***Supplemental Methods***

**Table S1. Parental Harshness.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Reporter** | **Question** | **Response** |
| **1y** |  |  |  |
| m2e5 | Mother | In the past month, has (CURRENT PARTNER) spanked (CHILD) because (he/she) was misbehaving or acting up? | 1 = yes; 2 = no |
| m2e5a | Mother | Did (CURRENT PARTNER) do this … | 1 = every day; 2 = a few/week; 3 = a few/month; 4 = once or twice |
| m2c4 | Mother | In the past month, has (FATHER) spanked (CHILD) because (he/she) was misbehaving or acting up? | 1 = yes; 2 = no |
| m2c4a | Mother | Did he do this (spank child) … | 1 = every day; 2 = a few/week; 3 = a few/month; 4 = once or twice |
| m2b19 | Mother | In the past month, have you spanked (CHILD) because (he/she) was misbehaving or acting up? | 1 = yes; 2 = no |
| m2b19a | Mother | Did you do this (spank CHILD) ... | 1 = every day; 2 = a few/week; 3 = a few/month; 4 = once or twice |
| **3y, 5y, 9y** |  |  |  |
| p3j3, p4g3, p5q1c\* | Primary caregiver | How many times in the past year did you shake child? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j4, p4g4, p5q1d\* | Primary caregiver | How many times in the past year did you it (him/her) on the bottom with something like a belt, hairbrush, a stick or some other hard object? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j6, p4g6, p5q1f\* | Primary caregiver | How many times in the past year did you shout, yell, or scream at (CHILD)? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j7, p4g7, p5q1g\* | Primary caregiver | How many times in the past year did you spank (him/her) on the bottom with your bare hand? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j8, p4g8, p5q1h\* | Primary caregiver | How many times in the past year did you swear or curse at (him/her)? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j9, p4g9, p5q1i\* | Primary caregiver | How many times in the past year did you say you would send (him/her) away or would kick (him/her) out of the house? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j10, p4g10, p5q1j\* | Primary caregiver | How many times in the past year did you threaten to spank or hit (him/her) but did not actually do it? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j11, p4g11, p5q1k\* | Primary caregiver | How many times in the past year did you slap (him/her) on the hand, arm, or leg? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j13, p4g13, p5q1m\* | Primary caregiver | How many times in the past year did you pinch (him/her)? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j14, p4g14, p5q1n\* | Primary caregiver | How many times in the past year did you call (him/her) dumb or lazy or some other name like that? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| **15y** |  |  |  |
| k6c9c | Child | How often does your primary caregiver shout, yell, scream, swear or curse at you? | 1 = never, 2 = sometimes, 3 = often |
| k6c9d | Child | How often does your primary caregiver hit or slap you? | 1 = never, 2 = sometimes, 3 = often |
| p6d28 | Primary caregiver | How often in the past year have you shouted, yelled, screamed, swore or cursed at (him/her)? | 1 = never, 2 = sometimes, 3 = often |
| p6d29 | Primary caregiver | How often in the past year have you hit or slapped (him/her)? | 1 = never, 2 = sometimes, 3 = often |

\*9y variables and responses were the same as 3y and 5y but had different coding (all were recoded before analysis.

**Table S2. Parental Disengagement.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Reporter** | **Question** | **Response** |
| **1y** |  |  |  |
| m2b18a | Mother | (How often do you) play games like "peek-a-boo" or "gotcha" with (CHILD)? | 205 = never; 204 = 1-2 times/month; 203 = several times/month; 202 = several times/week; 201 = every day |
| m2b18b | Mother | (How often do you) sing songs or nursery rhymes to (CHILD)? | 205 = never; 204 = 1-2 times/month; 203 = several times/month; 202 = several times/week; 201 = every day |
| m2b18c | Mother | (How often do you) read stories to (CHILD)? | 205 = never; 204 = 1-2 times/month; 203 = several times/month; 202 = several times/week; 201 = every day |
| m2b18d | Mother | (How often do you) tell stories to (CHILD)? | 205 = never; 204 = 1-2 times/month; 203 = several times/month; 202 = several times/week; 201 = every day |
| m2b18e | Mother | (How often do you) play inside with toys such as blocks or Legos with (CHILD)? | 205 = never; 204 = 1-2 times/month; 203 = several times/month; 202 = several times/week; 201 = every day |
| m2b18g | Mother | (How often do you) hug or show physical affection to (CHILD)? | 205 = never; 204 = 1-2 times/month; 203 = several times/month; 202 = several times/week; 201 = every day |
| m2h19b | Mother | In the past year, did your child go hungry? | 1 = yes, 2 = no |
| **3y, 5y, 9y** |  |  |  |
| p3j15, p4g15, p5q2a\* | Primary caregiver | How many times in the past year did you have to leave your child home alone, even when you thought some adult should be with (him/her)? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j16, p4g16, p5q2b\* | Primary caregiver | How many times in the past year were you not able to show or tell your child that you loved (him/her)? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j17, p4g17, p5q2c\* | Primary caregiver | How many times in the past year were you not able to make sure (CHILD) got the food (he/she) needed? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j18, p4g18, p5q2d\* | Primary caregiver | How many times in the past year were you not able to make sure your child got to a doctor or hospital when (he/she) needed it? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| p3j19, p4g19, p5q2e\* | Primary caregiver | How many times in the past year were you so drunk or high that you had a problem taking care of your child? | 0 = never happened; 1 = once; 2 = twice; 3 = 3-5 times; 4 = 6-10 times; 5 = 11-20 times; 6 = > 20 times; 7 = yes, but not in past year |
| **15y** |  |  |  |
| p6h82 | Primary caregiver | How often has your drinking interfered with your responsibilities at work or school, or at home in the past year? | 0 = never, 1 = 1 time, 2 = more than 1 time |
| p6h84 | Primary caregiver | How often have you had problems with your family, friends, or people at work or school because of your drinking in the past year? | 0 = never, 1 = 1 time, 2 = more than 1 time |
| p6h90 | Primary caregiver | How often has your illegal drug use interfered with your responsibilities at work or school, or at home in the past year? | 1 = never, 2 = 1 time, 3 = more than 1 time |
| p6h92 | Primary caregiver | How often have you had problems with your family, friends, or people at work or school because of your illegal drug use in the past year? | 1 = never, 2 = 1 time, 3 = more than 1 time |
| k6c8 | Child | How often do you spend time alone in your home without an adult present? | 1 = often, 2 = sometimes, 3 = never |
| p6b24 | Primary caregiver | In the last 12 months, has (YOUTH) been seen by a doctor, nurse, or other health care professional for a regular check-up or well visit? | 1 = yes, 2 = no |

\*9y variables and responses were the same as 3y and 5y but had different coding (all were recoded before analysis.

**Supplemental Results**

Table S3. Correlation table of parental harshness and disengagement variables.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** | **9.** | **10.** | **11.** | **12.** |
| 1. Harsh from 1-15y
 | -- |  |  |  |  |  |  |  |  |  |  |  |
| 1. Disengage from 1-15y
 | .32\*\*\* | -- |  |  |  |  |  |  |  |  |  |  |
| 1. Harsh at 1y
 | .59\*\*\* | .15† | -- |  |  |  |  |  |  |  |  |  |
| 1. Disengage at 1y
 | .16\* | .46\*\*\* | .11 | -- |  |  |  |  |  |  |  |  |
| 1. Harsh at 3y
 | .70\*\*\* | .37\*\*\* | .24\*\* | .26\*\* | -- |  |  |  |  |  |  |  |
| 1. Disengage at 3y
 | .20\* | .74\*\*\* | .07 | .12 | .37\*\*\* | -- |  |  |  |  |  |  |
| 1. Harsh at 5y
 | .78\*\*\* | .39\*\*\* | .26\*\* | .13 | .52\*\*\* | .22\* | -- |  |  |  |  |  |
| 1. Disengage at 5y
 | .23\*\* | .62\*\*\* | .25\*\* | .19\* | .12 | .44\*\*\* | .27\*\* | -- |  |  |  |  |
| 1. Harsh at 9y
 | .74\*\*\* | .13 | .29\*\*\* | .02 | .30\*\*\* | -.01 | .54\*\*\* | .11 | -- |  |  |  |
| 1. Disengage at 9y
 | .23\*\* | .58\*\*\* | .06 | .03 | .13 | .33\*\*\* | .26\*\* | .28\*\* | .27\*\* | -- |  |  |
| 1. Harsh at 15y
 | .71\*\*\* | .12 | .25\*\* | .09 | .35\*\*\* | .07 | -.38\*\*\* | .02 | .42\*\*\* | .08 | -- |  |
| 1. Disengage at 15y
 | .13† | .50\*\*\* | .00 | .04 | .22\*\* | .26\*\* | .24\*\* | -.03 | -.03 | .04 | .06 | -- |
| Mean | -.02 | .00 | .98 | -.03 | 18.04 | .61 | 16.53 | .36 | 12.88 | .65 | .00 | .03 |
| Standard Deviation | .70 | .60 | 1.50 | .53 | 9.81 | 1.86 | 9.37 | 1.11 | 9.13 | 2.06 | .64 | .51 |
| Minimum | -1.33 | -.67 | .00 | -.61 | .00 | .00 | .00 | .00 | .00 | .00 | -.95 | -.20 |
| Maximum | 2.11 | 4.04 | 7.00 | 2.61 | 48.00 | 13.00 | 49.00 | 7.00 | 41.00 | 14.00 | 2.41 | 3.52 |

*N* = 171. Correlations computed using SPSS v25. †*p* < 0.10, \**p*<.05. \*\**p*<.01. \*\*\**p*<.001. Parental harshness and disengagement from 1-15y was the mean of the z-scored harshness and disengagement variables from ages 1-15y. Individual items within harshness at 1y and harshness and disengagement from 3-9y were all on the same scale so sum scores were used with a minimum score of 0. For disengagement at 1y and harshness and disengagement at 15y, individual items were on different scales, and thus, z-scores for each item was calculated and these z-scores were averaged for the composite variables. This difference in items over time leads to difficulty in directly comparing levels of harshness and disengagement at each time point. Harshness reports from 3-9 years are on the same scale, and disengagement reports from 3-9 years are on the same scale, so these measures are directly comparable over the three assessments. Harsh = parental harshness; Disengage = parental disengagement.

Table S4. Correlation table of adolescent mental health variables.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **1.** | **2.** | **3.** | **4.** | **5.** | **6.** | **7.** | **8.** | **9.** | **10.** | **11.** | **12.** | **13.** |
| 1. MFQ youth
 | -- |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. MFQ parent
 | .07 | -- |  |  |  |  |  |  |  |  |  |  |  |
| 1. CDI youth
 | .42\*\*\* | .20\*\* | -- |  |  |  |  |  |  |  |  |  |  |
| 1. CDI parent
 | .13 | .62\*\*\* | .26\*\* | -- |  |  |  |  |  |  |  |  |  |
| 1. K-SADS MDE
 | .27\*\*\* | .19\* | .32\*\*\* | .09 | -- |  |  |  |  |  |  |  |  |
| 1. K-SADS dysthymia
 | -.03 | .04 | .12 | .18\* | .26\*\*\* | -- |  |  |  |  |  |  |  |
| 1. SCARED youth
 | .995\*\*\* | .08 | .43\*\*\* | .14† | .27\*\*\* | -.04 | -- |  |  |  |  |  |  |
| 1. SCARED parent
 | .17\* | .51\*\*\* | .17\* | .44\*\*\* | .13 | .01 | .18\* | -- |  |  |  |  |  |
| 1. CBCL anxiety
 | .10 | .58\*\*\* | .16\* | .49\*\*\* | .11 | -.01 | .11 | .51\*\*\* | -- |  |  |  |  |
| 1. K-SADS social anxiety
 | .22\*\* | .13† | .14† | .29\*\*\* | .08 | .15† | .21\*\* | .06 | .27\*\*\* | -- |  |  |  |
| 1. CBCL aggressive
 | -.02 | .46\*\*\* | .07 | .48\*\*\* | .03 | .06 | -.02 | .28\*\*\* | .36\*\*\* | .08 | -- |  |  |
| 1. CBCL rule-breaking
 | -.05 | .41\*\*\* | .02 | .56\*\*\* | .01 | .10 | -.03 | .23\*\* | .25\*\* | .14† | .83\*\*\* | -- |  |
| 1. SRD
 | -.04 | .29\*\*\* | .08 | .32\*\*\* | .05 | -.06 | -.01 | .04 | .19\* | -.01 | .37\*\*\* | .44\*\*\* | -- |
| 1. K-SADS ODD/CD
 | -.03 | .33\*\*\* | .12 | .47\*\*\* | .06 | .12 | -.02 | .16\* | .14† | .02 | .72\*\*\* | .73\*\*\* | .41\*\*\* |

*N* = 171. Correlations computed using SPSS v25. †*p* < 0.10, \**p*<.05. \*\**p*<.01. \*\*\**p*<.001. MFQ = Mood and Feelings Questionnaire; CDI = Children’s Depression Inventory; K-SADS = Kiddie Schedule for Affective Disorders and Schizophrenia; MDE = major depressive episode; SCARED = Screen for Child Anxiety Related Emotional Disorders; CBCL = Child Behavior Checklist; SRD = Self-Report of Delinquency; ODD/CD = oppositional defiant disorder/conduct disorder.

**Sex Differences Analyses**

The free model where all paths were allowed to vary by sex had excellent fit to the data: CFI = 1.00, RMSEA = 0.00, SRMR = 0.05. The model where the ages 1-15 parental harshness to overall cortisol output path was constrained had excellent fit to the data: CFI = 1.00, RMSEA = 0.00, SRMR = 0.05. Model comparisons resulted in a chi-square difference test value of 0.01 and a change in degrees of freedom of 1, which returned a p-value of 0.92, suggesting that the model did not differ by sex. The model where the ages 1-15 disengagement to overall cortisol output path was constrained had excellent fit to the data: CFI = 1.00, RMSEA = 0.00, SRMR = 0.05. Model comparisons resulted in a chi-square difference test value of 0.29 and a change in degrees of freedom of 1, which returned a p-value of 0.59, suggesting that the model did not differ by sex. The model where the overall cortisol output to depressive symptoms path was constrained model had excellent fit to the data: CFI = 1.00, RMSEA = 0.00, SRMR = 0.05. Model comparisons resulted in a chi-square difference test value of 0.67 and a change in degrees of freedom of 1, which returned a p-value of 0.41, suggesting that the model did not differ by sex. The model where the overall cortisol output to anxiety symptoms path was constrained model had excellent fit to the data: CFI = 1.00, RMSEA = 0.00, SRMR = 0.05. Model comparisons resulted in a chi-square difference test value of 3.46 and a change in degrees of freedom of 1, which returned a p-value of 0.06, suggesting that the model did not differ by sex. The model where the overall cortisol output to antisocial behavior path was constrained model had excellent fit to the data: CFI = 1.00, RMSEA = 0.00, SRMR = 0.05. Model comparisons resulted in a chi-square difference test value of 0.08 and a change in degrees of freedom of 1, which returned a p-value of 0.77, suggesting that the model did not differ by sex.

**Curvilinear Analyses**

 The centered, natural log-transformed hair cortisol concentration value was squared, and this term was entered into the cumulative parental harshness and disengagement from 1-15y model as a mediator in addition to the log-transformed hair cortisol concentration value. Direct paths from cumulative parental harshness and disengagement from 1-15y to hair cortisol concentration squared and from hair cortisol concentration squared to each of the mental health outcomes. Covariates were pared to *p* < .10 for all variables in the model (see Table S5 for full model results). This model had excellent fit to the data (CFI = 1.00, RMSEA = 0.00, SRMR = 0.04). The R2 for the endogenous variables are as follows: hair cortisol concentration (0.30), hair cortisol concentration squared (0.05), depressive symptoms (0.08), anxiety symptoms (0.03), and antisocial behaviors (0.09). The R2 for the hair cortisol concentration squared variable was not significant in the model, *p* = .14. The R2 for depressive, anxiety, and antisocial behaviors did not change when adding the hair cortisol concentration squared variables. Thus, the addition of the quadratic hair cortisol concentration term to the model did not improve the explanatory power of the model.

**Table S5. Curvilinear analysis.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | *Unstandardized* *B value* | *95% CI* |
| **Cumulative harshness from 1-15y** |  |  |  |  |
|  Female | -0.18\* | -0.33, -0.04 |
|  Maternal age | -0.14\* | -0.27, -0.01 |
|  African American or multiracial | 0.28\*\*\* | 0.14, 0.41 |
| **Cumulative disengagement from 1-15y** |  |  |
|  Maternal education | -0.16\*\* | -0.27, -0.04 |
| **Overall cortisol output at 15y** |  |  |
|  Cumulative harshness from 1-15y | 0.27\* | 0.06, 0.48 |
|  Cumulative disengagement from 1-15y | -0.25\* | -0.44, -0.05 |
|  African American or multiracial | 0.46\*\*\* | 0.31, 0.62 |
|  Hair straightening | 0.31\*\* | 0.13, 0.49 |
|  Hair quantity (2cm versus 1cm) | 0.12 | -0.02, 0.26 |
|  Poverty ratio at birth | -0.22\*\* | -0.37, -0.07 |
| **Overall cortisol output squared at 15y** |  |  |
|  Cumulative harshness from 1-15y | 0.27 | -0.28, 0.82 |
|  Cumulative disengagement from 1-15y | -0.43 | -0.93, 0.06 |
|  Hair straightening | 0.64\* | 0.03, 1.24 |
| **Depressive symptoms at 15y** |  |  |
|  Overall cortisol output at 15y | 0.11 | -0.02, 0.24 |
|  Overall cortisol output squared at 15y | -0.01 | -0.06, 0.05 |
|  Cumulative harshness from 1-15y | -0.12 | -0.28, 0.05 |
|  Cumulative disengagement from 1-15y | 0.08 | -0.05, 0.20 |
|  Female | 0.21\*\* | 0.08, 0.34 |
| **Anxiety symptoms at 15y** |  |  |
|  Overall cortisol output at 15y | 0.05 | -0.08, 0.18 |
|  Overall cortisol output squared at 15y | -0.01 | -0.06, 0.05 |
|  Cumulative harshness from 1-15y | -0.01 | -0.17, 0.16 |
|  Cumulative disengagement from 1-15y | 0.05 | -0.12, 0.21 |
|  Maternal education | -0.14\* | -0.27, -0.01 |
| **Antisocial behaviors at 15y** |  |  |
|  Overall cortisol output at 15y | -0.09 | -0.29, 0.11 |
|  Overall cortisol output squared at 15y | 0.01 | -0.06, 0.06 |
|  Cumulative harshness from 1-15y | 0.16\* | 0.004, 0.31 |
|  Cumulative disengagement from 1-15y | 0.07 | -0.15, 0.29 |
|  Parents married at child birth | -0.15\* | -0.29, -0.02 |
|  African American or multiracial | 0.14\* | 0.003, 0.28 |

*Note.* All estimates reported are standardized estimates and 95% confidence intervals (CI) for each of the direct pathways to behavior problems. Dependent variables are in bold with independent variables and associated unstandardized regression coefficients. *Note.* Covariates were included in the curvilinear model if they were associated with the model variable at *p* < .10. \**p*<.05. \*\**p*<.01. \*\*\**p*<.001.

**High and Low Harshness and Disengagement with Overall Cortisol Output**

Due to correlations between parental harshness and disengagement, additional analyses were conducted to probe overall cortisol output in adolescents with varying levels of high versus low harshness and disengagement. Median splits were calculated for harshness (1-15y) and disengagement (1-15y). A univariate analysis compared group differences in ln-transformed overall cortisol output (outliers > 3SD removed) with the harshness and disengagement variables (0 = below median, 1 = above median) as fixed factors. Analyses were conducted to display group means rather than to calculate statistical significance of group differences as these were post-hoc analyses. Figure S1 (harshness and disengagement) displays the means and standard error bars by group. Table S6 displays the means and 95% confidence intervals by group. The highest cortisol output was in the group with high harshness and low disengagement.

Figure S1. Ln-transformed cortisol levels in above- and below-median harshness and disengagement groups.



Table S6. Overall Cortisol Output Means and 95% Confidence Intervals by Parental Harshness and Disengagement Group (Median Split).

|  |  |  |
| --- | --- | --- |
| **Group** | **Mean** | **95% CI** |
| Low Disengagement, Low Harshness | 2.64 | 2.25, 3.03 |
| Low Disengagement, High Harshness | 3.52 | 3.04, 4.00 |
| High Disengagement, Low Harshness | 2.60 | 2.13, 3.07 |
| High Disengagement, High Harshness | 2.83 | 2.44, 3.22 |