



# The Impact of Promoting Alternative Thinking Strategies (PATHS) on Loneliness in Primary School Children: Results From a Randomized Controlled Trial in England

Alexandra Hennessey\*, Pamela Qualter and Neil Humphrey

Manchester Institute of Education, The University of Manchester, Manchester, United Kingdom

## OPEN ACCESS

### Edited by:

Herman Hay-ming Lo,  
Hong Kong Polytechnic University,  
Hong Kong, SAR China

### Reviewed by:

Wim Van den Noortgate,  
KU Leuven Kulak, Belgium  
Lilly Augustine,  
Jönköping University, Sweden

### \*Correspondence:

Alexandra Hennessey  
alexandra.hennessey@  
manchester.ac.uk

### Specialty section:

This article was submitted to  
Educational Psychology,  
a section of the journal  
Frontiers in Education

**Received:** 08 October 2021

**Accepted:** 22 November 2021

**Published:** 09 December 2021

### Citation:

Hennessey A, Qualter P and  
Humphrey N (2021) The Impact of  
Promoting Alternative Thinking  
Strategies (PATHS) on Loneliness in  
Primary School Children: Results From  
a Randomized Controlled Trial  
in England.  
Front. Educ. 6:791438.  
doi: 10.3389/feduc.2021.791438

Research suggests that loneliness during childhood is associated with poor well-being and mental ill-health. There is a growing social and educational imperative to explore how school-based interventions can support young children's social development. The Promoting Alternative Thinking Strategies (PATHS) curriculum is a universal school intervention focused on social and emotional learning, and it has a significant evidence based supporting its positive impact on children's social-emotional and mental health outcomes. Yet the impact on children's reported loneliness has not been explored. This paper presents the first large scale analyses of the impact of PATHS on reducing children's loneliness in England. A cluster randomized controlled trial (RCT) with two arms: intervention (PATHS—23 schools) and control (usual practice—22 schools) assessed the impact of PATHS on children's loneliness from baseline to 2-year follow-up. Two-level (school, child) multi-nomial regression models were used to assess "intention-to-treat" effects, controlling for important demographic co-variates such as gender, age, free school meal eligibility, ethnicity, and special educational needs. These analyses revealed a significant positive effect of PATHS on children's loneliness. Furthermore, sensitivity analyses, treating loneliness as a dichotomous variable and using different cut-offs for loneliness, revealed the positive effect of PATHS was maintained and, thus, robust. This is the first RCT to demonstrate that a school-based universal social-emotional learning intervention such as PATHS can reduce loneliness in children.

**Keywords:** loneliness, social and emotional learning, universal intervention, school randomized trial, hierarchical linear model

## INTRODUCTION

People report loneliness when they do not have as many social relationships as they want and/or when those relationships are not as fulfilling as they would like (Hawkley and Cacioppo, 2010). Among children and adolescents, feelings of loneliness have been consistently linked to concurrent well-being, and has longer-term negative effects on mental health, academic attainment, and general health (Eccles et al., 2020; Hawkley and Capitano, 2015; Qualter et al., 2021). Social restrictions, school closures and the continued school disruption associated with the COVID-19 pandemic has significantly affected the education sector globally. The closing of schools across many countries has

disrupted the functioning of the school system, reducing student learning opportunities and restricting the work of education authorities and decision-makers. Such changes also raise concerns about the school climate and inter-personal relationships for children, giving rise to concerns that loneliness has increased among school-aged children and adolescents (Demkowicz et al., 2021; Holmes et al., 2020), with potential longer-term impact of this on mental health (Cooper et al., 2021). Given the pivotal role of loneliness in these outcomes, the need for intervention now is crucial, especially among school-children (Loades et al., 2020). School-based universal curriculum approaches that nurture the social, emotional, and mental wellbeing skills of children and adolescents through explicit instruction as part of all children's classroom learning (Weissberg et al., 2015) are a prime candidate for school-based loneliness interventions. However, very few interventions have been designed to reduce loneliness among school-children, with even fewer having been evaluated systematically (Eccles and Qualter, 2020); no interventions have been developed as a universal intervention to reduce loneliness in children delivered as a whole school program specifically. The question, of course, is whether we need an intervention specifically developed for loneliness or whether currently available school-based interventions are available that can mitigate loneliness in children. In the current study, we evaluate whether a social and emotional learning (SEL) programme, the Promoting Alternative Thinking Strategies (PATHS) curriculum, is effective at reducing loneliness when delivered to school-children in England. PATHS is a universal SEL intervention for children aged 4–11 years, delivered by the class teacher, that aims to promote emotional awareness and understanding, positive self-esteem, self-control, and interpersonal problem-solving skills. It includes specific lessons on loneliness, making and keeping friends, and increasing awareness and understanding of difficult emotions. These foci suggest that it has significant potential to reduce loneliness, and the negative emotions that accompany it, among school-children.

Most of us have experienced loneliness at some point in our lives. For most of us that experience is transitory and does not contribute to negative consequences; it functions as an important state that motivates us to reconnect with other people (Qualter et al., 2015). However, for some people, loneliness can be a prolonged experience with negative consequences (Qualter et al., 2015). Academic enquiry of loneliness has been almost exclusively focused on adults, despite the fact that children as young as 5 years of age understand what it means to be lonely (Asher and Paquette, 2003) and report having those experiences often (Qualter and Munn, 2002; 2003). Loneliness can also have similar negative consequences (e.g., self-harm, emotional problems, poorer general health, sleep disturbance) for children as it does for adults (Eccles et al., 2020; Harris et al., 2013; Qualter et al., 2010; Yang et al., 2020), highlighting the need for robust interventions to reduce or mitigate the effect of loneliness among children. Given findings from a recent meta-analysis that loneliness decreases between the ages of 6 and 12 years (Mund et al., 2020), supporting the proposition that most children master and overcome the experience of it via

connection with peers (Qualter et al., 2015), interventions should be designed that can not only aid this developmental decrease in loneliness, but more importantly help children who suffer from prolonged loneliness. Reducing sustained loneliness and increasing feelings of connectedness can protect against the negative consequences of loneliness, which in the time of COVID-19 is crucial to ensure that the existing mental health crisis among our youth is not further exacerbated.

Universal social emotional interventions can target loneliness directly through the discussion of the experience and how it can be managed, and indirectly through the teaching of related emotional experiences and how those can be regulated. PATHS is underpinned by the Affective-Behavioural-Cognitive-Developmental model of development, which emphasises the developmental integration of affect, emotion language, behavior, and cognitive understanding to promote social-emotional competence (Greenberg and Kusche 1993). For example, the curriculum includes specific lessons on shyness, loneliness, and making and keeping friends, and includes the teaching of awareness and understanding of emotions, problem solving, listening to others, fairness, teasing, and different points of view. It would therefore appear to be a prime candidate for supporting children to understand and manage feelings of loneliness. Indeed, because PATHS aims to promote emotional awareness in oneself and the development of coping strategies and techniques to manage and regulate emotions, this should have implications for how children manage and respond to experiences of loneliness. For example, if children are better able to label and understand the negative feelings associated with loneliness in themselves, they will also be able to initiate approaches to manage such feelings and put in to place strategies to cope with loneliness. PATHS also aims to help children be aware of and understand emotional states in others. We would therefore expect children participating in the intervention to be better able to recognise if a classmate is lonely, and know how to support them, creating a more connected school climate. Yet, to date there has been limited research specifically exploring the impact of PATHS on child reported loneliness. Seifer et al. (2004) found a non-significant trend for children receiving PATHS to report lower levels of loneliness at school, but this was a small-scale US-based quasi-experimental study (n = 150 children). Therefore, the current study is the first to empirically investigate the impact of PATHS on loneliness in a large-scale randomized controlled trial (RCT).

Multiple RCTs have demonstrated the positive impact of PATHS on children's social and emotional competence (e.g., Domitrovich et al., 2007; Humphrey et al., 2016) and mental health (e.g., Crean and Johnson, 2013). Consequently, it was recommended for widespread implementation in the United Kingdom in an influential review of early intervention (Allen, 2011). While PATHS is founded on a strong international evidence base, independent research in the United Kingdom has been somewhat more mixed. One RCT in Northern Ireland produced effects that were "weak and inconsistent, but generally in a positive direction" (Ross et al., 2011, p. 61), while a second RCT in Birmingham, England, yielded null results (Berry et al., 2016). A third recent major RCT

**TABLE 1** | School sample characteristics and national average comparisons.

School characteristic	National average	PATHS	Usual practice	Balance at randomisation (Cohen's <i>d</i> )
Number of full-time equivalent pupils on roll <sup>a</sup>	242.5	313.26 (111.15)	287.36 (96.47)	0.24
Overall absence (% half-days missed) <sup>b</sup>	5.2	5.00 (0.94)	5.60 (1.24)	0.48
Proportion eligible for free school meals <sup>a</sup>	18.2%	30.1%	30.9%	0.04
Proportion speaking English as an additional language <sup>a</sup>	17.5%	20.6%	23.6%	0.12
Proportion White British <sup>a</sup>	73.5%	67.0%	65.7%	0.04
Proportion with special educational needs and disabilities <sup>c</sup>	19.8%	16.6%	17.3%	0.12
Proportion achieving Level 4 (or above) in English and Maths at end of KS2 <sup>d</sup>	79.0%	80.7%	75.4%	0.43

<sup>a</sup>Department for Education (2010).

<sup>b</sup>Department for Education (2014).

<sup>c</sup>Department for Education (2012).

<sup>d</sup>Department for Education (2013).

(Humphrey et al., 2018) suggested more promising findings on pupil self-report outcomes and demonstrated that PATHS led to a small, statistically significant improvement in children's psychological wellbeing, with further analysis illustrating increased intervention effects for psychological wellbeing, and revealing significant medium to large effects for peer social support and school connectedness among schools with increased compliance to the intervention (Panayiotou et al., 2019). Thus, the impact PATHS may have on child loneliness warrants exploration.

The authors were jointly funded by the National Institute for Health Research (NIHR) and the Education Endowment Foundation (EEF) to conduct a 2-year trial of PATHS in English primary schools. This paper is a secondary data analysis of those study data, and uses an intention-to-treat (ITT) analysis (Gupta, 2011) to explore the impact of PATHS on children's loneliness over a 2-year longitudinal study. It is hypothesised that children in primary schools that are implementing PATHS over a 2-year period will demonstrate significantly reduced feelings of loneliness compared with those of children attending control schools.

## MATERIALS AND METHODS

### Design

The study design used a 2-year cluster RCT with two arms (intervention—PATHS; and control—usual practice). Schools were randomly allocated to intervention or control arms by an independent trials unit. Allocation was balanced by proportions of children eligible for free school meals (FSM) and speaking English as an additional language (EAL) via adaptive stratification (minimisation). Loneliness was assessed at baseline (pre-randomisation) and 2 years later at the conclusion of implementation.

### Sample

58 schools were recruited from seven Local Authorities, of which 45 met the eligibility criteria for randomization that included completion of baseline measures and signing a memorandum of agreement to adhere to the trial protocol. Participating schools were representative of norms in England in respect of size,

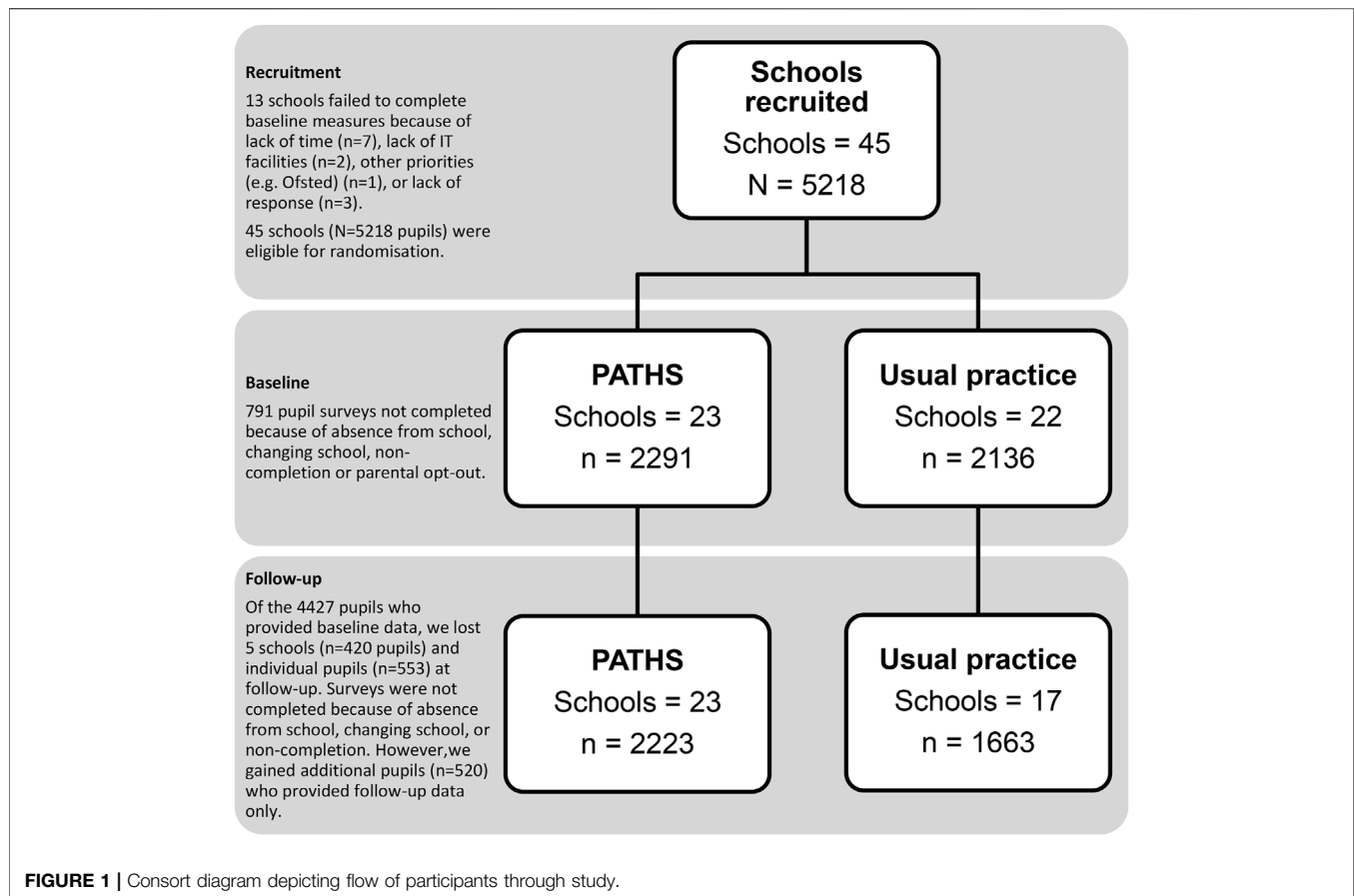
attendance, ethnic composition, attainment, and the proportion of children identified as having special educational needs, but had higher proportions of children eligible for FSM and speaking EAL than national averages (Department for Education 2010, 2012, 2013, 2014; see **Table 1**). There were minimal differences in school demographics (i.e., proportions of children eligible for FSM, with special education needs or disabilities (SEND), and speaking EAL) between trial arms, with the exception of absence and attainment, where small differences were observed.

There were 5,218 children in the 45 participating schools (PATHS: 2,676 children; usual practice: 2,542 children) in Years 2–4 at baseline (ages 6–8 years). See **Figure 1** for a consort diagram illustrating the flow of participants with loneliness data through the trial. Child sample demographic characteristics are displayed in **Table 2** and were largely consistent with national norms, albeit with the same exceptions noted above regarding school characteristics (e.g., higher proportions of EAL and FSM; Department for Education 2010).

## Measures

### Loneliness

To measure loneliness a direct single-item measure was used taken from the KIDSCREEN27 (KS27). Children responded to one question, "Thinking about the last week, have you felt lonely?", using the semantic responses "never", "seldom", "quite often", "very often" and "always". The KS27 is psychometrically robust, with high internal consistency (>0.8), good reproducibility (test-retest ICCs are >0.6), and criterion validity (Ravens-Sieberer et al., 2007; Robitail et al., 2007). Single item measures are common place within research, often demonstrating no difference in terms of predictive validity to that of multiple-item measures (Bergkvist and Rossiter, 2007), and have long been used in population surveys to measure health status (Bowling, 2005), making them suitable for research with large sample sizes. Many recent studies have used similar single-item measures of loneliness, including the Health Behaviour in School-Aged Children surveys (e.g., Eccles et al., 2020; Lyyra et al., 2021; Madsen et al., 2019; Qualter et al., 2021) and Office for National Statistics reports (ONS, 2018a; ONS, 2018b). Single-item measures of loneliness have been shown to be highly correlated with multi-item indirect measures and to be just as



effective as longer measures at predicting outcomes (Cavanaugh and Buehler, 2016; Eccles et al., 2020).

As well as being treated as multi-categorical, the responses on such items have also previously been collapsed to form a dichotomous category of “lonely” (“very often” and “always”) and non-lonely’ (“never”, “seldom”, and “quite often”), to aid interpretation and allow differentiation between severe/chronic loneliness from transient and no experiences of loneliness (Madsen et al., 2019). To further measure feelings of loneliness, our single item is used as a dichotomous variable in this manner. The classification of transient versus prolonged loneliness has been shown to be effective for analysis in children (Eccles et al., 2020), albeit using a slightly different measure of loneliness and response options. To be conscious that the classification of responses into transient versus prolonged loneliness was subjective, we followed Madsen et al., 2019 recommendation to explore the variations of different cut-offs for determining lonely group membership e.g., those who reported sometimes/quite often were included in the lonely group in our sensitivity analyses.

### School and Child Characteristics

The following child demographic data were extracted from the National Pupil Database for use as covariates in the analyses: gender, FSM eligibility, ethnicity, and SEND status. At the school level, data on school size, proportion of children eligible for FSM, proportion of children speaking EAL, proportion of children

identified as having SEND, were obtained from the Department for Education performance tables database.

### Intervention

PATHS is implemented by class teachers in a series of lessons that include such topics as identifying and labelling feelings, controlling impulses, understanding other people’s perspectives, interpersonal problem-solving, peer relationships, self-control, reducing stress, and study skills. Beyond the taught curriculum, teachers are encouraged to use generalisation activities and techniques to make use of “teachable moments” to help children understand how and when they might use these strategies and skills throughout the school day, and there are supplementary send-home activities available to extend learning to the home environment.

Each class receives curriculum packs containing lessons and send-home activities. Associated physical resources and artifacts (e.g., posters, feelings faces, and feelings dictionaries) are also provided. In the current study, class teachers were also given an implementation guidance manual developed by the research team that emphasized the PATHS programme theory and the importance of effective implementation.

PATHS lessons follow a standard format that includes an introduction from the teacher, a main activity, and a brief plenary/closure. Prompts to elicit pupil responses and clarify learning are included throughout. The programme adopts a “spiral” curriculum model (e.g., topics and concepts are revisited, units and

**TABLE 2** | Child characteristics.

	Total (%)	PATHS (%)	Usual practice (%)
<b>Distribution by gender</b>			
Percent boys	51.4	49.9	53.0
Percent girls	48.6	50.1	47.0
<b>Distribution by Year group at baseline</b>			
Percent Year 2	36.1	36.4	35.7
Percent Year 3	32.7	32.0	33.4
Percent Year 4	31.3	31.7	30.8
<b>Distribution eligible for free school meals</b>			
Eligible	30.5	32.4	28.5
Not eligible	69.5	67.6	71.5
<b>Distribution by ethnic group</b>			
White British	71.6	73.3	69.9
Other ethnic group	28.4	26.7	30.1
<b>Distribution speaking English as additional language</b>			
English as first language	77.5	78.2	76.7
English as additional language	22.5	21.8	23.3
<b>Distribution with special educational needs and disabilities (SEND)</b>			
Without SEND	80.3	81.3	79.1
With SEND	19.7	18.7	20.9
<b>Percent lonely at follow-up</b>			
Never lonely	65.3	67.5	62.2
Seldom lonely	17.0	16.9	17.1
Quite often lonely	10.7	9.4	12.4
Very often lonely	4.6	4.1	5.1
Always lonely	2.5	2.1	3.1

lessons are developmentally sequenced) Lessons last approximately 30–40 min and are designed to be delivered twice-weekly throughout the school year. Curriculum packs contain an average 40 lessons across all year group curriculums.

Teachers in PATHS schools received one full day of initial training with a half-day follow-up 4 months later, led by certified trainers from Pennsylvania State University (PSU). Training included a range of activities designed to familiarise teachers with PATHS theory, concepts and materials. In addition to this training, on-going technical support and assistance was provided by three coaches trained and supervised by PSU staff. Coaching visits were bespoke to schools' needs, but were typically once a month/half-term and included modelling and observing PATHS lesson and providing feedback, and providing phone and email support to address concerns and queries. Schools allocated to the control arm of the trial continued their usual practice. This typically comprised lessons on Personal, Social and Health Education as part of the standard school curriculum and use of other SEL programmes and related activities.

## Analytic Strategy

Approaches recommended for ITT school-based intervention analysis were followed (Torgerson et al., 2013) using Mplus8.2. A multi-level fixed effects random intercepts multi-nomial regression model was fitted to test whether those children receiving PATHS were less likely to be “always lonely” compared to those in the usual practice group. Using “always lonely” in the last week as the reference group, comparisons were made to “never lonely”, “seldom lonely”, “quite often

lonely”, and “very often lonely” categories. Multi-level modelling controlled for clustering at the school level (children at the same school are more alike than children at other schools). Taking clustering into account this way is vital for education research as failing to acknowledge these natural structures (e.g., standard multiple regression) can seriously underestimate the standard error of the regression coefficient, which could lead more easily/readily to false-positive results. Partitioning the variance to naturally existing levels like this allowed examination of the amount variance in the outcome attributable to differences between schools and children respectively. While children will all have different starting points for loneliness (random intercepts), but we cannot reliably predict how the intervention would impact children and schools in different ways (fixed effects).

A model building approach was used. First, a background model with co-variables was fitted. At level one (child-level), gender, year group, FSM eligibility, ethnicity, SEND status, and baseline loneliness score were all entered as co-variables (given their known associations with the response variable). At level two (school-level), both minimisation variables (%FSM and %EAL) were entered in to the model. Second, the test model was fitted. In the test model, trial group (PATHS versus usual practice) was added at the school level. A comparison of background and test models allows identification of the a significant change in model fit once the variable of interest, trial group, was added, ultimately testing if children in PATHS schools reported a significant change in loneliness (compared to those in the control group) at the end of the 2-year trial.

**TABLE 3 |** Hierarchical multi-nomial regression models of the impact of PATHS curriculum on loneliness.

Compared to always lonely	Never lonely		Seldom lonely		Quite often		Very often	
School level	Standardised $\beta$ (SE)		Standardised $\beta$ (SE)		Standardised $\beta$ (SE)		Standardised $\beta$ (SE)	
% FSM	0.21 (0.45)		-0.22 (0.43)		-0.03 (0.34)		0.33 (0.75)	
% EAL	-0.52 (0.39)		-0.60 (0.37)		<b>-0.96 (0.27)</b>		<b>-0.97 (0.28)</b>	
Trial group – if PATHS	<b>1.68 (0.49)</b>		<b>1.35 (0.64)</b>		0.41 (1.11)		0.66 (1.27)	
Child level	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Gender - if female	-0.11 (0.10)	0.80 (0.56–1.13)	0.07 (0.15)	1.10 (0.76–1.59)	0.14 (0.25)	1.14 (0.78–1.66)	0.23 (0.27)	1.24 (0.81–1.90)
FSM - if eligible	-0.07 (0.12)	0.86 (0.56–1.33)	-0.14 (0.18)	0.80 (0.51–1.26)	-0.05 (0.28)	0.95 (0.59–1.52)	0.10 (0.30)	1.11 (0.66–1.87)
Year group If Year 3	<b>0.21 (0.10)</b>	1.58 (1.08–2.29)	0.11 (0.15)	1.19 (0.80–1.76)	0.07 (0.04)	1.08 (0.72–1.62)	-0.01 (0.27)	0.99 (0.63–1.57)
If Year 4	<b>0.71 (0.08)</b>	<b>4.84 (2.81–8.33)</b>	<b>0.76 (0.11)</b>	<b>3.33 (1.90–5.81)</b>	<b>0.69 (0.22)</b>	<b>2.01 (1.13–3.58)</b>	0.39 (0.33)	1.50 (0.79–2.86)
Ethnicity - if non-White	0.14 (0.14)	1.39 (0.81–2.37)	0.15 (0.21)	1.27 (0.73–2.22)	0.45 (0.29)	1.60 (0.90–2.82)	<b>0.68 (0.24)</b>	<b>2.07 (1.11–3.85)</b>
SEND – if with SEND	<b>-0.38 (0.09)</b>	<b>0.38 (0.25–0.56)</b>	<b>-0.43 (0.14)</b>	<b>0.46 (0.30–0.70)</b>	-0.39 (0.22)	0.63 (0.41–0.97)	<b>-0.56 (0.24)</b>	<b>0.51 (0.21–0.84)</b>
Baseline loneliness (1–5)	<b>-0.52 (0.10)</b>	<b>0.65 (0.57–0.74)</b>	<b>-0.42 (0.14)</b>	<b>0.78 (0.68–0.89)</b>	0.37 (0.23)	0.87 (0.76–1.00)	-0.08 (0.24)	0.97 (0.83–1.13)

Estimates in bold are significant at  $p < .05$ .

Sensitivity analyses were performed treating loneliness as a dichotomous variable with all other possible cut-offs to ensure robustness of results (Madsen et al., 2019).

Odds ratios (OR) and 95% confidence intervals (CI) for loneliness are reported for child level co-variates. In multi-level multi-nomial regression, calculating standard ORs at the cluster level (i.e., school) does not have the same interpretation as at the individual level (i.e., child) and are often misinterpreted to give a “population average” interpretation; thus a cluster level variable OR cannot be interpreted in the same way as an individual level OR (Merlo et al., 2006; Austin and Merlo, 2017) and is, therefore, not reported in the Mplus software. Consequently, a comparison of background model and test model significance can be used, alongside variable co-efficient significance, to identify significant treatment effects.

Follow-up loneliness data were missing for 25% of cases and were deemed to be missing at random (MAR; conditional on observed data). A multi-level logistic regression demonstrated that children with missing data were more likely to be of an ethnic minority and/or identified as having SEND (OR = 1.54,  $p = 0.005$  and OR = 1.35,  $p = 0.021$ ); no other variables (i.e., trial group, gender, FSM, year group, baseline loneliness or school FSM or EAL) significantly predicted missingness. Thus, full information maximum likelihood (FIML) was used to enable the inclusion of both partially and completely observed cases for all 45 schools and 5,218 children, thereby reducing the bias associated with attrition. FIML is recommended as a method for handling missing data and has been shown to produce unbiased parameter estimates and standard errors under MAR conditions (Enders, 2001). Available data on child level gender, FSM eligibility, year group, ethnic group, special education needs, and baseline loneliness were used in the FIML to help impute missing data.

## RESULTS

ITT analysis, documented in Table 3, revealed a significant positive effect of PATHS on children’s loneliness, as a

comparison between the background model (with all explanatory variables) and the test model (now with trial group added) demonstrated a significant model change ( $X^2 = 16.48$ ,  $df = 4$ ,  $p = 0.003$ ) demonstrating those children receiving PATHS were less likely to be “always lonely” compared to those in the usual practice group. Children in the PATHS intervention group are significantly more likely to report feeling “never lonely” or ‘seldom lonely’ compared to “always lonely” than the usual practice group ( $\beta = 1.68$ , SE = 0.49,  $p = 0.001$  and  $\beta = 1.35$ , SE = 0.64,  $p = 0.034$ ). There were no differences between the groups for ‘quite often lonely’ and ‘very often lonely’ ( $\beta = 0.41$ , SE = 1.11  $p = 0.713$  and  $\beta = 0.66$ , SE = 1.27  $p = 0.604$ ). These findings suggest children in the intervention group were more likely to report lower instances of feeling lonely.

The ITT analysis also supported some previous demographic trends. For example, younger children and children with special educational needs reported greater feelings of loneliness (see Table 3).

The sensitivity analysis treating loneliness as a dichotomous variable of lonely (“very often” and “always”) and non-lonely (“never”, “seldom”, and “quite often”) (as per Madsen et al., 2019) similarly revealed a significant impact of PATHS on child loneliness and the comparison between a background model and a test model demonstrated a significant model change ( $X^2 = 4.35$   $df = 1$ ,  $p = 0.037$ ) (Table 4). Children in PATHS schools were less likely to be lonely at follow-up compared to children in usual practice schools ( $\beta = -1.34$ , SE = 0.40,  $p = 0.001$ ). The further sensitivity analyses, using the different possible loneliness cut-offs, showed that the positive effect of PATHS was generally maintained. A comparison between the background models and the test models (i.e., the additional impact of trial group) demonstrated a significant model change for sensitivity analysis 3 and 4 ( $X^2 = 6.55$   $df = 1$ ,  $p = 0.010$  and  $X^2 = 3.97$   $df = 1$ ,  $p = 0.046$ ), but fell below significant for sensitivity analysis 2 ( $X^2 = 2.65$   $df = 1$ ,  $p = 0.104$ ) (see Table 4). Thus, using these cut-offs for loneliness the effect of trial group is more variable. However these differences are not too surprising since each sensitivity analysis moves towards an incrementally wider definition of “lonely”.

**TABLE 4 |** Sensitivity analysis hierarchical logistic regression models of the impact of PATHS curriculum on loneliness.

	Sensitivity analyses 1		Sensitivity analysis 2		Sensitivity analysis 3		Sensitivity analysis 4	
	For lonely (always, very often) versus not lonely (quite often, seldom, never)		For lonely (always) versus not lonely (never, seldom, quite often, very often)		For lonely (always, very often, quite often) versus not lonely (never, seldom)		For lonely (always, very often, quite often, seldom) versus not lonely (never)	
	Standardised $\beta$ (SE)		Standardised $\beta$ (SE)		Standardised $\beta$ (SE)		Standardised $\beta$ (SE)	
<b>School level</b>								
% FSM	0.14 (0.24)		-0.13 (0.19)		0.13 (0.19)		-0.24 (0.23)	
% EAL	0.17 (0.31)		0.30 (0.24)		0.05 (0.18)		-0.04 (0.22)	
Trial group – if PATHS	<b>-1.34 (0.40)</b>		-0.82 (0.36)		<b>-0.93 (0.29)</b>		<b>-1.11 (0.35)</b>	
<b>Child level</b>	<b>OR (95% CI)</b>		<b>OR (95% CI)</b>		<b>OR (95% CI)</b>		<b>OR (95% CI)</b>	
Gender - if female	<b>0.07 (0.03)</b>	<b>1.29 (1.04–1.60)</b>	0.02 (0.05)	1.10 (0.78–1.58)	<b>0.07 (0.02)</b>	<b>1.33 (1.15–1.54)</b>	<b>0.09 (0.02)</b>	<b>1.40 (1.25–1.58)</b>
FSM - if eligible	0.05 (0.04)	1.22 (0.96–1.56)	0.04 (0.06)	1.16 (0.76–1.74)	0.03 (0.03)	1.13 (0.94–1.35)	0.01 (0.02)	1.03 (0.89–1.19)
Year group If Year 3	<b>-0.08 (0.03)</b>	<b>0.71 (0.56–0.90)</b>	-0.08 (0.05)	0.72 (0.50–1.05)	<b>-0.09 (0.02)</b>	<b>0.70 (0.59–0.82)</b>	<b>-0.09 (0.02)</b>	<b>0.70 (0.61–0.80)</b>
If Year 4	<b>-0.27 (0.04)</b>	<b>0.33 (0.24–0.45)</b>	<b>-0.31 (0.07)</b>	<b>0.26 (0.15–0.45)</b>	<b>-0.23 (0.03)</b>	<b>0.38 (0.31–0.46)</b>	<b>-0.17 (0.02)</b>	<b>0.50 (0.43–0.58)</b>
Ethnicity - if non-White	0.03 (0.04)	1.15 (0.86–1.54)	-0.08 (0.07)	0.71 (0.42–1.14)	0.02 (0.03)	1.11 (0.91–1.35)	0.00 (0.02)	1.00 (0.85–1.18)
SEND – if with SEND	<b>0.09 (0.03)</b>	<b>1.56 (1.20–2.02)</b>	<b>0.17 (0.05)</b>	<b>2.34 (1.57–3.48)</b>	<b>0.10 (0.03)</b>	<b>1.62 (1.35–1.95)</b>	<b>0.08 (0.02)</b>	<b>1.48 (0.23–1.68)</b>
Baseline loneliness (1–5)	<b>0.20 (0.03)</b>	<b>1.38 (1.28–1.50)</b>	<b>0.19 (0.05)</b>	<b>1.37 (1.21–1.55)</b>	<b>0.19 (0.02)</b>	<b>1.34 (1.27–1.42)</b>	<b>0.17 (0.02)</b>	<b>1.30 (1.24–1.37)</b>

Estimates in bold are significant at  $p < .05$

## DISCUSSION

This is the first paper to demonstrate that a universal school-based SEL intervention, PATHS, can reduce feelings of loneliness among children. Children attending schools assigned to implement the PATHS intervention for 2 years were less likely to report instances of feeling lonely at follow-up compared to children in schools that continued their usual practice during this period. This finding was also generally insensitive to different cut-offs for dichotomising loneliness, highlighting a robust effect. Therefore, it appears SEL interventions can be successful at mitigating chronic feelings of loneliness. However, returning to the question posed at the start on whether we need an intervention specifically developed for loneliness or whether currently available school-based interventions are available to help mitigate feelings of loneliness in children, the findings reported here support the latter. SEL interventions that teach children about labelling and recognising their own emotions, teaching skills around pro-social behaviour, making and sustaining friendships, and resolving conflict, can provide children with some necessary skills to manage feelings of loneliness and act to reduce these when they occur. Similarly, from an interpersonal perspective, SEL interventions that teach children to identify and understand how other children are feeling, and provide them with both an awareness that they can act to help and the skills to do this in an effective way. Yet, the question still remains that an intervention specifically targeted reducing loneliness may help to further build skills to reduce feelings of loneliness, and whether an individual targeted approach may have more impact.

Our findings are promising considering the absence of loneliness interventions currently on offer for United Kingdom schools. The noted effects may be small, but traditional indicators of effect size strength (e.g., Cohen’s benchmarks) are discouraged as expecting such interventions to yield effects of over 0.50 is unrealistic. The strength of an intervention is therefore best evaluated relative to the context of said intervention and

relevant outcome (Tanner-Smith et al., 2018). Therefore, first accounting for the fact that the PATHS programme is not a specific loneliness intervention and reducing loneliness is not its primary focus, and second, the myriad of individual level factors that will have contributed to feelings of loneliness, the effects are clearly noteworthy. Taken alongside the previous evidence (Humphrey et al., 2016; Panayiotou et al., 2019), the current findings highlight that PATHS can yield promising impact on child wellbeing and peer and social support.

The current findings support those from a recent meta-analysis that showed school-based interventions can be successful in reducing feelings of loneliness in children, and that is particularly the case where they focus on developing social and emotional skills (Eccles and Qualter, 2020). The PATHS programme aims to develop social and emotional competencies, and includes content on making and sustaining friends, dealing with conflicts and resolving problems, and general lessons on understanding emotions in oneself and others and regulating and managing emotions. Such programmes teach and equip children with general skills to foster positive peer relationships, manage feelings of isolation and loneliness, and they reduce hostile and aggressive social behaviour in children and young people relative to control groups (Crean and Johnson, 2013), which reduces the number of negative social encounters in school that are associated with loneliness (Yang et al., 2020). Given findings that discriminating school climates and those that tolerate bullying behaviour are important predictors of loneliness (Jefferson et al., 2021. Under review)<sup>1</sup>, it is likely that the PATHS programme is also successful at reducing loneliness because it increases acceptance among students and between students and teachers, and creates a more accepting and tolerant school community.

<sup>1</sup>Jefferson, R., Barreto, M., Jones, F., Conway, J., Chohan, A., Rich-Madsen, K., et al. (2021). Adolescent Loneliness across the World and its Relation to Culture, school climate, and academic performance. Under review.

Other notable demographic trends were also observed. Younger children in the current study (age 9 years) reported significantly more loneliness than older children (age 11 years). While at first this may seem counter-intuitive given research that has highlighted increases in loneliness during adolescence (Qualter et al., 2015), there has been limited work with younger children to determine the pattern of change in loneliness during the childhood years. Recent research (Mund et al., 2020) suggests that during childhood there is a reduction in loneliness, and we support that finding here, and this only goes to highlight why interventions such as PATHS are especially timely at this age. Children with SEND in the current study were also more likely to be classed as lonely compared to their non-SEND peers, a finding that is consistent with other research (Bossart et al., 2012). Such students may experience greater feelings of loneliness as a consequence of comparatively lower levels of self-concept, reduced social skills, and difficulties in peer relations (Kucukera and Cifci Tekinarslan, 2015).

### Strengths and Limitations

Notable strengths of the current study include the large scale cluster-randomized control design with independent allocation. Multi-level modelling analysis took account of the hierarchical and clustered nature of the dataset, and sensitivity analyses were conducted to test the robustness of the effect to changes in how loneliness was scored.

Nonetheless, the current study is not without its limitations. The analysis relied on ITT, and while that has its merits, implementation variability is likely to have significant effect on the results. Implementation data from the current trial revealed that dosage (how much of the intervention has been delivered) was noticeably lower than recommended, and, on average, teachers were delivering slightly less than one lesson a week instead of two. Other studies of PATHS have reported similar dosage rates (e.g., Faria et al., 2013). An analysis accounting for compliance demonstrated that the impact of PATHS on psychological wellbeing, peer and social support, and school connectedness were much more pronounced once these dosage rates were taken into account (Panayiotou et al., 2019); an avenue for future research is therefore to determine whether the magnitude of the intervention effect identified here varies by dosage, suggesting there is a possibility the effects seen in the current

paper could be heightening using an analysis that takes into account compliance.

## CONCLUSION

This is the first paper to demonstrate that SEL interventions, such as PATHS, can be an effective intervention for reducing feelings of loneliness among children, and by extension highlights the potential of readily available universal school-based interventions to target loneliness in childhood.

## DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. Requests to access the datasets should be directed to alexandra.hennessey@manchester.ac.uk.

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The University of Manchester, ethics committee 5, Project Ref 11470. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

## AUTHOR CONTRIBUTIONS

AH was responsible for the paper concept, data analysis, and manuscript write-up, PQ and NH supported write-up and commented on the development of the manuscript. NH was the recipient and principal investigator for the funding associated with the overall project.

## FUNDING

This study was funded by the National Institute for Health Research (10/3006) and the Education Endowment Foundation.

## REFERENCES

- Allen, G. (2011). *Early Intervention, the Next Steps: An Independent Report to Her Majesty's Government*. London: HM Government.
- Asher, S. R., and Paquette, J. A. (2003). Loneliness and Peer Relations in Childhood. *Curr. Dir. Psychol. Sci.* 12, 75–78. doi:10.1111/1467-8721.01233
- Austin, P. C., and Merlo, J. (2017). Intermediate and Advanced Topics in Multilevel Logistic Regression Analysis. *Stat. Med.* 36, 3257–3277. doi:10.1002/sim.7336
- Bergkvist, L., and Rossiter, J. R. (2007). The Predictive Validity of Multiple-Item versus Single-Item Measures of the Same Constructs. *J. Marketing Res.* 44 (2), 175–184. doi:10.1509/jmkr.44.2.175
- Berry, V., Axford, N., Blower, S., Taylor, R. S., Taylor, R. S., Edwards, R. T., et al. (2016). The Effectiveness and Micro-costing Analysis of a Universal, School-Based, Social-Emotional Learning Programme in the UK: A Cluster-Randomised Controlled Trial. *Sch. Ment. Health* 8, 238–256. doi:10.1007/s12310-015-9160-1
- Bossart, G., Colpin, H., Pijl, S. J., and Petry, K. (2012). Loneliness Among Students with Special Educational Needs in Mainstream Seventh Grade. *Res. Dev. Disabil.* 33, 1888–1897. doi:10.1016/j.ridd.2012.05.010
- Bowling, A. (2005). Just One Question: If One Question Works, Why Ask Several? *J. Epidemiol. Community Health* 59 (5), 342–345. doi:10.1136/jech.2004.021204
- Cavanaugh, A. M., and Buehler, C. (2016). Adolescent Loneliness and Social Anxiety. *J. Soc. Personal Relationships* 33 (2), 149–170. doi:10.1177/0265407514567837



- Cooper, K., Hards, E., Moltrecht, B., Reynolds, S., Shum, A., McElroy, E., et al. (2021). Loneliness, Social Relationships, and Mental Health in Adolescents during the COVID-19 Pandemic. *J. Affect Disord.* 289, 98–104. doi:10.1016/j.jad.2021.04.016
- Crean, H. F., and Johnson, D. B. (2013). Promoting Alternative Thinking Strategies (PATHS) and Elementary School Aged Children's Aggression: Results from a Cluster Randomized Trial. *Am. J. Community Psychol.* 52, 56–72. doi:10.1007/s10464-013-9576-4
- Demkowicz, O., Panayiotou, M., Parsons, S., Feltham, A., Arseneault, L., Ingram, B., et al. (2021). Looking Back to Move Forward: Reflections on the Strengths and Challenges of the COVID-19 UK Mental Health Research Response. *Front. Psychiatry* 12, 622562. doi:10.3389/fpsy.2021.622562
- Department for Education (2012). *Children with Special Educational Needs: An Analysis*. London: Department for Education.
- Department for Education (2013). *National Curriculum Assessments at Key Stage 2: 2012 to 2013*. London: Department for Education.
- Department for Education (2014). *Pupil Absence in Schools in England: 2012 to 2013*. London: Department for Education.
- Department for Education (2010). *Schools, Pupils and Their Characteristics*. London: Department for Education.
- Domitrovich, C. E., Cortes, R. C., and Greenberg, M. T. (2007). Improving Young Children's Social and Emotional Competence: A Randomized Trial of the Preschool "PATHS" Curriculum. *J. Prim. Prevent* 28, 67–91. doi:10.1007/s10935-007-0081-0
- Eccles, A. M., Qualter, P., Madsen, K. R., and Holstein, B. E. (2020). Loneliness in the Lives of Danish Adolescents: Associations with Health and Sleep. *Scand. J. Public Health* 48, 877–887. doi:10.1177/1403494819865429
- Eccles, A. M., and Qualter, P. (2020). Review: Alleviating Loneliness in Young People - a Meta-analysis of Interventions. *Child. Adolesc. Ment. Health* 26, 17–33. doi:10.1111/camh.12389
- Enders, C. K. (2001). The Performance of the Full Information Maximum Likelihood Estimator in Multiple Regression Models with Missing Data. *Educ. Psychol. Meas.* 61 (5), 713–740. doi:10.1177/001316440161500110.1177/00131640121971482
- Faria, A. M., Kendziora, K., Brown, L., O'Brien, B., and Osher, D. (2013). *PATHS Implementation and Outcome Study in the Cleveland Metropolitan School District: Final Report*. Washington, DC.
- Greenberg, M. T., and Kusche, C. A. (1993). *Promoting Social and Emotional Development in Deaf Children: The PATHS Project*. Seattle, WA, US: University of Washington Press.
- Gupta, S. K. (2011). Intention-to-treat Concept: A Review. *Perspect. Clin. Res.* 2, 109–112. doi:10.4103/2229-3485.83221
- Harris, R. A., Qualter, P., and Robinson, S. J. (2013). Loneliness Trajectories from Middle Childhood to Pre-adolescence: Impact on Perceived Health and Sleep Disturbance. *J. Adolesc.* 36, 1295–1304. doi:10.1016/j.adolescence.2012.12.009
- Hawkey, L. C., and Cacioppo, J. T. (2010). Loneliness Matters: A Theoretical and Empirical Review of Consequences and Mechanisms. *Ann. Behav. Med.* 40 (2), 218–227. doi:10.1007/s12160-010-9210-8
- Hawkey, L. C., and Capitanio, J. P. (2015). Perceived Social Isolation, Evolutionary Fitness and Health Outcomes: a Lifespan Approach. *Philos. Trans. R. Soc. Lond. B Biol. Sci.* 370 (1669), 20140114. doi:10.1098/rstb.2014.0114
- Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., et al. (2020). Multidisciplinary Research Priorities for the COVID-19 Pandemic: a Call for Action for Mental Health Science. *Lancet Psychiatry* 7 (6), 547–560. doi:10.1016/S2215-0366(20)30168-1
- Humphrey, N., Barlow, A., Wigelsworth, M., Lendrum, A., Pert, K., Joyce, C., et al. (2016). A Cluster Randomized Controlled Trial of the Promoting Alternative Thinking Strategies (PATHS) Curriculum. *J. Sch. Psychol.* 58, 73–89. doi:10.1016/j.jsp.2016.07.002
- Humphrey, N., Hennessey, A., Wigelsworth, M., Lendrum, A., Pert, K., Joyce, C., et al. (2018). Evaluating the Efficacy of the Promoting Alternative Thinking Strategies (PATHS) Curriculum in Promoting Social and Emotional Wellbeing Among Children in Primary School: a Cluster Randomised Controlled Trial and Process Evaluation and Economic Analysis. *Public Health Res.* 6, 10. doi:10.3310/phr06100
- Kucukera, S., and Cifci Tekinarslan, I. (2015). Comparison of the Self-Concepts, Social Skills, Problem Behaviors, and Loneliness Levels of Students with Special Needs in Inclusive Classrooms. *Educ. Sci-theor Pract.* 15, 1559–1573. doi:10.12738/estp.2015.6.2331
- Loades, M. E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A., et al. (2020). Rapid Systematic Review: The Impact of Social Isolation and Loneliness on the Mental Health of Children and Adolescents in the Context of COVID-19. *J. Am. Acad. Child. Adolesc. Psychiatry* 59 (11), 1218–e3. doi:10.1016/j.jaac.2020.05.009
- Lyyra, N., Thorsteinsson, E. B., Eriksson, C., Madsen, K. R., Tolvanen, A., Löfstedt, P., et al. (2021). The Association between Loneliness, Mental Well-Being, and Self-Esteem Among Adolescents in Four Nordic Countries. *Int. J. Environ. Res. Public Health* 18 (14), 7405. doi:10.3390/ijerph18147405
- Madsen, K. R., Holstein, B. E., Damsgaard, M. T., Rayce, S. B., Jespersen, L. N., and Due, P. (2019). Trends in Social Inequality in Loneliness Among Adolescents 1991–2014. *J. Public Health (Oxf)* 41, e133–e140. doi:10.1093/pubmed/fdy133
- Merlo, J., Chaix, B., Ohlsson, H., Beckman, A., Johnell, K., Hjerpe, P., et al. (2006). A Brief Conceptual Tutorial of Multilevel Analysis in Social Epidemiology: Using Measures of Clustering in Multilevel Logistic Regression to Investigate Contextual Phenomena. *J. Epidemiol. Community Health* 60, 290–297. doi:10.1136/jech.2004.029454
- Mund, M., Freuding, M. M., Möbius, K., Horn, N., and Neyer, F. J. (2020). The Stability and Change of Loneliness across the Life Span: A Meta-Analysis of Longitudinal Studies. *Pers Soc. Psychol. Rev.* 24, 24–52. doi:10.1177/1088868319850738
- ONS (2018b). *Loneliness - what Characteristics and Circumstances Are Associated with Feeling Lonely?*. <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/lonelinesswhatcharacteristicsandcircumstancesareassociatedwithfeelinglonely/2018-04-10> Accessed on October 6<sup>th</sup>, 2021).
- ONS (2018a). *National Measurement of Loneliness: 2018*. <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/compendium/nationalmeasurementofloneliness/2018> Accessed on October 6<sup>th</sup>, 2021).
- Panayiotou, M., Humphrey, N., and Hennessey, A. (2019). Implementation Matters: Using Complier Average Causal Effect Estimation to Determine the Impact of the Promoting Alternative Thinking Strategies (PATHS) Curriculum on Children's Quality of Life. *J. Educ. Psychol.* 112 (2), 236–253. doi:10.1037/edu0000360
- Qualter, P., Brown, S. L., Munn, P., and Rotenberg, K. J. (2010). Childhood Loneliness as a Predictor of Adolescent Depressive Symptoms: an 8-year Longitudinal Study. *Eur. Child. Adolesc. Psychiatry* 19, 493–501. doi:10.1007/s00787-009-0059-y
- Qualter, P., Hennessey, A., Yang, K., Chester, K. L., Klemmer, E., and Brooks, F. (2021). Prevalence and Social Inequality in Youth Loneliness in the UK. *Int. J. Environ. Res. Public Health* 18 (19), 10420. doi:10.3390/ijerph181910420
- Qualter, P., Vanhalst, J., Harris, R., Van Roekel, E., Lodder, G., Bangee, M., et al. (2015). Loneliness across the Life Span. *Perspect. Psychol. Sci.* 10, 250–264. doi:10.1177/1745691615568999
- Ravens-Sieberer, U., Auquier, P., Erhart, M., Gosch, A., Rajmil, L., Bruil, J., et al. European KIDSCREEN Group (2007). The KIDSCREEN-27 Quality of Life Measure for Children and Adolescents: Psychometric Results from a Cross-Cultural Survey in 13 European Countries. *Qual. Life Res.* 16, 1347–1356. doi:10.1007/s11136-007-9240-2
- Robitail, S., Ravens-Sieberer, U., Simeoni, M. C., Rajmil, L., Bruil, J., Power, M., et al. KIDSCREEN Group (2007). Testing the Structural and Cross-Cultural Validity of the KIDSCREEN-27 Quality of Life Questionnaire. *Qual. Life Res.* 16, 1335–1345. doi:10.1007/s11136-007-9241-1
- Ross, S. M., Sheard, M. K., Cheung, A., Elliott, L., Slavin, R., Hanley, P., et al. (2011). Promoting Primary Pupils' Social-Emotional Learning and Pro-social Behaviour: Longitudinal Evaluation of the Together 4 All Programme in Northern Ireland. *Eff. Educ.* 3, 61–81. doi:10.1080/19415532.2012.665773

- Seifer, R., Gouley, K., Miller, A. L., and Zakriski, A. (2004). Implementation of the PATHS Curriculum in an Urban Elementary School. *Early Educ. Dev.* 15, 471–486. doi:10.1207/s15566935eed1504\_6
- Tanner-Smith, E. E., Durlak, J. A., and Marx, R. A. (2018). Empirically Based Mean Effect Size Distributions for Universal Prevention Programs Targeting School-Aged Youth: A Review of Meta-Analyses. *Prev. Sci.* 19, 1091–1101. doi:10.1007/s11121-018-0942-1
- Torgerson, C. J., Torgerson, D. J., and Styles, B. (2013). *Randomised Trials in Education: An Introductory Handbook*. Educational Endowment Fund, 16–26.
- Weissberg, R. P., Durlak, J. A., Domitrovich, C. E., and Gullotta, T. P. (2015). “Social and Emotional Learning: Past, Present and Future,” in *Handbook of Social and Emotional Learning*. Editors J. A. Durlak, C. E. Domitrovich, R. P. Weissberg, and T. P. Gullotta (Guilford Press), 3–19.
- Yang, K., Petersen, K. J., and Qualter, P. (2020). Undesirable Social Relations as Risk Factors for Loneliness Among 14-Year-Olds in the UK: Findings from the Millennium Cohort Study. *Int. J. Behav. Dev.*, 016502542096573. doi:10.1177/0165025420965737

**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

**Publisher’s Note:** All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2021 Hennessey, Qualter and Humphrey. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.