Supplementary Table 1: Social Aggression Descriptive Statistics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Mean (SD) | Minimum | Maximum | Skewness (SE) | Kurtosis (SE) |
| Twin Social Aggression | Teacher-Report | 14.48 (5.11) | 11 | 49 | 2.21 (.067) | 6.35 (.13) |
| Maternal-Report | 17.92 (4.88) | 11 | 46 | .89 (.055) | .97 (.11) |
| Paternal-Report | 17.58 (4.59) | 11 | 49 | .86 (.060) | 1.43 (.12) |
| Parental Social Aggression | Maternal Self-Report | 18.32 (4.43) | 11 | 32 | .41 (.056) | -.18 (.11) |
| Paternal Self-Report | 18.40 (4.66) | 11 | 39 | .58 (.061) | .49 (.12) |

Note: The STAB Social Aggression Scale presents 11 behaviors and asks the informants to report on the frequency with which the child commits each behavior. This scale ranges from 1 (never) to 5 (nearly all the time), and overall scale scores could conceivably range from 11 to 55.

Supplementary Table 2: Nuclear twin family design model fitting results for those families with married biological parents (*N*=749)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Informant | Model | -2LnL | *df* | AIC | BIC | SABIC | DIC |
| Teacher | Baseline | 6532.75 | 2401 | - | - | - | - |
| **ADSE** | **6557.53** | **2423** | **1711.53** | **-4736.60** | **-889.62** | **-2510.01** |
| **ASFE** | **6557.53** | **2423** | **1711.53** | **-4736.60** | **-889.62** | **-2510.01** |
| ADFE | 6560.61 | 2423 | 1714.61 | -4735.06 | -888.09 | -2508.47 |
| ASE | 6578.98 | 2424 | 1730.98 | -4729.18 | -880.62 | -2501.67 |
| ADE | 6563.87 | 2424 | 1715.87 | -4736.73 | -888.17 | -2509.23 |
| AFE | 6561.01 | 2424 | 1713.01 | -4738.16 | -889.60 | -2510.66 |
| AE | 6649.91 | 2425 | 1799.91 | -4697.03 | -846.88 | -2468.60 |
| Mother | Baseline | 7062.44 | 2865 | - | - | - | - |
| ADSE | 7312.95 | 2887 | 1538.95 | -5897.68 | -1314.01 | -3244.70 |
| **ASFE** | **7294.43** | **2887** | **1520.43** | **-5906.94** | **-1323.26** | **-3253.96** |
| ADFE | 7372.89 | 2887 | 1598.89 | -5867.71 | -1284.04 | -3214.73 |
| ASE | 7312.95 | 2888 | 1536.95 | -5900.99 | -1315.73 | -3247.09 |
| ADE | 7376.40 | 2888 | 1600.40 | -5869.26 | -1284.00 | -3215.36 |
| AFE | 7395.31 | 2888 | 1619.31 | -5859.81 | -1274.55 | -3205.91 |
| AE | 7424.83 | 2889 | 1646.83 | -5848.36 | -1261.51 | -3193.54 |
| Father | Baseline | 7005.39 | 2788 | - | - | - | - |
| ADSE | 7200.03 | 2810 | 1580.03 | -5699.31 | -1237.89 | -3117.10 |
| **ASFE** | **7153.23** | **2810** | **1533.23** | **-5722.72** | **-1261.30** | **-3140.50** |
| ADFE | 7276.21 | 2810 | 1656.21 | -5661.22 | -1199.80 | -3079.01 |
| ASE | 7200.03 | 2811 | 1578.03 | -5702.62 | -1239.62 | -3119.49 |
| ADE | 7281.30 | 2811 | 1659.30 | -5661.99 | -1198.98 | -3078.85 |
| AFE | 7300.44 | 2811 | 1678.44 | -5652.42 | -1189.41 | -3069.28 |
| AE | 7319.41 | 2812 | 1695.41 | -5646.24 | -1181.65 | -3062.19 |

Note: Additive genetic, dominant genetic, sibling environmental, familial environmental, and non-shared environmental influences are represented with A, D, S, F, and E, respectively. The best fitting model for each informant (as indicated by the lowest AIC, BIC, SABIC, and DIC values for at least 3 of the 4 fit indices) is highlighted in bold font.

Supplementary Table 3: Classical twin design model fitting results

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Informant | Model | -2LnL | *df* | AIC | BIC | SABIC | DIC |
| Teacher | ACE | 3593.340 | 1324 | 945.340 | -2577.827 | -475.739 | -1361.152 |
| **ADE** | **3593.949** | **1324** | **943.949** | **-2580.826** | **-477.151** | **-1363.232** |
| **AE** | **3593.949** | **1325** | **943.949** | **-2580.826** | **-477.151** | **-1363.232** |
| CE | 3620.638 | 1325 | 970.638 | -2567.481 | -463.806 | -1349.888 |
| Mother | **ACE** | **4986.588** | **1974** | **1038.588** | **-4322.684** | **-1187.921** | **-2508.700** |
| ADE | 5034.758 | 1974 | 1084.758 | -4302.052 | -1165.701 | -2487.149 |
| AE | 5034.758 | 1975 | 1084.758 | -4302.052 | -1165.701 | -2487.149 |
| CE | 5027.316 | 1975 | 1077.316 | -4305.773 | -1169.422 | -2490.870 |
| Father | ACE | 4144.012 | 1664 | 818.012 | -3527.807 | -887.230 | -1999.612 |
| ADE | 4270.691 | 1664 | 942.691 | -3467.835 | -825.670 | -1938.721 |
| AE | 4270.691 | 1665 | 942.691 | -3467.835 | -825.670 | -1938.721 |
| **CE** | **4144.043** | **1665** | **816.043** | **-3531.159** | **-888.994** |  |

Note: Additive genetic, shared environmental influences, and non-shared environmental influences are represented with A, C, and E, respectively. The best fitting model for each informant (as indicated by the lowest AIC, BIC, SABIC, and DIC values for at least 3 of the 4 fit indices) is highlighted in bold font.

Supplementary Table 4: Classical twin design heritability estimates

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Informant | Model | A | D | C | E |
| Teacher | ACE | 58.54%\*  [37.70, 71.66] | - | 7.26%  [0.00, 24.44] | 34.20%\*  [28.26, 41.60] |
| **ADE** | **66.50%\***  **[59.81, 72.08]** | **0.00%**  **[0.00, 0.00]** | **-** | **33.50%\***  **[27.92, 40.19]** |
| **AE** | **66.50%\***  **[59.81, 72.08]** | **-** | **-** | **33.50%\***  **[27.92, 40.19]** |
| CE | **-** | **-** | 47.33%\*  [40.83, 53.30] | 52.67%\*  [46.70, 59.17] |
| Mother | **ACE** | **35.72%\***  **[25.04, 46.93]** | **-** | **42.17%\***  **[31.82, 51.47]** | **22.11%\***  **[19.01, 25.79]** |
| ADE | 79.04%\*  [75.97, 81.70] | 0.00%  [0.00, 0.00] | - | 21.22%\*  [18.30, 24.03] |
| AE | 79.04%\*  [75.97, 81.7-] | - | - | 20.96%\*  [18.56, 24.28] |
| CE | - | - | 67.20%\*  [63.62, 70.49] | 32.80%\*  [29.51, 36.38] |
| Father | ACE | 0.99%  [0.00, 11.96] | - | 70.55%\*  [61.56, 74.42] | 28.46%\*  [24.20, 32.26] |
| ADE | 74.72%\*  [71.05, 77.92] | 0.00%  [0.00, 0.00] | - | 25.28%\*  [22.09, 28.95] |
| AE | 74.72%\*  [71.05, 77.92 | - | - | 25.28%\*  [22.08, 28.95] |
| **CE** | **-** | **-** | **71.25%\***  **[67.73, 74.44]** | **28.75%\***  **[25.56, 32.27]** |

Note: Additive genetic, dominant genetic, shared environmental influences, and non-shared environmental influences are represented with A, D, C and E, respectively. 95% confidence intervals are presented below the point estimate in brackets. The best fitting model for each informant is highlighted in bold font. \**p* < 0.05.

Appendix 1: The Subtypes of Antisocial Behavior (STAB) Questionnaire

The following items describe a number of different behaviors. Please read each item and report how often you have done this using the following scale.

1 - never

2 - hardly ever

3 - sometimes

4 - frequently

5 - nearly all the time

1.\_\_\_\_\_\_ Felt like hitting people

2.\_\_\_\_\_\_ Broke into a store, mall, or warehouse

3.\_\_\_\_\_\_ Blamed others\*

4.\_\_\_\_\_\_ Hit back when hit by others

5.\_\_\_\_\_\_ Broke the windows of an empty building

6.\_\_\_\_\_\_ Tried to hurt someone’s feelings\*

7.\_\_\_\_\_\_ Got angry quickly

8.\_\_\_\_\_\_ Shoplifted things

9.\_\_\_\_\_\_ Made fun of someone behind their back\*

10.\_\_\_\_\_\_ Threatened others

11.\_\_\_\_\_\_ Littered public areas by smashing bottles, tipping trash cans, etc.

12.\_\_\_\_\_\_ Excluded someone from group activities when angry with him/her\*

13.\_\_\_\_\_\_ Had trouble controlling temper

14.\_\_\_\_\_\_ Stole a bicycle

15.\_\_\_\_\_\_ Gave someone the silent treatment when angry with him/her\*

16.\_\_\_\_\_\_ Hit others when provoked

17.\_\_\_\_\_\_ Stole property from school or work

18.\_\_\_\_\_\_ Revealed someone’s secrets when angry with him/her\*

19.\_\_\_\_\_\_ Got into fights more than the average person

20.\_\_\_\_\_\_ Left home for an extended period of time without telling family/friends

21.\_\_\_\_\_\_ Intentionally damaged someone’s reputation\*

22.\_\_\_\_\_\_ Swore or yelled at others

23.\_\_\_\_\_\_ Sold drugs, including marijuana

24.\_\_\_\_\_\_ Tried to turn others against someone when angry with him/her\*

25.\_\_\_\_\_\_ Got into physical fights

26.\_\_\_\_\_\_ Was suspended, expelled, or fired from school or work

27.\_\_\_\_\_\_ Called someone names behind his/her back\*

28.\_\_\_\_\_\_ Felt better after hitting

29.\_\_\_\_\_\_ Failed to pay debts

30.\_\_\_\_\_\_ Was rude towards others\*

31.\_\_\_\_\_\_ Had trouble keeping a job

32.\_\_\_\_\_\_ Made negative comments about other’s appearance\*

Note: Items marked with an asterisk (\*) comprise the Social Aggression (SA) subscale.