



A Screening Instrument for Trauma-Related Behavior Among Young Primary School Students: Development and Validation of the RaPTOSS

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Abstract

This article reports on the development and psychometric evaluation of a new teacher observation instrument to systematically assess young primary school students' well-being and detect potential indicators of psychological trauma, the RaPTOSS: *Risk and Protective factors Trauma Observation School Situations*. The RaPTOSS is developed specifically for preschool and early primary school teachers, because of the limited abilities their young students have to verbally reflect and report on their well-being and stressful experiences. We examined the factor structure, internal consistency, convergent validity and criterion validity of the RaPTOSS in a sample of 406 4- to 8-year-old regular education students. Exploratory factor analyses yielded a four-factor structure for the risk items with the following factors: Withdrawn, Dysphoria, Destructive and Inattentive. The protective factor items revealed a four-factor structure closely aligning the theoretical factor structure: Safety and Relations, Self-Image, Everyday Life and Self-Regulation. All factors exhibited good to excellent internal consistency. Correlations between the RaPTOSS and existing measures of psychosocial well-being without a specific focus on trauma-related behavior demonstrated good convergent validity. Criterion validity was supported, as indicated by moderate to large positive correlations between teacher worries about a student and RaPTOSS risk factors, and moderate to large negative correlations between teacher worries and RaPTOSS protective factors. We conclude that the RaPTOSS is a promising measure for trauma-informed teaching and research, although future research is needed to establish its psychometric qualities in specific samples such as children diagnosed with PTSD and refugee children.

Keywords Trauma · Post-traumatic stress · Screening · Psychometric qualities · Trauma-informed teaching · Early childhood

Introduction

In an average classroom, at least one student has experienced stressful events, such as parental divorce, domestic violence, neglect, abuse or mental illness in the household (e.g., Bethell et al., 2017; Porche et al., 2016; Vink et al., 2016). Research has shown that children who experience

such adverse childhood experiences (ACEs) can develop symptoms of psychological trauma, which can hinder development in both their well-being and learning (Pechtel & Pizzagalli, 2011; Wilson et al., 2011). Current attention to the impact of this issue has led to a broader acceptance of trauma-informed teaching in primary education. The growing amount of studies on and implementations of trauma-informed teaching practices reflect an increasing awareness among teachers and schools of the importance of creating a safe learning environment for possibly traumatized students (e.g., Brunzell et al., 2019; Stratford et al., 2020; Thomas et al., 2019; Wassink-de Stigter, et al., 2022). Trauma-informed teaching relies on teachers' detection of psychological trauma-related behaviors in the classroom. However, identifying such symptoms of trauma can be challenging, because it is often the hidden cause behind other worrisome behaviors (Cook et al., 2017; Gabowitz et al., 2008; O'Neill et al., 2010). Identification is especially difficult in young

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children, because they generally lack the capacity to reflect and report on their well-being and stressful events they may have experienced (Scheeringa et al., 2006, 2011; Simonelli, 2013). Particularly early childhood is a crucial developmental phase because of the brain maturation taking place. Experiencing ACEs and having difficulties coping with these is negatively associated with children's brain development (Kolb et al., 2003; van der Kolk, 2003). Meanwhile, it has been reported that in these early years, the plasticity and adaptability of the brain is relatively high (Kolb et al., 2003). Hence, positive experiences, such as trauma-informed teaching practices, are particularly important for young traumatized children.

In the current study, we introduce a teacher observation instrument to assess young students' well-being, particularly targeting manifestations of psychological trauma in the classroom: the RaPTOSS (Risk and Protective factors Trauma Observation School Situations). The RaPTOSS aims to systematically assess potential indicators of psychotrauma, especially in preschool and early primary education, since these young children are not yet skilled to talk about traumatic events or stressful thoughts and feelings. Moreover, the RaPTOSS also aims to increase awareness among teachers of the possible impact of trauma on young students' behavior and development. The RaPTOSS can aid shifting teachers' mindset to questioning "What can I do to let this student feel safe to participate?" instead of "What is wrong with this student?" in case of problematic behavior. By introducing the RaPTOSS and assessing its psychometric properties, this study aims to contribute to both educational practice and research on trauma-informed teaching.

Conceptual Model of ACE and Trauma

Several studies have indicated high prevalence rates of children exposed to ACE(s), such as those by Bethell et al. (2017) and Porche et al. (2016) in the US, and Vink et al. (2016) in the Netherlands. The impact of ACEs on well-being and development varies widely between children, as do the challenges for teachers educating these children. Most children are able to process their ACE(s) well and continue to develop typically, while others have difficulties coping and develop psychological trauma (Cicchetti, 2013). Rice and Groves (2005) describe psychological trauma as "[...] an exceptional experience in which powerful and dangerous events overwhelm a person's capacity to cope" (p. 3). This implies that trauma does not refer to the traumatic event itself, but it concerns an individual's response to the event.

The Window of Tolerance model (Siegel, 1999) offers a framework for understanding how individuals cope with different levels of stress, including stress caused by ACEs. It describes how different levels of arousal can affect emotions, behavior and cognition. This widely used

model distinguishes between three levels of stress: states of optimal arousal, hyperarousal and hypoarousal. When a student's stress level is located within the "window," it refers to a range of optimal arousal states in which they are able to regulate their emotions and integrate and reflect on experiences. In the classroom context, this means that the student has the capacity to concentrate and to learn. However, high stress levels can create a state of hyperarousal or hypoarousal, meaning that the student goes beyond their window of tolerance. In a hyperarousal state, the brain is in a state of extreme alertness, and the student has difficulty concentrating. In a state of hypoarousal, heart rate decreases, and cognitive dissociation may be experienced. Both in hyperarousal and hypoarousal states, students are less able to regulate their emotions and experiences and react with a stress response of either fight, flight or freeze, which impairs the student's capacity to learn. It has been argued that students who suffer from psychological trauma have narrower windows of tolerance which makes it more likely that these students become hyper- or hypo-aroused (Corrigan et al., 2011; Ogden et al., 2006; Siegel, 1999).

Experiencing high levels of stress and having a narrow window of tolerance can have long-term detrimental effects, particularly on students' socio-emotional, behavioral and cognitive development (McKelvey et al., 2018; Pechtel & Pizzagalli, 2011; Porche et al., 2016; Wilson et al., 2011). The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*, American Psychiatric Association, 2013) links unsuccessful coping with direct or indirect ACE exposure to acute stress disorder (ASD) and/or post-traumatic stress disorder (PTSD). ASD refers to traumatic symptoms arising immediately after the traumatic event has happened, whereas PTSD refers to the long-term impact of such events. When an ASD lasts longer than 1 month, it is classified as PTSD in the *DSM-5*. It is also possible to develop PTSD without ASD, for example, when symptoms do not arise immediately after the traumatic event has happened and last for longer than a month. Both ASD and PTSD require a stressor of direct or indirect exposure to a traumatic event (criterion A). The *DSM-5* describes four different symptom clusters as criteria (B–E) for a PTSD diagnosis: (1) intrusion symptoms (re-experiencing the traumatic event), (2) avoidance of trauma-related stimuli, (3) negative alterations in cognitions and mood and (4) alterations in arousal and reactivity. In addition to these diagnostic criteria, the *DSM-5* acknowledges that there could also be dissociative symptoms. Other *DSM-5* criteria for PTSD are as follows: symptoms last for more than 1 month (criterion F), symptoms create distress or functional impairment (criterion G) and symptoms are not due to medication, substance use or other illness (criterion H).

The *DSM-5* is the first edition of the manual in which a PTSD preschool subtype is defined, specifically targeting

children of 6 years and younger. In this preschool subtype, the symptom clusters “avoidance” and “negative mood alterations” are combined, due to lower prevalence rates of corresponding symptoms among young children. Moreover, diagnostic thresholds are lower, and wordings of some symptoms are adjusted so these are more developmentally appropriate for young children. The preschool subtype focuses more on behavioral manifestations instead of feelings and thoughts among possibly traumatized young children. The inclusion of the separate preschool subtype acknowledges PTSD symptoms being expressed in different ways and takes into account that young children are not yet skilled to reflect on possibly traumatic events.

Promoting Resilience: Protective Factors

In recent years, various studies have started to emphasize the importance of a resilience-focused perspective on mental health (Bonanno, 2004; Brunzell et al., 2015; Marley & Mauki, 2019). These studies have shown that multiple factors affect the resilience of traumatized children through activation of their natural recovery mechanism in stressful states. Within the optimal arousal states in their window, children are better able to cope with stressful experiences. Various trauma treatment interventions, including trauma-informed teaching practices, therefore aim to widen children’s window of tolerance through promoting certain protective factors (e.g., Blaustein & Kinniburgh, 2010).

Key protective factors for promoting resilience and treatment of traumatized children are described in the Attachment, Self-Regulation and Competency (ARC) Treatment Framework (Blaustein & Kinniburgh, 2010). In this framework, attachment, self-regulation and competency are formulated as core domains to enhance resilience and coping skills among traumatized youth. First, feeling safe and connected to others is crucial for traumatized children. As such, attachment can moderate the impact of ACEs. Second, well-developed self-regulation skills have shown to enhance children’s resilience and capacity to cope with adversities. Being able to modulate, reflect on and safely share stressful circumstances can serve as a protective factor for coping with ACEs. The third component of the ARC framework, competency, refers to self-development and identity development. Interventions for traumatized children focus on strengthening children’s self-image and expand their sense of agency. Additionally, children’s everyday life is also assessed in trauma therapy (Spierings, 2008). It is then inquired whether a child is resistant to stressors in everyday life, and to what extent they grow up in a “normal” and predictable environment. A stable and predictable everyday life can serve as a protective factor as well. Altogether, these four protective factors—safety and relations, self-regulation skills, positive self-image and

a stable and predictable environment in everyday life—can provide practical guidelines for teachers to promote resilience among possibly traumatized students.

These protective factors can serve as basic capacities or contexts which can help improve students’ abilities to return to their optimal zone of arousal in case of hyper- or hypoarousal (Siegel, 1999). When protective factors are not well developed or absent, children can become more vulnerable to traumatic stress. For instance, regarding social relations, research has shown that it is difficult to interpret social signals in stressful situations (Porges, 2011). Chronic stress in traumatized students can, therefore, negatively affect their ability to maintain social relations and express prosocial behavior toward others. Yet, enhancing positive relations and attachment is a key feature of trauma-informed teaching to help reduce students’ stress levels. Hence, the inability to experience positive relatedness to others can be a risk, whereas being able to maintain positive relations can serve as protection against negative consequences of trauma. This illustrates how protective factors can help students to cope with stress, whereas the absence of protective factors can negatively affect students’ coping and well-being.

Trauma Behind Worrisome Behavior?

The wide variety in types of ACEs children possibly experience, and the complex interplay between symptoms and protective factors leads to much variation in manifestations of trauma-related behavior. In the classroom, this can be visible in a myriad of symptoms on a socio-emotional, behavioral and/or cognitive level. These behaviors often overlap with symptoms of other externalizing or internalizing problem behaviors, making it difficult to recognize or identify trauma as a hidden diagnosis (Cook et al., 2017; Gabowitz et al., 2008; O’Neill et al., 2010). A limited number of studies have investigated the clinical prevalence of PTSD in combination with other disorders. For instance, Scheeringa, et al. (2003) conducted a study among preschoolers who experienced different types of traumatic events. The results demonstrated that children who were diagnosed with PTSD showed more symptoms of separation anxiety disorder (SAD; 63% comorbidity) and oppositional defiant disorder (ODD; 75% comorbidity) and higher rates of internalizing problems as compared to a healthy control group. However, it remained unclear to what extent these children already dealt with these comorbid disorders before they experienced a traumatic event, or whether these disorders arose after the traumatic event. That is, it is possible that children who have certain disorders are more vulnerable to develop PTSD, or that PTSD contributes to the development of other disorders, or that it can be explained by the overlapping symptoms

between these disorders. Therefore, in a more recent study, Scheeringa and Zeanah (2008) studied comorbidity among 3- to 6-year-old children ($N = 70$) after they experienced Hurricane Katrina. The results showed that 88.6% of the children with PTSD suffered from at least one other comorbid disorder, approximately half of them started post-hurricane. Respectively, comorbid disorders reported started post-hurricane were major depressive disorder (MDD; 60.0% comorbidity), oppositional defiant disorder (ODD; 56.5% comorbidity), separation anxiety disorder (SAD; 50.0% comorbidity) and attention-deficit hyperactivity disorder (ADHD; 29.4% comorbidity). This indicates that comorbidity with PTSD arises in various ways; other disorders may already be present before an ACE, or they may arise after an ACE, or it could be related to the overlapping symptoms between PTSD and other disorders. In conclusion, studies (Scheeringa & Zeanah, 2008; Scheeringa et al., 2003) have shown high comorbidity between PTSD symptoms and other disorders such as MDD, ODD, SAD and ADHD.

Relating this to the Window of Tolerance model (Siegel, 1999), the interplay between symptoms of PTSD and other disorders can be explained by the high levels of stress and feelings of unsafety experienced by traumatized children. These high levels of stress can make children go beyond their window of tolerance. In a state of hypo- or hyper-arousal, children are not able to regulate their feelings and thoughts, and experience difficulties in self-control and inhibition skills. Consequently, this may be expressed in problematic externalizing or internalizing behaviors. Although it remains unclear how the comorbidity between symptoms of PTSD and other disorders develops precisely, several scholars (e.g., Gabowitz et al., 2008; O'Neill et al., 2010) warn for incomplete diagnoses solely based

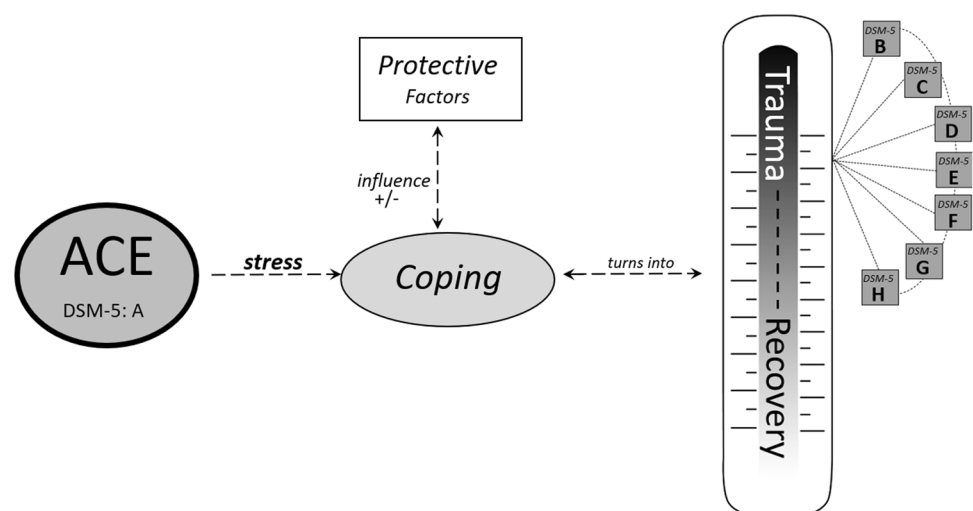
on behavioral manifestations of isolated symptoms (e.g., aggression and concentration difficulties), and thereby not including coping with the traumatic event in interventions.

Dimensional Perspective on Trauma and Well-Being

The high comorbidity rates between symptoms of PTSD and other disorders touch upon the complex issue of clear-cut *DSM* classifications and diagnostic labeling. Based on the literature, we present a conceptual model of ACEs, trauma, recovery and well-being in Fig. 1. This model builds upon recent developments in the field of psychopathology. Rather than taking a categorical approach in which an individual is either diagnosed or not, a large amount of recent studies has shown how psychological disorders can be approached on a continuum of dimensions instead of crisp categories (for a meta-analysis see Haslam et al., 2020). For instance, PTSD can be conceptualized as the extreme end of a stress response continuum (Broman-Fulks et al., 2009; Ruscio et al., 2002). In the current study, this refers to all symptom clusters of PTSD (intrusion symptoms, avoidance, negative alterations in cognitions and moods, alterations in arousal and reactivity and dissociation) and their interplay with the protective factors (safety and relations, self-regulation skills, positive self-image and a stable everyday life situation).

This dimensional approach is incorporated in the network theory of mental disorders (Borsboom, 2017), which helps understanding the interplay between symptoms and protective factors as suggested in the conceptual model of the current study. According to this theory, a psychological disorder cannot be seen as an independent latent entity, but merely reflects an expression of its constitutive symptoms. That is, the network approach describes symptoms being a complex network constitutive of a psychological disorder,

Fig. 1 Conceptual model of adverse childhood experiences (ACE), trauma and recovery



instead of symptoms being a reflection of the disorder. The central idea of the network approach holds symptoms being causally connected, affecting each other's trajectory and possibly in circular self-reinforcing ways. Applied to the context of PTSD, an ACE can activate certain symptoms, like intrusive memories, which then interact with other symptoms such as fear and emotional numbness (see McNally et al., 2015). In case, the strength of these causal connections between symptoms reach a certain threshold and becomes self-sustaining, the network can result in a disorder state. Psychological disorders can thus be understood as a complex network of interacting symptoms which self-maintain a cluster of symptoms (Borsboom, 2017).

Relating the network theory of mental disorders to the conceptual model of the current study, we argue for a dimensional perspective on trauma and recovery (for taxometric evidence of this dimensional perspective on PTSD, see: Broman-Fulks et al., 2009; Ruscio et al., 2002). As shown in Fig. 1, ACEs affect individuals in different ways, and depending on their (in)abilities to cope with the stress caused by ACEs, it turns into recovery or symptom(s) of trauma/PTSD. Coping mechanisms are, in turn, affected by protective factors such as safety and relations, self-regulation skills, self-image and everyday life. Variability in children's coping also comes with different perceptions of events, that is, some children may experience a certain event as traumatic whereas others do not. It is also known that children's subjective perception of an ACE predicts emotional difficulties better than the objective nature of the ACE (Taylor & Weems, 2009). In sum, whatever type of stressful event a child has experienced, and whether a child meets only a few or all PTSD symptom criteria, all symptoms possibly interact. They can affect children's well-being negatively, independent of being classified with a PTSD diagnosis or not. Hence, in the context of the present study, we argue for a dimensional perspective on trauma, recovery and its impact on well-being. Therefore, we developed the RaPTOSS as a non-classifying tool in which teachers observe their young students' behavior and align their teaching to assist learning in students' optimal arousal states, without the need to assign classifying diagnosis to their students. Since we do not want to provoke the idea that the RaPTOSS can determine whether a child either does or does not have PTSD, we use the term "*risk factors*" instead of symptoms of PTSD or trauma. With this term though, we refer to behavioral indicators that we know from the literature and the *DSM-5* to be related to different levels of stress that children possibly experience after ACEs.

Primary School Teachers Need: Trauma Screening Tool

Although teachers often do not know and cannot determine if children suffer from psychotrauma, it is important for them to be aware of possible hidden trauma in case students experience learning difficulties. Despite the increased attention for trauma-informed teaching practices in recent years, teachers report having difficulties detecting trauma-related behaviors (Berger et al., 2023; Dutch Education Council, 2017). Several instruments have been developed to detect trauma (for an overview see Olf, 2015; Strand et al., 2005), but these instruments do not respond to the needs of teachers of young primary school students. These existing tools are mainly diagnostic tools, used by health-care professionals and focus on the traumatic event(s) itself and long-term changes (e.g., Preschool Age Psychiatric Assessment, Egger & Angold, 2004). Moreover, these existing instruments often consist of questions regarding feelings and thoughts, which are also difficult to systematically assess for teachers of young students.

Other instruments that specifically target several internalizing or externalizing problems among primary school students, such as the Strengths and Difficulties Questionnaire (Goodman, 2006), are able to detect behavioral problems, but do not include specific PTSD symptoms. For this reason, the results cannot easily be interpreted through the perspective of trauma as hidden etiological factor. Hence, primary school teachers can be helped with an easily accessible trauma screening tool based on behavioral observations of students in the classroom. This tool may contribute to recognition of specific behaviors in young children that could be indicators of post-traumatic stress. Consequently, such an instrument can contribute to trauma-informed teaching practices in which teachers acknowledge problematic behavior as an expression of constant alertness and feeling unsafe instead of misbehavior by the student.

Present Study Aims

The aim of this study is to present the RaPTOSS—a teacher observation instrument that assesses young student's well-being based on behavioral clusters that are associated with psychotrauma—and investigate its psychometric properties. The RaPTOSS provides systematic insights in students' behavior with regard to both risk and protective factors related to trauma. Because the instrument is based on naturalistic behavior observation, it can be used in repeated measurements of the same children in order to describe the development of trauma symptoms over time. In addition, the RaPTOSS is very well suited to serve as a conversation tool

for educational professionals in order to help determine what type of support may be appropriate for a particular student. Therefore, the RaPTOSS can enhance support to possibly traumatized students, while it also contributes to trauma-informed professional development for teachers.

Before implementation in educational practice, evidence-based assessment is an important prerequisite. As such, the specific aims of this study were to (a) describe the development of the RaPTOSS, (b) examine the factor structure and internal consistency, (c) assess the convergent validity and (d) assess the criterion validity of the RaPTOSS. The empirical findings of this study will result in a new proposed version of the RaPTOSS.

Method

Participants

Data of 406 4- to 8-year-old students were collected through 67 teachers of 31 primary schools from different regions in the Netherlands. Primary school teachers in the Netherlands were invited to participate through emails, social media posts and snowball sampling. Participating teachers then sent an information letter and informed consent forms to their students' parents, via email and/or paper-based. The inclusion criteria were regular education students in the 4–8 years age range who were born in the Netherlands, and within this sample, children with different backgrounds were included. Teachers had the autonomy to select students who met the inclusion criteria, and decide the number of students they completed questionnaires on. Teachers completed all instruments for a minimum of 1 and a maximum of 15 students. Table 1 presents additional demographic information of the sample. As

all students attended regular education, the psychotrauma prevalence rate was expected to be low in the current sample.

Development of the RaPTOSS

The development of the RaPTOSS started with extracting relevant domains from the literature. In line with the *DSM-5* PTSD symptom clusters, we formulated five preliminary risk factors: (1) intrusion symptoms (re-experience of the traumatic event), (2) avoidance of trauma-related stimuli, (3) negative alterations in cognitions and mood, (4) alterations in arousal and reactivity and (5) dissociation. The Attachment, Self-Regulation and Competency (ARC) Treatment Framework (Blaustein & Kinniburgh, 2010) was used for the formulation of four preliminary protective factors: (1) safety and relations, (2) self-regulation, (3) self-image and (4) everyday life.

For the risk factors, item formulation was driven by the PTSD symptoms as described in the *DSM-5*. Moreover, several existing trauma assessment instruments were consulted: Dutch versions of the *Children's Responses to Trauma Inventory* (SVLK, child and parent version; Alisic et al., 2012), *Children's Revised Impact of Event Scale* (CRIES-13, child version and parent version; Olff, 2005; Verlinden & Lindauer, 2005), *Process of Recognition and Orientation of Torture Victims in European Countries to facilitate Care and Treatment* (PROTECT) and *Kidscreen Quality of Life Questionnaire* (Kidscreen-27-K; The Kidscreen Group Europe, 2006). Items related to the *DSM* symptoms for PTSD were extracted from these existing instruments. For the protective factor items, the following Dutch tests were consulted: *Kidscreen Quality of Life Questionnaire* (Kidscreen-27-K; The Kidscreen Group Europe, 2006) as input for the items regarding safety and relations, a resilience test (*Draagkrachttest*; Spierings, 2008) as input for the items assessing self-regulation and self-image and a daily life test (*Dagelijks Leven Test*; Spierings, 2008) for the items concerning children's everyday life.

Next, most importantly, together with a psychotrauma therapist, we revised all items to align them as much as possible with the teachers' perspective on young children's behavior in the classroom. For example, questions such as "Did you/your child try not to think about the event?" (item CRIES-13) or "Do you often have nightmares?" (item PROTECT) are difficult to systematically assess for teachers because these items presume teachers to know about the traumatic event that possibly happened, or about children's thoughts and events that happened outside the classroom. Therefore, we transformed such descriptions into concrete observable behaviors in the classroom, such as "the student covered themes or aspects of an unpleasant event/experience while at play" or as "the student made a tired impression" with multiple example behaviors corresponding to each item, such as "draws or talks about the unpleasant event/

Table 1 Demographic characteristics of the student sample ($N=406$)

Characteristics	<i>n</i>	%
<i>Gender^a</i>		
Boy	198	48.9
Girl	207	51.1
<i>Age, years^a</i>		
4	73	18.0
5	100	24.7
6	84	20.7
7	79	19.5
8	69	17.0
<i>Parents' country of birth^a</i>		
Both parents born in NL	337	83.2
One parent born outside NL	36	8.9
Both parents born outside NL	32	7.9

^aData was missing for one participant

experience” and “yawns a lot.” Protective factor items were also aligned with the teacher perspective and transformed to concrete observable behaviors. For instance, the item “Has your life been enjoyable?” (item Kidscreen-27-K) was transformed to “The student made a happy impression.” Also, several example behaviors were added, for instance, “the student takes initiative, raises their hand, doesn’t mind being the focus of attention” to the item “The student had confidence in themselves.” All items were then reviewed on their comprehensibility and face validity by a team of trauma and education experts. We removed and revised several items based on the expert feedback.

The procedure described above resulted in a questionnaire with 55 items on the frequency of observable trauma-related behavior—both in terms of risk factors and protective factors—in the classroom over the past 2 weeks. All items are presented in Table 2 (risk factor items) and Table 3 (protective factor items). We created both a paper-based and digital version in Excel version of the RaPTOSS. Through different colors, the questionnaire is visually divided in, respectively, risk factors (red) and protective factors (green). For each item, the examples of how this behavior could be recognized in the classroom could be consulted in the Excel file or a separate document (paper-based). Answer options of all items range from (0) not applicable, (1) a little applicable, (2) often applicable and (3) very often applicable. The answer options are presented both with text and colored flags. For the risk factors, flags range from green (risk factor not applicable) to red (risk factor very often applicable), and vice versa for the protective factors. High scores on risk scales indicate the presence of many risk behaviors (symptoms that can be associated with psychotrauma), whereas high scores on protective scales represent the presence of protective factors and should be interpreted positively. We would like to emphasize that the presence of many risk factors reflects an increased chance that a child has experienced ACEs and possibly deals with symptoms of PTSD. By using the term “risk factors,” we do not mean that children with relatively high-risk factor scores are more at risk to experience ACEs and PTSD symptoms in the future.

Measures for Validity Assessment

To assess the convergent validity of the RaPTOSS, teachers also filled in two additional questionnaires that assess student’s behaviors for each participating student. These also focus on psychosocial well-being, but do not have a trauma perspective. These instruments are: the *Strengths and Difficulties Questionnaire* (van Widenfelt et al., 2003) and the *Social–Emotional Questionnaire* (Scholte & van der Ploeg, 2018). To assess criterion validity of the RaPTOSS, we asked to what extent teachers worry about each student.

We used this as a proxy measure for criterion validity because we consider the teacher as a key figure to signal worrisome behaviors among their students which are of clinical relevance.

Strengths and Difficulties Questionnaire (SDQ)

The Dutch SDQ Teacher Report T4-17 years (van Widenfelt et al., 2003) is a brief behavioral questionnaire assessing five domains of socio-emotional functioning. One scale focuses on prosocial behavior as a strength, and the other scales focus on behavioral difficulties: emotional problems, peer problems, conduct problems and hyperactivity/inattention. Scores on emotional problems and peer problems were combined into a scale internalizing behaviors, and scores on conduct problems and hyperactivity into a scale externalizing behaviors (Goodman et al., 2010). Higher scores indicate more behavioral difficulties, except for the subscale prosocial behavior where higher scores represent more prosocial skills. Scale reliabilities (α) in our sample were acceptable to good (respectively, for internalizing behavior, externalizing behavior and prosocial behavior: $\alpha = .72$, $\alpha = .82$ and $\alpha = .75$). Finally, an impact score (range 0–6) was calculated for each child by summing the responses on three questions assessing to what extent difficulties upset or distress the child, and to what extent these difficulties interfere with the child’s everyday life in peer relationships and classroom learning.

Social–Emotional Questionnaire (SEV)

The SEV is a widely used Dutch questionnaire used in education and youth care, based on teacher and/or parent reports (Scholte & Van der Ploeg, 2018). The instrument is known for its good psychometric properties and its ability to detect a range of social–emotional and behavioral problems among children aged 4–18 years (Cotan, 2022). The questionnaire consists of 72 items, belonging to four main categories with several underlying domains. Attention-deficit hyperactivity disorder (18 items) distinguishes between attention deficit, hyperactivity and impulsivity. Problematic social behavior (26 items) assesses underlying domains of oppositional defiant behavior, aggressive behavior and antisocial behavior. Anxious and mood disturbing behavior (18 items) classifies underlying domains of general anxiety, social anxiety and anxious depressive behavior. Autistic behavior is measured with 10 items without subdomains. Frequency ratings are used as answer options: (0) never, (1) occasionally, (2) regularly, (3) often and (4) very often. Scale reliabilities (α) in our sample ranged from .82 to .95.

Teachers' Worries about Students

To examine criterion validity of the RaPTOSS, a general teacher impression of each student was assessed through asking the following question: "Do you worry about this student? Answers were measured on an ordinal scale with the following options: "I am not worried about this student," "I am slightly worried about this student," "I am very worried about this student" and "I am extremely worried about this student."

Procedures and Ethical Considerations

Data collection took place between 2019 and 2021. The study was approved by the Ethical Committee of Psychology of the University of Groningen (PSY-1819-S-0012) and was conducted in compliance with the GDPR. Parental permission of students was obtained with active informed consent forms via the teachers. Teachers needed approximately half an hour to complete all three questionnaires in total for each student, and they decided themselves how (33% of the questionnaires paper-based and 67% digital) and when they filled in the questionnaires. They received a book about trauma-informed teaching (Horeweg, 2018) as a reward for their effort when they completed questionnaires for at least 12 students. One school completed questionnaires for 48 students and received a workshop on trauma-informed teaching and implementation of the RaPTOSS instrument, given by a psychotrauma therapist and EMDR Europe practitioner. The questionnaires were completed anonymously, meaning that the teacher did not include student names, and no individual results were communicated to the teachers and parents. To guarantee student's anonymity as much as possible, we aimed for data minimization. For instance, we only collected birth month and year, and whether parents were born inside or outside the Netherlands. As such, no specific information was asked about the specific birth date or country or origin. Informed consent forms were not linked to the questionnaires and were stored separately from the data. Data were pseudonymized for further analyses. Data storage followed the guidelines outlined in the UG Research Data Policy and the Data Storage Protocol of The Heymans Institute for Psychological Research.

Statistical Analyses

Missing Data

In 21 cases (0.03% of all data), teachers selected two or in between answer options for one of the items of the questionnaires. In these cases, the highest of the reported options were scored. The dataset contained some missing

data at item level: 0.04% of all RaPTOSS data points, 0.31% of all SDQ data, 0.03% of all SEV data and the teacher impression question to assess criterion validity was not filled in for 6 students (1.48% of the data). Scale scores of the SDQ, SEV and RaPTOSS were calculated by summing the item scores. In case of missing items, these scores were scaled up pro-rata if at least 60% of the items were completed with the result being rounded to the nearest whole number, as prescribed in the SDQ scoring protocol. Adhering to this protocol, sufficient data were available to calculate RaPTOSS and SEV scale scores for all participants. SDQ data were not available for one participant. Additionally, the SDQ impact score could not be calculated for two participants. Mean imputation has been applied to substitute missing data in the factor analyses. In the correlational analyses assessing convergent and criterion validity, pairwise deletion was used with the few scale scores that were missing for three participants.

Exploratory Factor Analyses

This was the first study examining the factor structure of the RaPTOSS, justifying the use of exploratory factor analyses (EFA) in accordance with Henson and Roberts (2006). To improve item selection and investigate the factor structure of the RaPTOSS, two EFA's were performed: one for the risk factors items (30 items) and one for the protective factor items (25 items). In this way, we handle the items of the risk and protective factors as two theoretically separate constructs, and avoid negative collinearity and complicated interpretations which would occur in a joint factor analysis.

First, we determined whether the sample size ($N=406$) was large enough. Based on a large simulation study (Mundfrom et al., 2005), a minimum sample size of 350 is needed to achieve excellent level criterion with a variables-to-factors ratio of five, wide levels of communality and to extract up to six factors. Hence, our sample size was considered adequate to perform an EFA. Next, the factorability of the data was assessed through the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Additionally, we inspected the frequency distributions of the item responses and corrected item-total correlations, which provided information to aid the subsequent interpretation of the factor analysis and identify potential items for deletion or modification (Boateng et al., 2018). Because the sample consisted of students from regular education, positive skewness for the items of the risk factors and negative skewness for the items of the protective factors were expected. Subsequently, the factors were extracted from the data using unweighted least squares (ULS), as this factor extraction method is considered suitable in case of non-normally distributed data that do meet the assumption of

linearity (Flora et al., 2012). Factors were then rotated using oblique oblimin rotation, as it was expected that the factors would be correlated. To decide on the number of factors to retain, we used parallel analysis, minimum average partials (MAP), visual scree plots and the interpretability of each factor (Watkins, 2018).

The interpretations of the factor structure were done primarily based on the pattern matrix. Factors were considered adequate when having at least three salient factor loadings (pattern coefficients $\geq .30$), good internal consistency (Cronbach's $\alpha \geq .70$) and were theoretically meaningful (Watkins, 2018). Complex variables that demonstrated cross-loadings in the pattern matrix were handled individually appointed to the factor it loaded most strongly on, if the cross-loading was theoretically in line with the latent nature of the observed variable (Yong & Pearce, 2013). Items could be removed when they did not saliently load on either one of the factors, demonstrated low item communality ($< .25$), had low corrected item-total correlations ($< .30$), and if limited variance in item responses was observed (Boateng et al., 2018). EFAs were then performed again until a sufficient and meaningful factor solution was reached.

Validity Assessment

Convergent validity of the RaPTOSS was assessed through examining Pearson correlations between the separate RaPTOSS scales (as found in the EFA's) and scales of the SEV and SDQ. Due to the ordinal measurement level of teachers' worries, criterion validity was assessed through Spearman Rho correlations between teachers' worries about their students and the RaPTOSS scales.

Software

R Statistical Software (v4.2.3; R Core Team, 2021) was used to perform the EFA's using the ULS method. All other analyses (e.g., preliminary analyses and validity analyses) were performed in SPSS version 28.

Results

Item Response Descriptives

The frequency distributions and descriptive statistics of the risk factor items are displayed in Table 2. As expected, most responses were at the lower end of the scale. All but items 1.2 ("made a tired/weary impression") and 4.5 ("had difficulty paying attention to something, or concentrating") exhibited non-normal distributions as indicated by skewness scores above 2. In particular, responses on item 2.6 ("felt

that they had a limited future") demonstrated notable critical values for both skewness and kurtosis and very few variation in the item responses. The corrected item-total correlations were all well above the recommend level of .30, ranging from .36 to .74, except for item 2.6 with a low value of .16.

The frequency distributions of the protective factor items are shown in Table 3. As expected, most items responses were observed at the upper end of the scale, indicating the presence of many protective factors among the participants. Skew and kurtosis values were less extreme as compared with the risk factor items. Only three items just exceeded the threshold for extreme negative skewness: item 9.4 ("arrived at school on time"), item 9.5 ("had good attendance levels") and item 9.6 ("parents took interest"), but these items were not as skewed as most items of the risk factors. Corrected item-total correlations ranged from .45 to .77, indicating good discrimination of the protective items.

Risk Items: Factor Structure

The KMO value of 0.91 and Bartlett's test of sphericity ($\chi^2(435) = 6508.874, p < .001$) indicated that the items of the RaPTOSS risk factors were appropriate for factor analyses. The parallel analysis suggested an eight-factor solution, while the Velicer MAP criterion indicated retention of five factors. The scree plot indicated that a fifth, sixth and seventh factor would only have a minor contribution to the explained variance of the solution. Closer inspection revealed that factors five and six consisted of mostly cross-loading items that were difficult to interpret as separate factors, and only accounted for, respectively, 4% and 3% of the variance to the solution. We, therefore, retained a four-factor model for the RaPTOSS risk factor items. In this four-factor solution, item 2.6 ("felt that they had a limited future") did not saliently load on any factor. Also, its item communality was very low (.04), and retrospectively, this particular item had a low face validity because it is difficult for teachers to notice feelings of a limited future among young students. Therefore, we deleted this item and ran a second EFA with the remaining 29 items.

The final four-factor model explained 48% of the total variance (13%, 13%, 11% and 11% for each factor, respectively). The pattern matrix is presented in Table 4. The four-factor solution did not evidently resemble the *DSM* symptom clusters for PTSD. Based on the content of the four identified factors, we labeled the scales as follows: Withdrawn, Dysphoria, Destructive and Inattentive. We labeled the first factor as Withdrawn, as it comprised items concerning avoidance symptoms and numbing. In terms of concrete behaviors, these items are manifested as reduced responsiveness (e.g., "did not react at times") and more generally withdrawn behavior (e.g., "avoided certain people, conversations or situations"). The second factor, Dysphoria, captured

Table 2 Frequency distribution of item responses and descriptive statistics of RaPTOSS risk factor items

Item	0	1	2	3	<i>M</i>	<i>SD</i>	Skew	Kurtosis
<i>1. Intrusion symptoms (re-experience of the traumatic event)</i>								
1.1 ...covered themes or aspects of an unpleasant event/experience while at play.	368	29	7	2	0.12	0.41	3.99	17.84
1.2 ...made a tired/weary impression.	274	112	17	3	0.38	0.60	1.54	2.24
1.3 ...made an anxious/frightened impression. ^a	339	54	11	0	0.19	0.46	2.43	5.29
1.4 ...appeared to be suffering from physical complaints.	322	69	12	3	0.25	0.54	2.36	5.97
1.5 ...reacted in a neutral situation, in a non-neutral way.	362	25	15	4	0.17	0.52	3.45	11.97
<i>2. Avoidance of trauma-related stimuli</i>								
2.1 ...avoided talking about (trauma-) sensitive subjects.	355	35	11	5	0.18	0.52	3.39	12.10
2.2 ...avoided certain places or objects.	379	20	7	0	0.08	0.33	4.29	18.85
2.3 ...avoided certain people, conversations or (social) situations.	355	36	12	3	0.17	0.50	3.28	11.34
2.4 ...avoided certain activities.	358	32	10	6	0.17	0.53	3.54	13.14
2.5 ...displays reduced affect.	364	28	10	4	0.15	0.49	3.76	15.03
2.6 ...felt that they had a limited future. ^b	396	8	0	1	0.03	0.20	9.95	122.33
<i>3. Negative changes in cognitions and mood</i>								
3.1 ...appeared to feel guilty about certain matters.	371	31	4	0	0.10	0.33	3.57	13.08
3.2 ...made negative remarks about themselves, others or the world.	329	54	21	2	0.25	0.57	2.33	4.93
3.3 ...showed limited interest (compared to other students) in important activities.	356	36	11	3	0.17	0.49	3.35	11.99
3.4 ...made a sad impression. ^b	330	61	14	0	0.22	0.49	2.19	4.06
3.5 ...made an embarrassed impression.	372	29	4	1	0.10	0.35	4.16	20.33
3.6 ...did not seek contact with others, stayed separate. ^b	359	35	10	1	0.14	0.43	3.32	11.61
<i>4. Increased or decreased arousal</i>								
4.1 ...made an angry impression.	350	48	7	1	0.16	0.43	2.94	9.49
4.2 ...was reckless.	354	45	6	1	0.15	0.41	3.10	10.80
4.3 ...was overcareful or kept their guard up for no apparent reason.	385	13	7	1	0.07	0.34	5.22	29.24
4.4 ...forgot usual, everyday things.	353	39	11	3	0.17	0.49	3.24	11.25
4.5 ...had difficulty paying attention to something, or concentrating.	281	72	35	18	0.48	0.83	1.68	1.87
4.6 ...was (too) easily startled, or was nervous. ^b	353	43	5	4	0.16	0.47	3.56	14.69
4.7 ...bullied other students.	367	34	5	0	0.11	0.35	3.37	11.49
<i>5. Dissociation</i>								
5.1 ...acted younger than their age.	328	50	24	4	0.27	0.61	2.35	5.00
5.2 ...displayed sudden switches in behavior.	346	42	17	1	0.19	0.51	2.71	6.96
5.3 ...displayed sudden switches of emotion.	346	44	13	3	0.19	0.52	2.96	9.15
5.4 ...could do something one day, but absolutely could not the next.	363	25	15	3	0.16	0.50	3.46	12.07
5.5 ...appeared to have no memory of things that had (only just) happened or been said.	367	29	9	1	0.12	0.41	3.70	14.61
5.6 ...did not react (at times). ^b	337	47	19	2	0.22	0.55	2.55	6.15

The ellipses can be replaced by “In the past two weeks, the student...”

All item scores represent a range of values from 0 = not applicable to 3 = very often applicable. Skew and kurtosis values represent standardized values

^aData was missing for two participants

^bData was missing for one participant

items reflecting negative mood and cognitions (“made a sad impression” and “appeared to feel guilty”), anxiety (“made an anxious impression”) and restlessness (“was overcareful for no apparent reason”), all features of Dysphoria. We labeled the third factor as Destructive, as items seemed to capture outward behaviors which can be interpreted as aggressive, hostile, oppositional or harmful to either the student themselves (e.g., “made negative remarks about

themselves, others or the world”) or others (e.g., “bullied other students”). The fourth factor captured items reflecting cognitive impairment (e.g., “forgot usual, everyday things” and “had difficulty paying attention to something”) and dissociative symptoms (e.g., “appeared to have no memory of things that had just happened or been said”), manifested as Inattentive behavior.

Table 3 Frequency distribution of item responses and descriptive statistics of RaPTOSS protective factor items

Item	0	1	2	3	<i>M</i>	<i>SD</i>	Skew	Kurtosis
<i>6. Safety and relations</i>								
6.1 ...got on well with their teacher(s): The student gave positive responses during their contact with the teacher(s).	2	10	113	281	2.66	0.55	-1.53	2.38
6.2 ...got on well with their teacher(s): The student took initiative during their contact with the teacher(s).	4	24	135	243	2.52	0.65	-1.24	1.25
6.3 ...made positive contact with other students.	5	25	157	219	2.45	0.67	-1.08	1.00
6.4 ...other students sought positive contact with the student.	5	32	143	226	2.45	0.69	-1.11	0.78
6.5 ...liked being at school.	5	13	132	256	2.57	0.62	-1.48	2.47
6.6 ...made a happy impression.	4	31	135	236	2.49	0.68	-1.15	0.81
6.7 ...was a valued member of the group (good social status).	3	43	126	234	2.46	0.71	-1.04	0.20
<i>7. Self-regulation</i>								
7.1 ...adequately made their feelings clear.	25	84	153	144	2.02	0.90	-0.56	-0.56
7.2 ...was capable of correctly reflecting on and responding to the behavior and feelings of others.	19	77	165	145	2.07	0.86	-0.60	-0.39
7.3 ...was capable of calming themselves down (again) when they were angry, sad or afraid. ^a	55	62	125	163	1.98	1.05	-0.67	-0.79
7.4 ...was capable of calming down (again), with help from someone else, when they were angry, sad or afraid.	49	49	138	170	2.06	1.01	-0.82	-0.45
7.5 ...was flexible in their behavior.	15	65	135	191	2.24	0.85	-0.84	-0.19
7.6 ...thought before acting.	19	61	127	199	2.25	0.88	-0.92	-0.07
<i>8. Self-image</i>								
8.1 ...made a proud impression.	8	39	152	207	2.37	0.74	-1.02	0.58
8.2 ...talked about themselves in a positive way. ^a	15	37	162	191	2.31	0.79	-1.06	0.77
8.3 ...brought in (many) new ideas.	17	77	141	171	2.15	0.87	-0.67	-0.47
8.4 ...was capable of dealing with criticism well.	19	101	157	129	1.98	0.87	-0.38	-0.72
8.5 ...had confidence in themselves.	10	87	152	157	2.12	0.83	-0.50	-0.71
8.6 ...dares to take on new challenges.	10	68	154	174	2.21	0.81	-0.69	-0.34
<i>9. Everyday life</i>								
9.1 ...ate well.	6	14	104	282	2.63	0.63	-1.84	3.65
9.2 ...looked well-kept.	1	13	82	310	2.73	0.53	-1.90	3.31
9.3 ...was physically active.	2	11	101	292	2.68	0.55	-1.71	2.96
9.4 ...arrived at school on time.	5	8	91	302	2.70	0.57	-2.16	5.47
9.5 ...had good attendance levels (e.g., was not often sick).	9	13	71	313	2.69	0.64	-2.40	5.93
9.6 ...parents took interest.	4	13	85	304	2.70	0.58	-2.08	4.61

The ellipses can be replaced by "In the past two weeks, the student..."

All item scores represent a range of values from 0 = not applicable to 3 = very often applicable. Skew and kurtosis values represent standardized values

^aData was missing for one participant

In this final model, we have chosen to retain the six items that cross-loaded on two factors for conceptual reasons. For instance, item 5.5 assessing memory problems, loaded most strongly on factor Inattentive, but exhibited a cross-loading on the factor Withdrawn which included items capturing avoidance and numbing behaviors. Although memory problems manifest as inattentive behavior, they are also a symptom of numbing. In this way, the items that exhibited cross-loadings could all be theoretically justified, demonstrated acceptable communality values and were considered of practical importance.

Internal consistency was excellent for the 29 items concerning the general risk factor ($\alpha = .93$) and good for the four separate factors as identified in the EFA (see Table 5). The correlations between factors were positive and low to moderate (see Table 5), indicating that they represented related but conceptually distinct constructs.

Protective Items: Factor Structure

The KMO value of .93 and Bartlett's test of sphericity ($\chi^2(300) = 8176.680, p < .001$) indicated that the items of the

Table 4 Pattern matrix, eigenvalues and percent explained variance of a four-factor solution for the RaPTOSS risk factor items

RaPTOSS item	Factor loading				Communality	
	1	2	3	4		
<i>Factor 1: Withdrawn</i>						
2.3	...avoided certain people, conversations or (social) situations.	.86	-.03	.00	.03	.74
2.5	...displays reduced affect.	.65	.09	.11	-.16	.48
5.6	...did not react (at times).	.62	.08	.02	.28	.68
2.1	...avoided talking about (trauma-) sensitive subjects.	.60	.10	.07	-.05	.45
2.4	...avoided certain activities.	.49	.16	-.03	.29	.55
3.6	...did not seek contact with others, stayed separate.	.30	.23	.16	.00	.30
<i>Factor 2: Dysphoria</i>						
4.6	...was (too) easily startled, or was nervous.	.03	.67	-.13	.22	.54
4.3	...was overcareful or kept their guard up for no apparent reason.	.02	.64	-.08	.05	.42
1.3	...made an anxious/frightened impression.	.28	.62	-.01	-.07	.59
3.4	...made a sad impression.	.04	.51	.44	-.11	.59
3.1	...appeared to feel guilty about certain matters.	-.21	.47	.22	.15	.31
1.1	...covered themes or aspects of an unpleasant event/experience while at play.	-.14	.46	.11	.10	.23
2.2	...avoided certain places or objects.	.18	.45	-.05	.14	.38
1.4	...appeared to be suffering from physical complaints.	.20	.39	.21	-.29	.33
1.2	...made a tired/weary impression.	.11	.35	.34	-.06	.37
3.5	...made an embarrassed impression.	.17	.35	.16	.04	.32
<i>Factor 3: Destructive</i>						
4.1	...made an angry impression.	.03	-.03	.82	.04	.70
3.2	...made negative remarks about themselves, others or the world.	.08	.04	.57	-.10	.34
4.7	...bullied other students.	-.02	-.02	.57	.06	.34
5.2	...displayed sudden switches in behavior.	.26	-.03	.46	.31	.61
4.2	...was reckless.	-.16	-.12	.44	.41	.39
5.3	...displayed sudden switches of emotion.	.13	.14	.42	.24	.50
<i>Factor 4: Inattentive</i>						
4.4	...forgot usual, everyday things.	-.03	.27	.04	.60	.54
4.5	...had difficulty paying attention to something, or concentrating.	.00	.07	.24	.59	.56
5.5	...appeared to have no memory of things that had (only just) happened or been said.	.33	.04	.02	.56	.61
5.4	...could do something one day, but absolutely could not the next.	.18	.20	-.01	.49	.47
3.3	...showed limited interest (compared to other students) in important activities.	.31	-.01	.16	.48	.56
5.1	...acted younger than their age.	.14	.04	.21	.42	.41
1.5	...reacted in a neutral situation, in a non-neutral way.	.18	.30	.25	.32	.59
Eigenvalues		3.74	3.67	3.28	3.22	
Percent variance explained (%)		13%	13%	11%	11%	

The extraction method was unweighted least squares (ULS) with an oblique oblimin rotation. Per item, its loading on its intended factor is printed in bold

Table 5 Internal consistency (Cronbach's α) and factor correlations of four-factor solution RaPTOSS risk factor items

	α	F1	F2	F3	F4
Withdrawn (F1)	.85	–			
Dysphoria (F2)	.84	.53	–		
Destructive (F3)	.81	.36	.35	–	
Inattentive (F4)	.86	.39	.32	.39	–

RaPTOSS protective factors were appropriate for factor analyses. The decision on the number of factors to extract for the RaPTOSS protective factor items was less ambiguous as compared to the risk factor items. That is, the parallel analysis, Velicer MAP criterion and scree plot all suggested a four-factor solution. This four-factor model explained 64% of the total variance (22%, 18%, 13% and 12% for each factor, respectively). The content of these four factors was

Table 6 Pattern matrix, eigenvalues and percent explained variance of a four-factor solution for the RaPTOSS protective factor items

RaPTOSS item		Factor loading				Communality
		1	2	3	4	
<i>Factor 1: Safety and relations</i>						
6.4	...other students sought positive contact with the student.	.87	-.06	-.05	.07	.75
6.1	...got on well with their teacher(s); The student gave positive responses during their contact with the teacher(s).	.83	-.02	.13	-.10	.68
6.3	...made positive contact with other students.	.81	-.01	.05	.05	.73
6.7	...was a valued member of the group (good social status).	.79	.03	-.03	.10	.73
6.5	...liked being at school.	.77	.03	.03	.05	.70
6.6	...made a happy impression.	.68	.21	-.03	-.01	.65
6.2	...got on well with their teacher(s); The student took initiative during their contact with the teacher(s).	.62	.11	.13	-.07	.52
<i>Factor 2: Self-image</i>						
8.5	...had confidence in themselves.	-.07	.91	.02	.00	.76
8.6	...dares to take on new challenges.	-.06	.84	.13	-.01	.75
8.3	...brought in (many) new ideas.	.04	.77	-.07	.04	.62
8.2	...talked about themselves in a positive way.	.18	.73	.02	-.05	.69
8.1	...made a proud impression.	.21	.65	-.03	.05	.66
8.4	...was capable of dealing with criticism well.	-.04	.56	.09	.28	.62
7.1	...adequately made their feelings clear.	.30	.35	-.07	.30	.60
<i>Factor 3: Everyday life</i>						
9.4	...arrived at school on time.	-.04	-.02	.83	.02	.64
9.5	...had good attendance levels (e.g., was not often sick).	-.09	.08	.75	.02	.59
9.6	...parents took interest.	.04	.01	.71	-.04	.52
9.2	...looked well-kept.	.10	-.03	.64	.07	.49
9.3	...was physically active.	.26	.01	.55	.06	.55
9.1	...ate well.	.18	.09	.52	.02	.48
<i>Factor 4: Self-regulation</i>						
7.3	...was capable of calming themselves down (again) when they were angry, sad or afraid.	-.01	-.01	.01	.94	.86
7.4	...was capable of calming down (again), with help from someone else, when they were angry, sad or afraid.	.00	-.01	.04	.81	.67
7.5	...was flexible in their behavior.	.17	.20	.04	.54	.66
7.2	...was capable of correctly reflecting on and responding to the behavior and feelings of others.	.27	.27	.03	.38	.64
7.6	...thought before acting.	.31	.07	.10	.36	.48
Eigenvalues		5.47	4.45	3.17	2.95	
Percent variance explained		22%	18%	13%	12%	

The extraction method was unweighted least squares (ULS) with an oblique oblimin rotation. Per item, its loading on its intended factor is printed in bold

closely aligned with the initial four protective factors of the RaPTOSS, and therefore, we labeled the scales as follows: Safety and Relations, Self-Image, Everyday Life and Self-Regulation. The pattern matrix is displayed in Table 6.

The first factor, Safety and Relations, captured all seven items of this initial scale. The second factor consisted of all items of the initial Self-Image scale, and additionally, item 7.1 (“adequately made their feelings clear”). The third factor consisted of the six items of the Everyday Life scale, focusing on growing up in a stable daily environment. Last,

Table 7 Internal consistency (Cronbach’s α) and factor correlations of four-factor solution RaPTOSS protective factor items

	α	F1	F2	F3	F4
Safety and relations (F1)	.93	–			
Self-image (F2)	.92	.59	–		
Everyday life (F3)	.87	.44	.49	–	
Self-regulation (F4)	.89	.59	.58	.31	–

Table 8 Correlations between RaPTOSS risk scale scores, SDQ and SEV scale scores and teacher impression scores

Validity measures	RaPTOSS				
	Risk sum	Withdrawn	Dysphoria	Destructive	Inattentive
Convergent validity^a					
<i>SDQ</i>					
Internalizing behavior	.63	.53	.66	.47	.44
Externalizing behavior	.64	.40	.40	.64	.71
Prosocial behavior	-.46	-.40	-.30	-.48	-.39
Impact	.80	.61	.61	.66	.75
<i>SEV</i>					
ADHD	.63	.40	.37	.61	.74
Problematic social behavior	.56	.36	.31	.75	.53
Anxious and mood disturbing behavior	.70	.63	.70	.49	.53
Autistic behavior	.71	.61	.54	.55	.66
Criterion validity^b					
Teacher's worries	.60	.53	.50	.41	.56

All correlations are significant at the .01 level (two-tailed)

^aPearson correlation coefficients

^bSpearman Rho correlation coefficients

the fourth factor consisted of the five remaining items of the Self-Regulation scale (excluding item 7.1). All but item 7.1, which cross-loaded on the first, second and fourth factor, was thus in line with the intended and initial factor structure for the RaPTOSS protective factors. Internal consistency was excellent for the 25 items concerning the general protective factor ($\alpha = .95$), and good to excellent for the separate factors as identified in the EFA (see Table 7). The inter-factor correlations were positive and low to moderate (see Table 7), suggesting the factors to be related but representing conceptually distinct constructs.

Convergent Validity

Table 8 presents Pearson correlations between the RaPTOSS risk factor scales (as found in the EFA) and the SDQ scales, and between the RaPTOSS risk factor scales and the SEV scales. All correlations were significantly different from 0, with correlations ranging from .30 to .80. As an exception, correlations with the positively formulated SDQ scale prosocial behavior were moderately negative. The overall Risk Sum score of the RaPTOSS demonstrated large positive correlations to all scales of the SDQ and SEV. The separate risk factor scales of the RaPTOSS generally exhibited moderate to strong positive associations with the scales of the SDQ and SEV, except negative moderate correlations with prosocial behavior (SDQ). The RaPTOSS factor scales, Withdrawn and Dysphoria, were most strongly correlated to internalizing behavior (SDQ). RaPTOSS scale Dysphoria in particular was highly correlated to anxious and mood disturbing behavior (SEV), and RaPTOSS scale Withdrawn

was mostly associated with anxious and mood disturbing behavior (SEV) and autistic behavior (SEV). The RaPTOSS factor scales Destructive and Inattentive, though, were most strongly associated with externalizing behavior (SDQ). More specifically, RaPTOSS scale Inattentive was highly correlated to ADHD (SEV), and RaPTOSS scale Destructive was highly correlated to problematic social behavior (SEV). All RaPTOSS risk scales were strongly associated with the impact supplement score of the SDQ.

Table 9 presents Pearson correlations between the scales of the RaPTOSS protective factor scales (as found in the EFA) and the SDQ scales, and between the RaPTOSS protective factor scales and the SEV scales. All correlations were significantly different from 0, with negative correlations ranging from -.25 to -.62, and as exception, correlations with positively formulated SDQ scale prosocial behavior being negative. The overall RaPTOSS Protect Sum score demonstrated moderate negative correlations to all scales of the SDQ and SEV. The RaPTOSS factor scales Safety and relations and Self-regulation demonstrated moderate negative correlations to all scales of the SDQ and SEV. The RaPTOSS factor scale Self-image was most strongly negatively associated with internalizing behavior (SDQ) and anxious and mood disturbing behavior (SEV). Associations between RaPTOSS factor scale Everyday life and the SDQ and SEV were smaller in magnitude as compared to the other RaPTOSS scales.

Table 9 Correlations between RaPTOSS protective scale scores, SDQ scale scores, SEV scale scores and teacher impression scores

Validity measures	RaPTOSS				
	Protect sum	Safety and relations	Self-image	Everyday life	Self-regulation
Convergent validity^a					
<i>SDQ</i>					
Internalizing behavior	-.58	-.51	-.61	-.36	-.44
Externalizing behavior	-.56	-.49	-.47	-.33	-.57
Prosocial behavior	.52	.55	.42	.26	.49
Impact	-.59	-.52	-.55	-.34	-.52
<i>SEV</i>					
ADHD	-.51	-.45	-.43	-.29	-.53
Problematic social behavior	-.52	-.50	-.41	-.30	-.53
Anxious and mood disturbing behavior	-.57	-.53	-.62	-.25	-.44
Autistic behavior	-.58	-.55	-.51	-.30	-.53
Criterion validity^b					
Teacher's worries	-.57	-.48	-.53	-.36	-.54

All correlations are significant at the .01 level (two-tailed)

^aPearson correlation coefficients

^bSpearman Rho correlation coefficients

Criterion Validity

Teachers reported not to worry about a majority of the participating students ($n = 267$, 67%). Furthermore, teachers indicated to be, respectively, slightly worried ($n = 97$, 24%), very worried ($n = 31$, 8%) and extremely worried ($n = 5$, 1%), about the students. As displayed in Table 8, moderate to strong positive Spearman Rho correlations were found between teacher worries and the RaPTOSS risk factor scales. Conversely, moderate to strong negative correlations were found between teacher worries and the RaPTOSS protective factor scales (see Table 9). These results support the criterion validity of the RaPTOSS.

Discussion

This article describes the development and validation of the RaPTOSS: a trauma screening tool to aid teachers in detecting potential indicators of psychotrauma (risk factors) and trauma protective factors in the classroom. The results of our study, based on a sample of 4- to 8-year-old children, showed that the RaPTOSS yielded good internal consistency, convergent validity and criterion validity. Exploratory factor analysis of the items concerning the protective factors revealed four factors that were closely aligned with the factors as these were based on theory: Safety and Relations, Self-Image, Everyday Life and Self-Regulation. For the items of the risk factors, the factor solution was somewhat different than the theoretical symptom clusters of PTSD.

The first and second factors, which we labeled as Withdrawn and Dysphoria, reflected dimensions of internalizing behaviors, while the third and fourth factors, which we labeled as Destructive and Inattentive, reflected aspects of externalizing behaviors. The factor solution being different from the PTSD symptom clusters may have resulted from the fact that this study was based on a nonclinical sample with an expectedly low prevalence rate of PTSD. Presumably, the factor solution, therefore, clustered around the most common forms of (mild) psychopathology. This is in accordance with empirical research on the meta-structure of mental disorders, suggesting that internalizing and externalizing behaviors form the core underlying dimensions of psychopathology (Carragher et al., 2015). Moreover, the factor solution not completely reflecting the PTSD symptom clusters may also stem from numerous RaPTOSS risk items lacking specificity for PTSD, instead exhibiting overlaps with other behavioral and psychosocial symptoms in children. This was also demonstrated by the convergent validity assessment in which moderate to strong associations were found between the scores on the RaPTOSS, and social-emotional and behavioral problems such as ADHD, depressive symptoms, anxious behavior and autistic behavior. It reflects the high comorbidity between PTSD symptoms and other psychosocial symptoms in children as was also found in the previous studies (e.g., Scheeringa & Zeanah, 2008; Scheeringa et al., 2003).

Finally, the results of the current study are in line with prior factor analytic studies on PTSD symptomatology that have not confirmed the PTSD symptom clusters as implied by the fourth and fifth editions of the *DSM*. For instance,

in a meta-analysis, Yufik and Simms (2010) concluded that a four-factor model with factors Re-experiencing, Hyperarousal, Avoidance and Dysphoria yielded best model fit across studies, which is different from the current study in which the factor Inattentive emerged, and in which re-experiencing items loaded on the Dysphoria factor. However, most samples described in Yufik and Simms (2010) consisted of adults and adolescents and rarely included young children. In conclusion, empirical studies on the structure of PTSD symptomatology often not entirely overlap with the PTSD symptoms clusters as described in the *DSM* editions over the years, and differences across studies may be caused by different samples and trauma exposure.

Practical Implications

Final Version of the RaPTOSS

Based on the empirical findings of this study, we present a RaPTOSS with 54 items (see Supplementary Material 1 for the final version). This means that we excluded the original item 2.6 (“the student felt that they had a limited future”). Furthermore, an additional instruction was added to the description of two protective factor items assessing whether the student was capable of calming down when they were angry, sad or afraid, either themselves (item 7.3) or with help from someone else (item 7.4). That is, in case, a student had not been angry, sad or afraid in the past 2 weeks, the right answer should be “very often applicable.” In this way, we aim to minimize misinterpretation of these items and ensure that scores on the protective items will all be interpreted in the same direction.

An important note is that we have decided to continue using the original structure and names of the *DSM*-oriented scales of PTSD symptoms, albeit the factor analysis of the risk factor suggested another structure. As discussed before, the finding of factors reflecting general aspects of internalizing and externalizing behaviors rather than trauma-specific factors could be related to the nonclinical sample of the current study. By retaining the *DSM*-oriented scales, the RaPTOSS also serves as an educational tool for teachers to recognize post-traumatic stress in the classroom, according to the often used PTSD symptoms clusters as described in the *DSM*. In this way, the RaPTOSS creates a shared frame of reference concerning possible consequences that traumatic events may have on children’s behavior and learning processes in the classroom.

Finally, data from the current nonclinical sample were used to calculate norm-referenced percentile scores for the RaPTOSS scales. Adhering to the signaling purpose of the RaPTOSS, cutoffs aimed at identifying, respectively, the 5%, 10% and 20% most extremely scoring students on the risk and protective factors. We updated the digital version

of the RaPTOSS in such a way that when teachers complete the RaPTOSS for a certain student, graphs automatically show how the student scores with respect to the reference group. Teachers can fill in the RaPTOSS multiple times a year and visually inspect how the risk and protective factors of a student changed over time.

Using the RaPTOSS in Educational Practice

The RaPTOSS can be implemented in (early) primary education in case teachers have potentially trauma-related worries about a student. More specifically, when a teacher has reason to expect that a particular student may have experienced ACE(s), or when a student suddenly behaves differently at school. The RaPTOSS can enhance teachers’ understanding of a student’s behavior after experiencing ACE(s) and provide guidelines for trauma-informed teaching. Additionally, the trauma perspective of the RaPTOSS can be insightful for diffuse behaviors which are difficult to interpret, because it is known that trauma could be a hidden factor behind worrisome behaviors (Cook et al., 2017; Gabowitz et al., 2008; O’Neill et al., 2010; Scheeringa & Zeanah, 2008).

In view of the overlapping symptoms of post-traumatic stress-related behaviors and other psychosocial and behavioral problems (e.g., ADHD, anxiety and depressive symptoms), we discourage teachers and schools from using the RaPTOSS as a school-wide universal screening instrument for all students, even though some studies suggest universal school-based mental health screening on mental health issues including trauma (Gonzalez et al., 2016). The similarities between PTSD symptoms and other worrisome behaviors may create false positives, potentially resulting in overtreatment and teachers guessing what ACE could have been the cause of worrisome behavior. Furthermore, no information is available yet concerning the sensitivity and specificity of the RaPTOSS, due to the difficulty investigating this among the young children of the current sample. We, therefore, advice to use the RaPTOSS only in case of trauma-related worries or in case of diffuse behaviors among particular students.

We also advocate to implement the RaPTOSS as part of a comprehensive assessment in the (pre-)diagnostic process of particular students, in addition to classroom observations, conversations with parents/caregivers and other assessment instruments. In this way, the RaPTOSS adds another perspective to the interpretation of worrisome behavior. Adding this perspective, it shifts the focus from diagnostic labels toward understanding how stress responses can lead to various worrisome behaviors. In this way, we argue that the RaPTOSS can be part of a broad pre-diagnostic approach characterized by watchful waiting and easily accessible psychosocial interventions, instead of requiring a diagnostic

label prior to treatment interventions (see Batstra et al., 2012, 2021). Trauma-informed teaching practices in which teachers understand the impact of trauma on children and create a safe learning environment for all students can be an important step in this pre-diagnostic process. The protective factors that are included in the RaPTOSS encompass guidelines to promote children's resilience and coping skills rather than trying to remedy problematic behavior. In case of persistent or sudden distinct problematic RaPTOSS scores, teachers should inform health care for more elaborate diagnostic assessment and treatment.

Limitations and Future Research

The current study represents a first investigation of the psychometric properties of the RaPTOSS. One limitation of this study is that, in our nonclinical sample, we could not assess whether the participants have had experienced ACEs or were diagnosed with PTSD. This type of "ultimate" criterion validity, whether the RaPTOSS can differentiate between children with and without PTSD, was, therefore, impossible to examine in the current study. However, importantly, the aim of the RaPTOSS is not to classify and label children with ACEs or PTSD, but rather is to educate teachers about possible manifestations of traumatic stress in the classroom, with a dimensional perspective on (traumatic) stress responses in order to recognize potential PTSD indicators among their students. In fact, teachers often do not know if their students experienced ACEs, and ACE experiences do not always imply developing PTSD, because this is also affected by children's coping skills, contextual factors, etc. In addition, research has shown that the way children perceive and interpret ACEs are more strongly related to negative effects, such as emotional difficulties, compared to the objective nature/type of ACE itself (Taylor & Weems, 2009). Although the lack of this ultimate criterion validity measure can be seen as a limitation of this study, it is also evidently related to the rationale for developing the RaPTOSS for teachers. Future research with a clinical sample with children diagnosed with PTSD would be valuable to gain more understanding of the ultimate criterion validity, sensitivity and specificity of the RaPTOSS.

Another limitation of the study concerns the representativity of the current sample. All data were collected in regular education, thereby excluding children from special needs education and newcomer education. Moreover, in terms of cultural background, the current sample was rather homogeneous, with mostly Dutch students from non-migrant families and some children with a second-generation migration background. First-generation migrant children were not represented. In the current study, cross-cultural validity of the RaPTOSS was, therefore, not taken into account and deserves consideration in the future research because the

prevalence and relative salience of the PTSD symptom clusters tend to vary across different cultural groups (Asnaani & Hall-Clark, 2017; Hinton & Lewis-Fernández, 2011). It is also argued that cultural factors can affect, for instance, how traumatic stress is experienced, what symptoms are expressed and what coping strategies are used (Vinson et al., 2019). Future studies should also collect data among students with different cultural backgrounds and among different types of education.

Conclusions

In conclusion, the RaPTOSS is a psychometrically sound instrument that can be used in trauma-informed teaching practices to detect potential indicators of psychotrauma in the classroom. In case, a particular student has experienced a stressful event, or suddenly behaves differently at school, the RaPTOSS can enhance teachers' understanding of the student's behavior, and provide systematic insights into the student's behavior over time. The RaPTOSS contributes to awareness about potential consequences of ACEs on children's behavior and learning, and the protective factors offer guidelines to promote children's coping skills. Rather than early diagnostic labeling of children, teachers are encouraged to be aware of possible trauma behind worrisome behavior and provide support for all students, including possibly traumatized students.

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Author contributions HL, MVD, EK and MB contributed to the conceptualization and design of the study. HL, MVD, EK, MB and PT contributed to the methodology. HL collected the data. HL prepared the data and performed the analyses for validity assessment. PT performed the exploratory factor analyses. HL wrote the original draft and MVD, EK and MB reviewed and edited the manuscript. MVD, EK and MB obtained the funding acquisition and MVD, EK and MB supervised the research project.

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Data availability The anonymized data and statistical code that support the findings of this study are openly available via the Open Science Framework: <https://osf.io/gsqzcl>.

Declarations

Conflict of interest No potential competing interest was reported by the authors.

Ethical Approval The study was approved by the Ethical Committee of Psychology of the University of Groningen (PSY-1819-S-0012).

Informed Consent Active informed consent was obtained from all parents of the children included in the study.

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