Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.
eMethods. A 4-Step Regression Analysis to Test the Mediator of Childhood Peer Bullying

The hypothesis that the association between childhood intra-familial aggression and depression symptoms at later age will be mediated by peer bullying was tested using a four-step analysis with Sobel approach.\(^1\,^2\) Specifically, we tested the direct path between childhood physical maltreatment by guardian or siblings and adulthood depression symptoms, and estimated the extent to which the association was weakened by the inclusion of peer bullying exposure in childhood period. This analysis addresses the following questions:

**Step 1:** estimating the strength of the direct path. a Logistic model was constructed to test whether childhood intra-familial aggression was significantly associated depression symptoms at later age without adjusting for childhood peer bullying victimization.

\[
P(H_i = 1) = c_1 + c_2 \times mal_i + c_3 \times CON_i
\]

Where, \(H_i = 1\) indicates respondents having depression symptoms in adulthood; \(mal_i\) measures childhood parental physical maltreatment or sibling aggression victimization, \(CON_i\) are demographic characteristics, socioeconomic status, and level of physical health. \(c_1, c_2, c_3\) are the coefficients to measure. If childhood intra-familial aggression was significantly associated depression symptoms at later age, the mediator of childhood peer bullying victimization in the association of childhood intra-familial aggression and depression symptoms at later age was then tested.

**Step 2:** a Logistic model was applied to estimate whether childhood intra-familial aggression was significantly related to childhood peer bullying victimization.

\[
P(bully_i = 1) = a_1 + a_2 \times mal_i + a_3 \times CON_i
\]

Where, \(bully_i\) presents childhood peer bullying exposure, and \(a_1, a_2, a_3\) are the coefficients to measure.

Collect the parameter estimate \(a_2\), and its standard error, \(s_a\).

**Step 3:** a Logistic model to estimate the association between childhood intra-familial aggression and adulthood depression symptoms upon the addition of childhood peer bullying to the model.

\[
P(H_i = 1) = b_1 + b_2 \times bully_i + b_3 \times mal_i + b_3 \times CON_i
\]

Where, \(b_1, b_2, b_3\) are the coefficients to measure.

Collect the parameter estimate \(b_2\), and its standard error, \(s_b\).

Using the coefficient estimates \(a_2\) and \(b_2\) and their standard errors \(s_a\) and \(s_b\) from step 2 and 3, compute the standardized elements:

\[
Z_a = \frac{a_2}{s_a}, \quad Z_b = \frac{b_2}{s_b}
\]

their product:

\[
Z_{a \times b} = Z_a \times Z_b, \quad \text{and their collected standard error } \sqrt{1 + Z_a^2 + Z_b^2}
\]

**Step 4:** compute the z-test that combines results from step 2 and 3, to indicate whether there is a significant mediation effect:

\[
Z_{med} = \frac{Z_{a \times b}}{\sqrt{1 + Z_a^2 + Z_b^2}}
\]

Test \(Z_{med}\) was significant at the \(p=0.05\) level if it exceeds \(|1.96|\) (for a 2-tailed test with \(p=0.05\)), peer bullying was regarded as a mediator of the association between childhood intra-familial aggression and depression symptoms at later age.

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Then, following Buis, total effects were calculated in logistic regression, and the effects decomposed into direct and indirect effects. The use of the bootstrap was proposed in order to estimate standard errors.

1. Iacobucci D. Mediation analysis and categorical variables: the final frontier. J Consum Psychol. 2012; 22: 582–594.
2. VanderWeele TJ. Mediation analysis: a practitioner's guide. Annu R Publ Health. 2016; 37: 17-32.
3. Buis M L. Direct and Indirect Effects in a Logit Model. The Stata Journal: Promoting communications on statistics and Stata, 2010, 10(1):11-29.
### eTable 1. Descriptive Statistics for Respondents With Incomplete Data

| Variable                                      | All a | Male                  | Female                 |
|-----------------------------------------------|-------|-----------------------|------------------------|
| Variable                                      | Obs.  | Percent(%)            | Obs. Percent(%)        | Obs. Percent(%)        |
| Depression                                    | 18,780| 100                   | 8,705 100              | 9,754 100              |
| CES-D<12 b                                    | 10,454| 55.7                  | 5,562 63.9             | 4,724 48.4             |
| CES-D>=12                                      | 6,530 | 34.7                  | 2,452 28.2             | 4,012 41.1             |
| Unknown                                       | 1,796 | 9.6                   | 691 7.9                | 1,018 10.4             |
| Childhood parental physical maltreatment      | 17,941| 100                   | 8,516 100              | 9,425 100              |
| No                                            | 12,922| 72.0                  | 5,647 66.3             | 7,275 77.2             |
| Yes                                           | 5,019 | 28.0                  | 2,869 33.7             | 2,150 22.8             |
| Childhood sibling aggression                   | 17,941| 100                   | 8,516 100              | 9,425 100              |
| No                                            | 16,796| 93.6                  | 8,003 94.0             | 8,793 93.3             |
| Yes                                           | 1,145 | 6.4                   | 513 6.0                | 632 6.7                |
| Childhood peer bullying victimization         | 18,288| 100                   | 8,497 100              | 9,487 100              |
| No                                            | 15,310| 83.7                  | 6,963 82.0             | 8,092 85.3             |
| Yes                                           | 2,978 | 16.3                  | 1,534 18.0             | 1,397 14.7             |
| Marital status                                | 18,759| 100                   | 8,703 100              | 9,754 100              |
| Married                                       | 16,252| 86.6                  | 7,847 90.2             | 8,121 83.3             |
| Unmarried                                     | 2,507 | 13.4                  | 856 9.8                | 1,633 16.7             |
| Education                                     | 18,780| 100                   | 8,705 100              | 9,754 100              |
| Upper secondary and above                     | 16,914| 90.1                  | 7,509 86.2             | 9,121 93.5             |
| Lower secondary and below                     | 1,866 | 9.9                   | 1,199 13.8             | 633 6.5                |
| Financial situation before age 17            | 18,555| 100                   | 8,622 100              | 12,349 100             |
| Worse off than Them                           | 7,317 | 39.4                  | 3,587 41.6             | 3,611 37.5             |
| Same or better than them                      | 11,238| 60.6                  | 5,035 58.4             | 6,015 62.5             |

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| Parents’ education          |       |       |       |       |
|----------------------------|-------|-------|-------|-------|
|                            | 18,780| 100   | 8,705 | 100   | 9,754 | 100   |
| Upper secondary and above  | 4,847 | 25.8  | 2,210 | 24.4  | 2,629 | 27.0  |
| Lower secondary and below | 13,933| 74.2  | 6,585 | 75.7  | 7,125 | 73.0  |
| Having chronic disease     |       |       |       |       |
| Yes                        | 9,729 | 52.0  | 4,356 | 50.0  | 5,262 | 46.0  |
| No                         | 8,994 | 48.0  | 4,349 | 50.0  | 4,492 | 54.0  |
| Sex                        |       |       |       |       |
| Female                     | 9,754 | 52.8  | --    | --    | 9,754 | 100   |
| Male                       | 8,705 | 47.2  | 8,705 | 100   | --    | --    |
| Aged people                |       |       |       |       |
| >=65                       | 18,231| 100   | 8,516 | 100   | 9,425 | 100   |
| <65                        | 12,448| 68.3  | 5,610 | 65.9  | 6,601 | 70.0  |

2 Due to missing value for sex, the sum of males and females is fewer than the total sample size.
3 The Center for Epidemiologic Studies Depression: CES-D
### eTable 2. Association Between Childhood Intra-familial Aggression and Childhood Peer Bullying: Logistic Model

|                        | Excluding missing data | Missing data imputed a |
|------------------------|------------------------|------------------------|
|                        | OR b (95%CI)           | OR (95%CI)             |
| **Childhood intra-familial aggression** |                        |                        |
| Childhood parental maltreatment | 2.53 (2.25 - 2.83) | 1.67 (1.55 - 1.80) |
| Childhood sibling aggression | 3.05 (2.46 - 3.78) | 2.42 (2.14 - 2.73) |
| **Married**            | 0.95 (0.80 - 1.13)    | 0.64 (0.58 - 0.71)    |
| Senior high school and above | 1.28 (1.05 - 1.56) | 1.02 (0.90 - 1.14) |
| Children financial: worse off than Them | 2.13 (1.91 - 2.39) | 1.88 (1.76 - 2.04) |
| Parents' high school and above | 1.02 (0.90 - 1.17) | 1.69 (1.57 - 1.83) |
| Female                 | 0.86 (0.77 - 0.96)    | 0.89 (0.77 - 0.91)    |
| Aged people            | 0.61 (0.54 - 0.70)    | 0.89 (0.81 - 0.97)    |
| Having chronic diseases | 1.06 (0.95 - 1.19)    | 0.99 (0.92 - 1.08)    |
| Observations           | 15,450                | 16,984                 |

a Multiple imputation methods to impute missing data  
b Odd Ratio: OR; CI: Confidence Interval.
eTable 3. Association of Childhood Intrafamilial and Childhood Peer Bullying With Adult Depressive Symptoms in China With Missing Data Imputed: Logistic Model\textsuperscript{a}

|                                 | Association between childhood peer bullying and adulthood depression | Association between childhood parental maltreatment and adulthood depression | Association among childhood parental maltreatment, peer bullying and adulthood depression | Association between childhood sibling aggression and adulthood depression | Association among childhood sibling aggression, peer bullying and adulthood depression |
|--------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Childhood peer bullying        | 1.72                                                          | 1.65                                                          | 1.68                                          |                                               |                                               |
|                                | (1.57 - 1.87)                                                 | (1.51 - 1.81)                                                 | (1.54 - 1.84)                                 |                                               |                                               |
| Childhood parental maltreatment| 1.29                                                          | 1.20                                                          |                                               |                                               |                                               |
|                                | (1.20 - 1.38)                                                 |                                               |                                               |                                               |                                               |
| Childhood sibling aggression    | 1.38                                                          | 1.24                                                          |                                               |                                               |                                               |
|                                | (1.21 - 1.56)                                                 |                                               |                                               |                                               |                                               |
| Married                        | 0.65                                                          | 1.38                                                          | 0.65                                          | 0.65                                          | 0.65                                          |
|                                | (0.58 - 0.71)                                                 |                                               | (0.59 - 0.72)                                 | (0.59 - 0.72)                                 | (0.59 - 0.72)                                 |
| Senior high school and above   | 0.58                                                          | 1.38                                                          | 0.57                                          | 0.57                                          | 0.57                                          |
|                                | (0.52 - 0.65)                                                 |                                               | (0.51 - 0.64)                                 | (0.51 - 0.64)                                 | (0.51 - 0.64)                                 |
| Children financial: worse off than Them | 1.46                                                          | 1.38                                                          | 1.40                                          | 1.39                                          | 1.40                                          |
|                                | (1.37 - 1.56)                                                 |                                               | (1.31 - 1.50)                                 | (1.30 - 1.49)                                 | (1.31 - 1.50)                                 |
| Parents’ high school and above | 0.97                                                          | 1.38                                                          | 0.97                                          | 0.96                                          | 0.97                                          |
|                                | (0.90 - 1.04)                                                 |                                               | (0.90 - 1.04)                                 | (0.89 - 1.04)                                 | (0.90 - 1.04)                                 |
| Female                         | 1.91                                                          | 1.38                                                          | 1.89                                          | 1.93                                          | 1.89                                          |
|                                | (1.78 - 2.04)                                                 |                                               | (1.77 - 2.02)                                 | (1.81 - 2.07)                                 | (1.77 - 2.02)                                 |

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|                          |    |    |    |    |    |
|--------------------------|----|----|----|----|----|
|                          | 1.02 | 1.38 | 1.04 | 1.05 | 1.04 |
|                          | (0.94 - 1.10) | (1.21 - 1.56) | (0.96 - 1.12) | (0.97 - 1.13) | (0.97 - 1.13) |
| Aged people              |    |    |    |    |    |
| Having chronic diseases  | 1.73 | 1.38 | 1.75 | 1.74 | 1.75 |
|                          | (1.62 - 1.85) | (1.21 - 1.56) | (1.63 - 1.87) | (1.63 - 1.86) | (1.63 - 1.87) |
| Observations             | 16,984 | 16,984 | 16,984 | 16,984 | 16,984 |

* Multiple imputation methods to impute missing data

* Odd Ratio: OR; CI: Confidence Interval.