



The longitudinal associations between teacher-student relationships and school outcomes in typical and vulnerable student populations: a systematic review

Giulia Di Lisio^{1,2} · Amaia Halty¹ · Ana Berástegui¹ · Antonio Milá Roa¹ · Alba Couso Losada¹

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Abstract

This systematic review examines the teacher-student relationship (TSR) from an attachment perspective and explores its impact on academic (dis)engagement, (under)achievement and Early School Leaving (ESL) over time. It addresses two objectives: (1) examining the longitudinal influence of TSR on academic outcomes and (2) assessing its effect on vulnerable student populations, including those facing Social Vulnerabilities (e.g., students from ethnic minorities, migrant backgrounds, or living in low socioeconomic conditions), Special Needs (e.g., disabilities or learning difficulties), and Mental Health issues. Additionally, the review considers how individual characteristics such as gender may shape the quality and impact of TSRs. A total of 37 longitudinal studies from ERIC, Academic Search Complete, Scopus and Web of Science were analyzed, using the PRISMA guidelines to ensure transparency and replicability. The results revealed significant associations between the quality of TSR and academic (dis)engagement over time, with smaller effects on academic (under)achievement. Mixed results were found regarding gender. Students from low socioeconomic status, minority backgrounds, and those with mental health challenges experienced poorer TSR, which in turn led to poorer academic outcomes in the long run. For Special Needs students, positive TSRs supported behavioral engagement and academic achievement, while poor relationships were linked to increased conflict and risk of disengagement. The review underscores the importance of supportive and responsive teacher-student interaction in fostering a conducive learning environment over time, especially for vulnerable students. Additionally, it suggests that enhancing TSR quality can act as a protective factor against disengagement and underachievement, thereby reducing the risk of ESL. These findings highlight the need for targeted interventions to improve TSRs, particularly for students at higher risk of educational exclusion. Overall, the study provides a comprehensive understanding of how TSRs influence various academic outcomes

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over time, offering valuable recommendations for educators and policymakers to support vulnerable student populations.

Keywords Teacher-student relationship · Engagement · Achievement · Early school leaving · Systematic review · Vulnerable populations

1 Introduction

European countries have long struggled to mitigate educational disparities observed from early childhood education to secondary education (Eurostat, 2022). In turn, divergent levels of educational achievement among children in Europe widen socioeconomic disparities within the region (Marrero et al., 2024). This disparity, often referred to as the “educational gap” (Ballas et al., 2012) results in various negative outcomes such as wage inequality, higher levels of unemployment, and the intergenerational transmission of social exclusion for marginalized groups (Burger, 2016; Couso et al., unpublished; Hanushek & Woessmann, 2020). Much research has underscored the importance of the teacher-student relationship (TSR) in facilitating learning and increasing academic engagement, especially among students at risk of educational exclusion (Pham et al., 2022; Roorda et al., 2011).

From a theoretical perspective, Bowlby’s attachment theory (1969) has been widely applied to examine the influence of adult-child relationships on various developmental outcomes for children. Ample evidence suggests that positive relationships between children and adults can increase emotional self-regulation, higher confidence, and even improve academic performance (Dias et al., 2024; Sabol & Pianta, 2012; Twum-Antwi et al., 2019; Ungar et al., 2019). Particularly, failure to establish secure attachments with primary caregivers during early childhood has been linked to a myriad of negative outcomes, such as internalizing and externalizing symptoms (Badovinac et al., 2021; Muris et al., 2003) and decreased academic performance (Badovinac et al., 2021; Dias et al., 2024; Spruit et al., 2020; Wang et al., 2021). Although most of the attachment literature has been conducted among children and their primary caregivers, usually their parents, the role of teachers as attachment-like figures may be worth further exploring.

The literature on the influence of the TSR on student outcomes redefines the role of the teacher from a “knowledge-dispensing” authority figure to a caring adult, a caring coach (Snyder et al., 2003) with a multifaceted approach to the cognitive, behavioral, and emotional developmental needs of their pupils. This emerging paradigm posits that the TSR is a crucial component of children’s educational experience and that the relationship quality predicts student engagement and academic achievement (Costa et al., 2024; Kang et al., 2021; Quin, 2017) as well as a positive classroom climate (Pimpalkhute et al., 2023). Pianta and Steinberg (1992) took a step further early on to suggest the role of educators as attachment-like figures that aid in regulating students’ emotional responses in a classroom context, providing the emotional support necessary for exploration and engagement in school activities. Given that the role of teachers as attachment-like figures can potentially influence students’ academic outcomes, a critical next step would be to examine what aspects of the

TSR influence school outcomes in school-aged children and how these associations create different attainment trajectories for students, specifically focusing on the longitudinal effect on (dis)engagement, (under)achievement and Early School Leaving (ESL). Notably, we use the terms (dis)engagement and (under)achievement using the brackets to acknowledge that school outcomes can manifest positively and negatively throughout the literature. Furthermore, investigating the relationship between TSR and school outcomes longitudinally is crucial, as it facilitates the establishment of stronger causal inferences and offers insights into the evolving nature of these associations over time (Grammer et al., 2013; Keeves, 1987). The most up-to-date systematic review examining the link between TSR, academic engagement, and academic achievement with longitudinal studies was conducted by Daniel Quin in 2017, in which he concluded that better quality TSR preceded engagement or was associated with improved engagement over time.

The current systematic review pursues a double aim: (1) to examine the longitudinal relationship between different aspects of the TSR and academic outcomes, and (2) to explore how TSR functions specifically for students from vulnerable backgrounds (Lynch & Cicchetti, 1992; Pianta et al., 1995).

A central focus of this review is the examination of the three dimensions of TSR as conceptualized in the Student-Teacher Relationship Scale (STRS) by Pianta and Steinberg (1992) – Conflict, Closeness, and Dependency – and their influence on academic performance. These three dimensions reflect the attachment-like quality of teacher-student interactions, as attachment styles both influence and are influenced by this relationship, particularly during early childhood (Pianta et al., 1995; Sroufe et al., 1983). Conflict reflects the degree of negativity and perceived tension in the relationship, such as when a student is perceived as angry or unpredictable. Closeness represents the level of warmth, affection, and open communication between the teacher and student, as well as the extent to which the student perceives the teacher as a supportive figure. Finally, dependency describes the degree to which a student is perceived as overly reliant on the teacher, such as showing distress during a separation or seeking assistance even when it is seemingly unnecessary. Pianta et al. (1995) identified a significant relationship between these three dimensions and student outcomes. High levels of closeness, typically associated with secure attachment patterns (Sroufe, 1983), were indicative of a positive TSR and correlated with better school outcomes. In contrast, elevated conflict and overdependence, linked to insecure attachment patterns (Sroufe, 1983), characterized a negative TSR and were associated with poorer academic performance.

In addition to Pianta's TSR framework, attachment theory also provides a valuable lens for analyzing teacher-student interactions, particularly through the Safe Haven and Secure Base dimensions. A supportive TSR can function as a Safe Haven, offering students emotional security in times of distress, and as a Secure Base, fostering their autonomy and motivation to explore new academic challenges (Hamre & Pianta, 2001; Sabol & Pianta, 2012). Safe Haven responses involve a teacher's ability to regulate students' complex emotions, providing comfort and stability, while Secure Base responses focus on encouraging independence, supporting academic risk-taking, and reinforcing achievements. A previous study (*anonymous citation*, 2025) has explicitly applied attachment theory to analyze TSR quality through the

Safe Haven and Secure Base dimensions. This work highlights that Safe Haven characteristics in TSR, where teachers provide emotional security and support, help buffer the adverse effects of stress and instability on learning. Similarly, a strong Secure Base, where teachers encourage autonomy and exploration, fosters resilience and academic engagement among students. This categorization is compatible and complementary with Pianta's TSR dimensions. Closeness is closely aligned with the Safe Haven function, as it captures the warmth, trust, and emotional security provided by the teacher, which helps students regulate distress and feel supported in their learning environment. Dependency, on the other hand, can be understood as a mixed attachment response—while it may reflect an unmet need for security (Safe Haven), it can also indicate a lack of Secure Base, preventing students from developing autonomy and making them overly reliant on the teacher. Conflict appears to involve both dimensions, as it often relates to difficulties in emotional regulation (Safe Haven) and challenges in behavioral management that hinder students' ability to explore and engage in learning independently (Secure Base).

The role of gender has been examined across these relational dimensions, revealing its influence on teacher perceptions, students' experiences, and relational outcomes. Wang et al. (2018a, b) highlighted the presence of gender biases in teachers' expectations, while Romano et al. (2021) reported that male students perceived higher levels of emotional support from teachers compared to their female peers. Additionally, Gini et al. (2018) found that perceived teacher unfairness had a more significant impact on school satisfaction for girls and high school students than for boys and middle school students. These findings suggest that gender may moderate both how TSRs are formed and how they are experienced by students, with implications for emotional support, fairness, and engagement in the classroom. Taken together, these relational dynamics – shaped by attachment processes and moderated by factors such as gender – highlight the importance of considering how TSR quality may differ across various student populations.

There is a strong indication that the quality of the TSR may vary depending on students' specific characteristics, such as experiencing Social Vulnerabilities (e.g., belonging to ethnic minorities, having a migrant background, or living in low socioeconomic conditions), having Special Needs (e.g., disabilities or learning difficulties), or facing Mental Health challenges (e.g., diagnosed mental health conditions, traumatic experiences, or persistent emotional or behavioral difficulties) (Archambault et al., 2017; Ewe, 2019; Xuan et al., 2019).

Previous studies indicate that teachers tend to hold lower expectations for students from low-SES families and may exhibit negative biases towards ethnic minorities and students with migrant backgrounds (S. Wang et al., 2018a, b; Ulriksen et al., 2015). For instance, Xuan et al. (2019) demonstrated that SES is a significant predictor of TSR, with higher SES positively associated with stronger TSR, suggesting that lower SES may create barriers to fostering supportive relationships with the teachers. *However, some variation* TSR can act as a protective factor against academic underperformance, by mitigating the adverse effects of low SES, which is often linked to reduced self-efficacy beliefs and fewer opportunities (Liu et al., 2022). Regarding ethnic minority and migrant background students, Bryan et al. (2022) found that belonging to an ethnic minority group may hinder TSR due to discriminatory attitudes

from teachers, which subsequently undermines academic achievement. Conversely, culturally responsive teaching practices can counteract the effects of discrimination, fostering greater academic engagement among ethnic minority students (Bottiani et al., 2020). Similarly, studies on migrant-background students highlight the detrimental impact of teacher biases rooted in stereotypes or cultural misunderstanding, which reduce students' academic self-concept and motivation (Frühauf et al., 2023). Despite these challenges, teacher support has been shown to play a crucial role in enhancing academic outcomes for migrant-background students, underscoring the particular importance of this relationship for this population (Chobphon, 2021; Ulriksen et al., 2015). Students in non-parental care also exhibit greater academic challenges relative to their peers. Sengul et al. (2019) reported that while TSRs provide some support, students living with guardians continue to perform academically below than their peers in traditional family settings.

Teachers may also struggle with managing classrooms that include students with special needs or mental health concerns (DeShazer et al., 2023). These individual characteristics not only shape the quality of TSR but also influence the relationship between TSR and student outcomes (Hamre & Pianta, 2001; Roorda et al., 2011).

Evidence shows that students with special educational needs— including those with learning disabilities (LD) such as dyslexia or attention deficit hyperactivity disorder (ADHD), and developmental disorders like autism spectrum disorder (ASD) or intellectual disabilities— tend to experience more strained relationship with teachers. These students are often perceived as more challenging to engage with, which can lead to lower levels of Closeness and higher level of Conflict in the relationship (Prino et al., 2016; Zañartu & Pérez-Salas, 2023). Importantly, research highlights that the quality of TSR can significantly influence the socioemotional and behavioral adaptation of students with disabilities, suggesting that attachment-like relationships with teachers play a crucial role in supporting their adjustment and overall well-being in school settings (Granot, 2016).

Finally, the increased awareness of mental health challenges, particularly in the wake of the COVID-19 pandemic, underscores the need to examine these factors as additional vulnerabilities that may affect TSR and classroom dynamics. For example, evidence suggests that children who have experienced trauma exhibit a greater need for psychological proximity from teachers rather than task-related support (Lynch & Cicchetti, 1992; Pianta et al., 1995). This aligns with more recent research showing that students with diagnosed mental health conditions, traumatic experiences, or persistent emotional and behavioral difficulties often experience more conflictual and dependent relationships with teachers, and less closeness (Vösgen-Nordloh et al., 2023). Importantly, the relationship is not unidirectional. While students' mental health difficulties can strain TSRs, the quality of those relationships can, in turn, play a protective or risk-enhancing role in students' mental health trajectories. Longitudinal evidences shows that supportive, warm TSRs are associated with reduced anxiety and internalizing symptoms over time, whereas conflictual or dependent TSRs are linked to heightened emotional distress (Li, 2024; Salter et al., 2024), consequently negatively impacting engagement, motivation, and academic achievement (Deighton et al., 2018).

2 Current study

This systematic review aims to map the relational aspects of the TSR and their relationship with academic (dis)engagement, (under)achievement, and ESL, longitudinally. The systematic review responds to two main objectives:

1. To explore how the components of the TSR that influence students' academic (dis)engagement, (under)achievement, and ESL evolve over time.
2. To understand the effects of TSR on (dis)engagement, (under)achievement, and ESL in vulnerable populations.
3. Materials and Methods.

2.1 Search strategy

The search was conducted in March 2023, on the following online databases: ERIC, Academic Search Complete, Scopus, and Web of Science. Table 1 presents the syn-

Table 1 Systematic review research terms

Independent variable	Independent variable	Dependent variable	Setting
Axis 1	Axis 2	Axis 3	Axis 4
teacher-student	bond*	attainment	school
student-teacher	relation*	"academic achievement"	preschool*
teacher-pupil	attachment	"school achievement"	nursery
pupil-teacher	sensitivity	"academic underachievement"	kindergarten
teacher-child	responsiveness	"school underachievement"	"second-chance school"
child-teacher	security	"academic results"	
teacher	insecurity	"academic performance"	
	interaction	"academic grades"	
	safe*	"academic failure"	
	care	"school outcomes"	
	"teacher warmth"	"academic outcomes"	
	"teacher involvement"	"learning outcomes"	
	"teacher closeness"	"learning process"	
	"teacher support"	evaluation	
	teacher conflict	"school development"	
	"teacher dependency"	"academic development"	
	trust	well-being	
		"school engagement"	
		"academic engagement"	
		willingness	
		motivation	
		involvement	
		commitment	
		dropout	
		drop out	
		drop-out	
		"school wastage"	
		"school attendance"	
		presence	
		"school leaving"	
		absent*	
		absence	
		success	

taxis terms. The terms of each axis were included with the “OR” nexus, and the combination of the four axes with the “AND” nexus. In this way, at least one word from each axis had to appear simultaneously in the search results. Those terms have been searched among keywords in the years range from 2018 to 2022, from academic journals in English. We selected 2018 as the starting point because it aligns with the latest literature review available on the subject (Quin, 2017), and we aimed to examine developments in research since that time.

2.2 Inclusion and exclusion criteria

To ensure the retrieved articles were relevant to our aims, we applied the following eligibility criteria: (a) articles that used quantitative methodology, (b) articles that treated the TSR as the independent variables and academic outcomes as the dependent variables, and (c) articles with longitudinal designs.

Systematic reviews, meta-analyses, articles related to the design and evaluation of interventions, articles primarily focused on instrument validation, or articles that followed a strictly qualitative approach have been excluded. Additionally, exclusions were made for articles developed in an e-learning context, a university context, those focused on schooling in extreme conditions (such as lockdown situations due to COVID-19, armed conflict, natural disaster, child hospitalization, food insecurity, etc.), as well as articles assessing health programs or physical education outcomes. In cases of the absence of at least one of the variables studied or an inverse relationship between dependent and independent, the articles have been excluded. Furthermore, articles using non-causal inference statistical analysis or those with cross-sectional designs were also excluded from the review.

2.3 Study selection and data extraction

Results from the initial search were imported into Covidence systematic review software. The initial search identified 912 studies, reduced to 741 after eliminating duplicates. Two researchers were involved in the study selection phase, employing a double-blind process. In cases where conflicts arose, a thorough discussion took place until a consensus was reached. During the screening phase, a total of 554 studies were excluded based on four primary criteria:

1. Lack of relevant variables: the studies did not include at least one of the two key variables (TSR or academic outcomes) or examined them in an inverse relationship (e.g., analyzing how academic outcomes influence TSR rather than the other way around).
2. Unsuitable setting: the studies were conducted in educational contexts outside the scope of this review, such as higher education or university settings.
3. Non-empirical studies: the studies consisted of meta-analyses, reviews, or theoretical papers rather than empirical research.
4. Validation-focused research: the studies primarily aimed at validating instruments or evaluating interventions, rather than exploring TSR within its natural educational environment.

After the abstract screening, 187 studies proceeded to the full-text review, and, subsequently, 150 were excluded based on methodological criteria, leaving 37 articles selected for the extraction last phase.

The primary reasons for articles' exclusion during the full-text review were:

- 45 studies employed cross-sectional designs.
- 35 studies did not investigate academic outcomes.
- 16 studies followed qualitative research designs.
- 16 used non-causal statistical analysis, such as correlational analysis, Principal Component Analysis, cluster analysis, factor analysis, Multiple Correspondence Analysis).
- 12 studies did not consider the TSR as the independent variable.
- 10 studies focused on evaluating interventions.
- 7 studies aimed to validate measurement instruments.
- 6 studies were meta-analyses or systematic reviews.
- 3 studies were not published in English.

Some of the exclusion criteria at the full-text review phase overlapped with those applied during the abstract screening. Certain studies were retained beyond the abstract screening due to uncertainties regarding their alignment with the review's scope. In such cases, the authors opted to include the articles for full-text evaluation to ensure a thorough assessment before making exclusion decisions.

The extraction phase was also carried out in Covidence. An extraction template was created with the following information: generic article information (authors, publication year, DOI, title), socio-demographics (sample size, age, school level, country), theoretical framework considered, if any, type of vulnerable population studied, and its percentage, type of informant for the TSR variable and outcome(s), type of study design, statistical techniques employed, the number of years of the study and whether there were participants that dropped out at the final time, the coefficient of the causal relation between TSR and the outcome (with its respective mediators and moderators) as well as barriers and promoters for the initial, mid-term and final part of the study, and whether any specific biases were highlighted in the study. The obtained information was then exported to an Excel file for further analysis. Figure 1 illustrates the PRISMA flowchart, detailing the process of study selection.

3 Results

3.1 Descriptives

Sample sizes in the 37 studies selected for extraction ranged from 146 to 10 931. Most of the studies were from North America, but samples from Europe, Asia, Oceania, and the Middle East were also included. Most articles were conducted in secondary schools, followed by primary schools, with only two conducted during kindergarten. Most studies employed a multi-wave repeated measure design across academic years, followed by studies that focused on changes within the academic

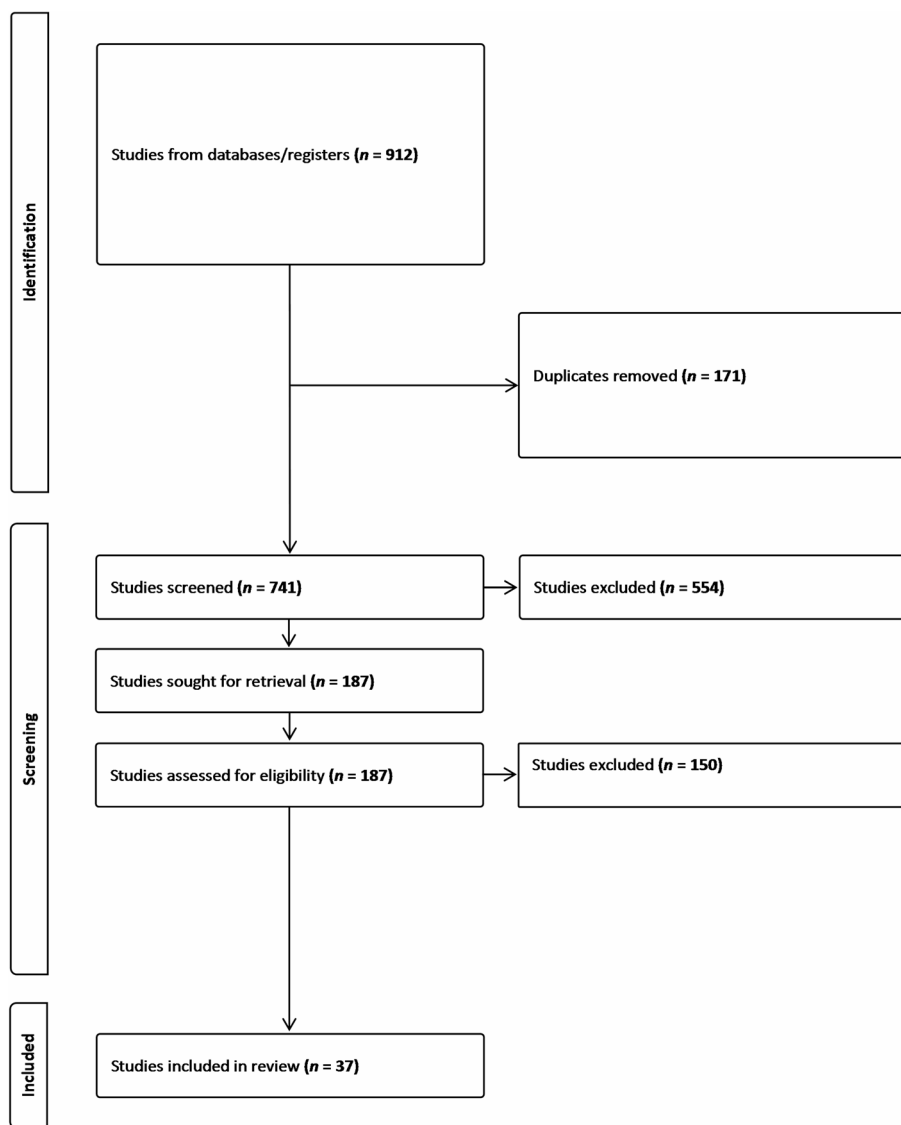


Fig. 1 PRISMA flowchart of included and excluded studies

year and those that used a mixed approach across academic years and within the same academic year. The descriptive details of the studies are presented in Table 4. For comprehensive details on each study, including country, sample size, educational level, and study duration, please refer to the table in Annex I.

Table 2 Descriptives of the articles

	<i>N</i>	%	Median	Mean (SD)
Sample				
<i>N</i> <500	10	27%	302	288.8
500> <i>N</i> >1000	9	24%	650	132
<i>N</i> >1000	18	49%	4 343	4
				271.5
School level				
Secondary school	16	43%		
From Primary to Secondary school	4	11%		
Primary school	9	24%		
From Kindergarten to Primary school	6	16%		
Kindergarten	2	6%		
TSR Informants				
Child	19	51%		
Teacher	16	43%		
Child & Teacher	2	6%		
Parent	0			
Other	0			
Outcome Informants				
Child	20	56%		
Teacher	6	19%		
Child & Other	5			
Teacher & Other	1			
Parent	0			
Other	5	25%		
World's regions				
North America	16	43%		
Oceania	5	14%		
Europe	11	30%		
Southeastern Europe and South-western Asia	1	3%		
Middle East	1	3%		
Asia	2	5%		
South America	1	3%		
Repeated measure design				
Across academic years	22	59%		
Within academic year	13	35%		
Mixed approach	2	5%		

3.2 TSR and academic outcomes variables

To address the first research question and provide a coherent and structured approach to this systematic literature review, we organized the general findings based on two criteria. First, we categorized the articles according to TSR dimensions, identifying the theoretical framework that lays the groundwork. In total, 15 articles used different adaptations of Pianta's (2001) Student-Teacher Relationship Scale (STRS),

which assesses the teacher-student interaction using three basic dimensions: Conflict, Closeness, and Dependency. As outlined in the Introduction, Conflict refers to perceived negativity and tension, potentially causing emotional strain in the relationship (e.g., “This child and I always seem to be struggling with each other”, “This child remains angry or resistant after being disciplined”, “This child and I always seem to be struggling with each other”). While STRS reflects the teacher’s perspective, we understand Conflict more broadly as a relational dynamic that can affect both participants. Indeed, conflictual TSRs has been linked to lower student engagement, academic difficulties, and increased emotional and behavioral problems (O’Connor et al., 2011; Spilt et al., 2012), underscoring their relevance to student outcomes even when assessed from the teacher’s viewpoint. Closeness reflects warmth, affection, and open communication, fostering the perception of the teacher as a supportive figure (e.g., “I share an affectionate, warm relationship with this child”, “This child openly shares his/her feelings and experiences with me”, “My interactions with this child make me feel affective and confident”). Dependency describes excessive student reliance on the teacher, marked by distress during separation or unnecessary help-seeking (e.g., “This child appears hurt or embarrassed when I correct him/her”, “This child is overly dependent on me”, “This child expresses hurt or jealousy when I spend time with other children”). Sometimes, the authors directly analyze the relationship between each dimension of the STRS and the academic outcomes, while at other times, they use the overall TSR construct. In addition to STRS, other measures were identified as part of a heterogeneous cluster of variables and indicators aiming to measure different aspects of the TSR. Among these, the Developmental Relationship Scale emerged as another prominent framework. Although it does not explicitly draw on attachment theory as STRS, its dimensions align with the concepts of Safe Haven and Secure Base. The dimensions of Express Care and Provide Support are particularly linked to the concept of Safe Haven. Express Care emphasizes the teachers’ ability to show students that they matter through dependability, warmth and encouragement (e.g., “My teachers are there for me when I need them”, “My teachers make me feel important”, “My teachers really listen to me when I talk”). Provide support refers to the teachers’ capacity to assist students in completing tasks and achieving goals (e.g., “I believe my teachers “have my back””, “My teachers do something when I am treated unfairly”, “My teachers and I solve problems together”). In turn, the dimensions of Challenge Growth, Expand Possibilities and Share Power align with the concept of Secure Base. Challenge Growth involves pushing students to improve by fostering resilience and responsibility (e.g., “My teachers have high expectations for me”, “My teachers encourage me to see failure as a chance to learn and get better”, “My teachers require me to take responsibility for my actions”). Expand Possibilities refers to connecting students with broader opportunities, ideas and networks (e.g., “My teachers create opportunities for me to practice my leadership skills”, “My teachers help me discover new things that interest me”). Finally, Share Power reflects treating students with respect, granting them a voice, and fostering collaboration (e.g., “When I say I’ll do something, my teachers expect me to do it”, “My teachers challenge me to try things that are little hard for me”, “I can share my ideas with my teachers, even when we disagree”). Table 2 provides a list of TSR variables, along with the corresponding authors who used them and the related academic outcomes. For detailed information

Table 3 Summary of TSR dimensions and academic outcomes per author

Authors	TSR dimensions	Relation with school outcomes
(Bayram Özdemir & Özdemir, 2020)	TSR overall	Emotional Engagement, Grades/Self-competence
(Baysu et al., 2021)	Teacher's support and rejection	Emotional and Behavioral Engagement, Grades
(Benner et al., 2021)	Teacher's expectations; Teacher-student connection	Grades
(Bosman et al., 2018)	Closeness*; Conflict*; Dependency*	Behavioral Engagement, Grades
(Bryce et al., 2019)	Conflict*; Closeness*	Behavioral Engagement, Grades
(Buhs et al., 2018)	Closeness*	Emotional Engagement
(Burns et al., 2019)	Teacher support	Behavioral and Emotional Engagement
(Burns, 2020)	TSR overall	Engagement, Grades
(Carmona-Halty et al., 2019)	TSR overall	Grades
(Cheung, 2019)	TSR overall	Behavioral and Cognitive Engagement, Self-competence
(Choe, 2021)	TSR overall	ESL
(Engels et al., 2021)	Conflict*; Closeness*	Behavioral and Emotional Engagement
(Evans & Field, 2020)	TSR overall; Teacher fairness; Teacher affect	Grades
(Grew et al., 2022)	Teacher support	Emotional Engagement
(Guay et al., 2019)	Closeness*	Emotional Engagement, Grades
(Heatly & Votruba-Drzal, 2019)	Conflict*; Closeness*	Emotional Engagement
(Holen et al., 2018)	TSR overall	Grades, ESL
(Hughes & Cao, 2018)	Teacher warmth; Conflict	Behavioral and Emotional Engagement; Grades
(Hwang et al., 2020)	Teacher's harsh and reward strategies	Emotional, Behavioral and Cognitive Engagement
(Legkauskas et al., 2019)	Conflict*	Grades
(L. Li et al., 2022)	Conflict*	Behavioral Engagement
(Lifshin et al., 2020)	Teacher responsiveness	Emotional Engagement
(Lippard et al., 2018)	Closeness*; Conflict*	Grades
(Losh et al., 2022)	TRS overall*	Behavioral Engagement
(Markus et al., 2022)	TSR overall	Emotional Engagement
(McDoniel & Bierman, 2023)	TRS overall*	Emotional Engagement
(Quin et al., 2018)	Teacher support	Emotional, Behavioral and Cognitive Engagement; ESL
(Rickert & Skinner, 2022)	Teacher Involvement	Emotional and Behavioral Engagement
(Rushton et al., 2020)	Conflict*; Closeness*	Emotional Engagement
(Scales, Van Boekel, et al., 2020)	TSR overall**; (Express Care; Challenge Growth; Expand Possibilities; Provide Support; Share Power)**	Emotional Engagement, Grades
(Scales, Pekel, et al., 2020)	TSR overall**; (Express Care; Challenge Growth; Expand Possibilities; Provide Support; Share Power)**	Cognitive Engagement, Grades
(Umarji et al., 2021)	Teacher caring	Cognitive Engagement, Grades

Table 3 (continued)

Authors	TSR dimensions	Relation with school outcomes
(Valdes et al., 2021)	Teacher expectations; Teacher Involvement	Self-competence
(C. Wang et al., 2018a, b)	Conflict*; Closeness*	Emotional Engagement, Grades
(J. Wang & Kiefer, 2020)	Teacher support	Behavioral Engagement
(Wu et al., 2022)	Closeness*	Emotional and Behavioral Engagement
(Zee et al., 2021)	Closeness*; Conflict*; Dependency*	Emotional and Behavioral Engagement, Grades

*It has been assessed with the Student-Teacher Relationship Scale (STRS)

** It has been assessed with the Developmental Relationship Scale

Table 4 Description of outcome variables

Outcomes Dimensions	Outcomes Variables
Achievement (19)	Academic results; Academic competence; Self-reported academic skills;
Engagement (28)	
General engagement	Intention to graduate
Behavioral engagement	Task motivation; Cooperative participation; Attitude towards school; Auto sabotage
Cognitive engagement	Interest in math; Math utility; Self-efficacy; Psychological investment in learning
Emotional engagement	Anxiety; Boredom; Enjoyment; Motivation; Motivational attitude; Reading intrinsic motivation; School avoidance; School belonging; School liking; School satisfaction; Failure accepting, School attachment; Feeling towards school; School well-being; Academic involvement, School bonding
Early School Leaving (2)	No completion rate; School dropout risk

on the effect sizes of the relationship between TSR and academic outcomes in each study, please refer to the table in Annex II.

Second, the outcome variables were categorized into three groups: (dis)engagement, (under)achievement, and ESL. Academic (dis)engagement was further divided into behavioral, cognitive, and emotional (dis)engagement, as it was operationalized by Archambault et al. (2009) and Fredricks et al. (2004). Behavioral engagement included variables related to students' regular attendance, active class participation, and participation in extracurricular activities. Cognitive engagement encompassed students' interest, motivation or active participation and investment in academic tasks. Emotional engagement reflected students' affective responses to their school experiences, such as motivation and enjoyment, or lack of negative affective responses, such as boredom or anxiety. (Under)achievement encompasses assessments of grades and self-reported math, language, and/or science skills. Finally, ESL was reported as a non-completion of upper-secondary education or self-perceived dropout risk. Table 3 outlines the variables used to measure academic outcomes, including engagement, achievement, and ESL when not explicitly defined as such in the articles.

As seen in Table 2, across the 37 articles included in this review, 15 articles studied the relationship exclusively between TSR and student engagement, six examined the

relationship exclusively between TSR and academic achievement, 14 articles examined the relationship between TSR and both academic (dis)engagement and (under) achievement, one article explored the relationship between TSR and ESL and one article explored the relationship between TSR and both ESL and achievement.

To address the second research question, the vulnerable populations examined in the studies included in the systematic review were categorized into three main groups: Social Vulnerability, Special Needs and Mental Health Concerns. This classification enables a differentiate analysis of these groups, facilitating a deeper understanding of their interactions with teachers and the impact of TSR on their academic outcomes.

3.3 The impact of TSRs on student (Dis)engagement and (Under)achievement

As indicated in the previous section, the reviewed literature examines the influence of TSRs on various dimensions of student (dis)engagement and (under)achievement, employing diverse measurement scales and conceptual frameworks. In this section, firstly, general findings on TSRs will be presented, and then specific dimensions and related concepts will be exposed.

A broad assessment of TSRs reveals predominantly positive associations with emotional and cognitive engagement and academic achievement while also showing negative connections with emotional disengagement and underachievement. For instance, Losh et al. (2022) reported a positive relationship between higher scores of overall TSR quality – which mean a more positive relationship - and student behavioral engagement over two years ($\beta=0.48$, $p<.001$) for students transitioning from kindergarten to primary school in the United States. Holen et al. (2018) demonstrated that TSR predicted better grades for secondary students with good mental health in Norway.

A substantial number of studies (15) utilized the Student-Teacher Relationship Scale (STRS), conceptualized by Pianta and Steinberg (1992), to probe the impacts of dimensions such as Closeness, Conflict, and Dependency, on students' behavioral and emotional (dis)engagement and academic (under)achievement.

The Closeness dimension consistently demonstrated positive associations with both emotional and behavioral engagement. Wu et al. (2022) reported strong links between teacher-child Closeness at the beginning of the year and emotional ($\beta=0.36$, $p<.001$) and behavioral ($\beta=0.34$, $p<.001$) engagement at the end of the year among kindergarten students in China. Similarly, Heatly & Votruba-Drzal (2019) found a robust relationship between teacher Closeness and emotional engagement in primary school students from 1st to 5th grade in the United States.

The Conflict dimension was negatively associated with school engagement and academic achievement. Bryce et al. (2019) identified a stable negative association between Conflict and reading achievement in 1st and 5th grades ($\beta = -0.013$, $p<.05$) in the United States. Zee et al. (2021) reported a significant negative long-term relationship between teacher Conflict and emotional engagement ($\beta = -0.17$, $p<.001$) in students from kindergarten to 6th grade in the Netherlands.

The Dependency dimension yielded mixed results. Zee et al. (2021) observed a negative relationship between Dependency and emotional engagement but noted a positive association with math scores in 3rd grade ($\beta=0.38$, $p<.001$) in China. How-

ever, this relationship turned marginally negative by 6th grade ($\beta = -0.09, p < .05$). Bosman et al. (2018) highlighted that increasing Dependency trajectories were linked to lower levels of vocabulary, math achievement, technical reading, and reading comprehension from grade 1 to grade 8 in the Netherlands. Interestingly, they reported less positive TSR trajectories among older male primary school students. Additionally, concepts such as teacher rejection, teacher responsiveness, teacher's harsh and reward strategies, and teacher caring reflect the teacher's roles in providing Safe Haven responses, which refer to the teacher's ability to create a sense of emotional security and support for students, helping them regulate stress, overcome challenges, and foster resilience within the learning environment. Baysu et al. (2021) found that high-decreasing teacher rejection negatively impacted emotional engagement, while low-increasing rejection worsened emotional engagement and increased behavioral disengagement in secondary school students in Belgium. Lifshin et al. (2020) reported a positive link between teacher responsiveness and emotional engagement ($b = 0.10, p < .001$) and a negative relationship with emotional disengagement ($b = -0.07, p < .01$) for primary school students in Israel. Umarji et al. (2021) found that teacher caring positively influenced cognitive engagement and math achievement of middle and high school students in the United States, while Hwang et al. (2020) identified a negative impact of harsh strategies on academic engagement for primary school students in the United Kingdom, with no effect from reward strategies.

Other studies focused on teacher support, involvement, and expectations, all key aspects of the role of the teacher as a Secure Base that fosters students' sense of safety necessary for exploration. Quin et al. (2018) showed strong positive effects of teacher support on engagement ($\beta = 0.46, p < .001$) and negative effects on disengagement ($\beta = -0.21, p < .05$) for secondary school students in Australia. J. H. Wang & Kiefer (2020) also reported significant links between teacher support and behavioral engagement ($\beta = 0.46, p < .001$ and $\beta = 0.43, p < .001$) for secondary school students in the United States. Rickert & Skinner (2022) found teacher involvement had a lasting impact on both behavioral ($\beta = 0.75, p < .001$) and emotional ($\beta = 0.58, p < .001$) engagement for primary school students in the United States. Valdes et al. (2021) reported that higher teacher expectations predicted greater self-competence in math ($\beta = 0.21, p < .05$), while Benner et al., (2021) noted a correlation between math teacher academic expectations and stronger teacher-student connections, both for secondary school students in the United States.

Scales, Pekel, et al. (2020) and Scales, Van Boekel, et al. (2020) developed the Developmental Relationship Scale, though not based on the attachment theory, aligns with Secure Base and Safe Haven concepts. The dimensions - Express Care, Challenge Growth, Provide Support, Share Power, and Expand Possibilities- showed positive associations with emotional and behavioral engagement and academic achievement of primary and secondary school students in the United States, with Challenge Growth notably impacting GPA (Grade Point Average) long-term ($\beta = 0.05, p < .01$).

Interestingly, while high-quality TSR enhances academic outcomes, the reverse is also true: academic success reinforces TSR quality, creating a cyclical and iterative process. Burns (2020) demonstrated that prior academic achievement predicted TSR quality in terms of socio-emotional support, instructional care, mutual respect and trust, with low-achieving secondary school students in Australia reporting lower

Table 5 Total mean, number and % of studies that consider the vulnerable population in the research

Vulnerability dimension/variable	Average % of Vuln. Pop. in the studies' samples ^a	N of studies that considered this variable	% of studies that considered this variable
Social vulnerability			
Ethnic minority	43	21	70%
Migrant background	22	8	22%
Low SES	56	1	3%
Special Needs			
Disability/learning difficulty	61	4	11%
Mental Health Concerns			
Mental Health Disorder	NA	1	3%
Adverse childhood experiences	NA	2	5%
Personality or Behavioral problems	NA	4	11%

^a The percentage has been determined by averaging the total percentages across all studies

levels of quality TSRs compared to their higher-achieving students. Additionally, Zee et al. (2021) found that teacher-student conflict diminished the cognitive engagement of primary school students in China, which negatively affected teacher expectations, creating a vicious circle.

3.4 The role of TSR in vulnerable groups

Approximately 70% of the articles included in this systematic review examined the impact of the TSR on the academic outcomes of vulnerable groups. In this context, the term “vulnerable populations” is employed to encompass students with characteristics traditionally linked to educational exclusion including ethnic minorities, students with migrant backgrounds, students with familiar situations of non-parental care, students with special needs, such as disabilities or learning difficulties, students with mental health issues and students from low socioeconomic status (SES) families. Out of the 37 articles, 26 have addressed vulnerable population groups in their studies. For detailed information on each study concerning vulnerable populations, refer to the table in Annex I.

We categorized vulnerabilities into three key dimensions: Social vulnerability, Special Needs and Mental Health Concerns (Table 5).

Regarding Social Vulnerability, Baysu et al. (2021) noted fewer positive TSR trajectories among ethnic minority primary school students in Belgium, who also benefited less in terms of school engagement compared with their majority counterparts. Other studies based in the United States (Bryce et al., 2019; Umarji et al., 2021; Valdes et al., 2021) underscore the importance of emotionally supportive teachers for ethnic minority students in primary and secondary school. However, ethnic minority students often experience negative relationships with teachers, marked by stereotypes, low expectations, and less support, leading to disengagement in countries like the United States, Norway and the Netherlands (Bryce et al., 2019; Buhs et al., 2018; Cheung, 2019; Frühauf et al., 2023; Zee et al., 2021). Similar results were found for migrant students in Australia (Wang et al., 2018a, b), while Bayram Özdemir &

Özdemir (2020) noted no significant differences in TSR trajectories for migrant versus non-migrant-background students in Sweden. Interestingly, Scales, Pekel, et al. (2020) found no GPA differences based on TSR for students from varying socioeconomic backgrounds for secondary school students in the United States.

Concerning Special Needs, positive TSRs significantly impacted behavioral engagement for students in the United States transitioning from kindergarten to primary school with autistic spectrum disorder (Losh et al., 2022), serving as a protective factor against disengagement. For students with speech and language concerns, strong TSRs were crucial for language and literacy achievement of primary school students (Wang et al., 2018a, b), while ADHD was linked to increased teacher-student conflict for primary and secondary school students (Rushton et al., 2020), both in Australia.

Regarding Mental Health Concerns, personality and behavioral problems, mental health disorders and adverse childhood experiences are tied to lower-quality TSR. Mental distress and externalizing problems were predictors of poor TSR quality for secondary school students in Norway (Holen et al., 2018), and shyness negatively impacted TSR and engagement of kindergarten students in China (Wu et al., 2022). Callous-unemotional (CU) traits also resulted in fewer teacher rewards for primary school students in the United Kingdom (Hwang et al., 2020). Early temperament traits, such as effortful control, predicted closer TSRs later in life for primary school students in the United States (Buhs et al., 2018). Experience traumatic events such as neglectful care, was associated with poorer TSR quality, which in turn, led to disengagement and increased ESL risk for both students transitioning from kindergarten to primary school and secondary school students in countries like South Korea and the United States (Choe, 2021; McDoniel & Bierman, 2023).

4 Discussion

This systematic literature review aimed to identify TSR components related to academic (dis)engagement, (under)achievement and ESL over time, expanding the analysis of TSR's role beyond academic achievement alone (Kim & Seo, 2018; Lei et al., 2023). Also, unlike previous reviews that addressed TSRs in general (e.g., Quin, 2017; Lei et al., 2023), this study fills the gap by focusing on vulnerabilities, including social, developmental and mental health risk factors.

A first-hand analysis of the included articles revealed a notable emphasis on large-scale studies, with nearly half involving over 1000 participants. Nevertheless, a substantial portion of the studies still relies on smaller sample sizes with fewer than 500 participants, reflecting a great variability in sample sizes. Regarding educational levels, most of the studies focus on secondary school students, leaving a significant gap in studies on early childhood education and transitions between educational stages, which represents a crucial experience that has long-lasting impacts on child development (Melhuish et al., 2015; Skouteris et al., 2012). Geographically, the studies are predominantly concentrated in North America and Europe, revealing a substantial lack of research from other global regions. This underscores the importance of fostering more diverse and inclusive research to reflect a wider array of cultural and

educational contexts. Finally, most studies adopt a repeated measures design across multiple academic years, indicating a strong focus on understanding the phenomenon longitudinally. However, some variation in how TSR is measured across studies has been registered, with a mix of validated and more context-specific instruments, which may influence comparability and interpretation of findings.

A key contribution of this systematic literature review, in comparison with previous studies (Emslander et al., 2023; Kim & Seo, 2018; Quin, 2017; Lei et al., 2023; Roorda et al., 2017), is the exploration of TSR dimensions using attachment theory, which emphasizes the importance of teachers' ability to provide comfort and security from one side and encourage independence from the other. These longitudinal studies confirm that TSRs characterized by closeness, support and responsiveness are strongly linked to better academic engagement and achievement, while the TSRs characterized by conflict and rejection predicted lower levels of behavioral and emotional engagement. Notably, mixed results were found regarding the TSR Dependency dimension, suggesting that the instrument used or cultural contexts might influence outcomes. In fact, it has been demonstrated that the original version of the STRS has not always yielded a reliable measure of Dependency (Oades-Sese & Li, 2011; Roorda et al., 2021). Additionally, since dependency can manifest in various degrees, such as emotional reliance or the need for excessive academic support, the child's level of dependency influences TSR safety (Davis, 2003) and, consequently, academic achievement (Verschueren & Koomen, 2021). Finally, in some cultures with a collectivistic orientation, teacher dependency is viewed positively and encouraged, resulting in improved academic outcomes (Ferreira et al., 2020), while in others with a more individualistic orientation, it is perceived as a lack of independence thereby hindering academic progress (Xu et al., 2023). This systematic review highlights this contrast, showing a more positive relationship between teacher dependency and academic outcomes in China, a collectivistic society (Zee et al., 2021), compared to the Netherlands, an individualistic society (Bosman et al., 2018). Also, the reciprocal relationship between TSR and academic outcomes was highlighted, where positive TSRs improve academic outcomes, which in turn enhances TSR quality. This iterative feedback loop supports the need for cultivating strong TSRs to promote student engagement and success. While synthesizing the reviewed studies, we noted that most of them employed teacher-report instruments to assess the quality of the TSR – particularly the STRS. Although widely used and psychometrically robust (Cadima et al., 2010; Drugli & Hjemdal, 2013), this instrument reflects the teacher's perception of the relationships, raising concerns about the potential perceptual asymmetries. Still, evidence shows that teacher-reported conflict is not merely a subjective or isolated experience: it has been significantly associated with students' academic grades, emotional well-being and levels of engagement or disengagement (Hamre & Pianta, 2001; Spilt et al., 2012). These associations justify its relevance within longitudinal models, even when student perspectives are absent. Nevertheless, future research should consider more reciprocal or triangulated measurement approaches. Instruments such as the Child-Adult Relationship and Teacher Scale (CARTS; Vervoort et al., 2015) offer promising alternatives by incorporating student-reported experiences of relational warmth, tension or support. Incorporating

both teacher and student perspectives may yield a more ecologically valid and comprehensive understanding of TSR dynamics across school trajectories.

Interestingly, we also observed that older male students were underrepresented in favorable TSR trajectories (Bosman et al., 2018). This suggests that maintaining high-quality TSRs becomes more challenging as male students progress through school. The result aligns with Alexander et al. (1997) and Balkis and Duru (2017), although differs from other studies where males have an advantage in terms of TSR and academic achievement over female students (Contini et al., 2017; Romano et al., 2021). The heterogeneity observed in the literature about gender, quality of the TSR, and student outcomes could be explained by other intersecting factors that split the binary comparisons of boys and girls into homogeneous groups (Yu et al., 2021). In examining the impact of TSR impact on vulnerable populations, the findings indicate significant underrepresentation. While more than half of the reviewed studies assess TSR's effect on ethnic minorities, there is a notable absence of research focused specifically on students in non-parental care and how this status influences both TSR dynamics and academic outcomes. This oversight is critical as these students face higher risks of absenteeism and academic failure (Moyer & Goldberg, 2020; Zetlin & Weinberg, 2004). TSRs play a pivotal role for such students by fostering their sense of self-efficacy, which can positively influence their academic performance and help mitigate the risks associated with their care situation. Findings from the current review indicate that students from minority backgrounds, ethnic minorities, and those with special needs often experience fewer positive TSR trajectories, leading to disengagement. Furthermore, high-quality TSRs significantly reduce ESL for diverse students, though minority students frequently face stereotypes, lower expectations, and less support. Those results align with previous research (Glock et al., 2013; Glock & Karbach, 2015; Steenwegen et al., 2024), showing that racial minority students face more judgmental attitudes from teachers compared to students without migrant backgrounds, leading to educational underachievement (Thompson & McDonald, 2016). Additionally, other studies highlight the critical role of the TSRs in minority students' academic engagement, which is more crucial for their academic outcomes than for native peers (Bingham & Okagaki, 2012; den Brok & Levy, 2005). For students with special needs and mental health concerns, TSRs could play a crucial role in improving outcomes, despite challenges such as ADHD-related conflict or callous-unemotional traits. These results are consistent with Rogers et al. (2015) and Ewe (2019), who found that the TSR bond with ADHD students is weaker and less collaborative, and these students feel close to their teachers compared to their non-ADHD peers.

This systematic review reaches different main findings that can contribute significantly to the literature on the topic. One of them is that the dimensions associated with the concept of closeness (responsiveness, relatedness, caring), emerged as the most frequent association. The findings are in line with attachment theory, which emphasizes the importance of adults meeting the needs of care and emotional regulation, so that the child can develop his or her exploration needs, thus providing opportunities for learning and growth (Mikulincer & Shaver, 2020; Riley, 2009).

Another important insight is that, while engagement has been found to be a more consistent outcome of the TSR than academic achievement, the cyclical relationship between TSR and academic achievement is well supported (Tsai, 2022). Finally, the

study makes a substantial contribution by exploring the causal relationship between TSR and academic outcomes in vulnerable populations, crucial for creating inclusive strategies in increasingly diverse classrooms.

5 Limitations and future directions

The results reported in this systematic review should be analyzed in light of several limitations. Firstly, potential publication bias may exist as articles with minimal or no effects are less likely to be published. Additionally, biases inherent in the selection of databases, limited to four English-language sources, should be acknowledged. Secondly, our inclusion criteria focused solely on peer-reviewed quantitative longitudinal studies, excluding qualitative and cross-sectional research. While this decision aimed to ensure consistency in analysis techniques, exploring alternative study designs could provide additional insights. Another important limitation lies in the methodological heterogeneity of the included studies. In particular, there is considerable variation in the tools used to measure TSRs. While 15 studies employed the STRS and one used the Developmental Relationship Scale, the remaining studies relied on a variety of less standardized instruments. The diversity complicates the comparability of results and may affect the validity and reliability of the finding across contexts. Finally, no formal quality assessment of the included studies was conducted. Although the selection criteria helped ensure a certain level of methodological rigor, future reviews should benefit from incorporating a systematic appraisal of study quality and risk of bias to better contextualize findings.

These limitations demonstrate the necessity for further empirical research on TSR and student outcomes, which should include a stronger focus on study quality and the standardization of measurement tools. It should also expand beyond English databases and incorporate studies from diverse linguistic backgrounds. Moreover, future review studies on the influence of relational factors (e.g., TSR) on educational outcomes should incorporate qualitative studies to delve into the subjective experiences of teachers and students; this integrative approach could offer researchers a more nuanced understanding of the interplay between the student vulnerability factors, their relationships with their teachers, and their risk of educational failure. Additionally, future research lines could expand the study of less investigated areas (according to our review), such as the impact of TSR on kindergarten outcomes, in students with limited or no parental care or on the risk of early school leaving (ESL).

6 Conclusion

The current study examined the influence of the TSR on students' outcomes longitudinally, drawing from a sample of studies with an ample range of TSR dimensions and different measures of student (dis)engagement, (under)achievement and ESL. Consistent with the literature on relational factors' role in educational outcomes, the quality of the TSR generally predicted better student outcomes at later points in time. Specifically, the reviewed articles revealed a strong association between the TSR

and different indicators of student engagement and significant yet slightly less pronounced effects on student achievement. Moreover, good quality TSR emerged as a protective factor against disengagement and subsequent underachievement for students from a wide array of vulnerabilities. These longitudinal results add to a growing literature on the importance of cultivating and maintaining positive TSR throughout students' academic trajectories to increase students' sense of safety and support in schools.

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Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

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Giulia Di Lisio Giulia Di Lisio is a PhD candidate at Universidad Pontificia Comillas (Madrid, Spain), affiliated with the University Institute of Migration Studies (IUEM) and closely collaborating with the University Institute of Family Studies (IUF). Her research explores the socio-educational vulnerability of children from migrant backgrounds. She is also a junior researcher on the EU-funded LET'S CARE project, which aims to foster inclusive and supportive schools. Her research interests include educational vulnerability, social psychology, migration, and applied data analysis.


Amaia Halty Dr. Amaia Halty is a researcher at the University Institute of Family Studies (IUF) and a faculty member in the Department of Psychology at the Universidad Pontificia Comillas (Madrid, Spain), where she teaches Developmental Psychology and Personality Psychology. Her research focuses on perinatal psychology, early attachment, parental development and the promotion of secure bonds in educational contexts, particularly in vulnerable populations. Dr. Halty is a member of the EU-funded LET'S CARE project, which aims to foster inclusive and supportive schools.

Ana Berástegui Pedro-Viejo Dr. Ana Berástegui Pedro-Viejo is the director of the University Institute of Family Studies (IUF) at the Universidad Pontificia Comillas (Madrid, Spain). Her research addresses family dynamics and family intervention in vulnerable social contexts, including child protection, adoption and fostering, disabilities, social exclusion and family spirituality. She is one of the Principal Investigators of the EU-funded project LET'S CARE, which promotes secure and inclusive educational environments for every children.

Antonio Milá Roa Antonio Milá Roa is a PhD candidate at the Universidad del País Vasco (Spain), affiliated with the Department of Clinical and Health Psychology and Research Methodology. He holds an MSc in Social and Cultural Psychology from the University of Oslo (Norway), as part of the Global-MINDS Erasmus Mundus program. His research interests include health psychology, cultural dimensions of human behavior, intersectionality, intergroup relations, and educational psychology.

Alba Couso Losada Alba Couso Losada holds a double Bachelor's Degree in Law and International Relations from the Universidad Rey Juan Carlos (Madrid, Spain) and a Master's Degree in International Cooperation from the Universidad Pontificia Comillas (Madrid, Spain). She has two years of experience in social science research, focusing on public policy analysis.

Authors and Affiliations

Giulia Di Lizio^{1,2}  · Amaia Halty¹  · Ana Berástegui¹  · Antonio Milá Roa¹  · Alba Couso Losada¹ 

✉ Giulia Di Lizio
gdilizio@comillas.edu

¹ Instituto Universitario de la Familia (IUF), Universidad Pontificia Comillas, Madrid, Spain

² Instituto Universitario de Estudios sobre Migraciones (IUEM), Universidad Pontificia Comillas, Madrid, Spain