0.23 | -0.42 | -0.84 | 0.11 | -0.11 | -0.20 | -0.02 | 0.42 | 0.37 | 0.20 |
|  | G 9 à P 12 | -0.23 | -0.36 | -0.03 | -0.06 | -0.62 | -1.00 | -0.01 | -0.07 | 0.06 | 0.91 | 0.07 | 0.01 |
| Variances and residual variances | P 7 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.75 | 0.00 | 0.25 |
|  | G 7 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.35 | 0.32 | 0.32 |
|  | P 9 | 0.60 | 0.54 | 0.65 | 0.90 | 0.00 | 1.00 | 0.97 | 0.95 | 0.99 | 0.45 | 0.15 | 0.39 |
|  | G 9 | 0.18 | 0.00 | 0.35 | 0.88 | 0.81 | 0.94 | 1.00 | 0.99 | 1.00 | 0.08 | 0.56 | 0.35 |
|  | P 12 | 0.44 | 0.32 | 0.54 | 0.79 | 0.00 | 1.00 | 1.00 | 0.99 | 1.00 | 0.42 | 0.04 | 0.54 |
|  | G 12 | 0.02 | 0.00 | 0.21 | 0.44 | 0.10 | 0.67 | 0.99 | 0.96 | 1.00 | 0.03 | 0.19 | 0.78 |

Note: A = genetic, C =shared environmental, E = nonshared environmental, CIs = 95% confidence intervals.

Model fit: CFI = .99; TLI = .99; RMSEA = .01; diffLL (123) = 173.76, p = .002.

# Table S14. Standardized ACE paths obtained from cross-lagged model of self-rated p and g from ages 9 to 16

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Paths | std. A | A lower-bound CIs | A upper-bound CIs | std. C | C lower-bound CIs | C upper-bound CIs | std. E | E lower-bound CIs | E upper-bound CIs | A% | C% | E% |
| Stability | P 9 à P 12 | 0.68 | 0.51 | 0.88 | 0.78 | 0.33 | 1.00 | 0.15 | 0.09 | 0.21 | 0.64 | 0.23 | 0.13 |
|  | G 9 à G 12 | 0.90 | 0.77 | 1.06 | 0.68 | 0.56 | 0.68 | 0.08 | 0.00 | 0.14 | 0.66 | 0.31 | 0.03 |
|  | P 12 à P 16 | 0.55 | 0.44 | 0.71 | 1.00 | -1.00 | 1.00 | 0.17 | 0.12 | 0.21 | 0.58 | 0.22 | 0.20 |
|  | G 12 à G 16 | 0.92 | 0.80 | 1.04 | 0.80 | 0.26 | 1.00 | 0.13 | 0.06 | 0.21 | 0.71 | 0.22 | 0.07 |
| Cross-sectional correlations | P 9 ó G 9 | -0.39 | -0.51 | -0.26 | -0.45 | -0.73 | -0.45 | -0.09 | -0.15 | -0.04 | 0.56 | 0.34 | 0.09 |
|  | P 12 ó G 12 | 0.00 | -0.22 | 0.11 | -0.21 | -0.49 | 0.24 | -0.06 | -0.12 | 0.00 | 0.01 | 0.58 | 0.41 |
|  | P 16 ó G 16 | -0.01 | -0.20 | 0.17 | 0.09 | -0.60 | 0.77 | -0.04 | -0.10 | 0.02 | 0.11 | 0.23 | 0.66 |
| Cross-lagged paths | P 9 à G 12 | 0.18 | -0.03 | 0.39 | -0.11 | -0.11 | 0.01 | -0.10 | -0.17 | -0.03 | 0.64 | 0.12 | 0.24 |
|  | G 9 à P 12 | -0.05 | -0.23 | 0.18 | 0.02 | -0.11 | 0.13 | 0.02 | -0.06 | 0.08 | 0.69 | 0.15 | 0.16 |
|  | P 12 à G 16 | -0.07 | -0.23 | 0.24 | 0.25 | -0.13 | 0.42 | -0.03 | -0.11 | 0.04 | 0.37 | 0.46 | 0.17 |
|  | G 12 à P 16 | 0.03 | -0.08 | 0.19 | 0.77 | 0.53 | 0.98 | -0.05 | -0.11 | 0.00 | 0.14 | 0.66 | 0.20 |
| Variances and residual variances | P 9 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.48 | 0.13 | 0.39 |
|  | G 9 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.38 | 0.40 | 0.23 |
|  | P 12 | 0.51 | 0.26 | 0.68 | 0.40 | 0.00 | 0.83 | 0.98 | 0.96 | 0.99 | 0.28 | 0.08 | 0.63 |
|  | G 12 | 0.28 | 0.05 | 0.46 | 0.45 | 0.05 | 0.68 | 0.98 | 0.96 | 1.00 | 0.28 | 0.16 | 0.56 |
|  | P 16 | 0.70 | 0.52 | 0.81 | 0.01 | 0.00 | 0.97 | 0.97 | 0.95 | 0.98 | 0.38 | 0.00 | 0.62 |
|  | G 16 | 0.12 | 0.00 | 0.34 | 0.50 | 0.00 | 0.79 | 0.98 | 0.96 | 1.00 | 0.10 | 0.15 | 0.75 |

Model fit: CFI = .99; TLI = .99; RMSEA = .00; diffLL (123) = 150.07, p = .049.