# Cognitive and Affective Empathy Predict Young Children's Involvement in Bullying One Year Later

# Supporting Information

## Appendix S1. Global Measure of Bullying

The descriptive statistics regarding bullying involvement according to the global measure are summarised in *Table S1*. According to this measure, most children were still not involved in bullying, with numbers going down across all forms of bullying involvement as opposed to the specific measure. We could once again see the slightly higher prevalence of males in the roles of bully (55.87%) as and bully-victim (60.34%). Victims (M = 8.63 years, SD = 0.92) and bullies (M = 8.63 years, SD = 0.97), were on average slightly younger than those classified as bully-victims (M = 8.83 years, SD = 0.86). Cognitive empathy at baseline was lower for bullies (M = 1.76, SD = 0.92) than non-involved children (M = 1.78, SD = 0.81), who showed lower levels of cognitive empathy than bully-victims (M = 1.80, SD = 0.80), whilst victims showed higher levels of cognitive empathy than any other groups at baseline (M = 2.02, SD = 0.82). Affective empathy was once again lower for bullies at baseline (M = 1.49, SD = 0.85), similar to bully-victims (M = 1.36, SD = 0.79) and higher for victims at baseline (M = 1.75, SD = 0.77) than for children not involved in bullying (M = 1.59, SD = 0.74).

Table S1: Descriptive Statistics for Bullying Involvement Based on the Global Classification

| Measure | Role | Prevalence (N) | Male (%) | Female (%) | Mean Age | SD Age | Mean Cognitive Empathy | SD Cognitive Empathy | Mean Affective Empathy | SD Affective Empathy |
|---|---|---|---|---|---|---|---|---|---|---|
| Global Classification | | | | | | | | | | |
| Global | Neither | 3397 | 50.99 | 49.01 | 8.81 | 0.92 | 1.78 | 0.81 | 1.52 | 0.74 |
| | Bully | 413 | 55.67 | 44.33 | 8.93 | 0.97 | 1.93 | 0.92 | 1.69 | 0.83 |
| | Victim | 792 | 43.18 | 56.82 | 8.63 | 0.90 | 2.02 | 0.82 | 1.75 | 0.77 |
| | Bully-Victim | 58 | 60.34 | 39.66 | 8.83 | 0.86 | 1.80 | 0.90 | 1.36 | 0.79 |

*Note*. Prevalence, gender percentages, mean age, and empathy scores (mean and standard deviation) are provided for each role. Role categories include Neither (not involved), Bully, Victim, and Bully-Victim.

**Empathy and Bullying Involvement Using the Global Measure**

The multinomial logistic regression showed that high cognitive empathy significantly predicted later victimisation (*OR* = 1.39, 95% CI [1.26, 1.53], $p < .001$), which can be seen in *Table S2*, as did high affective empathy (*OR* = 1.45, 95% CI [1.30, 1.61], $p < .001$), as represented in *Table S3*. A one-unit increase in total cognitive empathy score was associated with a 1.39 times higher likelihood of being a victim compared to the comparator group, and 1.45 as likely with a one-unit increase in the total score of affective empathy. There were no significant relationships between either type of empathy and involvement as bully or bully-victim.

Table S2: Affective Empathy Predicting Bullying Involvement According to the Global Measure of Bullying

| Outcome | *b* (Log Odds) | SE | *p* | OR | 95% CI |
|---|---|---|---|---|---|
| **Bully** | | | | | |
| Affective Empathy | -0.28 | 0.20 | 0.111 | 0.73 | [0.49, 1.08] |
| **Victim** | | | | | |
| Affective Empathy | 0.45 | 0.05 | < 0.001 | 1.45 | [1.30, 1.61] |
| **Bully-Victim** | | | | | |
| Affective Empathy | -0.30 | 0.24 | 0.138 | 0.70 | [0.44, 1.12] |

*Note:* Reference level is *Not involved*. Odds Ratios (OR) are exponentiated coefficients.

Table S3: Cognitive Empathy Predicting Bullying Involvement According to the Global Measure of Bullying

| Outcome | *b* (Log Odds) | SE | *p* | OR | 95% CI |
|---|---|---|---|---|---|
| **Bully** | | | | | |
| Cognitive Empathy | -0.24 | 0.18 | 0.130 | 0.76 | [0.54, 1.08] |
| **Victim** | | | | | |
| Cognitive Empathy | 0.39 | 0.05 | < 0.001 | 1.39 | [1.26, 1.53] |
| **Bully-Victim** | | | | | |
| Cognitive Empathy | 0.02 | 0.20 | 0.916 | 0.98 | [0.66, 1.46] |

*Note:* Reference level is *Not involved*. Odds Ratios (OR) are exponentiated coefficients.

**APPENDIX S2. Covariate Balance**

Below in Table S4 we report the Block-Average Absolute Standardized Bias (BASB) table to demonstrate balance of the covariates following propensity matching. The values demonstrate acceptable balance across all covariates for the generalised propensity scores for both measures of empathy.

Table S4: Block-Average Absolute Standardized Bias (BASB) for Covariates by Empathy GPS

| Covariate | Affective GPS | Cognitive GPS |
|---|---|---|
| Age | 0.046 | 0.078 |
| Gender | 0.031 | 0.076 |
| Emotional Symptoms | 0.064 | 0.093 |
| Bullying Involvement (Baseline) | 0.049 | 0.095 |

*Note*. BASB values < .10 are commonly interpreted as indicating acceptable covariate balance (Wu et al., 2021).

## Appendix S3. Clustering Analysis

Below we report the results of a Bayesian mixed-effect multinomial logistic regression which included random intercepts for the "School ID" variable, in order account for the nested nature of data and any potential clustering by schools whilst testing our research question about the influence of cognitive and affective empathy on later bullying involvement. This exploratory analysis confirms that our earlier findings hold true, even when clustering by schools is controlled for. Results for affective empathy are reported in Table S5 and results for cognitive empathy are reported in Table S6.

**Table S5.** Bayesian Multinomial Logistic Regression of Bullying Involvement on Affective Empathy (random school intercepts; reference = Neither)

| Role | OR | Est. Error | 95% CrI Low | 95% CrI High |
|---|---|---|---|---|
| Bully | 0.60 | 0.15 | 0.44 | 0.80 |
| Victim | 1.35 | 0.05 | 1.23 | 1.47 |
| Bully-Victim | 1.09 | 0.08 | 0.94 | 1.27 |

*Note.* These fixed effects estimates (expressed as log-odds) come from a Bayesian mixed-effects multinomial logistic regression predicting bullying involvement from affective empathy (with non-involvement as a reference category). The model adjusts for clustering at the school level via random intercepts.

**Table S6.** Bayesian Multinomial Logistic Regression of Bullying Involvement on Cognitive Empathy (random school intercepts; reference = Neither)

| Role | OR | Est. Error | 95% CrI Low | 95% CrI High |
|---|---|---|---|---|
| Bully | 0.74 | 0.14 | 0.56 | 0.96 |
| Victim | 1.33 | 0.04 | 1.23 | 1.44 |
| Bully-Victim | 1.11 | 0.07 | 0.97 | 1.28 |

*Note.* These fixed effects estimates (expressed as log-odds) come from a Bayesian mixed-effects multinomial logistic regression predicting bullying involvement from cognitive empathy (with non-involvement as a reference category). The model adjusts for clustering at the school level via random intercepts.