How does bullying impact the mathematical achievement of 9-year olds?

Dr Flavia Santos & Daráine Murphy

University College Dublin
School of Psychology

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Mathematics Achievement

- Mathematics is crucial in everyday life.

- Math is also essential in STEM areas, among others.

- "**Mathematical difficulties**" refers to inefficient learning in this school discipline, such as low grades, mistakes in homework, or during classroom activities.

- When a child struggles with math, several negative outcomes may happen. For example, reprobation, math's anxiety, etc.

Poor Mathematical Achievement

Mathematical failure has a long-lasting impact for the individual and the society (Ritchie & Bates, 2012)

It undermines psychological, social and economic outcomes in adulthood:

- depression
- trouble with authority
- lower occupational status
- lower incomes
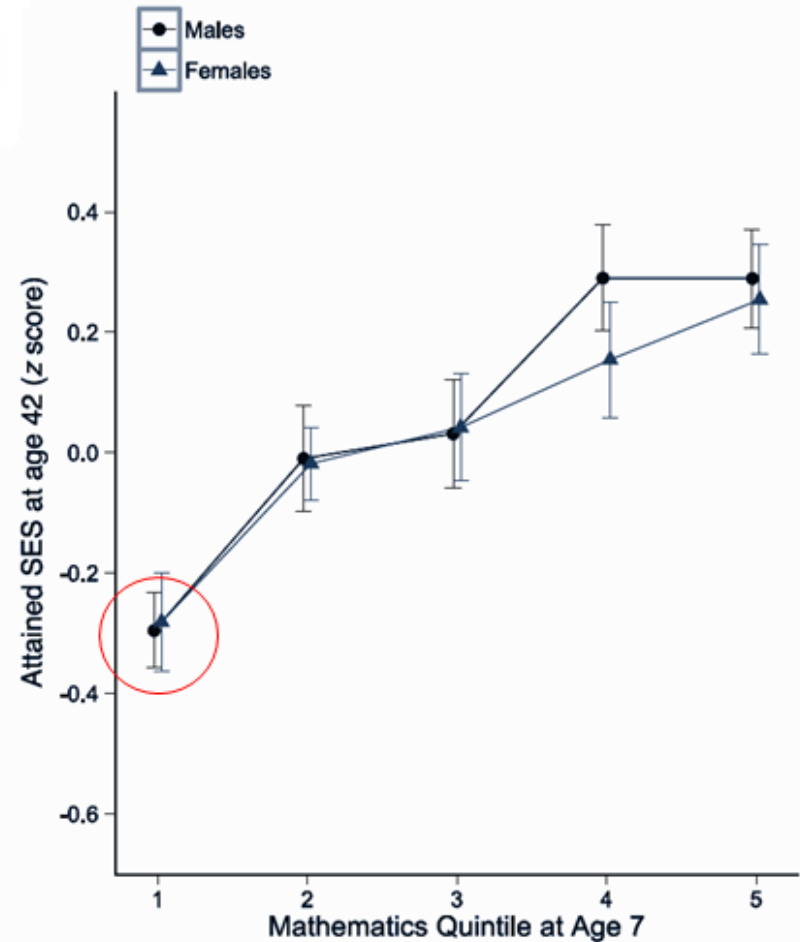
(Duncan et al 2007: Parsons and Bynner, 2005)

Impact of Mathematics Achievement
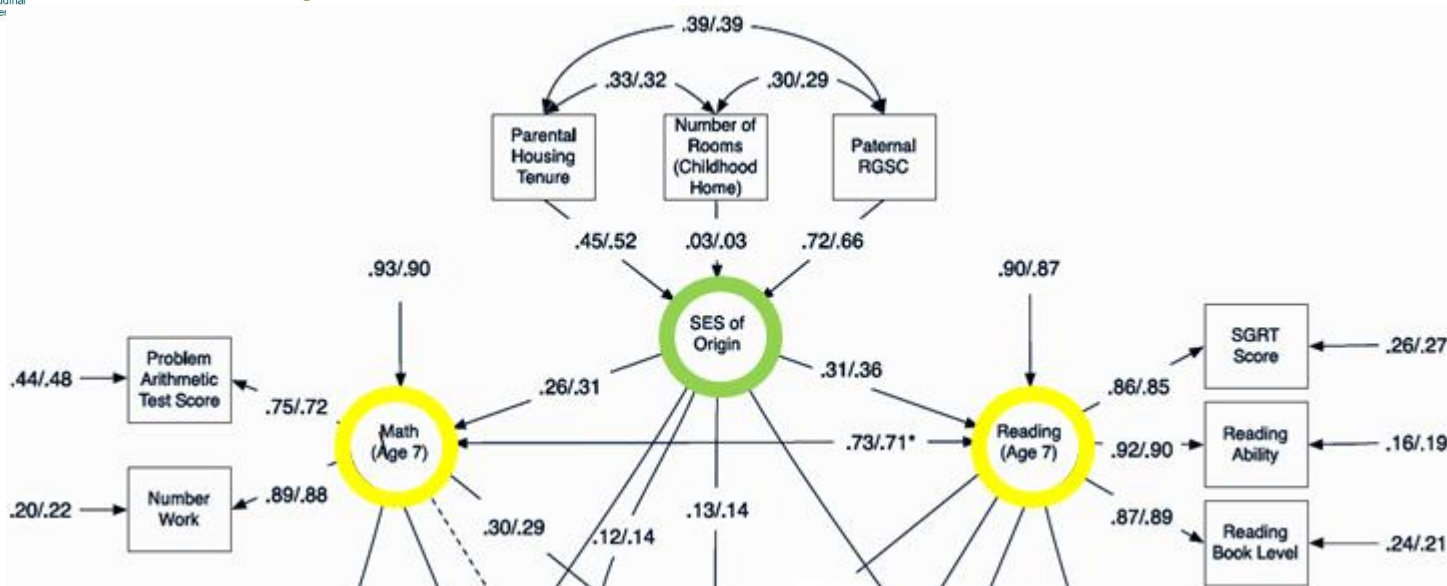
N= 14,425 at age 7

N= 11,419 at age 42

Children at age 7 ranked in the first quintile underperformed in mathematics and showed at age 42 the lowest attained SES score.
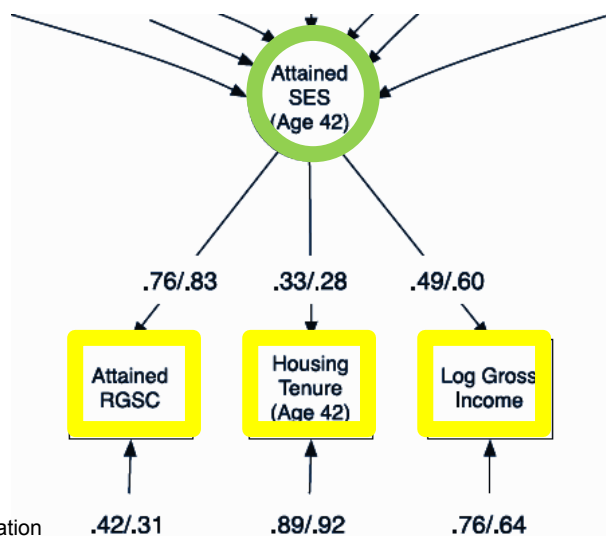
(Ritchie & Bates, 2012)

Impact of Mathematical Achievement

35 years later

Achievement in mathematics and reading was also significantly associated with intelligence scores, academic motivation, and duration of education

Saturated Structure Equation Model. In the sex-equated model, the latent factor (mathematics ability) had a significant association with SES with a model path weight of .18 for males and .10 for females.

(Ritchie & Bates, 2012)

RGSC = Registrar General's Social Classes occupational classification

Bullying and Mathematical Achievement

- Researchers have attempted to explain the relationship between academic performance and bullying. Nakamoto & Schwartz, (2010) conducted a meta-analysis of 33 studies and found a small but significant negative correlation between bullying and academic achievement.

- However, Hanish & Guerra (2002) found that bullying had no influence on school attendance or maths and reading standardised test achievement scores.

Bullying and Mathematical Achievement

- Some researchers propose that victimised students experience poorer academic performance **because** they feel unhappy in school and in turn begin to disengage thus reducing their classroom performance and school attendance (Cornell et al., 2013).

- Other researchers have proposed that bullying impacts on academic achievement **because** it causes the student considerable distress which in turn influences performance (Schwartz et al, 2005).

Current study:

There is a need for further research to add more clarity to the relationship between academic achievement, particularly mathematical achievement and bullying (Nakamoto & Schwartz, 2010).

The aim of this study is to understand the relationship between bullying and mathematical achievement considering children's and parent's perception of emotional variables and math's performance.

Method

- Data from Wave 1 and wave 3 from the Child Cohort of GUI was used in this study.
- Control variables known to influence math performance:
  - Mother's Education (*Primary, Secondary, Non-Degree, Degree*)
  - Income (*Quintiles*)
  - Social Class (*Professional, Manual, Semi-skilled, Unskilled, Never worked*)
  - Child Gender
  - Chronic health condition (*Y/N*)
  - If the child likes school (*child report*)
  - How well child does in math (*parent report*)
  - If child likes maths (*child report*)
  - How well child doing in school (*child report*)

- **Bullying:** The following question was answered by the study child. "Thinking back over the last year would you say that anyone (either a child or adult) picked on you?". The child was also asked if they had experienced the following types of bullying: physical, verbal, written, exclusion, electronic and other.

- *Mathematical Achievement:*
  - At age 9: The Drumcondra Primary Maths Test (Education Research Centre, 2006) was developed for Irish school children and is linked to the school curriculum. The test is grade specific and is strongly linked to the syllabus for each year.
  - At age 17: Grade in Mathematics in the Junior Certificate (state examination)- calculated similar to a point system used in the leaving certification.

Mediators:

- **Socio-emotional difficulties:** Socio-emotional difficulties was measured using the Strengths and Difficulties scale (Goodman, 1997). The Strengths and Difficulties scale contains twenty-five items and the respondent was required to indicate their level of agreement with each item on a three-point scale of 'Certainly true', 'Somewhat true' or 'Not true'. Item scores vary from 0-2 depending on the type of endorsement, and the total difficulties score ranges from 0-40.

- **Self-Concept:** The Piers Harris is a 60 item measure of the child's self-concept. The authors define self-concept as a relatively stable set of attitudes reflecting both the description and evaluation of one's own behaviour and attitudes.

Descriptives

% of children reporting bullying:

As reported by the child	38% (N=3265)
As reported by the parent	24% (N=2012)

Types of bullying (as reported by child):

Physical bullying	19%
Verbal bullying	26%
Electronic	2%
Written	5%
Exclusion	21.4%

Descriptives

Strengths and Difficulties Questionnaire*:

	M	SD
Entire sample	7.98	5.31
Those being bullied	9.087	5.65

Piers Harris (Self-Concept)*

	M	SD
Entire sample	46.31	8.67
Those being bullied	44.29	9.17

*statistically significant differences noted for each
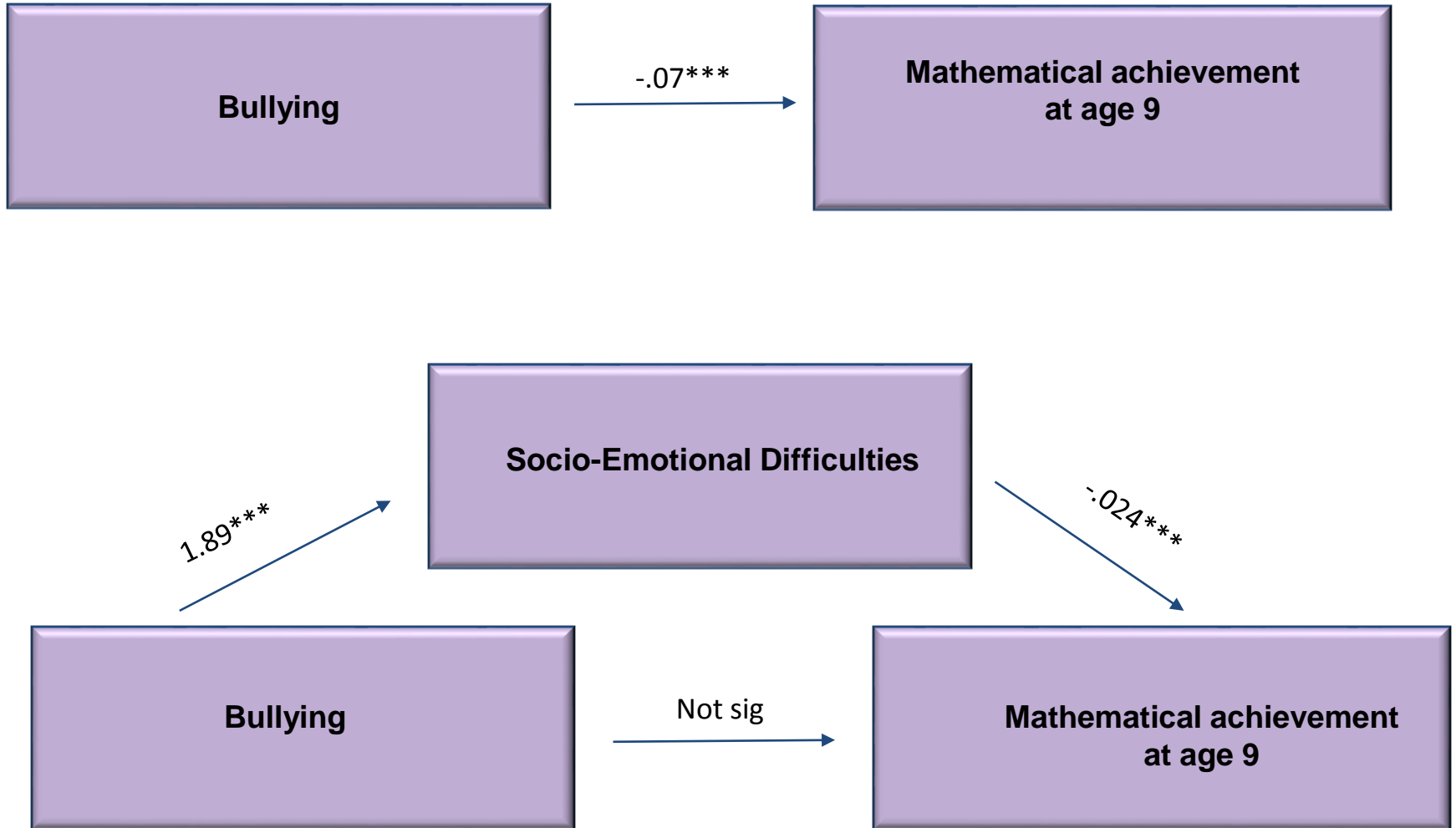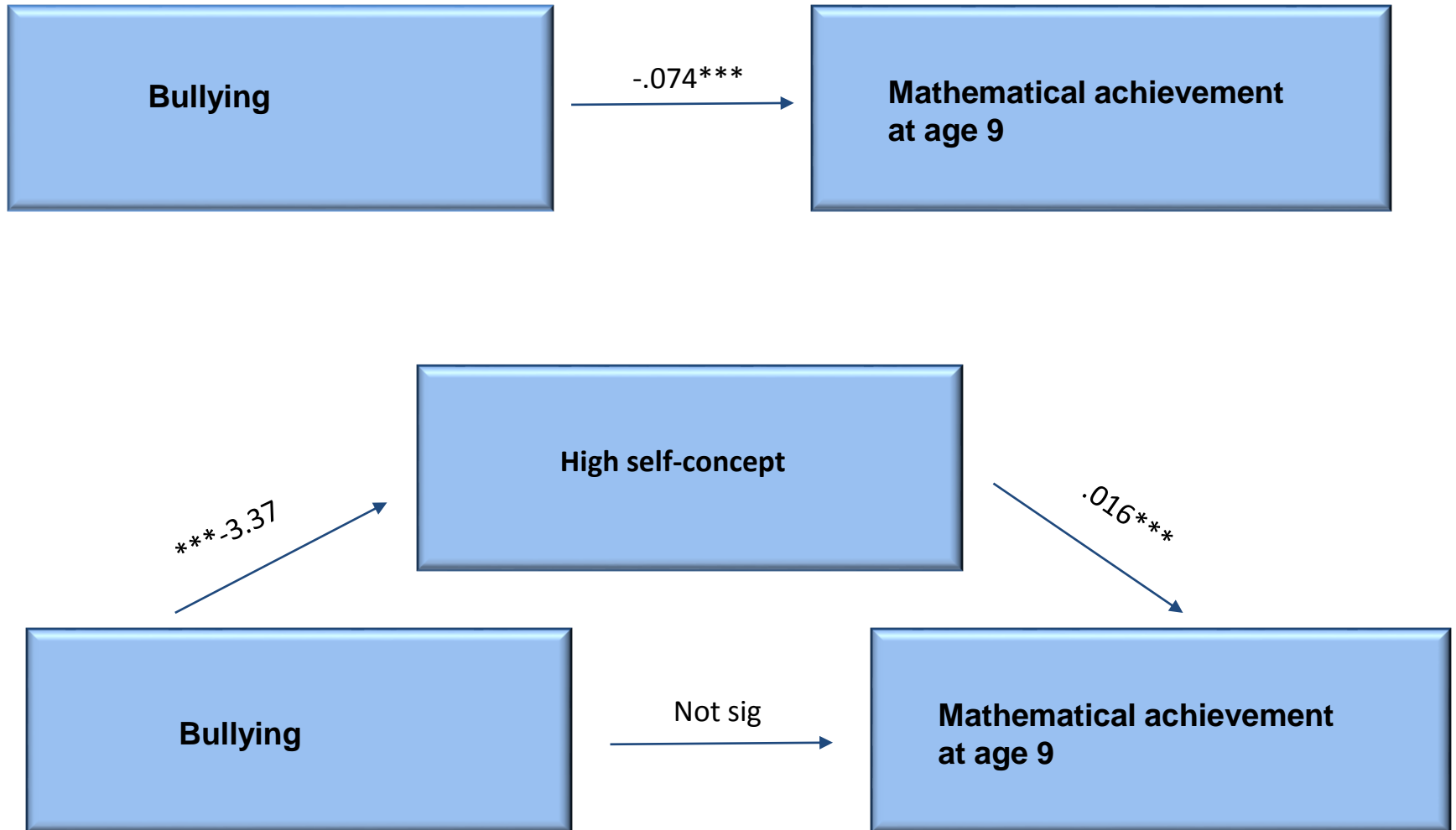
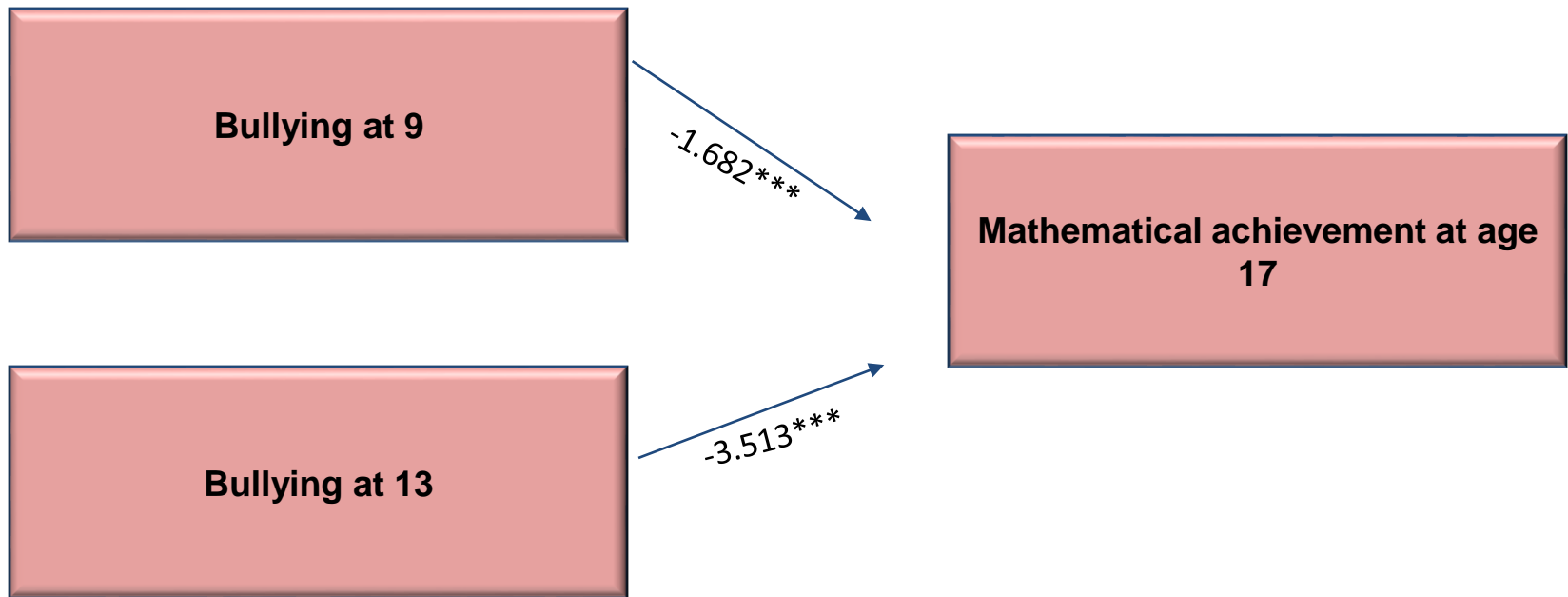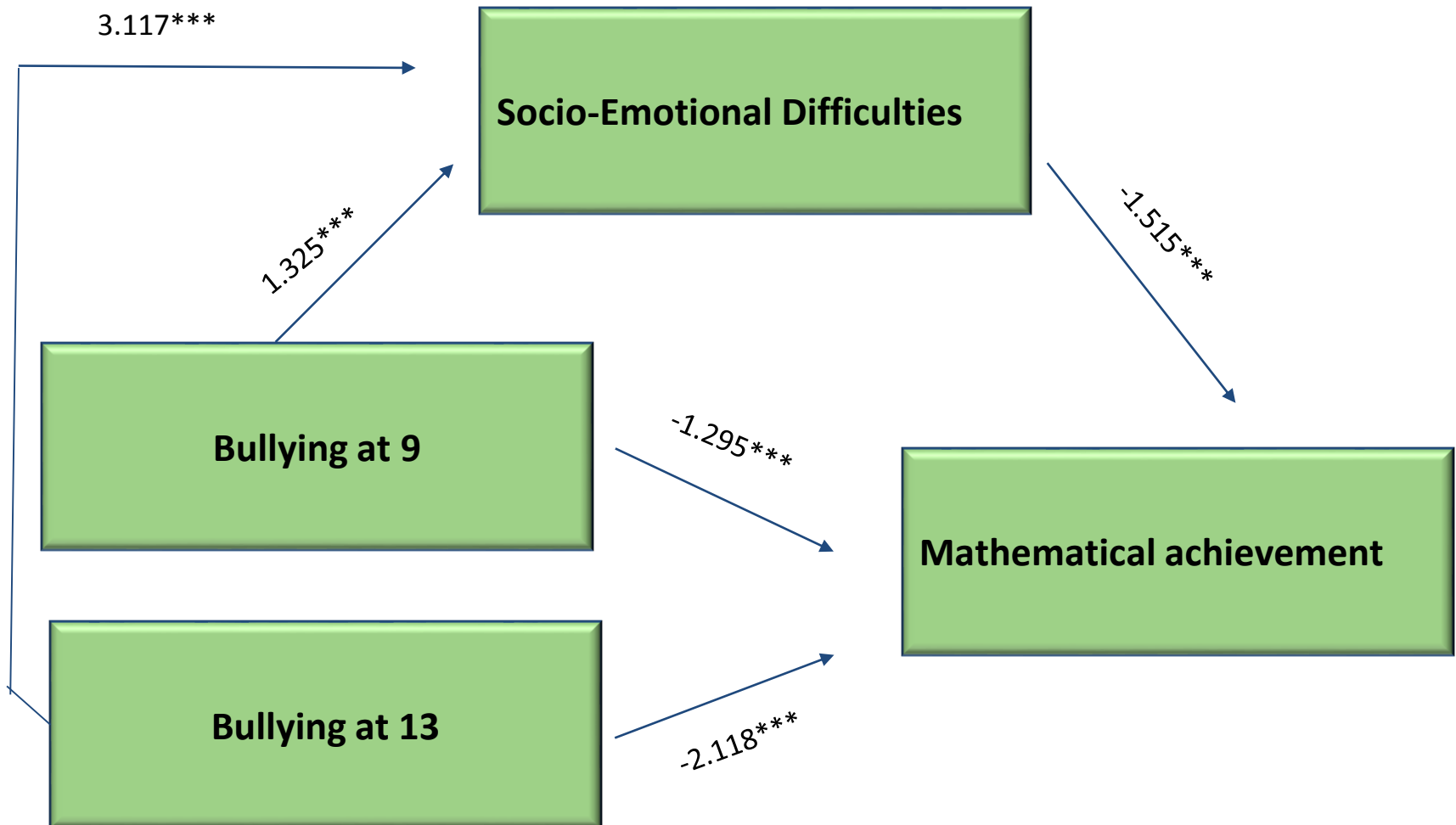# Model 1

Model 2

# Model 3

1. In our first model we saw that bullying had an effect on mathematical achievement, however, when we added socio-emotional difficulties to the model bullying was no longer significant. Indicating that it is socio-emotional difficulties that has the effect on achievement rather than bullying.

2. In our second model, when we added Pier Harris (Self-Concept) to the model bullying was no longer significant. Indicating that if an individual has a higher self-concept it can influence the effect bullying has on achievement.

3. We then looked at a **similar variables at age 17**, we found that bullying at **9** had an effect on mathematical achievement however, when we added socio-emotional difficulties to the model we found **bullying still remained significant**.

Recommendations

- Schools need to focus on interventions (such as resilience building exercises) to help students cope with the psychological impact bullying has on their well-being.

- More advanced modelling techniques e.g. structural equation modelling to further explore factors influencing relationship between bullying and achievement.

- Exploring further the longitudinal impact of bullying on achievement.
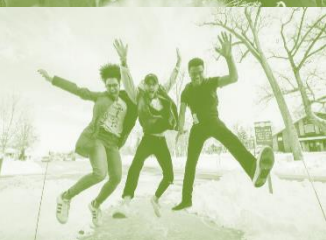
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Variables	Model 1	Model 2	Model 3
Primary (Ref: Degree)	-.452	-.450	-.398
Secondary	-.283	-.284	-.243
Non-degree	-.069	-.069	n.s
Manual (Ref: Professional)	-.145	-.144	-.135
Semi-skilled	-.219	-.216	-.200
Unskilled	-.216	-.209	-.185
Income 3 (Ref: Income 1)	.071	.073	n.s
Income 4	.108	.109	.105
Income 5	.133	.135	.122
Chronic health	-.116	-.111	n.s
Child does above average maths (PCG report)	1.035	1.033	.927
Child does average math (PCG report)	.498	.497	.420
Sometimes like school	-.106	-.111	-.117
Great school	.084	.082	.067
Bullying		-.086	-.048
Socio-emotional difficulties			-.024
Adjusted R^2	**.221**	**.223**	**.238**

Variables	Model 1	Model 2	Model 3
Primary (Ref: Degree)	-.408	-.407	-.387
Secondary	-.285	-.288	-.284
Non-degree	-.069	-.069	-.067
Manual (Ref: Professional)	-.138	-.137	-.125
Semi-skilled	-.221	-.216	-.198
Unskilled	-.233	-.226	-.173
Income 4 (Ref: Income 1)	.104	.104	.080
Income 5	.125	.125	.108
Chronic health	-.117	-.112	-.103
Child does above average maths (PCG report)	1.046	1.044	.969
Child does average math (PCG report)	.514	.514	.461
Sometimes like school	-.106	-.110	-.127
Great school	.085	.083	n.s
Bullying		-.087	n.s
Piers Harris			-.018
Adjusted R²	**.220**	**.222**	**.245**