**Supplementary Material**

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# **Appendix A. A Note on the Exclusion Criteria.**

Exclusions were made to those who were not first-born children to allow for independence of observation (Grawitch & Munz, 2004) and to remove the potential of child-order effects. That is, there appears to be different levels of aggression related schemas in first, second, and third children (Ardebili & Golshani, 2016), as well as higher risks of injuries in first-born children (Honda et al., 2020), which could influence the levels of conduct problem and head injuries highlighted in this study. Further exclusions were made to those whose main respondent in the study was not their biological mother. This exclusion was made because risk factors such as mother to child attachment were measured only for the biological mother. If we did not include this exclusion a proportion of the sample would not have available data for all risk factors at the mother-level. Finally, exclusions were made to those who did not have complete cumulative risk index (CRI) data. As the CRIs were created prior to analysis in Mplus, the missing data method (FIML) could not account for specific missingness apriori.

# **Appendix B. Model Fit Indices Guiding Optimum Number of Classes**

The Bayesian Information Criterion (BIC; Schwarz, 1978) and Akaike’s Information Criterion (AIC; Akaike, 1987) were used to examine model fit. The BIC and AIC assess a model’s ability to minimize variation within each class whilst maximizing variation between classes (Vermunt & Magidson, 2002). Lower BIC and AIC indices indicate a better fitting model (Collins & Lanza, 2009; Connell et al., 2009). Though there is not a defined guide on how to compare model fit, the BIC has been argued to be the most important factor to consider when comparing model fit and is widely used in LCA research (de Vries et al., 2022; Hamilton et al., 2021; Ma et al., 2022). However, it is not uncommon for the BIC to continue to decrease in size as more classes are introduced, therefore, it is critical to compare model fit indices alongside interpretability of classes produced (Aflaki et al., 2022).

The entropy is a summary statistic. It identifies how accurately the model can define its classes. It can range from 0 to 1, with a score closer to 1 suggesting better classification; a value of .80 and above is considered acceptable (Clark & Muthén, 2009).

# **Appendix C. Post-hoc Analysis: Negative Parenting Styles**

This study aimed to investigate if harsh parenting and withdrawal tactics were associated with group membership. Both have been previously associated with conduct problems (Hukkelberg & Ogden, 2021; Kingsbury et al., 2020; Speyer et al., 2022) and a greater risk of sustaining a head injury (Schnitzer et al., 2015). These were investigated at age 5 for two reasons: 1) there is limited research on the association between withdrawal tactics and conduct problems but of the available research, it suggests that a direct effect is evident from withdrawal tactics at age 5 to conduct problems at age 7 but not from age 3 (Speyer et al., 2022). 2) As can be seen in Figure 1, the first timepoint where we can start to differentiate between the direction of conduct problems in each pathway is at age 5. Therefore, to tease this apart we decided to investigate how negative parenting at age 5 may be associated with these pathways.

**Figure Legend**

# **Figure S1. A Flow Chart of the Total Analytical Sample**

Enrolled in study at T1 (*N*=18,786)

Completed T7

(*n*=10,345)

Lost to follow-up

(*n*=8,441)

First-born (*n*=10,238)

Not first-born child (*n*=107)

Missing SDQ information (*n*=945)

Completed T7 SDQ

(*n*=9,293)

Main respondent biological mother

(*n*=8,603)

Main respondent not the biological mother (*n*=690)

Missing data (*n*=3)

Complete cumulative risk data (*n*=8,600)

Final Analytical Sample (*n*=8,600)

This figure shows the exclusions made for the current study. It shows the number of participants excluded from the original total sample of *N* = 18,786 at timepoint 1 (T1) resulting in the final analytical sample of *n*= 8,600

# **Figure S2. A Figure of the 5-class Solution**

Conduct Problem Symptoms

**![Chart, line chart

Description automatically generated]()**

1. Head Injury Frequency

![Chart, line chart

Description automatically generated]()

This figure shows the 5 classes identified within a 5-class solution. Pathway 1 indicates an adolescent-onset high conduct problem symptoms with declining levels of head injuries. Pathway 2 indicates a single spike in conduct problem symptoms at ages 11 to 14 and a spike in head injuries at ages 7 to 11. Pathway 3 indicates a low-level conduct problem symptom and head injury class. Pathway 4 indicates child-limited conduct problem symptoms but there is a single spike in conduct problem symptoms at ages 7-11 and declining levels of head injuries. Pathway 5 indicates a persistent high conduct problem and head injury class. Whilst conduct problem symptoms remain somewhat interpretable alongside the previous literature, their linked head injury pathways become harder to disentangle and interpret within a 5-class solution.

# **Figure S3. A Figure of the 4-class Solution Conducted in a Whole Sample Analysis.**

1. Conduct Problem Symptoms

![Chart, line chart

Description automatically generated]()

1. Head Injury Frequency

![Chart, line chart

Description automatically generated]()

This figure shows the 4-class solution of conduct problem symptoms (a) and head injures (b) pathways across development when no exclusion criteria were applied. Figure 2a shows the same four conduct problems symptom pathways as when relevant exclusion criteria were applied. These are: low-level, persistent high, child-limited, and adolescent-onset high conduct problem symptoms. Figure 2b show similar pathways of head injuries as when relevant exclusion criteria were applied. These are: low frequency, childhood onward, childhood limited, and declining head injuries.

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