**Supplementary Materials**

***Individual- and Family-Level Associations between Child Psychopathology and Parenting***

**Sample Recruitment, Representativeness, and Weighting**

Households were identified for participation through the 2014 Canada Child Tax Benefit, stratified by urban vs. rural and income (for additional details, see Boyle et al., 2019; Duncan et al., 2019). Approximately half (50.8%) of eligible households agreed to participate (*K* = 6537). Families in lower income households were less likely to participate than families in higher income households. Additional information on response rates and comparisons with Canadian Census data are reported in Boyle et al. (2019). Sampling weights were applied in all analyses to adjust for sample representativeness and survey non-response.

**Missing Data**

A total of 197 children did not have any ratings on the OCHS Emotional Behavioural Scale (OCHS-EBS; *n* = 149) or the parenting questionnaire (*n* = 48) and therefore could not be included in our analysis. Compared to those included, children without questionnaire ratings were significantly more likely to live in a single–parent family (39.0% vs. 19.7% of children included in the analysis, *p* = .034) and to have no siblings (47.5% vs. 31.0% of children included in the analysis, *p* = .026), and significantly less likely to be living with their two biological parents (58.4% vs. 71.8% of children included in the analysis, *p* = .034). Total household income was not stated for more than 22% of children without questionnaire ratings (22.1% vs. 1.1% of children included in the analysis). Based on households with available income information, children without questionnaire ratings had significantly lower household income (*M* = 78,568.8 [±49,518.1] vs. *M* = 103,580.6 [±196,822.6], *p* = .003), although the proportion of households with total household income below the low income threshold was not significantly different (18.9% vs. 19.2%, *p* = .945). Rates of missing data for other variables included in our analysis were as follows: <1% missing number of biological parents in the home; 5.95% missing parent psychological distress scores; and 1.79% missing household income.

**Factor Structure and Reliability**

We tested the following models using confirmatory factor analysis: unidimensional with a single-factor (Model A); two correlated internalizing (27 items) and externalizing (25 items) factors (Model B); an orthogonal bifactor model, with a general psychopathology factor on which all items loaded, and uncorrelated specific internalizing and externalizing factors (Model C; hypothesized model); and a correlated bifactor model, with specific internalizing and externalizing factors allowed to correlate (Model D).

Model fits from the confirmatory factor analysis are presented in Table S1. Both the orthogonal (Model C) and correlated bifactor (Model D) models fit the data well, and better than the unidimensional (Model A) or correlated factor (Model B) models. We retained the orthogonal bifactor model for further analyses as it is less sample-dependent (Markon, 2019) and allowed us to examine separate, uncorrelated internalizing and externalizing factors.

We carried out further investigations to better understand the orthogonal bifactor model and its factors, including: 1) examining item loadings on the general and specific factors; 2) calculating reliability coefficients (internal consistency, proportion of variance attributable to each factor; and construct replicability; Revelle & Condon, 2019; Rodriguez, Reise, & Haviland, 2016; Watkins, 2017) for general and specific factors; and 3) running the model separately in age (4-11 and 12-17 years) and sex subgroups.

**Item Loadings.** Mean item loadings in the orthogonal bifactor model for internalizing items were .31 on the internalizing specific factor and .64 on the general psychopathology factor. For externalizing items, mean item loadings were .50 on the specific externalizing factor and .53 on the general psychopathology factor. The overall mean item loading for the general psychopathology factor was .59.

For the general psychopathology factor, item loadings were all positive and significant, and were slightly higher for items describing internalizing symptoms than for items describing externalizing symptoms. In particular, strong factors loadings (≥.70) were found for most items pertaining to generalized anxiety disorder (being too fearful or anxious; nervous, high-strung or tense; anxious or on edge; when anxious, his/her mind goes blank; finds it hard to stop worrying) and major depressive disorder (being unhappy, sad or depressed; having trouble enjoying self; trouble sleeping; getting no pleasure from usual activities; feeling worthless or inferior; deliberately harming self or attempting suicide; talking about killing self).

Item loadings on the specific internalizing factor were positive and significant for most items, with adequate and strong factor loadings (≥.40) for most items describing social phobia (e.g., being nervous with people he/she doesn’t know; getting anxious about meeting new people) and separation anxiety disorder (e.g., worrying that bad things will happen to loved ones or worrying that something bad will cause separation from loved ones); however, some items related to major depressive disorder had non-significant positive loadings (having trouble enjoying self; trouble sleeping; being overtired or lacking energy; feeling worthless or inferior) or loaded negatively on the internalizing factor (being unhappy, sad or depressed; deliberately harms self or attempts suicide; talking about killing self), as most of their variance was already captured by the general psychopathology factor. Item loadings on the specific externalizing factor were all positive and significant, with factor loadings for items related to conduct disorder and attention deficit hyperactivity disorder being especially high.

**Factor Reliability.** We computed the following reliability indicators for general and specific factors from the orthogonal bifactor model (Revelle & Condon, 2019; Rodriguez, Reise, & Haviland, 2016; Watkins, 2017): 1) coefficient omega (ω), a model-based estimate of reliability that is similar to alpha but without assuming equal loadings (Rodriguez et al., 2016); 2) omega hierarchical, an estimate of the proportion of variance attributable to the general factor (ωH), and to each specific factor after controlling for variance accounted for by the general factor (ωHS; Rodriguez et al., 2016); and 3) *H*, an estimate of construct replicability, with values > .80 suggesting that the latent variable is well-defined (Dueber, 2017).

Reliability and replicability for the general factor was good (ω = 0.981; ωH = 0.801; *H* = 0.975), suggesting that the general factor can be considered unidimensional (Dueber, 2017). For the specific internalizing factor, model-based reliability was good (ω = 0.969), as was factor replicability (*H* = 0.867); however, the overall variance attributable to the specific internalizing factor was low after accounting for variance attributable to the general psychopathology factor (ωH = 0.143), suggesting that the majority of variance for items making up the specific internalizing factor was taken up by the general factor. For the specific externalizing factor, model-based reliability and replicability were also good (ω = 0.968; *H* = 0.909). The overall variance attributable to the specific externalizing factor was moderate (ωH = 0.458), suggesting that the majority of the variance for externalizing items is taken up by the general factor, with a small but substantial amount of remaining variance attributable to the specific externalizing factor.

**Sex and Age.** We estimated the orthogonal bifactor model separately by sex (boys and girls) and by age (ages 4-11; and age 12-17 years). Model fit statistics were similar for boys (CFI = 0.946; TLI = 0.941; RMSEA = 0.019) and girls (CFI = 0.949; TLI = 0.945; RMSEA = 0.016), suggesting that the model fit comparably well in these two subgroups. Model fit statistics were also similar for 4-11 year-olds (CFI = 0.947; TLI = 0.943; RMSEA = 0.016) and for 12-17 year-olds (CFI = 0.961; TLI = 0.958; RMSEA = 0.017), suggesting that the model fit comparably well in these two age groups.

**Additional Multilevel Model Analyses**

**Sex Differences.** We tested the interaction of sex and age with parenting variables for each of the psychopathology factors and re-ran the multilevel models separately for boys (*n* = 5,400) and girls (*n* = 5,205; see Table S3). At the child level, there was a significant interaction between sex and parental warmth for the general psychopathology factor (*B* = -0.003, *SE* = 0.001, *p* = .013). When running the model separately by sex, the negative association between parental warmth and the general psychopathology factor was significantly stronger in girls than in boys. Also at the child level, there was a significant interaction between sex and parental warmth for the specific externalizing factor (*B* = -0.004, *SE =* 0.001, *p* = .004). The negative association between parental warmth and specific externalizing was significantly stronger in boys than in girls. Finally, at the child level, there was a significant interaction between sex and aversive/inconsistent parenting for the specific externalizing factor (*B* = -0.015, *SE* = 0.004, *p* < .001). The association between aversive/inconsistent parenting and specific externalizing was significantly stronger in boys than in girls. None of the other interactions between sex and parenting were significant at the child level.

At the family level, there was a significant interaction between sex and overall aversive/inconsistent parenting for the specific internalizing (*B* = 0.011, *SE* = 0.005, *p* = .036) and externalizing (*B = -* 0.013, *SE* = 0.004, *p* = .001) factors. The association between overall aversive/inconsistent parenting and specific internalizing was stronger in girls than in boys. In contrast, the association between overall aversive/inconsistent parenting and the specific externalizing factor was stronger in boys than in girls. None of the other interactions between sex and parenting were significant at the family level.

**Age Differences.** We tested the interaction of age with parenting variables for each of the psychopathology factors and re-ran the multilevel models separately for 4-11 year-olds (*n* = 6,259) and 12-17 year-olds (*n* = 4,346; see Table S4). There were no significant interactions with age at the child level. At the family level, there were significant interactions between age and overall parental warmth (*B* = -0.017, *SE* = 0.007, *p =* .021) and overall aversive/inconsistent parenting (*B* = -0.013, *SE* = 0.006, *p* = .020) for the specific internalizing factor. When running the model separately by age, the association between overall parental warmth with specific internalizing was significantly stronger in 4-11 year-olds than in 12-17 year-olds. Similarly, the association between overall aversive/inconsistent parenting with specific internalizing was significantly stronger in 4-11 year-olds than in 12-17 year-olds. None of the other interactions between age and parenting were significant at the family level.

References

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Table S1

*Confirmatory Factor Analysis Model Fit Statistics*

|  |  |  |  |
| --- | --- | --- | --- |
| Model | CFI | TLI | RMSEA |
| A. Unidimensional | .859 | .854 | .028 |
| B. Correlated factors | .912 | .909 | .023 |
| C. Orthogonal bifactor | .943 | .938 | .018 |
| D. Correlated bifactor | .948 | .943 | .018 |

CFI = comparative fit index; RMSEA = root mean square error of approximation; TLI = Tucker-Lewis index.

Table S2

*Descriptive Statistics for Continuous Independent Variables*

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | *M* | *SD* | α |
| Warmth | 18.26 | 12.36 | 0.84 |
| Aversive/inconsistent parenting | 5.24 | 3.25 | 0.72 |
| Parent psychological distress | 3.06 | 3.55 | 0.85 |

*Note.* Means and standard deviations are based on weighted data.

Table S3

*Separate Multilevel Regression Analyses in Boys (*n *= 5400) and Girls (*n *= 5205)*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Internalizing | | |  | Externalizing | | |  | General Psychopathology | | |
| Independent variable | β | *SE***(**β**)** | *p* |  | β | *SE***(**β**)** | *p* |  | β | *SE***(**β**)** | *p* |
| **Boys** |  |  |  |  |  |  |  |  |  |  |  |
| *Child level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Warmth | **0.080** | 0.023 | .001 |  | **-0.105** | 0.025 | <.001 |  | **-0.067** | 0.023 | .003 |
| Aversive/inconsistent | -0.018 | 0.019 | .344 |  | **0.134** | 0.025 | <.001 |  | **0.104** | 0.02 | <.001 |
| *Family level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Mean warmth | **0.186** | 0.060 | .001 |  | **-0.159** | 0.051 | .002 |  | **-0.282** | 0.037 | <.001 |
| Mean aversive/inconsistent | 0.009 | 0.055 | .869 |  | **0.510** | 0.058 | <.001 |  | **0.314** | 0.04 | <.001 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Girls** |  |  |  |  |  |  |  |  |  |  |  |
| *Child level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Warmth | 0.033 | 0.022 | .138 |  | **-0.059** | 0.025 | .016 |  | **-0.121** | 0.024 | <.001 |
| Aversive/inconsistent | -0.001 | 0.021 | .967 |  | **0.078** | 0.019 | <.001 |  | **0.046** | 0.022 | .034 |
| *Family level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Mean warmth | **0.156** | 0.044 | <.001 |  | **-0.202** | 0.063 | .001 |  | **-0.219** | 0.042 | <.001 |
| Mean aversive/inconsistent | **0.117** | 0.056 | .038 |  | **0.398** | 0.077 | <.001 |  | **0.344** | 0.043 | <.001 |

*Note.* Analyses controlled for age and number of biological parents at home at the child level, and parent psychological distress, number of siblings at home, and low income status at the household level.Bold values are significant at *p* < .05.

Table S4

*Separate Multilevel Regression Analyses in Younger (Ages 4-11,* n *= 6,259) and Older (Ages 12-17,* n *= 4,346) Children*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Internalizing | | |  | Externalizing | | |  | General Psychopathology | | |
| Independent variable | β | *SE***(**β**)** | *p* |  | β | *SE***(**β**)** | *p* |  | β | *SE***(**β**)** | *p* |
| **4-11 year-olds** |  |  |  |  |  |  |  |  |  |  |  |
| *Child level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Warmth | **0.055** | 0.025 | .027 |  | **-0.066** | 0.020 | .001 |  | **-0.108** | 0.019 | <.001 |
| Aversive/inconsistent | 0.009 | 0.020 | .650 |  | **0.126** | 0.018 | <.001 |  | **0.082** | 0.02 | <.001 |
| *Household level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Mean warmth | **0.165** | 0.042 | <.001 |  | **-0.194** | 0.064 | .003 |  | **-0.195** | 0.040 | <.001 |
| Mean aversive/inconsistent | **0.104** | 0.051 | .042 |  | **0.510** | 0.076 | <.001 |  | **0.371** | 0.043 | <.001 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **12-17 year-olds** |  |  |  |  |  |  |  |  |  |  |  |
| *Child level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Warmth | 0.019 | 0.025 | .454 |  | **-0.088** | 0.028 | .002 |  | **-0.119** | 0.029 | <.001 |
| Aversive/inconsistent | -0.026 | 0.020 | .203 |  | **0.092** | 0.028 | .001 |  | **0.059** | 0.022 | .007 |
| *Household level parenting* |  |  |  |  |  |  |  |  |  |  |  |
| Mean warmth | 0.058 | 0.058 | .317 |  | **-0.374** | 0.067 | <.001 |  | **-0.296** | 0.042 | <.001 |
| Mean aversive/inconsistent | -0.037 | 0.062 | .556 |  | **0.414** | 0.064 | <.001 |  | **0.331** | 0.043 | <.001 |

*Note.* Analyses controlled for age, sex, and number of biological parents at home at the child level, and parent psychological distress, number of siblings at home, and low income status at the household level.Bold values are significant at *p* < .05.