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Citation for published version:

Talty, A, Speyer, L, Murray, AL, Eisner, M, Ribeaud, D & Obsuth, I 2023, 'The role of student-teacher relationships in the association between negative parenting practices and emotion dynamics: Combining longitudinal and ecological momentary assessment data', *Journal of Research on Adolescence*.
<https://doi.org/10.1111/jora.12874>

Digital Object Identifier (DOI):

[10.1111/jora.12874](https://doi.org/10.1111/jora.12874)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Journal of Research on Adolescence

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Running head: STUDENT-TEACHER RELATIONSHIP AND EMOTIONS

The role of student-teacher relationships in the association between negative parenting practices and emotion dynamics– combining longitudinal and ecological momentary assessment data

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The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study is currently supported by funding from the Swiss National Science Foundation (SNSF; grant no. 10FI14_198052), the Jacobs Center (JC), and the Jacobs Foundation (JF). Substantial funding in previous project phases was provided by the SNSF, the JC, the JF, the Swiss Federal Office of Public Health, the Swiss State Secretariat for Migration and its predecessors, the Department of Education of the Canton of Zurich, the Bank Baer Foundation, and the Visana Foundation, which is gratefully acknowledged.

Wordcount: 6874

Abstract

Emotion dysregulation is increasingly implicated as a transdiagnostic risk factor in the aetiology of psychopathology. This project aimed to explore the links between emotion regulation, negative parenting and student-teacher relationships using longitudinal and ecologically-valid data. A sample of n=209 young people enrolled in the 'Decades-to-Minutes' (D2M) study, based in Zurich, Switzerland, provided data from the ages of 7 to 20 via parent- and self-report questionnaires and ecological momentary assessment. Data were analysed using Dynamic Structural Equation Modelling (DSEM). Worse student-teacher relationships predicted increased negative affectivity and emotional lability. Negative parenting practices predicted emotional lability only via their impact on student-teacher relationships. The findings point to worse student-teacher relationships as risk factors in the socioemotional development of children and young people.

Keywords: negative parenting practices, student-teacher relationships, negative affectivity, emotional inertia, emotional lability

Introduction

Negative affectivity, emotional inertia and emotional lability have been implicated as transdiagnostic risk factors in the aetiology of mental health disorders (Bradley et al., 2011). Despite this, there is a paucity of research exploring the mechanisms and pathways underlying these components of emotion dysregulation (Lynch et al., 2021). In recent years, developmental psychopathologists have suggested that relationships with primary caregivers play a fundamental role in the development of a child's emotion regulation skills. Specifically, negative parenting practices are thought to negatively influence children's ability to effectively regulate their emotions (Brody et al., 2014). However, other actors in the child's social environment may also be influential. Student-teacher relationships have been proposed as a mechanism for attenuating or facilitating the negative impact of negative parenting practices on emotion regulation (Liu et al., 2015; Pallini et al., 2019). These relationships are likely of particular significance during adolescence due to the increased neuroplasticity of the adolescent brain (Spielberg et al., 2014). However, a greater understanding of the temporal and interactive nature of the association is required, in order to explore the underlying dynamic links in these developmental trajectories. To achieve this, the present study aims to investigate the association between negative parenting practices in childhood, student-teacher relationships in adolescence, and negative affectivity (NA), emotional inertia (EI) and emotional lability (EL) in young adulthood using combined longitudinal data tracking children's development from age 7 and an ecological momentary assessment study of emotional functioning in daily life in young adulthood.

Emotion dysregulation refers to the maladaptive functioning of the set of internal processes employed in the initiation, identification, and modulation of emotional experiences (see Beauchaine, 2015). It consists of multiple aspects, with NA, EI and EL representing key components. NA relates to general levels of negative emotional valence and an individual's

tendency to experience negative emotions (Watson & Clark, 1992). EL pertains to the extent to which the individual experiences intense, sudden and frequent shifts in emotion (Anestis et al., 2009). EI can be defined as the degree to which emotions are resistant to change, and high EI implies that an individual's emotional state is likely to persist from one moment to the next (Kuppens et al., 2010). Although the literature on emotion dysregulation often binds NA, EI and EL together, using labels such as 'affect intensity/reactivity' 'emotional vulnerability' or by simply employing the umbrella term 'emotion dysregulation', research has shown these constructs to be distinct and independent from one another and confer differential patterns of risk (e.g., Lewis et al., 2022). For example, while NA and EI have been found to be associated with internalising and distress disorders (Byllesby et al., 2016), EL has been proposed as a risk factor for both internalising and externalising disorders (Stringaris & Goodman, 2009) and certain neurodevelopmental conditions (e.g., attention deficit hyperactivity disorder; Sobanski et al., 2010).

One perspective through which the aetiology of emotion dysregulation and subsequent mental health problems can be studied, is developmental psychology. Developmental psychologists view emotion regulation as resulting from either adaptive or maladaptive strategies to cope with emotional experiences during childhood and adolescence (Izard et al., 2015). Attachment theory (Bowlby, 1973) is frequently implicated in this formulation as its central tenet is that early interactions between child-caregiver dyads form the basis for the child's emotion regulation skills throughout the lifespan (Mikulincer & Shaver, 2019). Attachment theorists posit that through a caregiver's sensitive and contingent responsiveness to distress signals, the child's emotions are validated and contained (Siegel, 2012). However, when child stress is left unchecked, the infant is vulnerable to developing maladaptive mechanisms to cope with emotional distress, which may lead to patterns of emotion dysregulation (Stevens, 2014). Kerr et al., (2019) have proposed that parental

interactions influence the development of emotion regulation neurocircuitry; with sensitive and supportive parenting promoting positive emotion regulation via prefrontal regions, the amygdala and the anterior insula. In this way, the emotion regulation strategies established in childhood via child-caregiver relationships are influential across the developmental trajectory, into adolescence and adulthood (Henschel et al., 2020).

Given the importance of sensitivity and consistency in developing secure infant-caregiver relationships, it is unsurprising that negative parenting practices have been found to be suboptimal for children's socioemotional development and mental health (Gach et al., 2018; Mackenbach et al., 2014). Negative parenting practices (including harsh, neglectful, inconsistent and permissive parenting styles) have consistently been associated with a host of poor detrimental outcomes for children (e.g., Gach et al., 2018). In accordance with attachment theory, evidence suggests that the emotion dysregulation demonstrated by parents through overreactive, and excessively punitive actions can impact young people's capacity for emotion regulation (Zeinali et al., 2011). Brody et al. (2014) showed that harsh parenting is associated with poor adolescent health, via the mechanism of emotion dysregulation, while Hinnant et al. (2015) found that harsh parenting had a negative effect on adolescents' stress response system, thus predicting increased delinquency and substance use.

Adolescence, however, is a period of particular significance as it marks a developmental shift in the young person's neurocircuitry and social relationships (Spielberg et al., 2014). Adolescence has been identified as a "second window of opportunity" (Dahl et al., 2017) as the plasticity of the adolescent brain increases its sensitivity to intervention and preventative strategies. A normative process during adolescence is 'separation' from parents (Jager et al., 2015), considered adaptive as it enables the adolescent to decrease dependencies on parents and establish independent social relationships outside of the family. Due to adolescent neuroplasticity, it is plausible that these external relationships might exert an

influence comparable to the effects of the parental relationships on adolescent internal processes, such as emotion regulation.

This is consistent with more contemporary attachment theory which asserts that attachment is not necessarily a fixed factor determined by the prototypic relationship between the infant and caregiver, but rather a dynamic, transactional process, that can be influenced by other family members, peers, teachers and romantic partners throughout the lifespan (Fraley, 2002). In fact, in her evolutionary theory, Hrdy (2011) argues that ‘allo attachments’, defined as strong relationships with other adult figures, are cultivated throughout the lifespan to compensate for emotionally unavailable caregivers. Similarly, the ‘One Good Adult’ hypothesis (Dooley & Fitzgerald, 2012) proposes that the presence of a supportive adult figure in a young person’s life can buffer against a multitude of detrimental outcomes, including the effects associated with poor parental relationships. Early research by Lynch & Cicchetti (1992) showed that maltreated children make use of teachers as secondary or alternative attachment figures. Since then, building on dual and additive risk models, an increasing body of research has investigated the putative role of teachers in children and adolescents’ socioemotional development, finding that student-teacher relationships may exert a reparative effect on the harmful consequences of negative parenting practices (Liu et al. 2015) and may also be associated with strengthening the young person’s emotion regulation skills (Pallini et al. 2019; Harvey et al. 2022).

In addition, researchers have also explored and found support for the role of student-teacher relationships as a process through which parental attachment is related to a range of outcomes in early to middle childhood (e.g., Neuhaus et al., 2021; O’Connor et al., 2012; Verschueren et al., 2012). This mediating effect of student-teacher relationships has been explained based on the concept of ‘internal working models’, a core tenet in attachment theory. Internal working models represent structures embodying encoded early relationship

experiences that later guide attention, motivation and interpretation of relational events (Bowlby, 1973). The key to developing these internal working models, or representations, are parent-child interactions as they facilitate individuals' intrapersonal and interpersonal understandings of the world around them through so called "if-then" contingency beliefs (Baldwin & Sinclair, 1996). Based on their interactions with their caregivers, children learn that IF something happens, THEN something else can be expected. They will hold similar expectations for similar future events and adapt their behaviours, emotional responses, and affective experiences accordingly. It is therefore plausible that if, based on their early experiences with caregivers, children learn and encode in their working model that if they make a mistake, then they will not be loved by their parents, they may carry these expectations over to other relationships, including those with their teachers, which in turn is related to negative socio-emotional outcomes.

Different parenting strategies, employed through parent-child interactions, contribute to the development of specific types of attachment styles and underlying internal working models. Specific types of positive parenting practices, such as sensitive and responsive parenting contribute to the development of secure attachment (Koehn & Kerns, 2018) as well as positive socio-emotional development (Van Der Voort, et al., 2014). Others (e.g., Bernier et al., 2014, Grossmann et al., 2008) found that maternal support for autonomy and exploration are key factors in developing a secure attachment. On the other hand, parenting practices that are insensitive, disinterested, inconsistent and self-preoccupied are related to insecure or disorganised attachment and attachment representations (e.g., Therriault, et al., 2021). The close link between parenting practices and child attachment/representations is further evidenced in attachment-based interventions that are designed to promote positive parenting practices (see e.g., Juffer et al., 2008). It is therefore possible that, like attachment insecurity, having experienced different types of negative parenting practices may set up

young people to interpret other relationships with authorities, such as teachers, as more negative.

Positive student-teacher relationships are characterised by closeness, affection, warmth, support and care (Newberry & Davis, 2008). ‘Effortful engagement’ by the teacher, involving active interpersonal interaction with the student, has been identified as a key factor in the formation of a positive relationship (McHugh et al., 2012). As with early parental relationships, attachment theory has been implicated in explaining how relationships with teachers may impact students’ emotional adjustment (e.g., Pastore & Luder, 2021). Similarly, social learning theory (Bandura, 1977) suggests that it is via the teacher’s modelling of adaptive emotion regulation strategies within the relationship, that the student learns to effectively regulate their own emotions (Skalická et al., 2015). Admittedly, the association between student-teacher relationships and adolescents’ emotion regulation is likely bidirectional, as students with high emotion regulation skills are in a stronger position to establish positive relationships with their teachers (DeNeve et al., 2023). However, recent studies using propensity score analysis have provided evidence of the directional impact of student-teacher relationships on young people’s psychosocial and behavioural development up to five (Obsuth et al., 2017) and seven years later (Obsuth et al., 2021). This highlights not only the significance of the relationship but also its long-term effects in the context of early adulthood. Importantly, while there is an increasing body of evidence demonstrating the impact of student-teacher relationships on young adults, the mechanisms facilitating the association require further investigation, as noted by Obsuth and colleagues. It is certainly plausible that emotion dysregulation constitutes one such pathway and further longitudinal research is required to address this gap in the literature.

Furthermore, the majority of the research addressed thus far is limited in two key respects. Firstly, most studies were cross-sectional in nature and focused on very young

children. However, cross-sectional research is inherently limited in assessing causal mechanisms. For example, while Graziano et al. (2007) reported an association between emotion regulation and positive student-teacher relationships, the direction of this association was unclear. On the other hand, Obsuth et al., (2017; 2021) provided some of the first evidence for the potential causal role of student-teacher relationships in students' development of aggressive and prosocial behaviour using a longitudinal propensity-score matching design in a quasi-experimental context. In longitudinal research, variables can be temporally sequenced to indicate the direction of effects.

Secondly, mostly retrospective measures of emotion regulation have been employed. Given the highly subjective and transitory nature of emotional states, measures that rely on the individual making global appraisals of their emotion regulation skills are limited by recall bias. To address this, ecological momentary assessment (EMA) has been increasingly used to study psychological and behavioural dynamics in real-world settings to reduce recall bias while maximising ecological validity. EMA involves the repeated sampling of participants' current experiences in real time, in the participants' natural environment (Shiffman et al., 2008). However, common EL operationalisations within EMA have been criticised for failing to adequately capture the construct (Koval et al., 2013). Previous studies have employed mean squared successive differences (MSSD; Von Neumann, 1941) to derive a measure of EL by accounting for the individual's variability in affective states over a period of time (e.g., Murray et al., 2021). However, MSSD can be influenced by greater variability in the data, lower EI (manifesting as lower autoregressive effects) or a combination of both. This results in a lack of differentiation between whether the association between higher MSSD and susceptibility to mental health problems is explained by the variability within the data or by EI (Koval et al., 2013). Recently, Dynamic Structural Equation Modelling (DSEM; Asparouhov et al., 2018) has been employed to provide an improved measure of EL through

disaggregating observed data on negative affect into between and within-person components resulting in three different constructs of interest to research on emotion dynamics. First, mean levels of negative affect capture an individual's average levels of NA. Second, autoregressive effects capture the extent to which deviations from these mean levels of negative affect are predicted by deviations at a previous timepoint, thus representing EI. Third, innovation variances capture the observed within-person variances after the overall mean levels of emotion and the autoregressive effects have been accounted for – thus capturing the individual's mood variability, that is, emotional lability.

The goal of the present study is thus to explore the association between negative parenting practices in childhood, student-teacher relationships in adolescence, NA, EI and EL in young adulthood employing methods that overcome the limitations of previous studies by using longitudinal and ecologically-valid data from the longitudinal Zurich Project on the Social Development from Childhood to Adulthood (z-proso; Ribeaud et al., 2022) and its EMA sub-study, Decades-to-Minutes (D2M; Murray et al., 2022). The EMA data will be used in conjunction with longitudinal measures to build a trajectory of the aetiology of NA, EI and EL using a DSEM model. In order to elucidate the mechanisms underlying this trajectory, a developmentally-informed, lifespan approach will be adopted. Based on the previously discussed theories of attachment and emotional development, the following chronological framework will be used to conceptualise and organise the variables of interest: negative parenting practices will be assessed at childhood (when initial emotion regulation strategies are formed via the parental relationship), student-teacher relationships, during adolescence (due to the critical nature of this period for psychosocial development) and NA, EI and EL in early adulthood, to add to the findings of developmental literature demonstrating the lasting effects of internal experiences in childhood and adolescence to adulthood. Consistent with the reviewed theories and previous studies, we will explore both

the exacerbating or mitigating properties of student-teacher relationships (moderator) as well as student-teacher relationships as a process (mediator) linking negative parenting practices NA, EI and EL. We will test the following hypotheses:

1. Negative parenting practices in childhood will predict higher mean levels of NA, higher EI, and increased EL in early adulthood.
2. Negative student-teacher relationships in adolescence will predict higher mean levels of NA, higher EI, and increased EL in early adulthood.
3. Negative student-teacher relationship in adolescence will enhance the maladaptive impact of negative parenting practices on mean levels of NA, EI and EL.
4. Negative student-teacher relationships in adolescence will mediate the link between negative parenting practices and mean levels of NA, EI and EL.

Methods

Participants

Participants consisted of 209 (142 females) young people; a subsample of the z-proso study (Ribeaud et al., 2022). The z-proso sample is a school-year cohort, first recruited in 2004, when students were aged 7 years old. Fifty-six public primary schools in Zurich, Switzerland took part, selected based on stratification random sampling, with stratification according to the socioeconomic background of the area and the size of the school. Data was collected at approximate ages of 7 (range 5.7 – 8.3), 8 (6.5 – 9.0), 9 (7.8 – 10.2), 11 (10.0 – 12.2), 13 (12.3 – 14.7), 15 (14.2 – 16.5), 17 (16.1 – 18.6), and 20 (19.1 – 21.6). The full sample at the first wave/age of data collection (N = 1675) included participants from a wide range of ethnic backgrounds, consisting of caregivers (usually biological mothers) representing over 70 different birth countries with 36% of the mothers born in Switzerland. Approximately 10% of the child participants were born outside of Switzerland. The Average International Socioeconomic Index Scores (ISEI; Polanczyk et al., 2015) for this subsample was 49.0 (SD = 17.6). ISEI is metric of SES developed to provide a measure of occupational prestige that was internationally comparable. The average sample ISEI score of 49.0 corresponds to an occupational prestige level of a general manager with up to ten staff or small shop owner/manager (Ganzeboom & Treiman, 1996). The large standard deviation suggests a wide diversity of the sample with respect to SES. Previous studies have indicated that the z-proso sample can be considered representative of the population of that age group (e.g., Eisner et al., 2019). Further details on the procedures for this study are reported in Ribeaud and colleagues (2022).

At age 20, a subset of these participants were recruited via convenience sampling to participate in the ‘Decades-to-Minutes’ (D2M) study (Murray et al., 2022). The D2M study

was conducted over a 14-day period with EMA measurements recorded four times a day between 10am and 10pm, at quasi-random intervals. An application provided by *LifeDataCorp LLC* administered the measures, which participants were required to download to their smartphone device. Financial incentives were offered in accordance with the participant's level of compliance. A maximum of 50 CHF was awarded to participants with a response rate of over 70% throughout the two-week period. Analyses were carried out to compare the participants in the D2M subsample and the remaining participants who also provided data at wave 8/age 20 ($n = 1002$). The two samples were compared based on demographic as well as key study variables and differed with respect to the average ISEI that was significantly lower in the not included sample (43.4 versus 49.0 as mentioned above). However, these two values capture a similar level of occupational prestige. The D2M sample also has a higher proportion of females than the main cohort which has an approximately equal number of males and females. Importantly, no significant differences were found related to any of the key study variables between the two samples.

In addition to utilising data from the D2M study, the present study uses data collected at the following main z-proso study waves: ages 7, 8, 9, and 11 (for negative parenting practices scores) and ages 11, 13, 15, and 17 (for student-teacher relationship scores). These specific timepoints were chosen so that the variables would be ordered in a temporal sequence that was in accordance with the present study's hypotheses that early negative parenting practices initially impact NA, EI, and EL but that its effects may be mitigated by later positive relationships with teachers. Further details about the details of this study can be found in Murray and colleagues (2022).

Ethics

Ethical approval for the project was received from the School of Health in Social Science Ethics Committee in the University of Edinburgh. For the original z-proso and D2M studies, ethical approval was granted from the Ethics Committee of the Faculty of Arts and Social Sciences of the University of Zurich. When initially recruited, written informed consent was provided by the child's primary caregiver, prior to their participation in the study. From age of 13 years old onwards, youths were permitted to provide active consent whereas parents could opt their children out up to age 16 (passive consent).

Measures

Negative Parenting Practices

Negative parenting practices was assessed using the Alabama Parenting Questionnaire (APQ; Frick, 1991). The APQ is a parent-report measure of parenting practices that encompasses six subdimensions: parental involvement, positive parenting, poor monitoring, inconsistent discipline, corporal punishment and "other" discipline. The questionnaire's 40 items are answered using a 5-point Likert scale including the following options: 1 never, 2 almost never, 3 sometimes, 4 often, and 5 always. Higher scores represent more negative parenting practices. To derive an overall negative parenting practices score for each time-point, we summed up all items (excluding the items belonging to the "other" discipline subscale) after reverse coding items belonging to the parental involvement and positive parenting subscale (range 34-170). Finally, we took an average of the negative parenting scores across ages 7, 8, 9, and 11 as an indicator of experiences of negative parenting practices across middle childhood. The total score has been used in previous studies to capture a wider range of more negative, or less suitable parenting practices (see e.g., Escribano et al., 2013; Koyama, et al., 2022). Higher scores represent more negative

parenting practices. The APQ has previously demonstrated good reliability, with Cronbach's alpha coefficients averaging above .70 (Essau et al., 2006). The reliabilities in the current sample were at age 7 ($\alpha = .73$), at 8 ($\alpha = .77$), at 9 ($\alpha = .77$), at 11 ($\alpha = .82$).

Student-Teacher Relationship

The relationship between students and their teachers was measured when children were 11, 13, 15, and 17 years old using 3 items (e.g., "The teacher supports me") relating to student's relationships to their teacher measured on a 4-point Likert scale (*completely untrue to completely true*). A mean score of the three responses from the four selected timepoints (child ages 11, 13, 15 and 17) was calculated for each participant. Internal consistency has previously been reported to be good ($\alpha = .79$ in Obsuth et al., 2021). Higher scores represent worse teacher relationships. The reliabilities in the current sample were at age 11 ($\alpha = .78$), at age 13 ($\alpha = .77$), at age 15 ($\alpha = .81$), at age 17 ($\alpha = .74$).

Negative Affect

Negative affect was measured in the EMA component of the D2M study. The mean response rate was 67%. An abbreviated version of the Positive Affect Negative Affect Schedule Expanded (PANAS-X; Watson & Clark, 1999) including the following affective states was used: afraid, ashamed, distressed, guilty, hostile, nervous and upset. Participants responded using a 5-point Likert scale (*Extremely to Very slightly or Not at all*). After reverse scoring, scores on the individual items were averaged up to create an overall NA score. Higher scores on this measure represent higher levels of negative affect. This was used within a univariate time-series DSEM model in order to derive a measure of EL (innovation variances), EI (autoregressive effects) and within-person NA (means) for each participant. Reliabilities in the current sample were $\alpha = .87$; ICC = .98.

Analytical Plan

To investigate the association between negative parenting, student-teacher relationships, NA, EI and EL, Dynamic Structural Equation Modelling (DSEM; Asparouhov et al., 2018) was used, as implemented in Mplus 8.8 (Muthén & Muthén, 2017). DSEM combines structural equation modelling, time-series analysis and multilevel modelling (McNeish & Hamaker, 2020, Speyer et al., 2022). NA was modelled using a univariate DSEM that disaggregates the data into latent within- and between-person factors. The between-person factor includes the within-person means of NA and the within-person factor includes the within-person temporal deviations from these within-person means (McNeish & Hamaker, 2020). In the within-person component, NA was regressed on NA at the previous timepoint. These lag-1 autoregressive effects represent carry-over effects, that is EI. Further, random innovation variances (within-person variances after accounting for autoregressive effects) were modelled in order to capture individuals' mood variability, that is EL. At the between-person level, NA, EI and EL were allowed to covary. Negative parenting experiences and student-teacher relationships were included as between-person predictors of means, autoregressive effects and innovation variances to explore whether between-person differences in negative parenting experiences and student-teacher relationships significantly moderate NA, EI and EL. To test our moderation hypothesis (hypothesis 3), an interaction between negative parenting experiences and student-teacher relationships was modelled to investigate whether student-teacher relationship moderate the associations between negative parenting experiences mean levels of NA, EI and EL. In the case of significant interaction effects, we planned to probe the interaction by testing the effect of negative parenting on NA, EI and EL at three levels of student-teacher relationships: ± 1 SD from the mean and for the mean of student-teacher relationships. The variables assessing parenting and student-teacher relationships were grand mean centered. See Figure 1 for an illustration of the DSEM model testing the moderation hypothesis. Finally, to test for a potential mediation pathway

(hypothesis 4) of negative parenting practices on NA, EI and EL via student-teacher relationships, we tested a mediation model including pathways from negative parenting practices to student-teacher relationships (a path), from student-teacher relationships to NA, EI, EL (b paths), and a direct pathway from negative parenting practices on NA, EI and EL (c paths). We tested significance of indirect effects by multiplying a and b paths using the Model Constraint command within Mplus. See Figure 2 for an illustration of the tested pathways.

The DSEM model was run using Bayesian estimation utilising the Mplus default uninformative priors and a maximum of 50000 Markov Chain Monte Carlo iterations. After first convergence, the number of iterations was doubled to ensure stable convergence (Potential Scale Reduction values below 1.05). Random innovation variances were modelled using log transformed variances in order to ensure that all values are positive. Time-intervals were set to be equidistant (4-hour intervals) with missing variables introduced where measurement occasions were too far apart. A Bayesian estimation approach was used to facilitate convergence given the large number of random effects (McNeish & Hamaker, 2020). Missing data were consequently treated as additional unknown quantities, and thus sampled from their conditional posterior distribution (McNeish & Hamaker, 2020).

As a sensitivity analysis, we also ran the model controlling for the following covariates: sex (female/male), primary caregiver country of origin (Switzerland/Other) and childhood socioeconomic status (based on mean International Socioeconomic Index of occupational status household scores), and levels of internalising symptoms at age 20 [mean of 13 items measuring internalising symptoms on the Social Behavior Questionnaire (SBQ, Tremblay, 1991); $\alpha = .92$; example items include feeling unhappy, crying, sad without reason] .

Specifically, we added these as predictors of means, autoregressive effects and innovation variances in the between-person part of the model.

Figure 1. DSEM Moderation Model

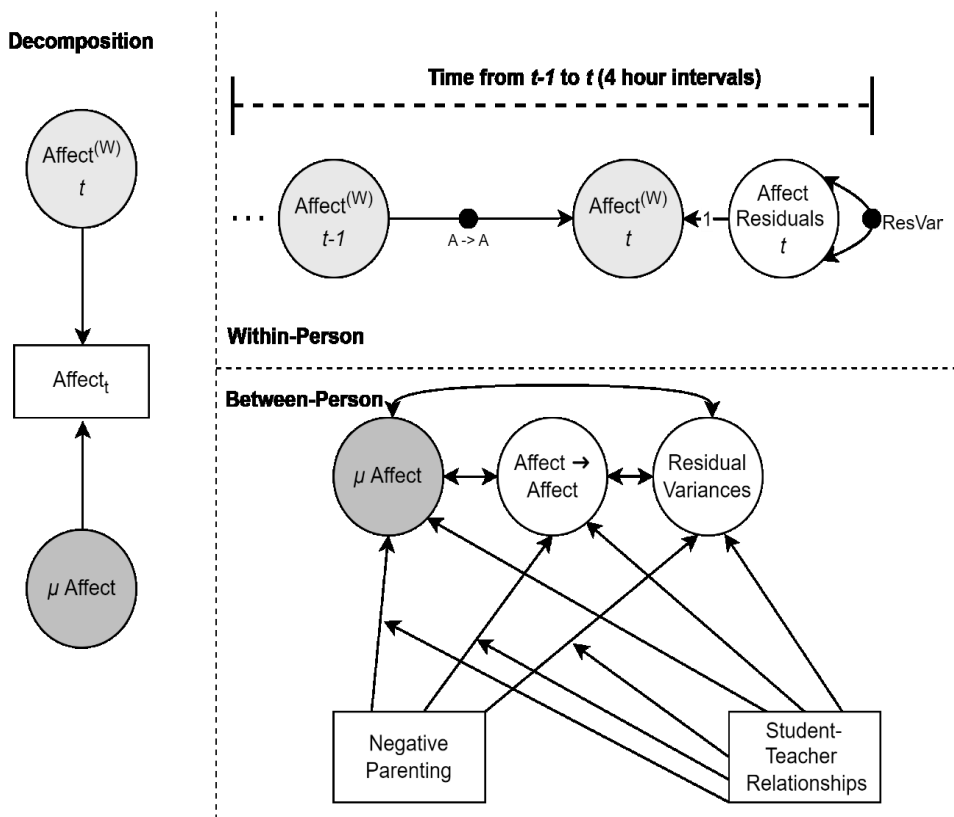
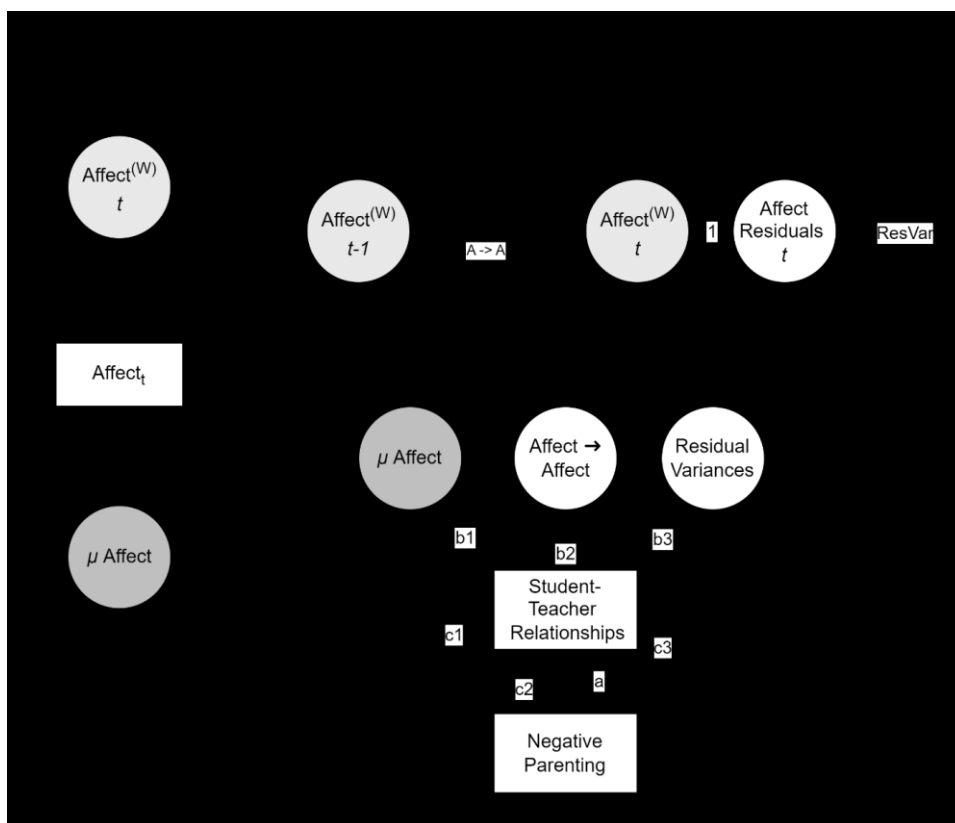


Figure 2. DSEM Mediation Model



Results

Descriptive statistics

Table 1 displays the means, standard deviations and ranges of the key study variables.

Table 1. *Descriptive Statistics*

Variable	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Negative Affect	7278	1.30	0.53	1	5
Student-Teacher Relationship	209	1.80	0.44	1	3.67
Negative Parenting Experiences	209	59.93	8.18	42.67	81.75

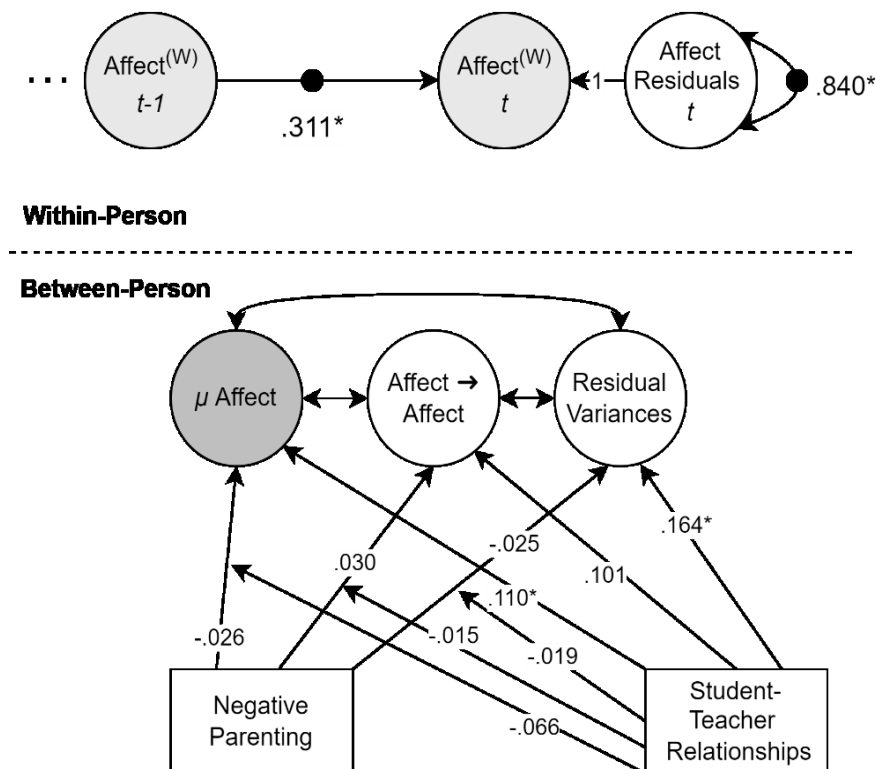
Note. Student-Teacher Relationships were averaged across ages 11, 13, 15, and 17. Negative Parenting Experiences was averaged across ages 7, 8, 9 and 11.

Inferential statistics

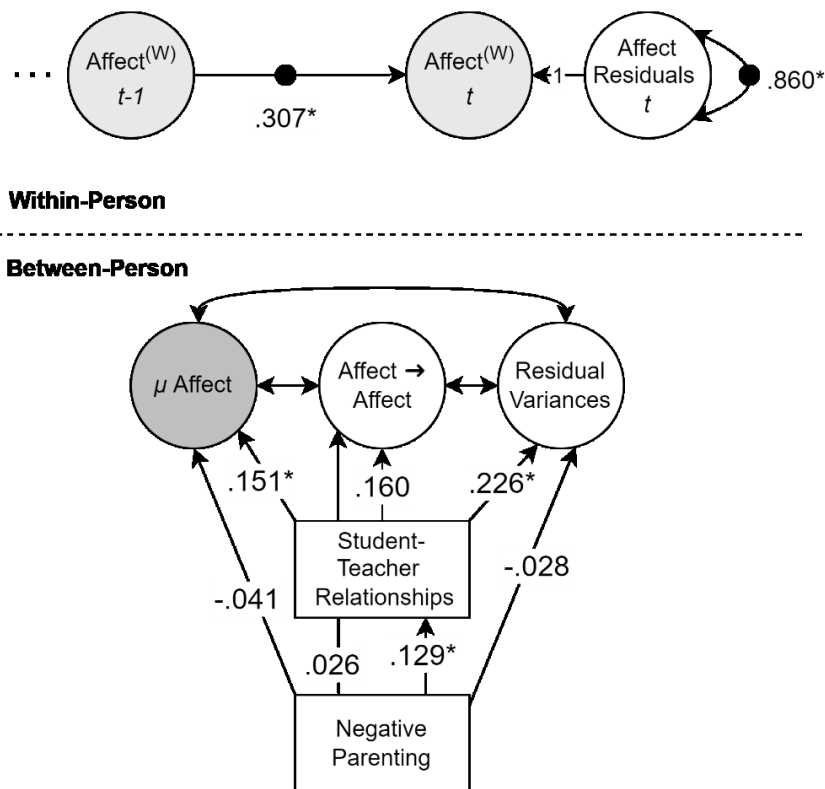
Results of the DSEM showed significant lag-1 autoregressive effects for negative affect, indicating a carry-over effect (EI) of emotions from one moment to the next at the within-person level. At the between-person level, student-teacher relationships significantly predicted the random innovation variances or emotional lability (EL) as well as overall levels of negative affect (NA), with worse student-teacher relationships being associated with increased emotional lability and increased negative affect. On the other hand, negative parenting practices did not predict NA or EL. Emotional inertia was not predicted by either student-teacher relationships or negative parenting. The moderation analysis also did not suggest any significant interaction effects of student-teacher relationships and negative parenting practices on either NA, EI or EL. In contrast, the mediation analysis suggested that student-teacher relationships mediated the associations between negative parenting practices

and EL ($B=0.008$, $CI=0.002-0.017$) but not between negative parenting practices and NA and EI, albeit the indirect effect for NA showing credible intervals just about containing zero ($B=0.001$, $CI=0.000-0.002$). Further, the mediation model suggested that higher levels of negative parenting practices during childhood were associated with worse levels of student-teacher relationships during adolescence. Results of the moderation and mediation models are summarised in Figures 3 and 4, respectively, and available in full on the Open Science Framework: https://osf.io/fhma7/?view_only=b34acc685d4c43428abe7411fd8b722f.

Figure 3. *Standardised Results of the DSEM Moderation Model*



Note. Higher negative affect scores represent higher levels of negative affect, higher student-teacher relationship scores represent worse relationships, and higher negative parenting practices scores represent more negative parenting practices. *Significant based on credible intervals not containing 0.

Figure 4. *Standardised Results of the DSEM Mediation Model*

Note. Higher negative affect scores represent higher levels of negative affect, higher student-teacher relationship scores represent worse relationships, and higher negative parenting practices scores represent more negative parenting practices. *Significant based on credible intervals not containing 0

Sensitivity analyses

Results of the model including covariates suggested that effect of negative student-teacher relationships on increased emotional lability was robust whereas the effect of negative student-teacher relationships on overall levels of negative affect was no longer significant. The mediation pathway of negative parenting practices on emotional lability via student-teacher relationships was also robust to the inclusion of covariates. Of all the control variables, only internalising symptoms at age 20 was an additional significant predictor of means, autoregressive effects and innovation variances. Results are available in full online: https://osf.io/fhma7/?view_only=b34acc685d4c43428abe7411fd8b722f.

Discussion

The aim of the present study was to clarify the nature of the way in which experiences with parents and teachers interact to influence emotional functioning, namely three distinct aspects of emotion regulation: Negative Affectivity (NA), Emotional Inertia (EI) and Emotional Lability (EL). The findings suggested that there was no direct association between negative parenting practices in childhood and mean levels of NA, EI, and EL in early adulthood. Student-teacher relationships, on the other hand, were found to predict both mean levels of NA and EL, with worse student-teacher relationships during adolescence (from age 11 to 17) leading to significantly higher mean levels of NA and EL in young adulthood, at age 20. Furthermore, negative student-teacher relationships did not significantly exacerbate any negative parenting practices. However, negative parenting practices in childhood had an impact on negative student-teacher relationships, which in turn lead to increased emotional lability. This suggests that the quality of student-teacher relationships is a critical factor in shaping the emotional adjustment of young adults.

The finding that relationships with teachers in adolescence significantly predicted NA and EL in young adulthood is in accordance with the increasing literature highlighting the potential for student-teacher relationships to exert an effect on adolescents' and young adults' psychological outcomes (e.g., Ansari et al., 2020; Obsuth et al., 2023; Nivette et al., 2022). It supports the results of recent research suggesting that a positive relationship with a teacher can lead to lower levels of overall emotion dysregulation for students, while conversely showing that worse student-teacher relationships can have a detrimental impact on students' emotion regulation skills; thus, positioning the relationship as both a significant risk and protective factor in young people's developmental trajectories (e.g., De Neve et al., 2023).

The finding that negative parenting practices were not directly associated with either mean levels of NA, EI or EL in early adulthood was unexpected, given the significant body of literature showing the seemingly clear link between parenting style and children's emotion regulation capabilities (e.g., Brody et al., 2014). This may be due to the operationalisation and measurement of negative parenting practices in the current study which relied on a total score of the 34 items of the Alabama Parenting Questionnaire. This approach has been utilised in previous studies (e.g., Escribano et al., 2013; Koyama et al., 2022; Mitchell-Krishnan, 2023; Kleefman et al., 2014) with promising findings suggesting associations between negative parenting and adverse outcomes. However, further examination of this scale, via exploring inter-item correlations suggested that this variable was primarily capturing lack of parental involvement and poor monitoring. Thus, it appears that what we captured and examined in this study was the impact of rather mild forms of negative parenting. It is possible that negative parenting practices may negatively impact functioning only at more extreme forms, such as directly physically or emotionally abusive.

It is also necessary to acknowledge the potential of measurement and timepoints used to have influenced this result. While student-reports of the student-teacher relationship were used, parent-reports of the child-parent relationships were employed. The student-teacher relationship was assessed in adolescence but the child-parent relationship was measured in childhood. As previously outlined, this choice of timepoints was deliberate, to ensure the variables would be ordered in a temporal sequence, consistent with the developmental framework used to conceptualise the study. However, as relationships with parents fluctuate and evolve, if measured at the same time, parental and student-teacher relationships might be found to interact with one another. Future research would benefit from exploring the subtlety of using sequential versus concurrent timepoints further, from utilising a more robust

measure of negative parenting practices and from exploring both maternal and paternal parenting practices.

However, it may be the case that 13 years is too long a time span to expect to see direct effects of mildly negative parenting practices, without accounting for the role of peers, friendships, romantic relationships and other attachment figures in the young person's life. As previously highlighted, adolescence often marks a normative shift in interpersonal relationships, with adolescents relying on their peers for emotional support as opposed to their parents, making these more important proximal influences (Theisen et al., 2018). Indeed, research has found that adolescent friendships have unique effects on young people's emotion regulation (Miller-Slough & Dunmore, 2018). Similarly, romantic relationships in adolescence have partially explained emotion dysregulation among female adolescents, via attachment anxiety (Marszał & Jańczak, 2018). Therefore, it is likely that negative parenting practices in childhood do exert an influence on emotion regulation capabilities in young adulthood, but only in combination with, or through the linking mechanisms of friendships and romantic relationships. The lack of inclusion of peer relationships as a potential moderating or mediating factor is a limitation of the present study.

Our findings, that student-teacher relationships act as a mediating process through which parenting relationships can exert an effect on EL, rather than a moderating factor (meaning they would have either ameliorated or worsened the impact of negative parenting) are more in line with the former outlined pathway. They suggest that even mildly negative parenting can impact negatively upon student-teacher experiences resulting in detrimental outcomes for young people's emotion regulation. Our findings also highlight the developmental, sequential timing of this trajectory; we showed that having experiences of mildly negative parenting in childhood led to perceptions of more negative student-teacher relationships in adolescence, which in turn led to higher emotional lability at age 20. To our

knowledge this is the first study, exploring student-teacher relationships as a mediator of negative parenting and emotional dysregulation. However, the findings are consistent with similar studies related to child attachment in middle childhood (e.g., Neuhaus et al., 2021) in suggesting that childhood experiences of negative parenting may set adolescents up to perceive relationships with other adults in positions of authority as more negative, which in turn relates to negative outcomes. Given our negative parenting measure and what it captures, this may be the case specifically for mild forms of negative parenting, captured by low parental involvement and monitoring. Interestingly, these are also the two parenting practices that have been described to be closely linked to parental sensitivity (DePasquale & Gunnar, 2020), a key construct linked to secure attachment.

Building on attachment theory that has been proposed to explain the role of student-teacher relationships in young people's lives (Verschueren, 2015), it is possible that young people who grow accustomed to negative interactions in the context of negative parenting form internal working models based on these experiences that predispose them to expect the worst in relationships with other adults in positions of authority and care, such as teachers (see Waters et al., 2022). However, it is difficult to ascertain if this is the case as there is still a relative lack of understanding about the factors underlying student-teacher relationships, in terms of what they represent, how they form and how they impact aspects such as NA and EL in young people. While attachment theory offers one explanation, it is possible that other processes (e.g., modelling and social learning theory) are also implicated.

While providing evidence for the importance of nonparental supportive adults in children's psychological wellbeing and development, our findings also serve to highlight that adolescence and the relationships formed throughout are highly developmentally important, even when compared to the critical early childhood period and infant-parent relationships. They illustrate that clearly, there is a need to address the disproportionate focus of attachment

and broader relationships-related research on the parent-child bond and relationships during infancy and childhood, resulting in a scarcity of research on the potential for other adult figures in later life who may become crucial for further development and adjustment.

The current study expands on previous research in several important ways. It provides evidence that the impact of the quality of student-teacher relationships can be lasting, reaching beyond the timeframe or developmental period it encompasses, to years later (in this case, from early adolescence to early adulthood). Furthermore, the current study elucidated which specific components of emotion dysregulation were affected by the quality of relationships with teachers. Interestingly, both the tendency to experience overall negative emotionality (NA), and intense, sudden and frequent shifts in negative emotion (EL), were significantly predicted by student-teacher relationships. While increased NA has long been identified as posing a risk for both physical and psychological health, EL is now increasingly being implicated as a mechanism in a range of deleterious mental health and behavioural outcomes (Maire et al., 2017). This study provides preliminary evidence that NA and EL may be two long-term mechanisms via which adolescent student-teacher relationships might affect adult behavioural outcomes such as aggression, delinquency and prosocial behaviour (Obsuth et al., 2017; 2021), although further research is required to examine this. This finding, and its hypothesised implications, are strengthened by the study's use of 'real world' measures of emotion regulation, as collected in an ecological context, over the course of daily life (Harvey et al., 2022; Pallini et al., 2019).

Further strengths of the current study include reliance on student-reported accounts of the student-teacher relationship, instead of teacher-reported accounts, thus achieving a more accurate representation of the student's perceptions of the relationship. Although employing multiple informant methods and using both student- and teacher-reported accounts would be optimal, previous studies using the z-proso dataset have found that in relation to students'

developmental outcomes, the student-reported account of the relationship appeared to be more relevant (Obsuth et al., 2021). Importantly, the dataset analysed comprised a large and ethnically diverse group of young people, with varying socioeconomical and cultural backgrounds. This greatly contributes to the generalisability of the study's findings. Finally, the longitudinal relations between the variables was explored within a DSEM framework (Asparouhov et al., 2018), thus ensuring the levels of EL analysed were not merely representative of variability within the data but were captured after accounting for overall levels of negative affect and emotional inertia. Limitations include that neither attachment style nor the quality of the parent-child relationship or other important relationships such as peer relationships were examined in the assessment of the association between negative parenting practices and EL. The possibility of bidirectional feedback between student-teacher relationships and students' ability to effectively regulate their emotions must too be acknowledged. Also, our student-teacher relationship measure only included three items, thus captured only some aspects of relationships. Future research may examine other important elements of student-teacher relationship quality and their role in negative affect. Similarly, our negative parenting measure, seemed to primarily capture mild forms of negative parenting in the form of low parental involvement and poor monitoring. Future studies may wish to explore the links between different types of parenting. Furthermore, we focused on negative parenting practices and student-teacher relationships on average over periods of four years. While these findings provide important information, future research may explore these links at specific ages to provide age-specific insights, with a special focus on transition points or critical periods of development.

Our findings have potential implications for interventions. Although there are a host of therapeutic interventions aimed at targeting family relationships, fewer focus specifically on student-teacher relationships. Indeed, to the authors' knowledge there is only one

intervention specifically targeting adolescent-teacher relationships: the LLInC (Leerkracht-Leerling Interactie Coaching in Dutch, or Teacher Student Interaction Coaching; Spilt et al., 2012). There is only preliminary empirical evidence supporting the efficacy of this intervention, but the existing research is optimistic for its success (see Bosman et al., 2021). The need for focus on interventions to improve the quality of student-teacher relationships has been recently highlighted by Harvey and colleagues (2022).

To conclude, this project sheds valuable light on the significance of student-teacher relationships as both risk and protective factors in the socioemotional development of children and young people. It highlights the necessity of incorporating contemporary attachment perspectives into research and challenges the assumption that parental figures are the single most integral figures in terms of children's psychological adjustment. A crucial next step is to extend the research on interventions targeting student-teacher relationships and increasing awareness of the important role that teachers play in young people's lives.

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