

Supplemental Methods, Findings, Tables, and Figures

Socioemotional dispositions of children and adolescents predict general and specific second-order factors of psychopathology in early adulthood: A 12-year prospective study

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Table S1. Spearman correlations among the three CADS dispositions based on parent and youth ratings (N = 499).

| | Parent Informant | | | Youth Informant | | |
|-----------------------|-----------------------|----------------|----------------|-----------------------|--------------|--------|
| | Negative emotionality | Prosociality | Daring | Negative emotionality | Prosociality | Daring |
| Parent Informant: | | | | | | |
| Negative emotionality | | | | | | |
| Prosociality | -0.30*** | | | | | |
| Daring | 0.21*** | -0.23*** | | | | |
| Youth Informant: | | | | | | |
| Negative emotionality | <i>0.25***</i> | -0.14** | -0.01 | | | |
| Prosociality | -0.11* | <i>0.39***</i> | -0.17*** | -0.06 | | |
| Daring | 0.07 | -0.18*** | <i>0.41***</i> | 0.03 | -0.08 | |

Italics indicate cross-informant correlations of ratings of the same dispositions.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table S2. Frequencies of each count of symptoms of each first-order dimension of psychopathology in early adulthood.

| Dimension | Count | Frequency | % |
|---------------------|-------|-----------|-------|
| Specific Phobia | 0 | 282 | 56.51 |
| | 1 | 137 | 27.45 |
| | 2 | 47 | 9.42 |
| | 3 | 25 | 5.01 |
| | 4 | 7 | 1.40 |
| | 5 | 1 | 0.20 |
| Social Phobia | 0 | 320 | 64.13 |
| | 1 | 0 | 0.00 |
| | 2 | 57 | 11.42 |
| | 3 | 64 | 12.83 |
| | 4 | 58 | 11.62 |
| Agoraphobia/Panic | 0 | 389 | 77.96 |
| | 1 | 75 | 15.03 |
| | 2 | 27 | 5.41 |
| | 3 | 3 | 0.60 |
| | 4 | 3 | 0.60 |
| | 5 | 2 | 0.40 |
| Generalized Anxiety | 0 | 376 | 75.35 |
| | 1 | 55 | 11.02 |
| | 2 | 16 | 3.21 |
| | 3 | 13 | 2.61 |
| | 4 | 8 | 1.60 |
| | 5 | 6 | 1.20 |
| | 6 | 11 | 2.20 |
| | 7 | 9 | 1.80 |
| | 8 | 5 | 1.00 |
| PTSD | 0 | 400 | 80.1 |
| | 1 | 21 | 4.2 |
| | 2 | 13 | 2.6 |
| | 3 | 10 | 2.0 |
| | 4 | 4 | 0.8 |
| | 5 | 11 | 2.2 |
| | 6 | 7 | 1.4 |
| | 7 | 10 | 2.0 |
| | 8 | 10 | 2.0 |
| | 9 | 4 | 0.8 |
| | 10 | 3 | 0.6 |
| | 11 | 2 | 0.4 |
| | 12 | 2 | 0.4 |
| | 13 | 1 | 0.2 |
| | 14 | 1 | 0.2 |
| Major depression | 0 | 90 | 18.04 |
| | 1 | 90 | 18.04 |

| | | | |
|------------------------|----|-----|-------|
| | 2 | 73 | 14.63 |
| | 3 | 71 | 14.23 |
| | 4 | 65 | 13.03 |
| | 5 | 37 | 7.41 |
| | 6 | 39 | 7.82 |
| | 7 | 19 | 3.81 |
| | 8 | 8 | 1.60 |
| | 9 | 6 | 1.20 |
| | 10 | 1 | 0.20 |
| Obsessive-Compulsive | 0 | 436 | 87.37 |
| | 1 | 46 | 9.22 |
| | 2 | 15 | 3.01 |
| | 3 | 2 | 0.40 |
| Antisocial personality | 0 | 222 | 44.49 |
| | 1 | 123 | 24.65 |
| | 2 | 62 | 12.42 |
| | 3 | 60 | 12.02 |
| | 4 | 19 | 3.81 |
| | 5 | 6 | 1.20 |
| | 6 | 6 | 1.20 |
| | 7 | 1 | 0.20 |
| Alcohol Use Disorder | 0 | 372 | 74.55 |
| | 1 | 53 | 10.62 |
| | 2 | 29 | 5.81 |
| | 3 | 18 | 3.61 |
| | 4 | 10 | 2.00 |
| | 5 | 6 | 1.20 |
| | 6 | 6 | 1.20 |
| | 7 | 3 | 0.60 |
| | 8 | 1 | 0.20 |
| | 9 | 0 | 0.00 |
| | 10 | 1 | 0.20 |
| Cannabis Use Disorder | 0 | 413 | 82.77 |
| | 1 | 31 | 6.21 |
| | 2 | 22 | 4.41 |
| | 3 | 13 | 2.61 |
| | 4 | 9 | 1.80 |
| | 5 | 8 | 1.60 |
| | 6 | 1 | 0.20 |
| | 7 | 0 | 0.00 |
| | 8 | 1 | 0.20 |
| | 9 | 1 | 0.20 |
| Nicotine Use Disorder | 0 | 354 | 70.94 |
| | 1 | 39 | 7.82 |
| | 2 | 30 | 6.01 |
| | 3 | 29 | 5.81 |

| | | | |
|---------------------------|----|-----|-------|
| | 4 | 26 | 5.21 |
| | 5 | 6 | 1.20 |
| | 6 | 7 | 1.40 |
| | 7 | 2 | 0.40 |
| | 8 | 3 | 0.60 |
| | 9 | 2 | 0.40 |
| | 10 | 1 | 0.20 |
| Inattention | 0 | 334 | 66.93 |
| | 1 | 64 | 12.83 |
| | 2 | 40 | 8.02 |
| | 3 | 29 | 5.81 |
| | 4 | 13 | 2.61 |
| | 5 | 8 | 1.60 |
| | 6 | 3 | 0.60 |
| | 7 | 3 | 0.60 |
| | 8 | 1 | 0.20 |
| | 9 | 4 | 0.80 |
| Hyperactivity-Impulsivity | 0 | 265 | 53.11 |
| | 1 | 101 | 20.24 |
| | 2 | 56 | 11.22 |
| | 3 | 25 | 5.01 |
| | 4 | 18 | 3.61 |
| | 5 | 15 | 3.01 |
| | 6 | 10 | 2.00 |
| | 7 | 4 | 0.80 |
| | 8 | 3 | 0.60 |
| | 9 | 2 | 0.40 |
| Mania | 0 | 352 | 70.54 |
| | 1 | 91 | 18.24 |
| | 2 | 33 | 6.61 |
| | 3 | 18 | 3.61 |
| | 4 | 2 | 0.40 |
| | 5 | 1 | 0.20 |
| | 6 | 2 | 0.40 |

SUPPLEMENTAL ANALYSES

Supplemental Analyses to Estimate the Stability of Second-Order Factors from Childhood and Adolescence (Wave 1) to Early Adulthood (Wave 2) in the Tennessee Twins Study

Each informant was interviewed in the family home separately using the Child and Adolescent Psychopathology Scale (CAPS)²⁹ by trained lay interviewers. The CAPS queried DSM-IV symptoms of inattention and hyperactivity/impulsivity, oppositional defiant disorder (ODD), conduct disorder (CD), major depressive disorder (MDD), generalized anxiety disorder (GAD), separation anxiety disorder (SAD), agoraphobia, social phobia, specific phobia, obsessive-compulsive disorder (OCD), and panic attacks during the last 12 months. Informants rated each symptom on a four-point scale, reflecting both frequency and severity. The test-retest intra-class correlations (ICCs) for ratings of dimensions of symptoms of DSM-IV mental disorders across informants were .62 - .89, median = .77 (Lahey et al., 2004). As in previous analyses of wave 1 CAPS data (Tackett et al., 2013), parent and youth reports of symptoms of anxiety disorders, depression, and CD were combined by taking the higher rating of each symptom from the adult caretaker or youth (Piacentini, Cohen, & Cohen, 1992). Only caretaker ratings defined ODD, inattention, and hyperactivity due to concerns about the reliability and validity of youth reports of these symptoms (Lahey et al., 2004).

Statistical Analyses

Analyses were restricted to the 499 participants with data at both waves. All analyses took selection strata, clustering within families, and sampling weights into account as in the analyses of predictive associations between CADS dispositions and wave 2 psychopathology. To test the longitudinal stability of second-order factors, we simultaneously fit two separate freely estimated bifactor measurement models to data at wave 1 and wave 2. All three second-order psychopathology factors at wave 2 were simultaneously regressed on all three second-order disposition factors at wave 1 resulting in 9 regression coefficients. Specific externalizing and internalizing factors within wave were not allowed to correlate based on the results of the best fitting bifactor models for wave 1¹⁹ and wave 2 data³⁵. Drawing on these published findings, the bifactor models were fit to first-order psychopathology dimensions as follows: At wave 1, MDD and GAD loaded on the general factor only. Social phobia, specific phobia, agoraphobia, SAD and OCD loaded on the general factor and specific internalizing factor. Inattention, hyperactivity/impulsivity, ODD and CD loaded on the general factor and specific externalizing factor. The wave 2 model was the same one used to assess predictions from wave 1 CADS dispositions in this paper. At wave 2, mania loaded only on the general factor only. MDD, GAD, PTSD, social phobia, specific phobia, agoraphobia/panic, and OCD loaded on the general factor and specific internalizing factor. Inattention, hyperactivity-impulsivity, antisocial personality disorder and maladaptive marijuana, nicotine and alcohol use loaded on the general factor and specific externalizing factor. The MLR estimator was used to account for any non-normality in the distribution of the first-order symptom dimensions and to adjust standard errors to reflect the clustering of twins within twin pairs. Factor loadings for the freely estimated psychopathology factor models in the two waves are presented in Table S3.

Table S3. Standardized factor loadings for second-order factors of psychopathology estimated separately using data from wave 1 and wave 2 (N = 499 in both waves).

| Factor loadings | Second-order factors | | |
|---------------------------------------|----------------------|-------------------|------|
| | General | INT | EXT |
| <i>Wave 1 (childhood/adolescence)</i> | | | |
| Depression | 1.00 | | |
| GAD | 0.87 | | |
| Separation Anxiety | 0.63 | 0.42 | |
| Social Phobia | 0.51 | 0.30 | |
| Specific Phobia | 0.42 | 0.67 | |
| Agoraphobia | 0.47 | 0.73 | |
| OCD | 0.66 | 0.31 | |
| Inattention | 0.37 | | 0.72 |
| Hyper-Impulsivity | 0.35 | | 0.66 |
| ODD | 0.41 | | 0.72 |
| CD | 0.49 | | 0.31 |
| <i>Wave 2 (Early adulthood)</i> | | | |
| Depression | 0.53 | 0.37 | |
| GAD | 0.26 | 0.57 | |
| Social Phobia | 0.18 | 0.40 | |
| Specific Phobia | 0.07 ^a | 0.60 | |
| Agoraphobia/Panic | 0.20 | 0.70 | |
| OCD | 0.48 | 0.26 ^a | |
| PTSD | 0.37 | 0.41 | |
| Mania | 0.57 | | |
| Antisocial Personality | 0.39 | | 0.63 |
| Alcohol Misuse | 0.27 | | 0.32 |
| Nicotine Misuse | 0.25 | | 0.35 |
| Marijuana Misuse | 0.13 ^a | | 0.48 |
| Inattention | 0.64 | | |
| Hyper-Impulsivity | 0.56 | | |

^aFactor loading was not significant at $p < .05$.

Note: Hyper-Impulsivity = hyperactivity-impulsivity; INT = specific internalizing factor; EXT = specific externalizing factor.

Standardized regression coefficients resulting from simultaneously regressing all three wave 2 second-order factors on all three wave 1 second-order factors, controlling for age in wave 1, age in wave 2, sex, maternal education, log of total family income, and race-ethnicity (white versus other groups) are presented in Table S4. The general factor at wave 1 was a significant predictor of the wave 2 general factor after FDR correction for 9 tests. The wave 1 second-order specific internalizing factor did not predict any of the second-order factors at wave 2. The wave 1 second-order specific externalizing factor predicted its wave 2 counterpart at a nominal level of significance.

Table S4. Wave 1 second-order factors predicting wave 2 second-order factors.

| | <i>Standardized Estimate (β)</i> | <i>SE</i> | <i>P</i> |
|------------------------------------|---|-------------|--------------|
| Gen ₁ -Gen ₂ | 0.32 | 0.10 | 0.002 |
| INT ₁ -Gen ₂ | 0.03 | 0.11 | 0.819 |
| EXT ₁ -Gen ₂ | 0.11 | 0.09 | 0.208 |
| Gen ₁ -INT ₂ | 0.22 | 0.12 | 0.068 |
| INT ₁ -INT ₂ | 0.12 | 0.10 | 0.196 |
| EXT ₁ -INT ₂ | 0.06 | 0.08 | 0.444 |
| Gen ₁ -EXT ₂ | 0.20 | 0.11 | 0.066 |
| INT ₁ -EXT ₂ | -0.15 | 0.10 | 0.116 |
| EXT ₁ -EXT ₂ | 0.23 | 0.11 | 0.040 |

Note: Gen₁ – general second-order factor at wave 1; INT₁ – internalizing second-order factor at wave 1; EXT₁ – externalizing second-order factor at wave 1; Gen₂ – general second-order factor at wave 2; INT₂ – internalizing second-order factor at wave 2; EXT₂ – externalizing second-order factor at wave 2. Gen₁ - Gen₂ refers to the regression coefficient for Gen₁ predicting Gen₂, etc.

Coefficient in bold is significant after false discovery rate correction for 9 tests at a 5% false discovery rate.

SENSITIVITY ANALYSES

Three sets of sensitivity analyses examined the extent to which modeling decisions influenced findings:

1. *Sensitivity analyses to evaluate the decision to fix unstandardized loadings in the bifactor psychopathology measurement model in the SEMs.*

The two SEMs presented in Table 3 were repeated, but with freely estimated bifactor measurement models under MLR in the SEMs for parent or youth CADS ratings, with the results presented in Table S5. Compared to the results presented in Table 3 based on psychopathology measurement models in which factor loadings were fixed, there were no appreciable differences between the two strategies in the directions or magnitudes of the regression coefficients and no differences in statistical significance after FDR correction. The few differences in the two sets of results reflected on differences in which associations were significant at nominal levels of after FDR correction.

Table S5. Standardized regression coefficients when latent general, specific internalizing, and specific externalizing dimensions of psychopathology measured at 23-31 years of age in *freely estimated* bifactor measurement models were simultaneously regressed on CADS dimensions of daring, negative emotionality, and prosociality measured at 10-17 years of age and demographic covariates^a. Separate models were fitted for CADS ratings by parent and youth informants (N = 499).

| <i>Parent-rated CADS dispositions</i> | | | | |
|---|--------------|----------------|-------------------------|--------------|
| | Estimate | Standard Error | 95% Confidence Interval | p < |
| Response variable: General factor of psychopathology | | | | |
| Daring | -0.151 | 0.100 | -0.330 – 0.062 | 0.131 |
| Negative emotionality | 0.196 | 0.070 | 0.054 – 0.328 | 0.005 |
| Prosociality | -0.002 | 0.083 | -0.182 – 0.144 | 0.981 |
| Response variable: Specific internalizing factor of psychopathology | | | | |
| Daring | 0.002 | 0.086 | -0.172 – 0.166 | 0.981 |
| Negative emotionality | 0.068 | 0.077 | -0.089 – 0.212 | 0.380 |
| Prosociality | -0.066 | 0.072 | -0.192 - 0.090 | 0.356 |
| Response variable: Specific externalizing factor of psychopathology | | | | |
| Daring | 0.210 | 0.096 | -0.001 – 0.375 | 0.028 |
| Negative emotionality | 0.192 | 0.075 | 0.005 – 0.299 | 0.010 |
| Prosociality | -0.213 | 0.092 | -0.355 – 0.005 | 0.020 |
| <i>Youth self-rated CADS dispositions</i> | | | | |
| | Estimate | Standard Error | 95% Confidence Interval | p < |
| Response variable: General factor of psychopathology | | | | |
| Daring | -0.035 | 0.102 | -0.221 – 0.179 | 0.733 |
| Negative emotionality | 0.023 | 0.096 | -0.149 – 0.227 | 0.810 |
| Prosociality | -0.164 | 0.084 | -0.331 - -0.001 | 0.052 |
| Response variable: Specific internalizing factor of psychopathology | | | | |
| Daring | -0.024 | 0.152 | -0.324 – 0.272 | 0.873 |
| Negative emotionality | 0.156 | 0.109 | -0.085 – 0.343 | 0.153 |
| Prosociality | -0.073 | 0.100 | -0.256 – 0.136 | 0.466 |
| Response variable: Specific externalizing factor of psychopathology | | | | |

| | | | | |
|------------------------------|--------------|--------------|----------------------|--------------|
| Daring | 0.231 | 0.080 | 0.035 – 0.349 | 0.004 |
| Negative emotionality | 0.223 | 0.062 | 0.075 – 0.275 | 0.000 |
| Prosociality | -0.173 | 0.077 | -0.291 – 0.011 | 0.024 |

^aCovariates = sex, age in wave 1, age in wave 2, maternal education, log of total family income, and race-ethnicity.

Note: CADS = Child and Adolescent Dispositions Scale. Bold indicates statistically significant after adjustment for 18 tests at a 5% false discovery rate.

2. Sensitivity analyses to evaluate the decision to treat the first-order dimensions of psychopathology data as continuous under maximum likelihood estimation with robust variance estimators (MLR).

The SEMs presented in Table S5 were repeated separately for parent- and youth-rated CADS dispositions, but treating the symptom counts as ordered categorical data under WLSMV. The CFAs in each measurement model were freely estimated to allow comparison across these models. It was necessary to top-code the number of symptoms of PTSD, depression, and nicotine use disorder at 9+ symptoms to conform to the limits of Mplus. In the measurement models in these SEMs, the CFA was conducted on polychoric correlation matrices.

The full results of four models (for both parent and youth CADS informants and both MLR estimation treating psychopathology dimensions as continuous under MLR and WLSMV estimation treating psychopathology dimensions as ordered categorical data are presented in Table S6. Across models, the factor loadings are relatively similar and consistent with the hypothesized psychopathology model (Lahey, Krueger, Rathouz, Waldman, & Zald, 2017). The fit statistics for each model are presented in Table S7. All four models fit adequately, with all fit indices indicating better fit in absolute terms for the WLSMV model for ordered categorical data than the MLR model for continuous data, except for SRMR.

Table S6. Fully standardized factor loadings and regression coefficients for four models run as sensitivity analyses in which the measurement models were freely estimated in bifactor measurement models and the resulting latent general, specific internalizing, and specific externalizing factors of psychopathology measured at 23-31 years of age were simultaneously regressed on three CADS dispositions measured at 10-17 years of age and demographic covariates of no interest.^a Separate models were fitted in Mplus (A) treating counts of symptoms as continuous under MLR, regressed on Parent CADS ratings, (B) treating counts of symptoms as continuous under MLR, regressed on Youth CADS ratings, (C) treating counts of symptoms as ordered categorical under WLSMV, regressed on Parent CADS ratings, and (D) treating counts of symptoms as ordered categorical under WLSMV, regressed on Youth CADS ratings (all N = 499).

| A. First-order psychopathology dimensions treated as continuous under MLR for Parent CADS | | | | |
|---|----------|----------------|--------|-------|
| Standardized factor loadings on general factor of psychopathology | | | | |
| | Loading | Standard Error | 95% CI | p < |
| Antisocial personality | 0.428 | 0.075 | | 0.000 |
| Alcohol Misuse | 0.300 | 0.086 | | 0.000 |
| Cannabis Misuse | 0.138 | 0.065 | | 0.034 |
| Nicotine dependence | 0.254 | 0.086 | | 0.003 |
| Hyper-impulsivity | 0.535 | 0.083 | | 0.000 |
| Inattention | 0.618 | 0.084 | | 0.000 |
| Depression | 0.562 | 0.061 | | 0.000 |
| PTSD | 0.390 | 0.066 | | 0.000 |
| Generalized Anxiety | 0.295 | 0.091 | | 0.001 |
| Mania | 0.582 | 0.069 | | 0.000 |
| Agoraphobia/Panic | 0.230 | 0.078 | | 0.003 |
| OCD | 0.509 | 0.095 | | 0.000 |
| Social Anxiety | 0.198 | 0.065 | | 0.002 |
| Specific Phobia | 0.106 | 0.088 | | 0.230 |
| Standardized factor loadings on specific internalizing factor of psychopathology | | | | |
| Depression | 0.363 | 0.110 | | 0.001 |
| PTSD | 0.412 | 0.075 | | 0.000 |
| Generalized Anxiety | 0.572 | 0.132 | | 0.000 |
| Agoraphobia/Panic | 0.696 | 0.065 | | 0.000 |
| OCD | 0.266 | 0.143 | | 0.063 |
| Social Anxiety | 0.397 | 0.092 | | 0.000 |
| Specific Phobia | 0.607 | 0.133 | | 0.000 |
| Standardized factor loadings on specific externalizing factor of psychopathology | | | | |
| Antisocial personality | 0.580 | 0.117 | | 0.000 |
| Alcohol Misuse | 0.309 | 0.109 | | 0.004 |
| Cannabis Misuse | 0.525 | 0.083 | | 0.000 |
| Nicotine dependence | 0.398 | 0.115 | | 0.001 |
| Hyper-impulsivity | 0.060 | 0.146 | | 0.679 |
| Inattention | -0.121 | 0.107 | | 0.260 |
| Standardized coefficients for regressions of parent-rated dispositions on 2nd-order psychopathology factors | | | | |
| Disposition | Estimate | Standard Error | 95% CI | p < |
| Response variable: General factor of psychopathology | | | | |

| | | | | |
|---|--------------|--------------|----------------------|--------------|
| Daring | -0.151 | 0.100 | -0.330 – 0.062 | 0.131 |
| NE | 0.196 | 0.070 | 0.054 – 0.328 | 0.005 |
| Prosociality | -0.002 | 0.083 | -0.182 – 0.144 | 0.981 |
| Response variable: Specific internalizing factor of psychopathology | | | | |
| Daring | 0.002 | 0.086 | -0.172 – 0.166 | 0.981 |
| NE | 0.068 | 0.077 | -0.089 – 0.212 | 0.380 |
| Prosociality | -0.066 | 0.072 | -0.192 - 0.090 | 0.356 |
| Response variable: Specific externalizing factor of psychopathology | | | | |
| Daring | 0.210 | 0.096 | -0.001 – 0.375 | 0.028 |
| NE | 0.192 | 0.075 | 0.005 – 0.299 | 0.010 |
| Prosociality | -0.213 | 0.092 | -0.355 – 0.005 | 0.020 |

| B. First-order psychopathology dimensions treated as continuous under MLR for Youth CADS | | | | |
|--|---------|----------------|--------|-------|
| Standardized factor loadings on general factor of psychopathology | | | | |
| | Loading | Standard Error | 95% CI | p < |
| Antisocial personality | 0.407 | 0.077 | | 0.000 |
| Alcohol Misuse | 0.286 | 0.079 | | 0.000 |
| Cannabis Misuse | 0.158 | 0.073 | | 0.030 |
| Nicotine dependence | 0.277 | 0.093 | | 0.003 |
| Hyper-impulsivity | 0.551 | 0.089 | | 0.000 |
| Inattention | 0.630 | 0.083 | | 0.000 |
| Depression | 0.537 | 0.061 | | 0.000 |
| PTSD | 0.394 | 0.068 | | 0.000 |
| Generalized Anxiety | 0.296 | 0.103 | | 0.004 |
| Mania | 0.574 | 0.071 | | 0.000 |
| Agoraphobia/Panic | 0.230 | 0.085 | | 0.007 |
| OCD | 0.520 | 0.113 | | 0.000 |
| Social Anxiety | 0.187 | 0.072 | | 0.009 |
| Specific Phobia | 0.101 | 0.093 | | 0.279 |
| Standardized factor loadings on specific internalizing factor of psychopathology | | | | |
| Depression | 0.375 | 0.104 | | 0.000 |
| PTSD | 0.409 | 0.072 | | 0.000 |
| Generalized Anxiety | 0.568 | 0.144 | | 0.000 |
| Agoraphobia/Panic | 0.684 | 0.077 | | 0.000 |
| OCD | 0.261 | 0.159 | | 0.100 |
| Social Anxiety | 0.412 | 0.077 | | 0.000 |
| Specific Phobia | 0.613 | 0.126 | | 0.000 |
| Standardized factor loadings on specific externalizing factor of psychopathology | | | | |
| Antisocial personality | 0.674 | 0.100 | | 0.000 |
| Alcohol Misuse | 0.339 | 0.094 | | 0.000 |
| Cannabis Misuse | 0.447 | 0.089 | | 0.000 |
| Nicotine dependence | 0.311 | 0.129 | | 0.016 |
| Hyper-impulsivity | 0.017 | 0.148 | | 0.906 |
| Inattention | -0.121 | 0.119 | | 0.311 |

| Standardized coefficients for regressions of youth-rated dispositions on 2nd-order psychopathology factors | | | | |
|--|--------------|----------------|--------|--------------|
| Disposition | Estimate | Standard Error | 95% CI | p < |
| Response variable: General factor of psychopathology | | | | |
| Daring | -0.035 | 0.102 | | 0.733 |
| NE | 0.023 | 0.096 | | 0.810 |
| Prosociality | -0.164 | 0.084 | | 0.052 |
| Response variable: Specific internalizing factor of psychopathology | | | | |
| Daring | -0.024 | 0.152 | | 0.873 |
| NE | 0.156 | 0.109 | | 0.153 |
| Prosociality | -0.073 | 0.100 | | 0.466 |
| Response variable: Specific externalizing factor of psychopathology | | | | |
| Daring | 0.231 | 0.080 | | 0.004 |
| NE | 0.223 | 0.062 | | 0.001 |
| Prosociality | -0.173 | 0.077 | | 0.024 |

| C. First-order psychopathology dimensions treated as ordered categorical under WLSMV for Parent CADS | | | | |
|--|---------|----------------|--------|-------|
| Standardized factor loadings on general factor of psychopathology | | | | |
| | Loading | Standard Error | 95% CI | p < |
| Antisocial personality | 0.507 | 0.045 | | 0.000 |
| Alcohol Misuse | 0.441 | 0.068 | | 0.000 |
| Cannabis Misuse | 0.251 | 0.073 | | 0.001 |
| Nicotine dependence | 0.328 | 0.049 | | 0.000 |
| Hyper-impulsivity | 0.628 | 0.056 | | 0.000 |
| Inattention | 0.726 | 0.054 | | 0.000 |
| Depression | 0.672 | 0.047 | | 0.000 |
| PTSD | 0.458 | 0.067 | | 0.000 |
| Generalized Anxiety | 0.446 | 0.057 | | 0.000 |
| Mania | 0.671 | 0.053 | | 0.000 |
| Agoraphobia/Panic | 0.309 | 0.072 | | 0.000 |
| OCD | 0.614 | 0.075 | | 0.000 |
| Social Anxiety | 0.250 | 0.064 | | 0.000 |
| Specific Phobia | 0.168 | 0.061 | | 0.006 |
| Standardized factor loadings on specific internalizing factor of psychopathology | | | | |
| Depression | 0.381 | 0.077 | | 0.000 |
| PTSD | 0.563 | 0.070 | | 0.000 |
| Generalized Anxiety | 0.657 | 0.067 | | 0.000 |
| Agoraphobia/Panic | 0.850 | 0.055 | | 0.000 |
| OCD | 0.384 | 0.143 | | 0.007 |
| Social Anxiety | 0.488 | 0.083 | | 0.000 |
| Specific Phobia | 0.613 | 0.064 | | 0.000 |
| Standardized factor loadings on specific externalizing factor of psychopathology | | | | |
| Antisocial personality | 0.582 | 0.059 | | 0.000 |
| Alcohol Misuse | 0.466 | 0.071 | | 0.000 |
| Cannabis Misuse | 0.735 | 0.068 | | 0.000 |

| | | | | |
|---|--------------|----------------|--------|--------------|
| Nicotine dependence | 0.503 | 0.069 | | 0.000 |
| Hyper-impulsivity | -0.057 | 0.091 | | 0.532 |
| Inattention | -0.204 | 0.084 | | 0.015 |
| Standardized coefficients for regressions of parent-rated dispositions on 2nd-order psychopathology factors | | | | |
| Disposition | Estimate | Standard Error | 95% CI | p < |
| Response variable: General factor of psychopathology | | | | |
| Daring | -0.134 | 0.079 | | 0.090 |
| NE | 0.222 | 0.063 | | 0.001 |
| Prosociality | 0.016 | 0.077 | | 0.839 |
| Response variable: Specific internalizing factor of psychopathology | | | | |
| Daring | -0.032 | 0.101 | | 0.749 |
| NE | 0.083 | 0.071 | | 0.245 |
| Prosociality | -0.083 | 0.080 | | 0.299 |
| Response variable: Specific externalizing factor of psychopathology | | | | |
| Daring | 0.267 | 0.072 | | 0.001 |
| NE | 0.187 | 0.080 | | 0.020 |
| Prosociality | -0.206 | 0.086 | | 0.016 |

| D. First-order psychopathology dimensions treated as ordered categorical under WLSMV for Youth CADS | | | | |
|---|---------|----------------|--------|-------|
| Standardized factor loadings on general factor of psychopathology | | | | |
| | Loading | Standard Error | 95% CI | p < |
| Antisocial personality | 0.492 | 0.051 | | 0.000 |
| Alcohol Misuse | 0.421 | 0.067 | | 0.000 |
| Cannabis Misuse | 0.245 | 0.072 | | 0.001 |
| Nicotine dependence | 0.315 | 0.053 | | 0.000 |
| Hyper-impulsivity | 0.629 | 0.055 | | 0.000 |
| Inattention | 0.727 | 0.055 | | 0.000 |
| Depression | 0.673 | 0.045 | | 0.000 |
| PTSD | 0.483 | 0.063 | | 0.000 |
| Generalized Anxiety | 0.444 | 0.054 | | 0.000 |
| Mania | 0.672 | 0.052 | | 0.000 |
| Agoraphobia/Panic | 0.324 | 0.071 | | 0.000 |
| OCD | 0.583 | 0.066 | | 0.000 |
| Social Anxiety | 0.256 | 0.065 | | 0.000 |
| Specific Phobia | 0.151 | 0.061 | | 0.013 |
| Standardized factor loadings on specific internalizing factor of psychopathology | | | | |
| Depression | 0.379 | 0.070 | | 0.000 |
| PTSD | 0.561 | 0.065 | | 0.000 |
| Generalized Anxiety | 0.646 | 0.057 | | 0.000 |
| Agoraphobia/Panic | 0.832 | 0.058 | | 0.000 |
| OCD | 0.397 | 0.115 | | 0.001 |
| Social Anxiety | 0.459 | 0.084 | | 0.000 |
| Specific Phobia | 0.618 | 0.063 | | 0.000 |

| Standardized factor loadings on specific externalizing factor of psychopathology | | | | |
|--|----------|----------------|--------|-------|
| Antisocial personality | 0.622 | 0.048 | | 0.000 |
| Alcohol Misuse | 0.448 | 0.069 | | 0.000 |
| Cannabis Misuse | 0.670 | 0.071 | | 0.000 |
| Nicotine dependence | 0.521 | 0.071 | | 0.000 |
| Hyper-impulsivity | -0.056 | 0.088 | | 0.526 |
| Inattention | -0.164 | 0.077 | | 0.033 |
| Standardized coefficients for regressions of youth-rated dispositions on 2nd-order psychopathology factors | | | | |
| Disposition | Estimate | Standard Error | 95% CI | p < |
| Response variable: General factor of psychopathology | | | | |
| Daring | 0.034 | 0.069 | | 0.629 |
| NE | 0.070 | 0.083 | | 0.403 |
| Prosociality | -0.136 | 0.071 | | 0.056 |
| Response variable: Specific internalizing factor of psychopathology | | | | |
| Daring | -0.109 | 0.107 | | 0.307 |
| NE | 0.181 | 0.078 | | 0.019 |
| Prosociality | -0.089 | 0.073 | | 0.223 |
| Response variable: Specific externalizing factor of psychopathology | | | | |
| Daring | 0.162 | 0.079 | | 0.041 |
| NE | 0.190 | 0.086 | | 0.028 |
| Prosociality | -0.223 | 0.087 | | 0.011 |

^aCovariates = sex, age in wave 1, age in wave 2, maternal education, log of total family income, and race-ethnicity.

FDR adjustments for multiple testing were made for the 18 tests in each of two families of analyses for (1) analyses under MLR for parent and youth CADS informants, and under WLSMV for parent and youth CADS informants. Bold indicates statistically significant after FDR adjustment for 18 tests at a 5% false discovery rate.

Table S7. Fit statistics for models run as sensitivity analyses in which the measurement models were freely estimated in bifactor models and second-order latent psychopathology factors were simultaneously regressed on the three CADS dispositions and demographic covariates of no interest.

| CADS informant | Model | X ² | d.f. | p | RMSEA (90% C.I.) | CFI | TLI | SRMR |
|----------------|-------|----------------|------|--------|---------------------|-------|-------|-------|
| Parent | MLR | 302.295 | 163 | 0.0001 | 0.041 (0.034-0.049) | 0.839 | 0.785 | 0.049 |
| | WLSMV | 203.951 | 163 | 0.0163 | 0.022 (0.010-0.032) | 0.950 | 0.934 | 0.158 |
| Youth | MLR | 302.354 | 163 | 0.0001 | 0.041 (0.034-0.049) | 0.831 | 0.775 | 0.049 |
| | WLSMV | 197.420 | 163 | 0.0342 | 0.021 (0.006-0.030) | 0.960 | 0.946 | 0.157 |

Note: MLR = maximum likelihood estimation treating first-order psychopathology dimensions as continuous data; WLSMV = mean- and variance-adjusted weighted least squares estimation treating first-order psychopathology dimensions as ordered categorical data; RMSEA = root mean square of estimation; CFI = comparative fit index; Tucker-Lewis index; SRMR = Standardized root mean square residual.

3. *Sensitivity analyses to evaluate the decision to test associations between dispositions and psychopathology separately by parent and youth informants on the CADS.*

Although our decision to test associations between dispositions and psychopathology separately by parent and youth informants on the CADS was based on previous findings of informant differences in associations between CADS dispositions and psychopathology (Tackett et al., 2013) and the broader literature on differences between parent and youth informants in the assessment of dispositions in this age range (Boson, Brandstrom, & Sigvardsson, 2018; Capaldi & Rothbart, 1992; Tackett, 2011), we also estimated the common variance in psychopathology factors predicted by parent and youth ratings together. In a freely estimated measurement model for the three CADS dispositions, parent and youth ratings on each CADS disposition loaded on latent negative emotionality, prosociality, and daring factors. These multiple-informant latent dispositions were simultaneously regressed on freely estimated general, specific externalizing, and specific internalizing factors of psychopathology and demographic covariates used in the primary analyses.

The results of sensitivity analyses in which the second-order psychopathology factors were simultaneously regressed on multi-informant latent disposition scores jointly defined by parent and youth reports in a measurement model are presented in Table S8. The results were similar to the results for the separate analyses of parent-rated CADS dimensions, but the predictive associations were weaker. When latent multi-informant dispositions were the predictors, negative emotionality predicted the general factor of psychopathology and the specific externalizing factor, but neither association was significant after FDR correction in spite of the smaller number of statistical tests.

Table S8. Standardized regression coefficients when latent general, specific internalizing, and specific externalizing dimensions of psychopathology measured at 23-31 years of age in freely estimated bifactor measurement models were simultaneously regressed on *latent multi-informant CADS dimensions of daring, negative emotionality, and prosociality* measured at 10-17 years of age based on parent and youth ratings and demographic covariates^a (N = 499).

| <i>Latent CADS multi-informant dispositions based on parent and youth ratings</i> | | | | |
|---|----------|----------------|-------------------------|-------|
| | Estimate | Standard Error | 95% Confidence Interval | p < |
| Response variable: General factor of psychopathology | | | | |
| Daring | -0.254 | 0.160 | -0.402 – 0.226 | 0.111 |
| Negative emotionality | 0.291 | 0.114 | -0.060 – 0.386 | 0.011 |
| Prosociality | -0.087 | 0.187 | -0.404 – 0.330 | 0.641 |
| Response variable: Specific internalizing factor of psychopathology | | | | |
| Daring | -0.093 | 0.184 | -0.339 – 0.383 | 0.613 |
| Negative emotionality | 0.171 | 0.246 | -0.254 – 0.710 | 0.487 |
| Prosociality | -0.082 | 0.159 | -0.430 – 0.194 | 0.604 |
| Response variable: Specific externalizing factor of psychopathology | | | | |
| Daring | 0.217 | 0.139 | -0.321 – 0.223 | 0.119 |
| Negative emotionality | 0.326 | 0.166 | -0.198 – 0.452 | 0.049 |
| Prosociality | -0.181 | 0.168 | -0.468 – 0.190 | 0.283 |

^aCovariates = sex, age in wave 1, age in wave 2, maternal education, log of total family income, and race-ethnicity.

Note: CADS = Child and Adolescent Dispositions Scale. No coefficients were statistically significant after adjustment for 9 tests at a 5% false discovery rate.

SUPPLEMENTAL FIGURES

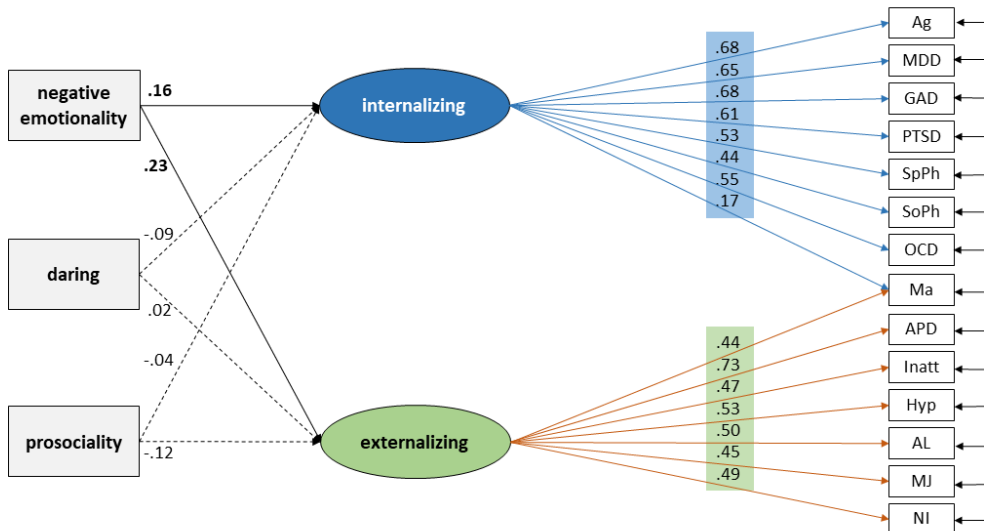


Figure S1. Standardized regression coefficients and factor loadings for the correlated-factors model of parent-reported dispositions at youth aged 10 to 17 years old predicting latent psychopathology factor scores. Note: Bold and solid arrows indicate statistically significant regression coefficient after false discovery rate adjustment.

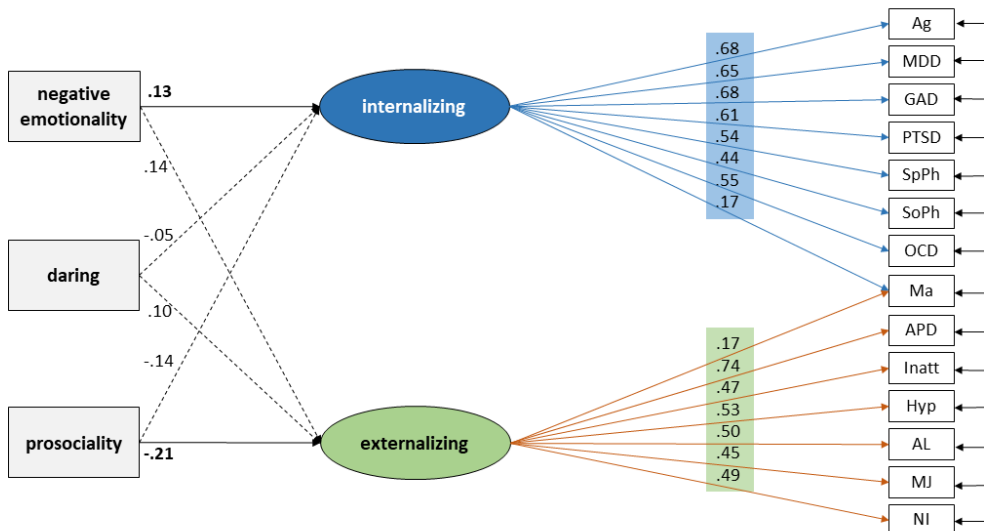


Figure S2. Standardized regression coefficients and factor loadings for the correlated-factors model of youth-reported dispositions at youth aged 10 to 17 years old predicting latent psychopathology factor scores. Note: Bold and solid arrows indicate statistically significant regression coefficient after false discovery rate adjustment.

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