Journal of Child & Adolescent Trauma
https://doi.org/10.1007/s40653-024-00663-0

ORIGINAL ARTICLE

Implementing a School-Wide Trauma-Informed Education Approach: An Evaluation of Student-Outcomes during the First Year of Implementation

Rianne Wassink – de Stigter[1,2] · Wendy Nelen[3] · Marc Delsing[3] · Afra de Berk[3] · Roel Kooijmans[4] · Evelyne Offerman[5] · Michiel Asselman[5] · Karin Nijhof[6,7] · Ramón Lindauer[2,8] · Petra Helmond[8]

Accepted: 7 October 2024
© The Author(s), under exclusive licence to Springer Nature Switzerland AG 2024

Abstract

Trauma-informed education is an internationally and widely adopted approach to support traumatized students in their needs in schools. In this two-year longitudinal pre-posttest design study, the outcomes of a school-wide trauma-informed approach during a baseline year and first year of implementation in two regular primary and six special primary and secondary schools were examined with six measurement waves. We examined students' perception of school class climate, more specifically class atmosphere, quality of student relationships, quality of teacher-student alliance and order in the classroom. In addition, we examined posttraumatic stress symptoms, internalizing, externalizing, attention and total behavioral problems, executive functioning, and resilience. Results of the piecewise latent growth curve models showed more positive scores for atmosphere in the classroom and resilience at the end of the first implementation year compared to the end of the baseline year. In addition, there was an increase in youth-reported classroom atmosphere during the implementation year. After the first year of implementing the trauma-informed educational approach initial modest positive outcomes begin to emerge.

Keywords Trauma-informed education · Evaluation · Students · School class climate · School-wide · Implementation

Introduction

In the past decades, scientists, clinicians, and more recently educators, have become aware about the high prevalence of adverse childhood experiences (ACEs) and their negative impact on children and adolescents. Educators daily handle consequences of ACEs concerning learning, behavior, and emotion regulation of students. Therefore, trauma-informed educational approaches have become more widely adopted across the globe to cope with the impact of ACEs in schools (Maynard et al., 2019). However, the evidence base of research evaluating the outcomes of *school-wide* trauma-informed education on a *student level* remains very limited. Therefore, in this study we longitudinally examine outcomes of a trauma-informed educational approach in the Netherlands on the student level during the first year of implementation.

Impact of ACEs and Traumatic Experiences

Across the world almost two-thirds of children and youth experience at least one ACE, such as child abuse or domestic

✉ Rianne Wassink – de Stigter
rianne.destigter@youz.nl

1 Youz, Denemarkenlaan 2, 2711 EL Zoetermeer, The Netherlands

2 Amsterdam UMC, Department of Child and Adolescent Psychiatry, Amsterdam Public Health, Meibergdreef 5, 1105 AZ Amsterdam, The Netherlands

3 Praktikon, Toernooiveld 5, 6525 ED Nijmegen, The Netherlands

4 Koraal Centre of Expertise, Hondsberg 5, 5062 JT Oisterwijk, The Netherlands

5 Stichting Orion, Bijlmerdreef, 1289 - 2.31 1103 TV Amsterdam, The Netherlands

6 Pluryn Research & Development, Pluryn Industrieweg 50, 6541 TW Nijmegen, The Netherlands

7 Radboud Universiteit Nijmegen, Houtlaan 4, 6525 XZ Nijmegen, The Netherlands

8 Levvel, Academic Center for Child and Adolescent Psychiatry, Meibergdreef 5, 1105 AZ Amsterdam, The Netherlands

Published online: 23 October 2024

violence (Carlson et al., 2019). Prevalence rates of children experiencing four or more *ACEs* range from 1 to 38% in a non-clinical sample (Hughes et al., 2017). Furthermore, in the United States, population-based estimates suggest that almost two-thirds of children experience at least one *traumatic event* before age 16 (U.S. Department of Health and Human Services, n.d.). ACEs and traumatic experiences are sometimes used interchangeably in ACE-related research. However, traumatic experiences differ from ACES in that they involve (in)direct exposure to actual or threatened death, serious injury, or sexual violence (American Psychiatric Association, DSM-5 Task Force, 2013) whereas ACEs also refer to a wider range of adverse experiences during childhood, such as parental divorce, abuse, neglect, and bullying.

Experiencing ACEs, especially a cumulation of ACEs, can negatively impact the development of children into adulthood by contributing to an increased risk of physical, educational, behavioral, and mental health problems (Perfect et al., 2016). Extensive research shows how healthy development can be deterred and brain development altered, especially during critical developmental periods, by excessive or prolonged activation of the body's stress response and immune systems (Avery et al., 2020). Chronic stress may dysregulate the neuroendocrine system, crucial for stress management. This may lead to a lower threshold for perceived stress among children, exaggerated stress responses, and eventually trigger or increase susceptibility to psychopathology in childhood and adulthood (Remmers et al., 2024).

Furthermore, a systematic review showed support for the theory that ACEs may lead to the development of maladaptive schemas in children and adolescents and psychopathology in adulthood (Pilkington et al., 2020). Maladaptive schemas are broad and pervasive dysfunctional themes or patterns of memories, emotions, cognitions and physical sensations about oneself and the relationship with others, developed during childhood or adolescence. They affect the perception, processing, and response to events (Pilkington et al., 2020). This theory fits with other cognitive and behavioral theories on the impact of ACEs and trauma, stating that children growing up in unsafe environments with increased levels of stress may be more likely to perceive the world as unsafe and feel less confident they can manage (ACEs-inEHRS, 2024). As a result, children may develop problems with emotion regulation, cognitive biases towards threats, learn to suppress emotions, and avoid situations they fear will cause further distress.

Among children and adolescents, both adverse experiences fulfilling and not fulfilling DSM-5 A criterion of traumatic experiences, are associated with an increased likelihood of depression, anxiety, suicidality, conduct/behavioral problems, irritability, attention-deficit/hyperactivity disorder, and substance use disorder (Bielas et al., 2016; Bomysoad & Francis, 2020; Kim et al., 2020; Sahle et al., 2021). Altered brain development may inhibit youth to regulate their attention, behavior and emotions and work productively in the classroom (Lohmiller et al., 2022). In addition, children who have to endure acute or chronic trauma exposure can present with learning difficulties due to impaired executive functioning (e.g., poor cognitive flexibility), possibly resulting in academic and social difficulties (De Bellis et al., 2009; Chugani et al., 2001; Garcia et al., 2023; Op den Kelder et al., 2018; Pears & Fisher, 2005). Educators deal with the impact of ACEs and traumatic experiences daily as they are confronted with suboptimal school achievements, behavioral incidents and school dropout of students and their own secondary traumatic stress and emotional burden (Alisic, 2012; Bethell et al., 2014; Christian-Brandt et al., 2020; Hunt et al., 2017; Hydon et al., 2015; Perfect et al., 2016).

Therefore, trauma-informed educational approaches have been created. A trauma-informed educational approach provides an educational environment with policies, procedures, and practices responsive to the needs of ACE-exposed students and their teachers (Brunzell et al., 2016; Chafouleas et al., 2016). Schools represent a natural environment to help prevent and reduce the impact of traumatic experiences and ACEs and effectively try to engage students in the learning process (Chafouleas et al., 2016; Maynard et al., 2019; Roseby & Gascoigne, 2021). Trauma-informed educational approaches aim to help schools and teachers creating safe and supportive learning environments, fostering ACE- and trauma-impacted students' regulatory and relational abilities (Perry & Daniels, 2016).

Trauma-Informed Education

Trauma-informed educational approaches refer to a broad array of trauma-specific school-based intervention programs and integrated school-wide trauma-informed approaches (Berger, 2019; Maynard et al., 2019; Wassink - de Stigter et al., 2022). An example of a trauma-specific school-based intervention programs is the Cognitive Behavior Intervention for Trauma in Schools (CBITS; Jaycox et al., 2009). Usually, these intervention programs focus on reducing symptoms of post-traumatic stress disorder, depression, and behavioral problems (Wassink - de Stigter et al., 2022). A school-wide trauma-informed approach involves the implementation of trauma-informed strategies and interventions at the professional, organizational, and practical level within the school (Hanson & Lang, 2016; Maynard et al., 2019). The intent of school-wide trauma-informed approaches is creating safe and supportive learning environments that support the wellbeing, development, and regulation of emotions of students to help them succeed socially and academically (Avery et al., 2020).

In the current scientific and practice international literature, trauma-informed education is increasingly embedded

in a multi-tiered service delivery framework (Berger, 2019; Chafouleas et al., 2016; Maynard et al., 2019). Within these pyramid prevention frameworks, there are three levels of intervention. The first level provides universal support in the form of a 'school-wide trauma educational approach' for all students, regardless of specific concerns regarding emotional and behavioral problems. The second and third level provides more intensive support in the form of group or individualized 'trauma-specific school-based intervention programs' for students with significant trauma symptoms and/or emotional and/or behavioral problems. These trauma-specific programs can be effective in reducing symptoms of depression and PTSD among students, but these programs alone are not expected to create a school-wide trauma-informed educational climate. Therefore, school-wide trauma-informed approaches, which is the focus of evaluation in the current study, have been developed and implemented.

There are several trauma-informed principles that form the basis of various school-wide trauma-informed educational approaches (Maynard et al., 2019; SAMHSA, 2014; Wassink - de Stigter et al., 2022). These principles guide the development of school staff in becoming aware of and acknowledging the impact of trauma, recognizing symptoms of trauma, responding by integrating knowledge about trauma into policies and practices and preventing retraumatization. These general guidelines are to be operationalized by schools within their specific organizational and cultural context. Little is known about essential elements of trauma-informed schools and delivery of trauma-informed educational approaches in schools is diverse (Roseby et al., 2021; Thomas et al., 2019). However, there are four main assumptions implicit within the trauma-informed educational approaches: (1) trauma exposure is widespread and has prevalent impact; (2) healing is possible; (3) relationships are crucial in the healing process; and (4) safety is critical within the process of healing and preventing further impact (Avery et al., 2020).

Implementing a trauma-informed school-wide approach aims to prevent, mitigate, and reduce trauma-related symptoms through evidence-informed practices by recognizing and responding to the behavior of students from a trauma-informed perspective. By creating a safe and supportive learning environment, a trauma-informed school-wide approach is expected to result in improved student outcomes on an academic, behavioral, and socio-emotional level (Maynard et al., 2019).

Student Outcomes of Schoolwide Trauma-Informed Education

Although trauma-informed educational approaches are being adopted across the globe, a systematic review concluded that evaluations using randomized-control trials or quasi-experimental designs of *school-wide* trauma-informed approaches are non-existing (Maynard et al., 2019) nor have any evaluation studies using these designs have been published since.

When we look at the scarce number of peer-reviewed evaluation studies with alternative designs on *student outcomes* of *school-wide* trauma-informed education interventions, we see some positive outcomes of trauma-informed education interventions (reviews by Stratford et al., 2020; Thomas et al., 2019). First, using a pre-posttest design with 10 months between the two measurements in a sample 70 students (14–18 years) a decrease of posttraumatic symptoms was found after the implementation of *The Heart of Teaching and Learning: Compassion, Resiliency, and Academic Success* (HTL; Day et al., 2015), but no difference was found in the perception of school climate among students. HTL consists of (booster) training sessions for school staff of a trauma-informed curriculum, classroom observations and individual coaching, and implementation of de-escalation rooms for students. Second, using a retrospective pre-posttest design among 1243 students (range of ages not mentioned) after implemented the *Healthy Environments and Response to Trauma in Schools* (HEARTS) improvements were found on ability to learn, time task and school attendance, disciplinary office referrals, incidents involving physical aggression and out-of-school suspensions (Dorado et al., 2016). HEARTS is a three-tier trauma-informed framework. In addition, a subgroup of 46 students (5–12 years) suffering from the impact of trauma were selected and received psychotherapy as part of a trauma-specific program (tier 3) and showed significant reductions of PTSD in the retrospective pre-posttest design. Other peer-reviewed studies on trauma-informed education do not focus on *school-wide* trauma-informed education, but focus on trauma-specific programs (e.g., Holmes et al., 2015; Perry & Daniels, 2016), or consist of only qualitative methods (e.g., Parris et al., 2015), or are not focused on outcomes of implementation (e.g., Crosby et al., 2017).

In sum, the state of the art of research into the effectiveness of schoolwide trauma-informed educational approaches on student outcomes is very limited. The preliminary *peer-reviewed* studies on *student-outcomes* of *school-wide* trauma-informed education are in their infancy by small samples, few measurements, and a retrospective pre-posttest design (Day et al., 2017; Dorado et al., 2016; Geldhof et al., 2018). In addition, school-level measures, such as school climate, and detailed information on school context and demographics are often missing in these studies (Thomas et al., 2019).

The aim of the current study is to bring the field of trauma-informed education a step forward by examining outcomes of school-wide trauma-informed education

longitudinally in a sample of $N = 367$ students. We evaluated the outcomes of a school-wide trauma-informed approach implemented in (special education) primary and secondary schools on students' perception of class climate (i.e., atmosphere in the classroom, quality of student relationships, quality of teacher-student alliance and order in the classroom), posttraumatic stress symptoms, emotional, behavioral and attention problems, executive functioning, and resilience. We expected an increase in positive class climate and resilience and a decrease in posttraumatic stress symptoms, emotional, behavioral and attention problems and executive functioning problems.

Method

Participants

The current study is part of the longitudinal project 'Creating a Trauma-Sensitive School Climate: Implementing trauma-informed practice in education through staff training and organizational focus.' Two regular primary education schools and six special primary and secondary education schools participated in the project. Special education accommodates children that benefit from additional support because of special needs, such as a learning disability and/or emotional and behavioral disorders. Our sample mainly consisted of special education schools accommodating children with severe emotional and behavioral problems. In total we collected data from 367 children and adolescents aged 7 to 19 years ($M = 12.3$ years, $SD = 2.56$). The sample consisted of 73.3% male ($n = 269$) and 26.7% female ($n = 98$) participants. Almost a quarter (22.9%) of the participants were recruited from regular primary education schools ($n = 84$; $M_{age} = 9.70$, $SD_{age} = 1.29$, range = 7–12 years). About one fifth (18.8%) of the sample was recruited from special primary education schools ($n = 69$; $M_{age} = 9.96$, $SD_{age} = 1.31$, range = 7–12 years). More than half (55.0%) of the participants were recruited from special secondary education schools (n = 202; $M_{age} = 14.10$, $SD_{age} = 1.49$, range = 12–19 years).

Procedure

Schools were requested to select students with an IQ of 70 or higher to participate in the study, to ensure adequate understanding of the questionnaires. All students, their parents, and teachers at participating schools received information letters about the project and collection of data. Anonymity and confidentiality of the students and teachers were ensured. For students younger than 16 years the student and the caregiver provided written informed consent. For students 16 years or older, only written consent from the student was required. The Ethics Committee of [name masked for review] approved this study ([number masked for review]).

Both students and teachers completed questionnaires. In case of concerns about current safety and/or well-being of the student, a contact person of the school, usually a psychologist, would be informed of these concerns without sharing specific details or answers on the questionnaires by the researcher. Before filling out questionnaires at each measurement wave each student was informed of this procedure. We used thermometers with emojis to see how children were doing before and after completing the questionnaires at each measurement wave. Children reported their stress levels on a 5-point stress thermometer with happy, neutral, and angry smileys. This way children could discuss with the researcher(-assistant) if they felt comfortable enough to fill out questionnaires, needed a break or be referred to the contact person within the school when necessary. Students filled out questionnaires under supervision of a researcher on a laptop. If participants were not able to read the questions by themselves, questionnaires were read aloud by the researcher.

Design

The current study is a pragmatic evaluation study in which the degree of beneficial outcomes of a school-wide trauma-informed approach on a student-level is measured in "real world" circumstances. In this longitudinal pre-posttest design study, it is examined whether the implementation of school-wide trauma-informed education is associated with changes in levels and changes in growth of levels of student outcomes. Data was collected in two separate cohorts of students throughout two academic years with six measurement waves (see Fig. 1). For cohort one we collected data in two schools in the academic years 2018–2020. For cohort two we collected data in six additional schools in the academic years 2019–2021. Year one – the baseline year – of each cohort consisted of a pre-intervention measurement in November (T0), March (T1) and June (T2). In year two – the implementation year – of each cohort, schools started implementing the trauma-informed approach and three intervention measurements took place in November (T3), March (T4) and June (T5). This study was primarily conducted during COVID-19. Due to lockdown of the schools as part of COVID-19 measures taken by the Dutch government, measurement T2 at four out of six schools of cohort two was cancelled, and measurement T5 of one school of cohort one was cancelled.

We received informed consent from $N = 367$ students for participation in the study. However, 12 students did

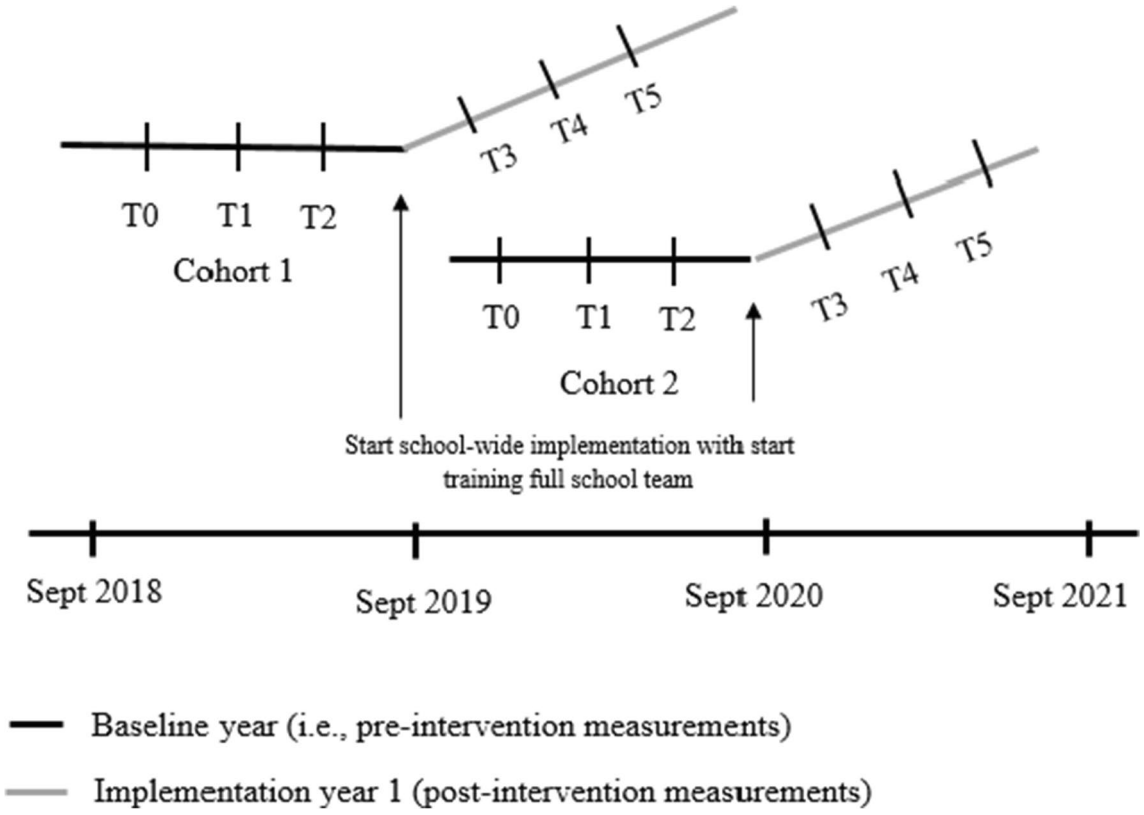

Fig. 1 An overview of the timeline of this study

not complete the T0 measures themselves, but their teachers did. At T0, all students ($n = 355$) completed a measure which included several questionnaires, including the ACE screener (ACES-YS) and PTSS screener (CRIES-13) which were used to select students. Students who had experienced at least two ACEs or one ACE and a score of 30 or more on posttraumatic stress symptoms completed all questionnaires in subsequent measurement waves. Students who did not score above these thresholds ($n = 35$) only completed the school climate questionnaires in waves T1-T5. The number of participants with data per variable per measurement wave is depicted in Table 1.

The Intervention

In this study, we evaluated a Dutch trauma-informed approach, called "Traumasensitive Education" and it consists of a train-the-trainer course, a 12-h full staff training curriculum (eight 1,5 h modules) and book "Lesgeven aan getraumatiseerde kinderen" [Teaching traumatized children] (Coppens et al., 2021). In short, the staff training and book focus on training school staff on the impact of trauma on a physical, behavioral, emotional, and academic level (i.e., realizing and recognizing; SAMHSA, 2014), and responding to trauma in an educational

Table 1 Number of participants with data per variable per measurement wave

Measurement wave	School climate	Resilience	PTSS	EBP- SR	EBP- TR	EF- SR	EF-TR	ACEs
T0	355	353	348	288	303	283	300	355
T1	124	108	91	81	201	79	203	
T2	204	181	179	155	191	154	191	
T3	183	168	168	125	186	126	193	
T4	202	183	184	141	212	140	212	
T5	175	159	157	118	193	117	194	

EBP externalizing, internalizing, and attention problems (total score), *EF* Executive Functioning, *SR* Self Report, *TR* Teacher Report. The total number of participants $N = 367$ is including participants that only had teacher-reported data and participants that only had self-reported data

environment within and outside of the classroom with students (i.e., self-regulation and co-regulation) and colleagues, collaboration with caregivers and involved care services, and self-care to prevent burn-out and compassion fatigue.

Every school received the same staff training that consisted of a standard format with a handbook for trainers and PowerPoint slides covering the same concepts. In the staff training the following content is covered in seven modules: trauma knowledge, trauma lens, safety and trust, stable relationships, self-regulation, resilience, collaboration, and self-care. Throughout these modules the concept of resilience is discussed. All topics were covered by explaining and discussing theory, providing, and discussing examples from practice and by doing hands-on exercises. An example of a hands-on exercise is that each staff member created a trauma-sensitive support plan for a student in which the concepts of the training were applied to one of their students. During the last module the implementation of trauma-informed education in the school was discussed.

Implementation

To help facilitate the implementation of a trauma-informed approach an implementation manual for school-wide implementation was developed and provided by the research project (Asselman et al., 2019). The manual for school-wide implementation for school staff and trainers gives a practical step-by-step approach to further develop a school-wide trauma-informed climate based on an international review on the implementation of a trauma-informed approach (Wassink - de Stigter et al., 2022), research on practice experience with implementing trauma-informed education among Dutch schools (Wassink - de Stigter et al., 2022) and insights from implementation science. This step-by-step approach outlines the various stages of development and provides support for reflecting on short- and long-term objectives in the implementation process.

In this study one or two staff members of each school participated in the train-the trainer course during the baseline year of measurements. Preferably, the school psychologist participated in the train-the-trainer course together with a teacher or second school psychologist. We refer to these trained staff members as internal trainers. At the end of the baseline year, there was a kick-off meeting from the internal trainers together with school management and one or two members of the research project group. During this meeting, several matters were discussed, such as the need for trauma-informed education within the school, information on the school team (e.g., safety and management support), school information (e.g., current policies and development) and the planning of team training and implementation. In addition, at the end of the baseline year internal trainers and members of the research project gave a presentation to staff regarding the relevance and planning of the implementation of trauma-informed education in the school.

At the start of the implementation year the internal school trainers formed a team with an external trainer and delivered the training of eight modules to the full school team, which takes 12 h of onsite training to complete. It is important to note that in principle every school received the same staff training and carried implementation out similarly according to the step-by-step manual for school-wide implementation. However, the specific implementation plan of trauma-informed education in each school was adaptive to the school's needs and wishes, a facilitating factor in implementation of trauma-informed education (Wassink - de Stigter et al., 2022).

To prepare for the implementation module, the internal school trainers together with a few other selected school staff members formed an implementation team. Together, they discussed themes and actions that were to be discussed during the staff training of the implementation module. After the implementation module had taken place, the implementation teams made and executed an implementation action plan based on the input of staff members and trainers.

Due to the impact of COVID-19 measures 25% ($n = 2$) of the schools had to resort to online instead of face-to-face staff training sessions. Additionally, 37.5% ($n = 3$) of the schools had to postpone most of the staff training to the second half of the implementation year due to COVID-19 measures. Four out of eight schools finished the full staff training (all eight modules completed) before T4, the second measurement of the implementation year. Two additional schools finished the full staff training (all eight modules completed) before T5, the final measurement of the implementation year. Two out of eight schools did not finish the full staff training before T5. One school completed seven out of eight modules and the other school completed four out of eight modules before T5. In sum, in total 88% ($n = 7$) of the schools received all seven modules in which the content of trauma-informed education was delivered and 50% ($n = 4$) of the schools had time during the implementation year to work on their execution of the implementation plan.

Measurements

The internal consistencies (i.e., reliability measures) of all instruments (i.e., total and subscales) were acceptable to excellent, and are depicted in Table 2.

Table 2 Internal reliabilities for the outcome variables

Variable	Cronbach's alpha					
	T0	T1	T2	T3	T4	T5
PTSS	0.89	0.84	0.90	0.88	0.89	0.91
EBP-SR						
Total	0.84	0.79	0.85	0.83	0.87	0.89
Internalizing	0.80	0.81	0.84	0.81	0.85	0.84
Externalizing	0.74	0.65	0.68	0.69	0.73	0.78
Attention problems	0.73	0.64	0.76	0.74	0.74	0.81
EBP-teacher reported						
Total	0.89	0.87	0.88	0.87	0.84	0.88
Internalizing	0.86	0.85	0.86	0.83	0.76	0.78
Externalizing	0.88	0.86	0.85	0.87	0.83	0.88
Attention problems	0.84	0.82	0.85	0.82	0.82	0.86
EF-SR	0.77	0.79	0.77	0.72	0.81	0.81
EF-teacher reported	0.91	0.90	0.91	0.91	0.91	0.93
Resilience	0.83	0.80	0.86	0.87	0.90	0.88
School Climate						
Quality of student relationships	0.88	0.88	0.89	0.88	0.87	0.89
Class atmosphere	0.81	0.85	0.82	0.81	0.81	0.80
Teacher-student relationship quality	0.91	0.93	0.93	0.89	0.90	0.92
Order in the classroom	0.81	0.82	0.83	0.83	0.86	0.82

Note. EBP = externalizing, internalizing, and attention problems (total score). EF = Executive Functioning

ACEs

ACEs were measured using the *ACE Youth Screener* (ACE-YS; Helmond et al., 2018) at T0. This is a self-report questionnaire for children aged 8–18 years old. Items of the ACE-YS are based on existing ACE screening instruments and previous research (Bethell et al., 2017; van Meijel et al., 2010; Wade et al., 2016; WHO, 2018). In total, the screener consists of 30 items measuring the 19 domains (e.g., 'Did you ever experience that nobody in your family loved you or thought of you as important' (i.e., emotional neglect) or 'Did you ever experience being bullied'). The domains are emotional abuse, physical abuse, sexual abuse, domestic violence, mental illness/suicide, alcohol/drugs of a parent/caretaker, emotional neglect, physical neglect, incarceration of a parent/caretaker, divorce, disaster/serious accident, being bullied, being discriminated, poverty, community violence, parental death, illness, foster care and being a war refugee. Items could be answered in the following way: (0) No, (1) Yes, once, and (2) Yes, more than once. For scoring purposes, the answers were dichotomized into (0) No and (1) Yes. The minimum score on the ACE-YS was 0 and the maximum score was 30. In addition, the ACE-YS contains three open-ended questions to ask for adverse experiences not mentioned by the 30 items and received or desired help. More information about the ACE-YS is available from the corresponding author upon request.

Posttraumatic stress symptoms

Posttraumatic stress symptoms (PTSS) were measured using the Children's Revised Impact of Event Scale (CRIES-13; Children & War Foundation, 1998). This self-report questionnaire for children aged 8–18 years old contains 13 items and three subscales: intrusion, avoidance, and arousal. An example item is: 'Do you think about it even when you don't mean to?.' Children were asked how frequently the comments were true for them during the past seven days, with the answering options being (0) not at all, (1) rarely, (3) sometimes, and (5) often. The total score was computed by summing the scores on the three subscales. The minimum score is 0 and the maximum score is 65. A score of 30 or higher indicates a heightened risk for posttraumatic stress disorder (Verlinden et al., 2014). Previous research has identified the CRIES-13 as a reliable and valid instrument (Verlinden et al., 2014).

Emotional, Behavioral and Attention Problems

The Brief Problem Monitor (BPM-Y and BPM-T, Achenbach et al., 2011), an abbreviated version of the Child Behavioral Checklist (CBCL), was used to assess dysregulation (i.e., anxious/depressed, aggressive behavior, and attention problems). The BPM-Y is a self-report questionnaire for children aged 11–18 years old, the BPM-T is reported by teachers. Both questionnaires consist of three subscales:

attention problems, internalizing behavior problems, and externalizing behavior problems. Additionally, the total score was computed by summing the scores of the subscales. The BPM-Y consists of 19 items and the BPM-T consists of 18 items, missing the item on obedience at home. An example item is: 'I threaten people/threatens people.' Items are rated on a 3-point scale from (0) not at all applicable to me/not true of student to (2) clearly applicable to me/very true of student. Previous research has identified the BPM as a reliable and valid instrument (Achenbach et al., 2011; Piper et al., 2014).

Executive functioning

The Behavior Rating Inventory of Executive Functioning (BRIEF Screener; Huizinga & Smidts, 2016) was used to assess executive functioning of students aged 11–18 years old by means of child-report and teacher-report. The BRIEF screener consists of 14 items divided in 7 domains (i.e., inhibit, shift, emotional control, initiate, working memory, plan/organize, organization of materials, and monitor). For example, students are asked 'I find it difficult to finish big assignments, like papers or book reports' and teachers are asked whether the student 'gets overwhelmed by big assignments.' Students are asked to indicate whether the item applies to them on a 3-point scale from (1) never, (2) sometimes, to (3) often. The screener has a minimum score of 14 and a maximum score of 42 points. A higher score indicates more problems with executive functioning. Previous research has shown good validity and reliability (Huizinga & Smidts, 2016; Waschl et al., 2023).

Resilience

The Brief Resilience Scale (BRS; Smith et al., 2008) was used to assess resilience. This self-report questionnaire consists of six items (e.g.,'I tend to bounce back quickly after hard times'), that are rated on a five-point scale from (1) not true at all to (5) completely true. To form a final score, the raw scores were added up and a mean score was calculated, with a minimum value of 1 and a maximum value of 5. The BRS is proven to be a reliable and valid instrument (Windle et al., 2011).

School climate

Students reported on school climate using the Climate Scale (Donkers & Vermulst, 2014). This scale consists of two parts: one more general part with 16 questions on the class the student is in and one part with 17 questions about the teacher. Example items are:'In this classroom, students are being bullied,' and'This teacher will let you know when you did something good.' The climate scale consists of four subscales: quality of student relationships (eight items), class atmosphere (eight items), order in the classroom (six items), and quality of teacher-student alliance (11 items). Answer possibilities are (1) (almost) never, (2) sometimes, (3) regularly, and (4) often. After scores on negative items are reversed, an average score is calculated per subscale over the items belonging to that subscale. Research on psychometric properties of the school climate scale showed adequate validity and reliability (Donkers & Vermulst, 2014).

Analytic Strategy

We investigated changes in outcomes on six measurement waves across the two consecutive academic years using a series of piecewise latent growth curve models. In these models, different growth factors were specified for different phases. More specifically, level and slope discontinuity latent growth models were specified, as proposed by Rioux and colleagues (2021) to deal with discontinuities in patterns of change due to the onset of COVID-19.

These models (Fig. 2) estimate whether an event (i.e., implementation of trauma-informed education) is associated with changes in levels (i.e., a bump) as well as a different growth pattern (slope) pre- and post-event. Figure 2 shows the general path diagram of the level and slope discontinuity latent growth models that were specified. As a result of our coding of time through the slope factor loadings, Intercept (I) represents the level of the outcome variable at T2 (i.e., in June of the baseline year). Slope 1 represents the linear rate of change from T0 (i.e., November baseline year) to T2 (i.e., June baseline year), which is the rate of change during the baseline year or year of pre-intervention measurements. Event represents the difference between the levels of the outcome variable at T2 (i.e., June of the baseline year) and T5 (i.e., June of the implementation year). Slope 2 represents the linear rate of change from T3 (i.e., November implementation year) to T5 (i.e., June implementation year), which is the (first) year of implementation of trauma-informed education. Through the Event factor, we could investigate differences between the levels of the outcome variables at the end of the baseline and first year of implementation in June (i.e., at T2 and T5). These time points were deemed most relevant in view of our research questions, since at T2, the intervention had not yet started, whereas at T5, the first year of implementation of trauma-informed education was ending in all participating schools. Furthermore, we could investigate differences in the rate of change in the outcome variables between the baseline year and first year of implementation based on the slope factor means. These differences were examined through Satorra-Bentler chi-square difference tests in which the fit of a model in which the means of slope 1 and slope 2 were constrained to be equal was compared to the fit of a model in which both means were freely estimated. All

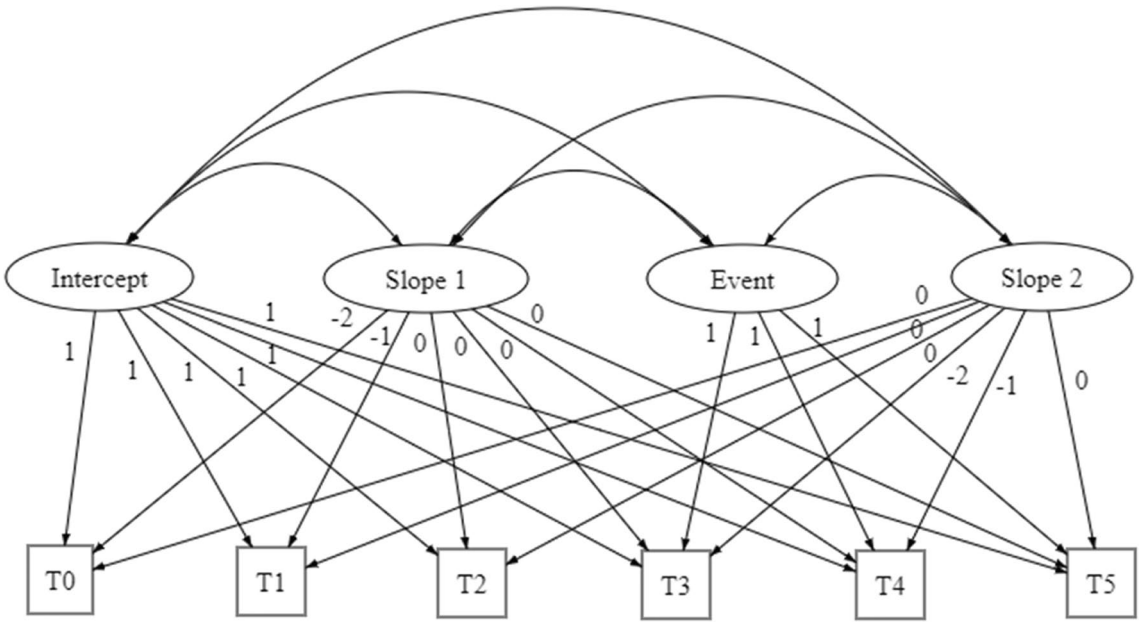

Fig. 2 Path diagram of the estimated level and slope discontinuity latent growth models

analyses were conducted in Mplus 7.4 (Muthén & Muthén, 1998–2012). Missing data were handled using robust full information maximum likelihood estimation. This approach makes use of all the available data and provides better estimations of standard errors when normality assumptions are violated. We accounted for the non-independence of the data due to cluster sampling (children nested within schools) by adjusting the standard errors using the COMPLEX module in Mplus.

Results

Descriptive Results

Table 3 shows the standard deviations and means across all variables at each measurement wave. Regarding ACEs, the top five of childhood adversities experienced by our sample were being bullied (66.5%), divorce (i.e., parental separation; 48.9%), illness of a close person (46.2%), community violence (40.9%), and having experienced intensive arguments between parents/caregivers (i.e., part of domestic violence; 40.8%). Of all students, 2.5% ($n = 12$) experienced zero ACEs, 6.5% ($n = 23$) experienced one ACE, 24.7% ($n = 120$) experienced one to three ACEs and 62.8% ($n = 223$) experienced four or more ACES. Regarding PTSS, 31.3% ($n = 110$) of the students was at heightened risk for posttraumatic stress disorder (PTSD) based on their PTSS-score.

Results of the Piecewise Latent Growth Curve Models

Table 4 shows the fit indices of the level and slope discontinuity latent growth models. The models had an adequate to excellent fit to the data, with CFI values > 0.95, and RMSEA and SRMR values < 0.08.

Table 5 shows the estimated means of the growth curve factors from the level and slope discontinuity latent growth models. As can be seen, the Event factor mean was significantly positive for resilience and class atmosphere. These findings indicate that students reported higher resilience and class atmosphere scores at the end of the first implementation year (i.e., T5 June) compared to the end of the baseline year (i.e., T2 June). Regarding the other variables, no significant differences were found between the scores at T2 and T5.

Furthermore, significant slope 1 means indicate that increases across the baseline year (i.e., from T0 to T2) were found for all four school climate variables, more specifically increases were detected in student experiences in class atmosphere, quality of student relationships, quality of teacher-student alliance and order in the classroom. Furthermore, significant decreases across the baseline year were found for youth-reported externalizing and total problems, teacher-reported internalizing, externalizing and total problems. Across the implementation year, a significant increase was found regarding student experienced class atmosphere, however, for all other variables no significant increase or decrease was found.

Table 3 Means and standard deviations at each measurement wave

Variable	T0		T1		T2		T3		T4		T5	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
ACEs (30 items)	5.88	4.60										
PTSS	20.88	16.33	21.44	14.14	18.68	16.60	18.49	14.83	19.07	16.01	18.75	16.84
EBP-SR												
Total	10.97	6.26	10.67	5.35	10.12	6.18	10.22	6.09	9.88	6.40	10.76	7.24
Internalizing	2.70	2.69	2.46	2.60	2.51	2.80	2.51	2.79	2.27	2.78	2.57	2.94
Externalizing	3.29	2.67	3.09	2.24	2.76	2.78	3.02	2.41	2.81	2.44	3.07	2.72
Attention problems	4.98	2.76	5.12	2.47	4.85	2.75	4.69	2.72	4.80	2.71	5.13	3.15
EBP-teacher reported												
Total	13.05	7.77	13.19	7.06	11.84	6.69	12.60	7.15	11.49	6.71	11.50	7.18
Internalizing	3.57	3.21	3.81	3.03	3.10	2.76	3.35	2.91	2.86	2.54	2.88	2.62
Externalizing	3.76	3.35	3.76	3.18	3.28	2.92	3.41	3.10	3.04	2.84	3.16	3.13
Attention problems	5.71	3.44	5.63	3.22	5.45	3.37	5.83	3.39	5.58	3.51	5.47	3.59
EF-child reported	23.27	4.76	22.85	4.89	22.69	4.60	23.10	4.31	22.94	5.18	22.83	5.29
EF-teacher reported	36.38	8.40	36.66	7.76	36.17	8.01	35.93	8.48	36.29	8.92	36.47	8.98
Resilience	3.31	.95	3.13	.84	3.33	.89	3.34	.938	3.34	.99	3.36	.87
School Climate												
Quality of student relationships	2.98	0.74	3.19	0.69	3.15	0.69	3.09	0.70	3.20	0.68	3.13	0.72
Class atmosphere	3.14	0.60	3.18	0.64	3.24	0.60	3.30	0.56	3.44	0.52	3.37	0.52
Teacher-student relationship quality	3.33	0.62	3.36	0.65	3.44	0.61	3.45	0.53	3.48	0.55	3.47	0.59
Order in the classroom	2.80	0.73	2.95	0.68	3.06	0.65	3.09	0.64	3.12	0.69	3.06	0.67

EBP externalizing, internalizing, and attention problems (total score), *EF* Executive Functioning. The sample for EF and EBP was smaller due to the measurement instruments only fit for children aged 11–18 years old

Table 4 Fit indices of the level and slope discontinuity latent growth models

Variable	X^2	*df*	*p*	CFI	RMSEA	SRMR
PTSS	6.720	7	.459	1.00	.000	.063
EBP-child reported						
Total	35.942	7	.000	.926	.119	.052
Internalizing problems	11.766	7	.109	.983	.048	.029
Externalizing problems	25.032	7	.001	.955	.094	.066
Attention problems	15.556	7	.030	.977	.065	.038
EBP-teacher reported						
Total problems	4.709	7	.696	1.000	.000	.024
Internalizing problems	7.254	7	.403	.999	.010	.022
Externalizing problems	6.377	7	.497	1.000	.000	.025
Attention problems	5.459	7	.604	1.000	.000	.011
EF-child reported	18.965	7	.008	.963	.077	.094
EF-teacher reported	5.808	7	.562	1.000	.000	.020
Resilience	7.113	7	.417	1.000	.007	.063
School climate						
Class atmosphere	31.275	7	.000	.986	.098	.086
Quality of student relationships	30.319	7	.000	.990	.096	.036
Quality of teacher-student alliance	30.573	7	.000	.952	.097	.069
Order in the classroom	2.305	7	.941	1.000	.000	.020

CFI comparative fit index, *RMSEA* root mean square error of approximation, *SRMR* standardized root mean square residual, *EBP* externalizing, internalizing, and attention problems (total score), *EF* Executive Functioning

Table 5 Growth curve factor means from level and slope discontinuity latent growth models

Variable	I	Event	Slope 1	Slope 2
PTSS	19.00	-0.90	-0.93	0.04
EBP-child reported				
Total	10.02	-0.28	-0.44**	0.01
Internalizing problems	2.34	-0.10	-0.16	-0.05
Externalizing problems	2.84	-0.07	-0.21***	-0.09
Attention problems	4.86	-0.12	-0.06	0.12
EBP-teacher reported				
Total	12.28	-0.55	-0.41*	-0.22
Internalizing problems	3.22	-0.41	-0.21*	-0.18
Externalizing problems	3.48	-0.26	-0.17**	-0.04
Attention problems	5.58	0.09	-0.04	-0.01
EF-child reported	22.60	-0.64	-0.30	-0.31
EF-teacher reported	36.60	0.35	0.15	0.48
Resilience	3.32	0.09**	0.01	0.03
School climate				
Class atmosphere	3.26	0.14**	0.06**	0.03*
Quality of student relationships	3.12	-0.01	0.07***	0.01
Quality of teacher-student alliance	3.41	0.05	0.05***	0.01
Order in the classroom	3.04	0.04	0.12[a]***	-0.00[b]

EBP externalizing, internalizing, and attention problems (total score), *EF* Executive Functioning. Different superscripts indicate significant differences between the means of slope 1 and slope 2

*$p < .05$, **$p < .01$, ***$p < .001$

Satorra-Bentler chi-square difference tests revealed that only regarding order in the classroom, a significant difference was found between the means of slope 1 and slope 2, indicating a steeper increase in youth-reported order in the classroom across the baseline year than across the implementation year (ΔSBX^2 (1) = 19.69, $p < 0.01$).

Discussion

In this two-year longitudinal pre-posttest design study, we examined the outcomes of a school-wide trauma-informed approach during the first year of implementation in regular primary and special primary and secondary schools. We examined students' perception of school class climate, posttraumatic stress symptoms (PTSS), internalizing, externalizing, attention and total problems, executive functioning (EF), and resilience. Our findings show that after the first year of implementation of trauma-informed practices in participating schools, the first modest positive outcomes begin to emerge. The results indicate that students experienced an increase in class atmosphere during the implementation of a schoolwide trauma-informed education approach and that students' experiences of both class atmosphere and resilience are reported more positively at the end of the first implementation year compared to the end of the baseline year. These outcomes illustrate that implementing a schoolwide trauma-informed in the short term helps students experiencing a more positive classroom atmosphere and experiencing stronger resilience. In this study, resilience is operationalized as the ability to bounce back from hard times. However, we did not find improvement in other student-reported class climate aspects (i.e., quality of student relationships, quality of student–teacher alliance and order in the classroom), growth in resilience, reduction of PTSS, student- and teacher reported internalizing, externalizing, attention and total behavioral problems and executive functioning problems during the first year of implementation.

A primarily explanation of these limited positive outcomes might be the short timeline in which outcomes of implementation were measured. Building knowledge and competence of school staff in realizing, recognizing, and responding to (the impact of) trauma of school staff is an important first step in building a trauma-sensitive school climate (SAMHSA, 2014). However, one year of implementation of a school-wide trauma-informed education approach might be a too short for finding intended outcomes on a student-level. Implementation research shows that achieving intended outcomes through implementing well-constructed, defined, and researched programs takes at least two to four years (Fixsen et al., 2005).

Furthermore, a significant part of students included in this study proved to be a particularly at-risk population, with remarkably high incidences of reported ACEs and PTSS. Therefore, targeted specialized tier-2 and tier-3 level interventions might be necessary for this high-risk population in addition to the school wide trauma-informed approach of this study implemented by the schools as a tier-1 intervention. For example, Dorado and colleagues (2016) found that students who received trauma-specific psychotherapy (tier 3) within the overall school-wide trauma-informed HEARTS program showed a decrease in trauma-related symptoms.

Finally, the progress of implementation at the schools was compromised by COVID-19 measures, making it even more difficult to find intended outcomes within a year of implementation. During the two years of measurements and implementation, multiple lockdowns took place. These lockdowns and other measures taken by the government had a negative impact on the measurements and on the implementation of trauma-informed education (e.g., the team training, see Method section). Schools and staff were under high pressure to provide education under difficult circumstances, such as absenteeism due to illness, anxiety or stress, quarantine, and illness and death of family members or friends. Heightened educator stress complicates the adoption of innovations

(Baker et al., 2021; Koslouski, 2022). Hence, the results of this study should be interpreted considering the pandemic.

Implications

The first results of this study imply that implementing school-wide trauma-informed education within the first year may foster a safer and more pleasant school and class climate for all students and result in more student resilience. These results fit with the intent of school-wide trauma-informed approaches to create safe and supportive learning environments (Avery et al., 2020). A positive classroom atmosphere indicates pupils feel safe within their classroom. Experiencing a safe classroom environment is necessary for pupils, especially ACE-impacted students, to build trusting relationships and to grow socially and academically. Furthermore, in the literature, ACEs are associated with reduced psychological resilience in youth (Morgan et al., 2021). Fostering resilience among pupils by implementing a trauma-informed educational climate could be very important, as resilience may have a protective and mediating role regarding impact of ACEs on physical and psychological outcomes (Goldenson et al., 2020; Morgan et al., 2021).

Results on the prevalence of ACEs and PTSS of our sample validate the relevance of implementing school-wide trauma-informed education to foster resilience among youth. In our sample more than half of the students experienced four or more ACEs and about one third of the students were at heightened risk for PTSD. ACE-, or trauma-impacted students often experience more externalizing or internalizing behaviors due to the impact of trauma and altered brain development (Lohmiller et al., 2022). These students may therefore experience significant stress and struggle to participate fully in the classroom, which also may place a strain on staff. Therefore, professional development is required among school staff on ACEs, trauma, their impact on behavior, learning and academic achievement, and how to translate this knowledge to trauma-informed educational practice in everyday school life. Educators unaware of the prevalence and impact of ACEs and traumatic experiences or lacking resources to support impacted students may not understand the need expressed by their students' behavior and inadvertently further escalate student behavior or misassign consequences (Lohmiller et al., 2022). Educators aware of the impact may be more able to establish a nurturing, safe and positive learning environment for impacted students mitigating the impact of ACEs or traumatic experiences.

Moreover, increasing awareness of trauma among educational professionals is not sufficient to realize a trauma-informed, restorative educational climate. Implementing school-wide trauma-informed education has consequences at the professional, organizational, and practical level of an educational organization (Hanson & Lang, 2016; Maynard et al., 2019; Wassink - de Stigter et al., 2022). At the organizational level, trauma-informed policies and procedures should be installed across the entire school. In addition, the implementation of a trauma-informed educational climate should be monitored and evaluated. Among educational professionals, continued training, coaching and peer consultation on (the impact of) traumatic experiences and continuous attention to the implementation of trauma-informed practices is needed. Finally, school leaders play an important role in creating support for trauma-informed education among staff and facilitating the implementation of a trauma-informed educational climate (Wassink - de Stigter et al., 2022; Garcia et al., 2023). Finally, implementing a multi-tiered trauma-informed approach including targeted interventions (tier 2 and 3) in conjunction with the school-wide trauma-informed approach (tier 1) implemented in this study might be needed for high risk students with significant trauma symptoms and/or emotional and/or behavioral problems to help them to reduce the distress they experience.

Limitations and Future Research

One notable limitation of our study is that we did not measure implementation fidelity. Hence, schools may have differed in their specific actions in the implementation of trauma-informed education based on the needs for that school or programmes already in place compatible with trauma-informed education. However, schools were comparable in the way they followed the step-by-step implementation process detailed in the implementation manual that was provided to them. Additionally, at the time of the present study it was still unclear how to measure implementation fidelity as trauma-informed education exists of general guidelines, which need to be more concretely operationalized into practices depending on the needs of (the population) of each school (Wassink - de Stigter et al., 2022). As part of the implementation guide for the current project, a first step has been taken into this direction with the development of a model in the implementation manual outlining the various stages of development with short- and long-term objectives in the implementation process (Asselman et al., 2019). For future studies, we recommend measuring implementation fidelity and relating implementation fidelity, baseline levels of implementation, specific actions, and growth in terms of implementation development to outcomes on a student-level.

Furthermore, this study uses a longitudinal design, in which the first year of measurements was the baseline year for each school and the second year was the first year of implementation. We expect positive outcomes on a student-level to become visible in the longer term. The preliminary findings of this study are promising in light of the fact that schools were only in their first year of implementation and

the COVID-pandemic made for very difficult implementation circumstances. Therefore, we recommend considering the time needed to implement trauma-informed education in future studies. Due to the longitudinal design without control condition, we cannot ensure that any effects found can be ascribed to the implementation of trauma-informed education, as other factors may come into play. If feasible, we recommend repeating the objective of this study with a randomized or quasi-experimental longitudinal repeated-measures design to be able to ascribe found effects to trauma-informed education.

Conclusion

This study is one of the first to longitudinally examine student-level outcomes of school-wide trauma-informed education. Findings demonstrate an increase in class atmosphere during the first year of implementation and more positive scores of resilience and class atmosphere at the end of the first implementation year compared to the end of the baseline year. More research following implementation for a longer period is needed to demonstrate whether implementation of trauma-informed education has an impact on students' PTSS, emotional, behavioral and attention problems, executive functioning, resilience, and other class climate aspects, such as teacher-student alliance.

Author contributions **Rianne Wassink - de Stigter**: Conceptualization, Investigation, Writing—original draft, Writing – review & editing, Project administration. **Wendy Nelen**: Conceptualization, Funding acquisition, Investigation, Writing – review & editing, Project administration. **Marc Delsing**: Methodology, Formal analysis, Data curation, Visualization. **Afra de Berk**: Formal analysis, Investigation, Writing – review & editing, Project administration. **Roel Kooijmans**: Conceptualization, Funding acquisition, Investigation, Writing – review & editing. **Evelyne Offerman**: Conceptualization, Funding acquisition, Writing – review & editing. **Michiel Asselman**: Conceptualization, Funding acquisition, Writing – review & editing. **Karin Nijhof**: Funding acquisition, Writing – review & editing. **Ramón Lindauer**: Supervision, Writing – review & editing. **Petra Helmond**: Project administration, Conceptualization, Funding acquisition, Supervision, Writing – review & editing.

Funding Execution of this research paper was funded by the Nationaal Regieorgaan Onderwijsonderzoek (The Netherlands Initiative for Education Research; NRO), grant number: 40.5.18540.143. The source of funding was not involved in the conduction of research, preparation for the article and decision to submit the article for publication.

Data Availability Data will be made publicly available on Data Archiving and Networking Services (DANS), the Dutch National Centre of Expertise and repository of research data.

Declarations

Ethical Approval The Ethics Committee of Radboud University approved this study (ECSW-2018–114).

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

References

ACEs in EHRs (2024, n.d.). *Theoretical framework and definitions*. Retrieved August 19, 2024, from http://acesinehrs.com/theory/

Achenbach, T. M., McConaughy, S. H., Ivanova, M. Y., & Rescorla, L. A. (2011). *Manual for the ASEBA brief problem monitor (BPM)*. ASEBA. Retrieved 26 September, 2022, from https://documents.acer.org/ASEBA_Brief_Problem_Monitor_Manual.pdf

Alisic, E. (2012). Teachers' perspectives on providing support to children after trauma: A qualitative study. *School Psychology Quarterly: The Official Journal of the Division of School Psychology, American Psychological Association, 27*(1), 51–59. https://doi.org/10.1037/a0028590

American Psychiatric Association, DSM-5 Task Force. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5™* (5th ed.). American Psychiatric Publishing.

Asselman, M., Offerman, E., Wassink-de Stigter, R., Buijze, J., Golbach, M., Kooijmans, R., De Berk, A., Nelen, W., & Helmond, P. (2019). *Traumasensitief Onderwijs - een handboek bij de implementatie*. Consortium Traumasensitief Onderwijs.

Avery, J. C., Morris, H., Galvin, E., Misso, M., Savaglio, M., & Skouteris, H. (2020). Systematic review of school-wide trauma-informed approaches. *Journal of Child & Adolescent Trauma, 14*(3), 381–397. https://doi.org/10.1007/s40653-020-00321-1

Baker, C. N., Peele, H., Daniels, M., Saybe, M., Whalen, K., Overstreet, S., & Orleans, T. I. S. L. C. T. N. (2021). The experience of COVID-19 and its impact on teachers' mental health, coping, and teaching. *School Psychology Review, 50*, 491–504. https://doi.org/10.1080/2372966X.2020.1855473

Berger, E. (2019). Multi-tiered approaches to trauma-informed care in schools: A systematic review. *School Mental Health, 11*(1), 650–664. https://doi.org/10.1007/s12310-019-09326-0

Bethell, C. D., Newacheck, P., Hawes, E., & Halfon, N. (2014). Adverse childhood experiences: Assessing the impact on health and school engagement and the mitigating role of resilience. *Health Affairs, 33*(12), 2106–2115. https://doi.org/10.1377/hlthaff.2014.0914

Bethell, C.D., Davis, M.B., Gombojav, N., Stumbo, S., & Powers, K. (2017). *Issue brief: A national and across state profile on adverse childhood experiences among children and possibilities to heal and thrive.* Johns Hopkins Bloomberg School of Public Health. Retrieved 14 October, 2024, from: http://www.cahmi.org/projects/adverse-childhood-experiences-aces/

Bielas, H., Barra, S., Krivanek, C., Aebi, M., Steinhausen, H., Bessler, C., & Plattner, B. (2016). The associations of cumulative adverse childhood experiences and irritability with mental disorders in detained male adolescent offenders. *Child and Adolescent Psychiatry and Mental Health, 10*, 1–10. https://doi.org/10.1186/s13034-016-0122-7

Bomysoad, R. N., & Francis, L. A. (2020). Adverse childhood experiences and mental health conditions among adolescents. *Journal of Adolescent Health, 67*(6), 868–870. https://doi.org/10.1016/j.jadohealth.2020.04.013

Brunzell, T., Stokes, H., & Waters, L. E. (2016). Trauma-informed flexible learning: Classrooms that strengthen regulatory abilities. *International Journal of Child Youth and Family Studies, 7*(2), 218–239. https://doi.org/10.18357/ijcyfs72201615719

Carlson, J. S., Yohannan, J., Darr, C. L., Turley, M. R., Larez, N. A., & Perfect, M. M. (2019). Prevalence of adverse childhood experiences in school-aged youth: A systematic review (1990–2015).

International Journal of School & Educational Psychology, 8(sup1), 2–23. https://doi.org/10.1080/21683603.2018.1548397

Chafouleas, S. M., Johnson, A. H., Overstreet, S., & Santos, N. M. (2016). Toward a blueprint for trauma-informed service delivery in schools. *School Mental Health, 8*(1), 144–162. https://doi.org/10.1007/s12310-015-9166-8

Children and War Foundation. (1998). *The Children's Revised Impact of Event Scale (13): CRIES-13*. Children and War. https://www.childrenandwar.org/wp-content/uploads/2019/06/cries_13_UK.pdf.

Christian-Brandt, A. S., Santacrose, D. E., & Barnett, M. L. (2020). In the trauma-informed care trenches: Teacher compassion satisfaction, secondary traumatic stress, burnout, and intent to leave education within underserved elementary schools. *Child Abuse & Neglect, 110*(Pt 3), 104437. https://doi.org/10.1016/j.chiabu.2020.104437

Chugani, H., Behen, M., Muzik, O., Juhász, C., Nagy, F., & Chugani, D. (2001). Local brain functional activity following early deprivation: A study of postinstitutionalized Romanian orphans. *NeuroImage, 14*(6), 1290–1301. https://doi.org/10.1006/nimg.2001.0917

Coppens, L., Schneijderberg, M., & van Kregten, C. (2021). *Les-geven aan getraumatiseerde kinderen. Een praktisch handboek voor het basisonderwijs*. SWP.

Crosby, S. D., Somers, C. L., Day, A. G., Zammit, M., Shier, J. M., & Baroni, B. A. (2017). Examining school attachment, social support, and trauma symptomatology among court-involved, female students. *Journal of Child and Family Studies, 26*(9), 2539–2546. https://doi.org/10.1007/s10826-017-0766-9

Day, A. G., Somers, C. L., Baroni, B. A., West, S. D., Sanders, L., & Peterson, C. D. (2015). Evaluation of a trauma-informed school intervention with girls in a residential facility school: Student perceptions of school environment. *Journal of Aggression, Maltreatment & Trauma, 24*(10), 1086–1105. https://doi.org/10.1080/10926771.2015.1079279

De Bellis, M. D., Hooper, S. R., Spratt, E. G., & Woolley, D. P. (2009). Neuropsychological fndings in childhood neglect and their relationships to pediatric PTSD. *Journal of the International Neuropsychological Society, 15*(6), 868–878. https://doi.org/10.1017/S1355617709990464

Donkers, A., & Vermulst, A. A. (2014). *Klimaatschaal: Handleiding* [Class Climate Scale: Manual]. Uden, The Netherlands: Orthopraktijk Ad Donkers & Ad Vermulst

Dorado, J., Martinez, M., McArthur, L., & Leibovitz, T. (2016). Healthy Environments and Response to Trauma in Schools (HEARTS): A whole-school, multi-level, prevention, and intervention program for creating trauma-informed, safe, and supportive schools. *School Mental Health, 8*(1), 163–176. https://doi.org/10.1007/s12310-016-9177-0

Fixsen, D., Naoom, S., Blase, K., Friedman, R., & Wallace, F. (2005). *Implementation research: A synthesis of the literature*. University of South Florida, Louis de la Parte Florida Mental Health Institute, National Implementation Research Network, Tamps, FL.

Garcia, A., Sprang, G., & Clemans, T. (2023). The role of school leaders in cultivating a trauma-informed school climate. *Children and Youth Services Review, 146*, 106816. https://doi.org/10.1016/j.childyouth.2023.106816

Geldhof, G. J., Warner, D. A., Finders, J. K., Thogmartin, A. A., Clark, A., & Longway, K. A. (2018). Revisiting the utility of retrospective pre-post designs: The need for mixed-method pilot data. *Evaluation and Program Planning, 70*, 83–89. https://doi.org/10.1016/j.evalprogplan.2018.05.002

Goldenson, J., Kitollari, I., & Lehman, F. (2020). The Relationship between ACEs, trauma-related psychopathology and resilience in vulnerable youth: Implications for screening and treatment. *Journal of Child & Adolescent Trauma, 14*(1), 151–160. https://doi.org/10.1007/s40653-020-00308-y

Hanson, R. F., & Lang, J. M. (2016). A critical look at trauma-informed care among Agencies and systems serving maltreated youth and their families. *Child Maltreatment, 21*(2), 95–100. https://doi.org/10.1177/1077559516635274

Helmond, P. H., Offerman, E. C. P., Kooijmans, R., & Lindauer, R. J. L. (2018). *The Adverse Childhood Experiences Youth Screener* [Unpublished manuscript].

Holmes, C., Levy, M., Smith, A., Pinne, S., & Neese, P. (2015). A model for creating a supportive trauma-informed culture for children in preschool settings. *Journal of Child and Family Studies, 24*(6), 1650–1659. https://doi.org/10.1007/s10826-014-9968-6

Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., Jones, L., & Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: A systematic review and meta-analysis. *The Lancet. Public Health, 2*(8), e356–e366. https://doi.org/10.1016/S2468-2667(17)30118-4

Huizinga, M., & Smidts, D. P. (2016). *BRIEF Screener. Vragenlijst voor snelle screening van executieve functies bij kinderen en jongeren*. Hogrefe Uitgevers.

Hunt, T. K. A., Slack, K. S., & Berger, L. M. (2017). Adverse childhood experiences and behavioral problems in middle childhood. *Child Abuse & Neglect, 67*, 391–402. https://doi.org/10.1016/j.chiabu.2016.11.005

Hydon, S., Wong, M., Langley, A. K., Stein, B. D., & Kataoka, S. H. (2015). Preventing secondary traumatic stress in educators. *Child and Adolescent Psychiatric Clinics of North America, 24*(2), 319–333. https://doi.org/10.1016/j.chc.2014.11.003

Jaycox, L. H., Langley, A. K., Stein, B. D., Wong, M., Sharma, P., Scott, M., & Schonlau, M. (2009). Support for students exposed to trauma: A pilot study. *School Mental Health*, *1*(2), 49–60. https://doi.org/10.1007/s12310-009-9007-8

Kim, I., Galván, A., & Kim, N. (2020). Independent and cumulative impacts of adverse childhood experiences on adolescent subgroups of anxiety and depression. *Children and Youth Services Review, 122*(3), 105885. https://doi.org/10.1016/j.childyouth.2020.105885

Koslouski, J. B. (2022). Developing empathy and support for students with the "most challenging behaviors: " Mixed-methods outcomes of professional development in trauma-informed teaching practices. *Frontiers in Education, 7*, 1–16. https://doi.org/10.3389/feduc.2022.1005887

Lohmiller, K., Gruber, H., Harpin, S., Belansky, E. S., James, K. A., Pfeiffer, J. P., & Leiferman, J. (2022). The S.I.T.E. framework: A novel approach for sustainably integrating trauma-informed approaches in schools. *Journal of Child & Adolescent Trauma, 15*(4), 1011–1027. https://doi.org/10.1007/s40653-022-00461-6

Maynard, B. R., Farina, A., Dell, N. A., & Kelly, M. S. (2019). Effects of trauma-informed approaches in schools: A systematic review. *Campbell Systematic Reviews, 15*, 1–18. https://doi.org/10.1002/cl2.1018

Morgan, C. A., Chang, Y., Choy, O., Tsai, M., & Hsieh, S. (2021). Adverse childhood experiences are associated with reduced psychological resilience in youth: A systematic review and meta-analysis. *Children, 9*(1), 27. https://doi.org/10.3390/children9010027

Muthén, L.K., & Muthén, B. O. (1998–2012). *Mplus user's guide* (7th Ed.). Los Angeles, CA: Muthén & Muthén.

Op den Kelder, R., Van den Akker, A. L., Geurts, H. M., Lindauer, R. J. L., & Overbeek, G. (2018). Executive functions in trauma-exposed youth: A meta-analysis. *European Journal of Psychotraumatology*, *9*(1), 1450595. https://doi.org/10.1080/20008198.2018.1450595

Parris, S. R., Dozier, M., Purvis, K. B., Whitney, C., Grisham, A., & Cross, D. R. (2015). Implementing Trust-Based Relational Intervention® in a charter school at a residential facility for at-risk

youth. *Contemporary School Psychology, 19*(3), 157–164. https://doi.org/10.1007/s40688-014-0033-7

Pears, K., & Fisher, P. A. (2005). Developmental, cognitive, and neuropsychological functioning in preschool-aged foster children: Associations with prior maltreatment and placement history. *Journal of Developmental & Behavioral Pediatrics, 26*(2), 112–122. https://doi.org/10.1097/00004703-200504000-00006

Perfect, M. M., Turley, M. R., Carlson, J. S., Yohanna, J., & Saint Gilles, M. P. (2016). School-related outcomes of traumatic event exposure and traumatic stress symptoms in students: A systematic review of research from 1990 to 2015. *School Mental Health: A Multidisciplinary Research and Practice Journal*, *8*(1), 7–43. https://doi.org/10.1007/s12310-016-9175-2

Perry, D. L., & Daniels, M. L. (2016). Implementing trauma—Informed practices in the school setting: A pilot study. *School Mental Health: A Multidisciplinary Research and Practice Journal, 8*(1), 177–188. https://doi.org/10.1007/s12310-016-9182-3

Pilkington, P. D., Bishop, A., & Younan, R. (2020). Adverse childhood experiences and early maladaptive schemas in adulthood: A systematic review and meta-analysis. *Clinical Psychology & Psychotherapy, 28*(3), 569–584. https://doi.org/10.1002/cpp.2533

Piper, B. J., Gray, H. M., Raber, J., & Birkett, M. A. (2014). Reliability and validity of brief problem monitor, an abbreviated form of the child behavior checklist. *Psychiatry and Clinical Neurosciences*, *68*(10), 759–767. https://doi.org/10.1111/pcn.12188

Remmers, M. C., Reijs, R. P., & Hoebe, C. J. (2024). Defining and distinguishing early life stress, trauma, adversity, toxic and chronic stress and allostatic load: a descriptive review. *Scandinavian Journal of Public Health,* 14034948241260105. Advance online publication. https://doi.org/10.1177/14034948241260105

Rioux, C., Stickley, Z. L., & Little, T. D. (2021). Solutions for latent growth modeling following COVID-19-related discontinuities in change and disruptions in longitudinal data collection. *International Journal of Behavioral Development, 45*(5), 463–473.

Roseby, S., & Gascoigne, M. (2021). A systematic review on the impact of trauma-informed education programs on academic and academic-related functioning for students who have experienced childhood adversity. *Traumatology, 27*(2), 149–167. https://doi.org/10.1037/trm0000276

Sahle, B. W., Reavley, N. J., Li, W., Morgan, A. J., Yap, M. B. H., Reupert, A., & Form, A. F. (2021). The association between adverse childhood experiences and common mental disorders and suicidality: An umbrella review of systematic reviews and meta-analyses. *European Journal of Child and Adolescent Psychiatry*. https://doi.org/10.1007/s00787-021-01745-2

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine*, *15*(3), 194–200. https://doi.org/10.1080/10705500802222972

Stratford, B., Cook, E., Hanneke, R., Katz, E., Seok, D., Steed, H., Fulks, E., Lessans, A., & Temkin, D. (2020). A scoping review of school-based efforts to support students who have experienced trauma. *School Mental Health, 12*(3), 442–477. https://doi.org/10.1007/s12310-020-09368-9

Substance Abuse and Mental Health Services Administration (SAMHSA). (2014). *SAMHSA's concept of trauma and guidance for a trauma-informed approach*. HHS Publication No. (SMA) 14-4884. Substance Abuse and Mental Health Services Administration.

Thomas, M. S., Crosby, S., & Vanderhaar, J. (2019). Trauma-informed practices in schools across two decades: An interdisciplinary review of research. *Review of Research in Education, 43*(1), 422–452. https://doi.org/10.3102/0091732X1882112

U.S. Department of Health and Human Services. (n.d.). *2019 Annual report*. Retrieved October 14, 2024, from https://www.hhs.gov/sites/default/files/2019-annual-report.pdf

Van Meijel, E. P. M., Verlinden, E., Diehle, J., & Lindauer, R. J. L. (2010). *Clinician Administered PTSD Scale for Children and Adolescents (CAPS-CA)*. Bohn Stafleu van Loghum.

Verlinden, E., van Meijel, E. P., Opmeer, B. C., Beer, R., de Roos, C., Bicanic, I. A., Lamers Winkelman, F., Olff, M., Boer, F., & Lindauer, R. J. (2014). Characteristics of the children's revised impact of event scale in a clinically referred Dutch sample. *Journal of Traumatic Stress*, *27*(3), 338–344. https://doi.org/10.1002/jts.21910

Wade, R., Jr., Cronholm, P. F., Fein, J. A., Forke, C. M., Davis, M. B., Harkins-Schwarz, M., Pachter, L. M., & Bair-Merritt, M. H. (2016). Household and community-level Adverse Childhood Experiences and adult health outcomes in a diverse urban population. *Child Abuse & Neglect, 52*, 135–145. https://doi.org/10.1016/j.chiabu.2015.11.021

Waschl, N., Khng, K. H., Bull, R., Ng, E. L., Sun, H., & Chan, W. T. (2023). Screening for executive function difficulties: An evaluation of the behavior rating inventory of executive function-2nd edition screener, teacher report (BRIEF2-TS). *Psychological Assessment*, *35*(4), 366–377. https://doi.org/10.1037/pas0001188

Wassink - de Stigter, R. W., Kooijmans, R., Asselman, M. W., Offerman, E. C. P., Nelen, W., & Helmond, P. (2022). Facilitators and Barriers in the Implementation of Trauma-Informed Approaches in Schools: A scoping review. *School Mental Health*, *14*(3), 470–484. https://doi.org/10.1007/s12310-021-09496-w

Windle, G., Bennett, K. M., & Noyes, J. (2011). A methodological review of resilience measurement scales. *Health and Quality of Life Outcomes*, *9*, 8. https://doi.org/10.1186/1477-7525-9-8

World Health Organization (2018). *Adverse childhood experiences international questionnaire (ACE-IQ)*. Retrieved 26 September, 2022, from https://www.who.int/violence_injury_prevention/violence/activities/adverse_childhood_experiences/en/

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.